DOE/RL-2015-47
Rev. 0

100-BC-2 Operable Unit Interim Remedial Action Report

United States
Department of Energy

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September 2015

United States Department of Energy

P.O. Box 550, Richland, Washington 99352

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ACRONYMS

ACM	asbestos-containing material
BCM	bank cubic meter
BCY	bank cubic yard
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
COC	contaminant of concern
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant difference
FSB	fuel storage basin
ISS	interim safe storage
MEF	metal examination facility
NPL	National Priorities List
OU	operable unit
RAG	remedial action goal
RAO	remedial action objective
RCRA	*Resource Conservation and Recovery Act of 1976*
RDR/RAWP	remedial design report/remedial action work plan
RESRAD	RESidual RADioactivity
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RTD	remove, treat, and dispose
SAP	sampling and analysis plan
SNF	spent nuclear fuel
TPH	total petroleum hydrocarbons
Tri-Parties	U.S. Department of Energy, Richland Operations Office, U.S. Environmental Protection Agency, and Washington State Department of Ecology
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
WAC	*Washington Administrative Code*
WIDS	Waste Information Data System
WSRF	waste site reclassification form
XRF	x-ray fluorescence

Acronyms

1.0 INTRODUCTION

The Hanford Site is a 1,517-km^2 (586-mi^2) federal facility located in southeastern Washington State along the Columbia River (Figure 1-1). From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In 1989, the 100 Area was one of four areas at the Hanford Site placed on the National Priorities List (NPL) under the authority of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Action of 1986*. In 1990, the mission of the Hanford Site changed from producing nuclear materials to cleaning up residual radioactive and hazardous wastes.

The River Corridor is a subregion of the Hanford Site that encompasses approximately 570 km^2 (220 mi^2) (Figure 1-1). The Columbia River borders the River Corridor towards the north and east. The remaining areas of the River Corridor border the Central Plateau, Hanford Reach National Monument, and City of Richland. In 2007, the River Corridor was divided into six geographic areas, commonly referred to as decision areas, to organize the remedial investigation/feasibility study (RI/FS) process for the River Corridor and support development of six final action records of decision (RODs). These decision areas encompass both the 100 Area and 300 Area NPL sites and include source and groundwater operable units (OUs). The six decision areas (100-BC, 100-K, 100-N, 100-D/H, 100-F/IU-2/IU-6, and 300), along with subareas referred to as segments, are shown in Figure 1-2. The 100-BC-2 OU and associated waste sites within and outside of this boundary are the focus of this report.

1.1 PURPOSE AND SCOPE

Interim remedial actions in the 100-BC-2 OU have been implemented to mitigate potential impacts from hazardous chemical and radioactive releases to the soil column as required by interim action RODs. This report documents the completion of interim remedial actions and has been prepared in accordance with U.S. Environmental Protection Agency (EPA) guidance in OSWER Directive 9320.2-22, *Close Out Procedures for National Priorities List Sites.*

This report documents remedial actions completion for source sites (e.g., contaminated soil). This report also provides a summary of the background and history of the Hanford Site (inclusive of the 100-B/C Decision Area), construction information, and performance data.

Figure 1-1. Hanford Site Location Map.

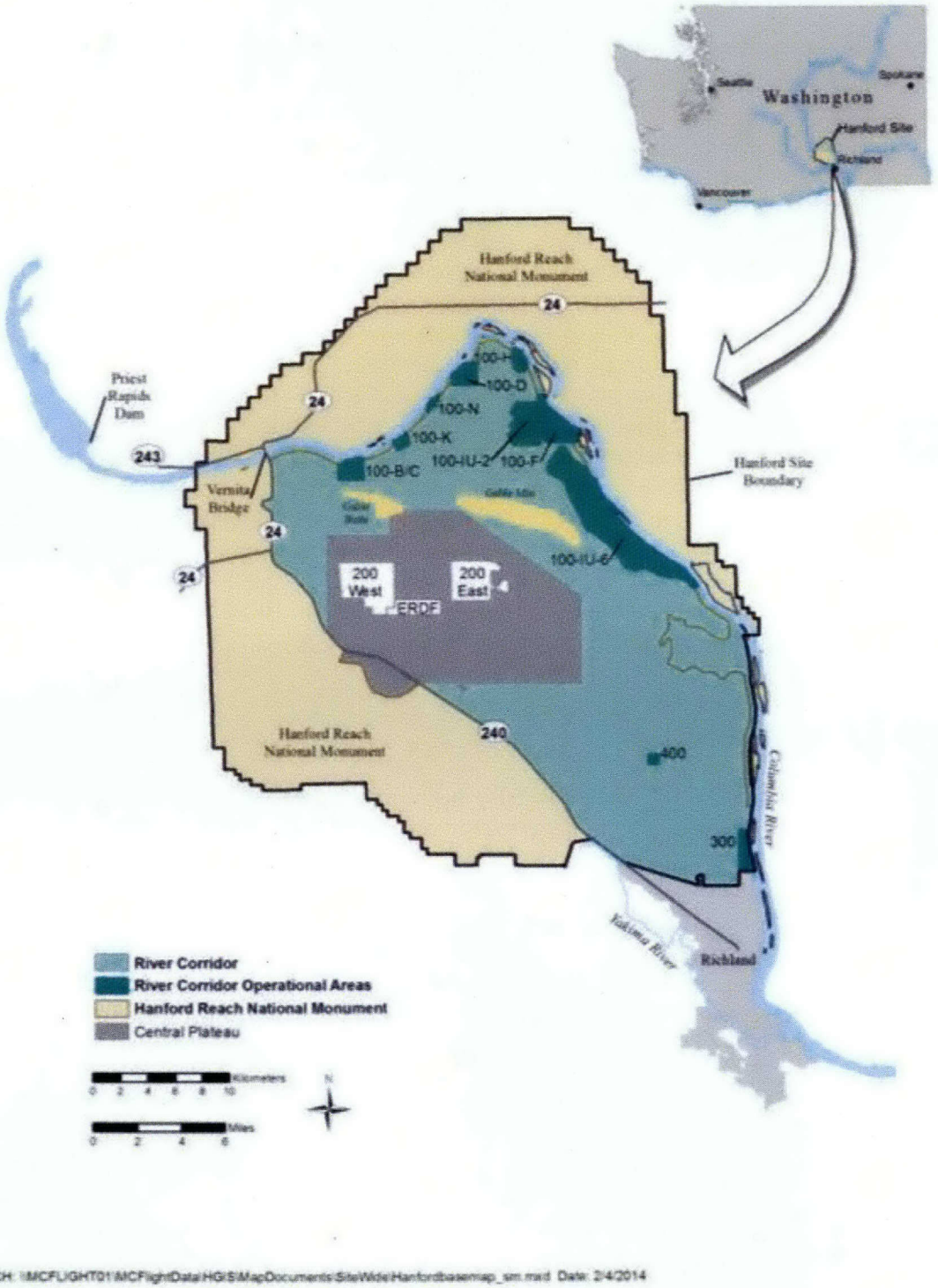
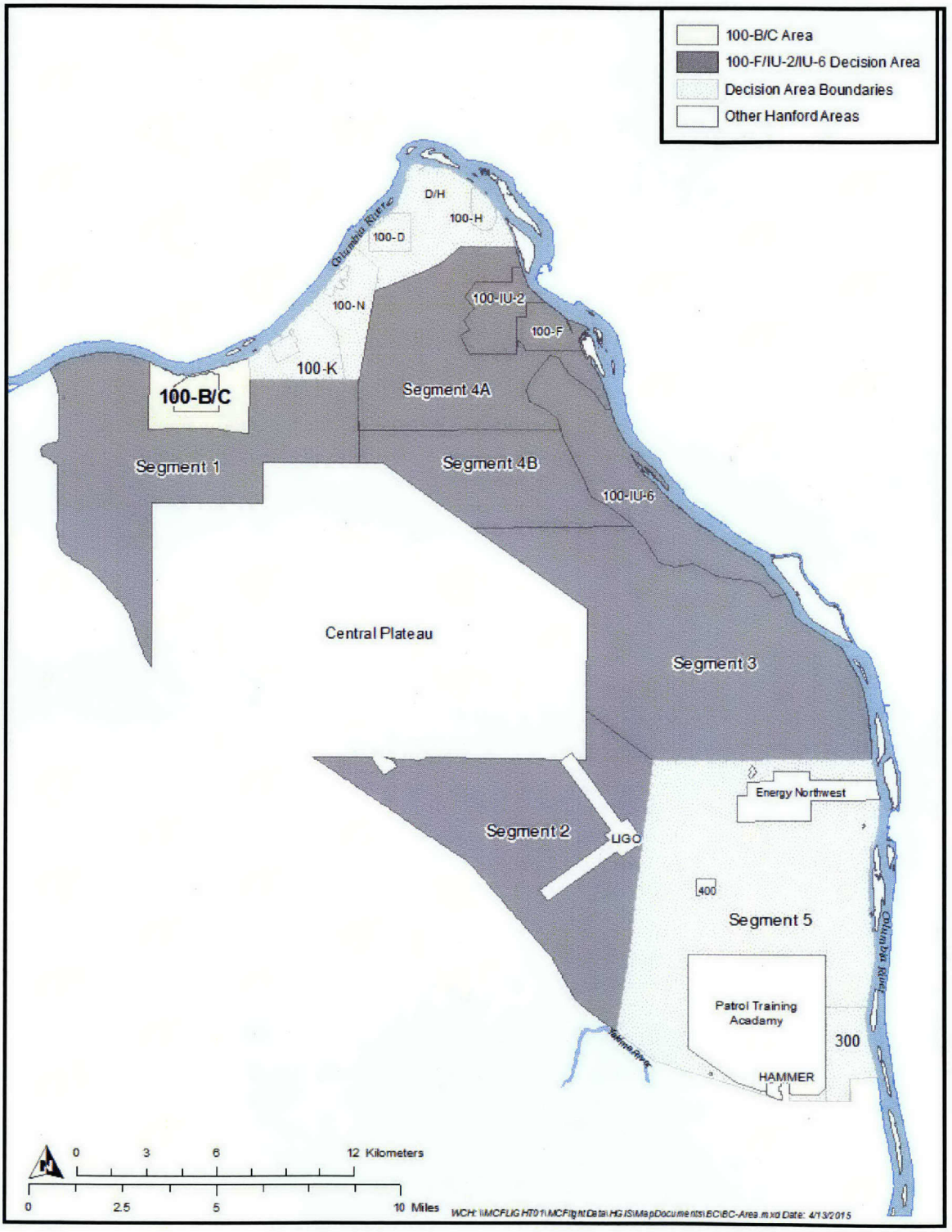


Figure 1-2. Decision Area and Segment Location Map.



Information provided herein presents input for future decision making and evaluation of technology. This report addresses the 100-BC-2 OU waste sites identified in the following decision documents, where remedial action objectives (RAOs) and remedial action goals (RAGs) have been achieved:

- *Amendment to the Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA 1997a)
- "Approved Action Memorandum for the 100 B/C Area Ancillary Facilities and the 108-F Building Removal Action," external letter CCN 042276 (EPA 1997b)
- *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999)
- *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site, Benton County, Washington (100 Area Burial Grounds)* (EPA 2000)
- *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Record of Decision, 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 2004)
- *Explanation of Significant Difference for the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units (100 Area Burial Grounds), Hanford Site, Benton County, Washington* (EPA 2007)
- *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (Remaining Sites Explanation of Significant Differences [ESD]) (EPA 2009)
- *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010 – Annual Listing of Waste Sites Plugged into the Remove, Treat and Dispose Remedy in the 1999 Interim Action Record of Decision for the 100 Area* (DOE-RL 2011)
- *100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2012 – Annual Listing of Waste Sites Plugged into the Remove, Treat and Dispose Remedy in the 1999 Interim Action Record of Decision for the 100 Area Remaining Sites* (DOE-RL 2013).

Sites included in this report have also been evaluated according to RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System."

If new sites are identified, the Remaining Sites ESD (EPA 2009) authorized that newly discovered waste sites in OUs included in the Remaining Sites ROD (EPA 1999) that meet the ROD requirements for plug-in or candidate sites should proceed in accordance with the provisions stated in the ESD (EPA 2009) without publication of an additional ESD. Plug-in sites qualified for cleanup action by remove, treat, and dispose (RTD) because remedial action was needed, while candidate sites required additional characterization to determine if remedial action was necessary. Additions of plug-in and candidate sites were documented in the Hanford Site Administrative Record and published in annual fact sheets issued by the U.S. Department of Energy, Richland Operations Office (DOE-RL) that identified the plug-in and candidate waste sites.

1.2 HANFORD SITE

In early 1943, the U.S. Army Corps of Engineers selected the Hanford Site as the location for production reactors and chemical separation facilities for the production and purification of plutonium for use in nuclear weapons as part of the Manhattan Project, as described in ERDA-1538, *Waste Management Operations Hanford Reservation, Richland, Washington.* Production reactors were constructed in the 100 Area of the Hanford Site along the Columbia River. Separation and purification plants were constructed on the Central Plateau within the 200 Areas of the Hanford Site.

The 100 Area is located along the southern banks of the Columbia River in the northeastern part of the Hanford Site and encompasses an area of approximately 68 km^2 (26 mi^2). The 100-B/C Area is one of six reactor areas in the 100 Area and consists of a 3.5-km^2 (1.4-mi^2) area along the southern shore of the Columbia River. The 100-B/C Area contains two retired nuclear production reactors, the 105-B and 105-C Reactors. The 105-B Reactor was the first of the original three constructed, beginning production in September 1944. The 105-B Reactor was permanently shut down and deactivated in February 1968. It was designated as a National Historic Landmark in August 2008 and is also identified in the *National Defense Authorization Act for Fiscal Year 2015* as part of the Manhattan Project National Historical Park. The 105-C Reactor operated from 1952 until 1969, and interim safe storage (ISS) was completed in September 1998.

The 100-BC-2 OU is one of three OUs in the 100-B/C Area. The 100-BC-1 and 100-BC-2 OUs are source OUs that included solid waste burial grounds, effluent disposal sites, and the associated vadose zone. The 100-BC-5 OU includes the groundwater beneath the source OUs.

1.2.1 100-BC-2 Source Operable Unit

The 100-BC-2 OU contained waste sites associated with the facilities to support 105-C Reactor operations and other waste sites at the 100-B/C Area including most of the solid waste burial grounds. The 105-C Reactor, built similar to the 105-DR Reactor completed 2 years earlier, was started up in September 1952. It utilized as many of the existing 105-B Reactor facilities as possible by expanding these facilities and/or cross-tying pipelines between facilities. The most

significant shared facilities included the river pump house, the reservoir, and the inert gas system. The 105-C Reactor was permanently shut down in April 1969 and in situ stabilized in 1998.

1.2.2 100-BC-1 Source Operable Unit and 100-BC-5 Groundwater Operable Unit

The 100-BC-1 OU contains waste units associated with the originally planned facilities constructed to support the 105-B Reactor operations, as well as the cooling water retention facilities to support both 105-B and 105-C Reactors. Waste sites in this OU included solid waste burial grounds, effluent pipelines, dry wells, tanks, outfall structures, retention basins, and liquid waste receiving sites (i.e., unlined trenches, cribs, and french drains). The *100-BC-1 Operable Unit Interim Remedial Action Report* (DOE/RL-2011-49, Rev. 0) was issued in August 2011.

The 100-BC-5 OU consists of contaminated groundwater beneath the 100-BC-1 and 100-BC-2 OUs. The 100-BC-5 OU groundwater area of interest also includes a large section of the 100 Area west of the 100-B/C Area. Previous assessments have not identified groundwater conditions that warrant interim remedial measures in the 100-BC-5 OU. Previous and current groundwater monitoring are documented in annual sitewide reports, the most recent of which is DOE/RL-2014-32, *Hanford Site Groundwater Monitoring Report for 2013.*

1.3 ENVIRONMENTAL SETTING

The Hanford Site is located within the semiarid Pasco Basin in the northern portion of the Columbia Plateau. Average annual precipitation on the Hanford Site is 16 cm (6 in.). Recharge in the 100 Area is estimated at 0.26 to 1.73 cm/yr (0.1 to 0.7 in.) (PNL-10285, *Estimated Recharge Rates at the Hanford Site).*

The vadose zone in the 100-B/C Area is composed of Hanford formation sand and gravel. The water table is at a depth of approximately 18 to 24 m. The upper portion of the unconfined aquifer beneath most of the 100-B/C Area is in the highly permeable sediments of the Hanford formation. The lower portion of the aquifer, and the entire aquifer near the Columbia River, is within the Ringold unit E sands and gravels. The unconfined aquifer is 32 to 48 m thick, and the base of the aquifer is a silt/clay-rich unit commonly called the Ringold upper mud unit (DOE/RL-2010-96, *Remedial Investigation/Feasibility Study for 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units*).

The hydraulic gradient is steepest in the north near the Columbia River, where the water table is within the Ringold unit E formation. In the northern 100-B/C Area, groundwater flow is primarily to the north during periods of low and moderate river stage. However, when the river stage is very high, river water flows from north to south, into the aquifer. The unconfined aquifer hydraulic gradient is very low in the southern 100-B/C Area where the water table is in the highly permeable Hanford formation. The water table is very flat in the southern 100-B/C Area.

2.0 100-BC-2 AREA BACKGROUND

In anticipation of CERCLA NPL listing of the Hanford Site in 1989, the EPA, Washington State Department of Ecology (Ecology), and the U.S. Department of Energy (DOE) entered into the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989). The Tri-Party Agreement is a legally binding agreement among the EPA, DOE, and Ecology (Tri-Parties) for the purposes of achieving compliance with the remedial action provisions of CERCLA and with treatment, storage, and disposal unit regulation and corrective action provisions of the *Resource Conservation and Recovery Act of 1976* (RCRA).

2.1 INTEGRATION WITH CERCLA CLEANUP ACTIONS

Cleanup actions in the River Corridor were performed in accordance with several interim action RODs that provided a regulatory framework, established cleanup objectives, and identified selected remedies. New waste sites identified and accepted in the Waste Information Data System (WIDS) by the Tri-Parties were added to the Remaining Sites ROD (EPA 1999) as plug-in or candidate sites per the conditions of the RODs or ESD (EPA 2009) by meeting the criteria to require remedial action or by requiring additional characterization.

2.2 REMEDIAL ACTION DECISIONS

In order to expedite the decision-making process to allow cleanup to begin as soon as possible, in 1991 the Tri-Parties adopted a "bias-for-action" approach for the remediation of the Hanford Site called the *Hanford Past-Practice Strategy* (DOE/RL-91-40). The "Past-Practice Strategy" streamlined the RI/FS process for contaminated waste sites to allow remediation to begin earlier than is typically allowed under the traditional CERCLA process. The decision documents authorizing remediation for waste sites in the 100-BC-2 OU include the following:

- *Amendment to the Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA 1997a). This interim action ROD amendment increases the scope of the *Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA 1995) by adding waste sites that received similar waste discharges. This interim action ROD amendment also eliminated soil washing as a possible treatment step for 100 Area liquid effluent disposal sites and provides guidance for revegetation in accordance with DOE/RL-96-19, *Mitigation Action Plan for Liquid Waste Sites in the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units.*

- *Approved Action Memorandum for the 100 B/C Area Ancillary Facilities and the 108-F Building Removal Action* (EPA 1997b). This action memorandum documents the nontime-critical removal actions for the 105-C Reactor Building and ancillary facilities, 105-B ancillary facilities, and the 108-F Building.

- *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 1999), also known as the 100 Area Remaining Sites ROD. This interim action ROD directs remedial action for waste sites that have been termed "100 Area Remaining Sites for Remove, Treat, and Dispose" because of indicated adverse impacts to human health and the environment. In addition, this interim action ROD identifies "Candidate 100 Area Remaining Sites for Plug-in of Remove, Treat and Dispose" because information was insufficient to determine if remedial action is needed. This interim action ROD also directs remedial action at proximity, analogous, and discovery waste sites that can be shown to plug in to the "Remove, Treat, and Dispose" remedy.

- *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site, Benton County, Washington (100 Area Burial Grounds)* (EPA 2000). This interim action ROD defines remedial action for areas used for near-surface disposal of solid wastes containing hazardous substances. The selected remedy includes removing contaminated soils, structures, and debris with disposal at the Environmental Restoration Disposal Facility (ERDF).

- *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 2004). Following the issuance of the Remaining Sites ROD in 1999, ongoing remedial activities in the 100 Area identified 28 additional waste sites, 2 of which were assigned to the 100-BC-2 OU. These sites were added using the "plug-in" approach to the 100 Area RTD remedy.

- *Explanation of Significant Difference for the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site, Benton County, Washington (100 Area Burial Grounds)* (EPA 2007). This ESD specifically addressed the 118-B-1 Burial Ground located in the 100-BC-2 OU and allowed for the modeling in the soil to be conducted without accounting for the irrigation rate for tritium at the waste site. In addition, it prohibited irrigation at the 118-B-1 waste site for 140 years.

- *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (Remaining Sites ESD) (EPA 2009). This ESD added 99 waste sites that were "plugged in" and remediated in accordance with the Remaining Sites ROD or that had been remediated in accordance with the plug-in approach without prior issuance of an ESD. Also, this ESD added 87 newly discovered waste sites that were candidates for remediation, 3 of which were assigned to the 100-BC-2 OU.

- *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010 – Annual Listing of Waste Sites Plugged into the Remove, Treat and Dispose Remedy in the 1999 Interim Action Record of Decision for the 100 Area* (DOE-RL 2011). The 2009 ESD authorized that additions of plug-in and candidate sites would be documented in the Administrative Record and a fact sheet would be published by DOE annually identifying the plug-in and candidate sites that were added. This fact sheet added 43 waste sites, 1 that was assigned to the 100-BC-2 OU and 2 that were located in the 100-B/C Decision Area that were remediated in accordance with the Remaining Sites ROD or were remediated in accordance with the plug-in approach without prior issuance of an ESD. In addition, the fact sheet listed 20 candidate sites that required further evaluation.

- *100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2012 – Annual Listing of Waste Sites Plugged into the Remove, Treat and Dispose Remedy in the 1999 Interim Action Record of Decision for the 100 Area Remaining Sites* (DOE-RL 2013). This fact sheet added two waste sites in the 100-IU-2 and 100-IU-6 OUs that were remediated in accordance with the Remaining Sites ROD or were remediated in accordance with the plug-in approach without prior issuance of an ESD. In addition, the fact sheet listed nine candidate sites that required further evaluation, one of which was assigned to the 100-BC-2 OU.

The decision documents described above also directed remedial action at waste sites within other River Corridor areas. However, this remedial action report only documents remedial action completed at waste sites in the 100-BC-2 OU.

Sites in the 100-BC-2 OU have a WIDS site classification/reclassification status of "Accepted," "Not Accepted," "No Action," "Interim Closed Out," and "Rejected." The following is a listing of the definitions of these terms from the *Tri-Party Agreement Handbook Management Procedures* (RL-TPA-90-0001):

- **Accepted:** A classification status indicating an assessment has been made that a WIDS site is a waste management unit.

- **Interim Closed Out:** A historical reclassification status indicating, due to actions taken, a waste management unit meets cleanup standards specified in an interim action ROD or action memorandum, but for which a final action ROD has not been issued. Use of **Interim Closed Out** in this report as documented on pre-2011 waste site reclassification forms (WSRFs) essentially means "Interim," a reclassification category indicating that the reclassification is based upon cleanup standards specified in an interim decision document (e.g., an interim ROD). A site with an interim reclassification will need a final reclassification to be fully dispositioned.

- **No Action:** A reclassification status indicating a waste site does not require any further remedial action under RCRA Corrective Action, CERCLA, or other cleanup standards based on an assessment of quantitative data collected for the waste site.

- **Not Accepted:** A classification status indicating an assessment has been made that a WIDS site is not a waste management unit.

- **Rejected:** A reclassification status indicating a waste site does not require remediation under RCRA Corrective Action, CERCLA, or other cleanup standards based on qualitative information such as a review of historical records, photographs, drawings, walkdowns, ground-penetrating radar scans, and shallow test pits. Such investigations do not include quantitative measurements.

Regulator approval of site status is documented on a WSRF, which is accompanied by a regulator-reviewed site-specific informal report discussing the reasons and justification for reclassification. Site classification and reclassification status are documented in WIDS and serve as formal notification to the public of site status.

A total of 42 waste sites (not including subsites) are identified within the scope of this report (Table 2-1). The locations and classification/reclassification status of all 100-BC-2 OU sites are shown in Figure 2-1.

The *100-BC-1 Operable Unit Interim Remedial Action Report* (DOE/RL-2011-49, Rev. 0) was issued in August 2011. For the purpose of completeness for the entire 100-B/C Decision Area, two sites (600-345 and 600-346) located outside of the 100-B/C operational area but within the 100-B/C Geographical Decision Area have been included in this report. The 600-345 and 600-346 waste sites are also identified for no additional action in the *Record of Decision, Hanford 100 Area Superfund Site 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units* (100-F/IU-2/IU-6 Final ROD) (EPA 2014).

NOTE: One accepted waste site that is currently part of the 100-BC-2 OU is not included in this report. The 118-C-3:1 subsite is currently in the process of being evaluated for the reclassification of "Rejected."

2.3 EXPOSURE AND LAND-USE ASSUMPTIONS

The reasonably anticipated future land use is important in CERCLA remedial actions in determining the appropriate extent of remediation. Future land use affects the types and frequency of exposures to residual contamination for both human and ecological receptors, thereby influencing the amount of cleanup needed. Decisions on future land use at the Hanford Site had not been made at the time most of the interim action RODs were issued.

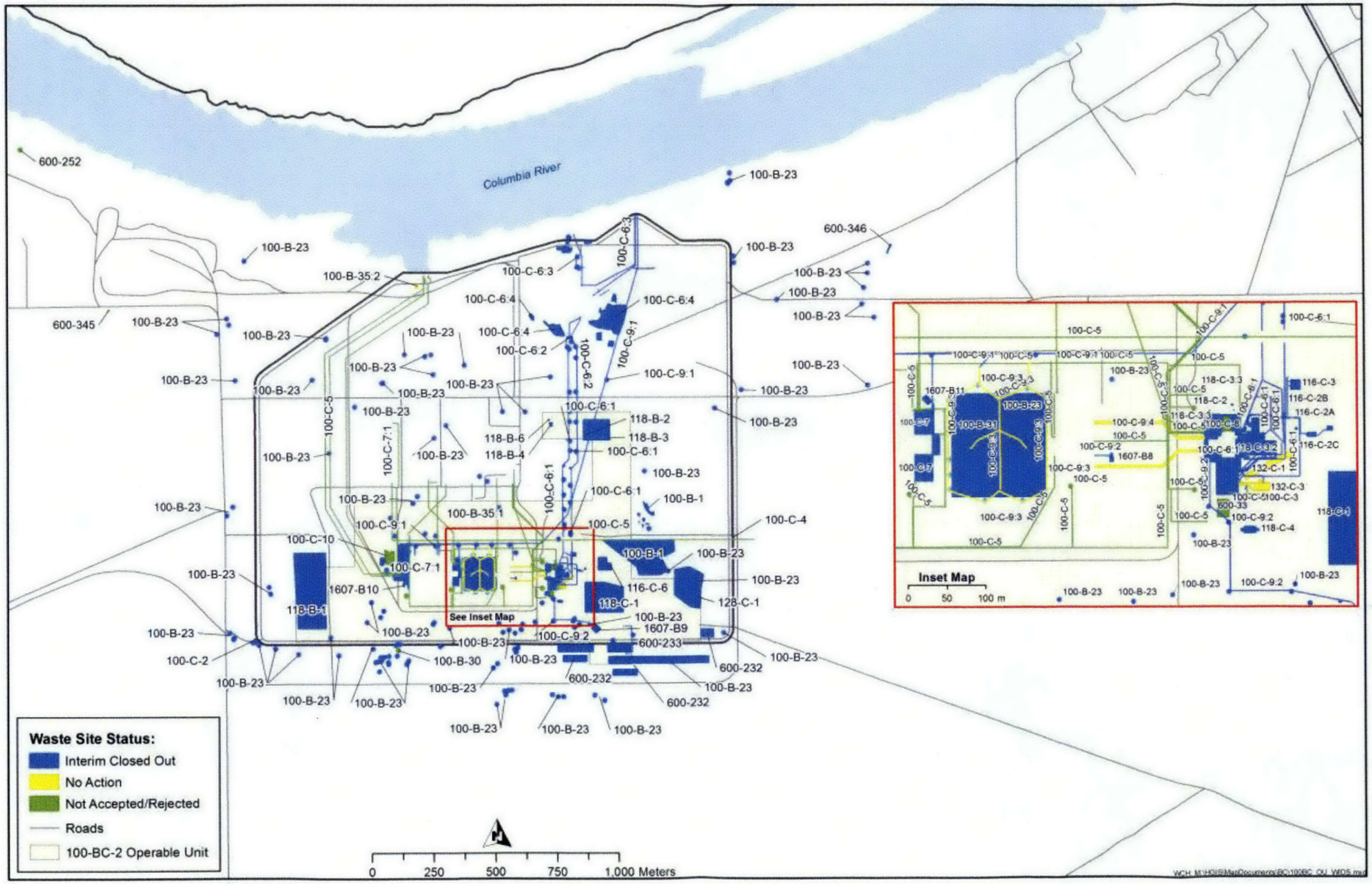
Table 2-1. 100-BC-2 Operable Unit Area Sites. (2 Pages)

Waste Information Data System Site Code/Name	Waste Site Status
100-B-1, Surface Chemical and Solid Waste Dumping Area, Laydown Yard	Interim Closed Out
100-B-23, 100-B/C Surface Debris	Interim Closed Out
100-B-30, Pipe South of 100-B/C	Not Accepted
100-B-31, Garnet Sand at the 183-C Clearwell Pads	Interim Closed Out
100-B-35:1, 151-B Primary Substation	Interim Closed Out
100-B-35:2, 152-B1 Secondary Substation	No Action
100-C-2, Possible Building Foundation and Parking Lot, Monitoring Station 1614-B-1	Not Accepted
100-C-3, 119-C Sample Building French Drain, 119-C French Drain	Interim Closed Out
100-C-4, Export Water Line Valve Pit	Not Accepted
100-C-5, 100-C Service Water Pipelines, 100-C Clean Water Pipelines	Not Accepted
100-C-6:1, 100-C Area South Effluent Pipelines	Interim Closed Out
100-C-6:2, 100-C Area North Effluent Pipelines	Interim Closed Out
100-C-6:3, 100-C Retention Basin to Outfalls Effluent Pipelines	Interim Closed Out
100-C-6:4, B/C Pipelines Discovery Areas	Interim Closed Out
100-C-7, 183-C Filter Building/Pumproom Facility Foundation and Demolition Waste	Interim Closed Out
100-C-7:1, 183-C Water Treatment Facility Head House Foundation and Stained Soils	Interim Closed Out
100-C-8, 105C Hydraulic Oil Release	Rejected
100-C-9:1, 100-C Main Process Sewer Collection Line	Interim Closed Out
100-C-9:2, 100-C Sanitary Sewer Lines	Interim Closed Out
100-C-9:3, 183-C Clearwell Pipelines	No Action
100-C-9:4, 100-C Cooling Water Transfer Pipelines and Tunnels	No Action
100-C-10, Yellow Stained Area Northwest of the 183-C Headhouse	Not Accepted
116-C-2A, 105-C Pluto Crib, 116-C-2, 105-C Crib	Interim Closed Out
116-C-2B, 105-C Pluto Crib Pump Station, 116-C-2-1, 116-C-2B Pump Station	Interim Closed Out
116-C-2C, 105-C Pluto Crib Sand Filter, 116-C-2-2, 116-C-8	Interim Closed Out
116-C-3, 105-C Chemical Waste Tanks	Interim Closed Out
116-C-6, 105-C Fuel Storage Basin Cleanout Percolation Pit, 105-C Pond	Interim Closed Out
118-B-1, 105-B Burial Ground, 105-B Solid Waste Burial Ground, Operations, Solid Waste Burial Ground, 108-B Burial Ground, Ext. to BG No. 1	Interim Closed Out
118-B-2, Construction Burial Ground No. 1, Minor Construction Burial Ground No. 1	Interim Closed Out

Table 2-1. 100-BC-2 Operable Unit Area Sites. (2 Pages)

Waste Information Data System Site Code/Name	Waste Site Status
118-B-3, Construction Burial Ground No. 2	Interim Closed Out
118-B-4, 105-B Spacer Burial Ground, 105-B Dummy Burial Ground	Interim Closed Out
118-B-6, 108-B Solid Waste Burial Ground, 108-B Solid Waste Burial Ground, No. 2	Interim Closed Out
118-C-1, 105-C Burial Ground, 105-C Solid Waste Burial Ground, 118-C-1, Burial Ground	Interim Closed Out
118-C-2, 105-C Ball Storage Tank, Ball 3X Storage Tank	Interim Closed Out
118-C-3:2, 105-C Reactor Building Below-Grade Structures and Underlying Soils	Interim Closed Out
118-C-3:3, 105-C French Drains	Interim Closed Out
118-C-4, 105-C Horizontal Control Rod Storage Cave	Interim Closed Out
124-C-4, Sanitary Waste Site	Not Accepted
128-C-1, 100-C Burning Pit	Interim Closed Out
132-C-1, 116-C Reactor Exhaust Stack Site, 105-C Reactor Stack Site	No Action
132-C-3, 117-C Filter Building	No Action
600-33, 105-C Reactor Test Loop Burial Site	Rejected
600-252, Old Tank from RCRA General Inspection #LORIVFY97 Item #8	Not Accepted
600-232, 100B Electrical Laydown Area	Interim Closed Out
600-233, Vertical Pipe Near 100B Electrical Laydown Area	Interim Closed Out
600-345, 100-BC Vicinity Oil Stain and Filter Area	Interim Closed Out
600-346, 100-BC Vicinity Ash and Debris Area	Interim Closed Out
1607-B8, 1607-B8 Septic Tank System, 124-C-2, 1607-B8 Sanitary Sewer System, Septic Tank & Disposal Field for 190-C Pumphouse	Interim Closed Out
1607-B9, 1607-B9 Septic Tank System, 1607-B9 Sanitary Sewer System, 124-C-3	Interim Closed Out
1607-B10, 1607-B10 Septic Tank System, Sewage Disposal Field	Interim Closed Out
1607-B11, 1607-B11 Septic Tank System	Interim Closed Out

Figure 2-1. 100-BC-2 Operable Unit Waste Site Location Map.



In the absence of such decisions, an assumption of "unrestricted use" was used to select a cleanup remedy and establish cleanup goals, such that future use of the land would not be precluded by contamination left from past Hanford Site operations. Unrestricted surface use was represented by a hypothetical rural-residential scenario. The interim action RODs stated that remediation to this scenario would also be protective of ecological receptors.

Under the unrestricted surface use scenario represented by an individual in a rural-residential setting, a human living in the remediated areas is conservatively assumed to consume crops raised in a backyard garden, meat and milk from locally raised livestock, and meat from game animals and fish. The following exposure pathways are used to consider estimated doses from radionuclides in soil: inhalation; soil ingestion; ingestion of crops, meat, fish, drinking water, and milk; and external gamma exposure. Unrestricted land-use cleanup levels for chemicals or nonradionuclides are based on *Washington Administrative Code* (WAC) 173-340-740(3), "Unrestricted Land Use Soil Cleanup Standards." The exposure pathway for residual nonradiological contamination is from ingestion of contaminated soil.

The final ROD for the 100-B/C Geographic Decision Area will incorporate prevailing exposure and land-use assumptions through an RI/FS. The RI/FS will incorporate applicable or relevant and appropriate requirements contained in prevailing guidance and regulations to support final RODs that are protective of human health and the environment. As a result, the assumptions that serve as the basis for establishing cleanup goals in the final ROD may be different from those reflected in the interim action RODs. Section 5.2 provides additional discussion on the final RODs for the River Corridor OUs. Once final RAOs have been met for the OU, a final remedial action report will be prepared.

2.4 REMEDIAL ACTION REQUIREMENTS

Implementation of remedial actions at the 100-BC-2 OU waste sites were done in accordance with interim action RODs that required implementation of the selected cleanup remedy to address actual or threatened releases.

The major components of the selected remedy (i.e., RTD) include the following:

- Planning and implementation of the remedial action according to an approved remedial design report/remedial action work plan (RDR/RAWP) document
- Stockpiling uncontaminated overburden and use for backfilling excavations when feasible
- Removal of contaminated soil, structures, and associated debris
- Disposing of contaminated materials at the Hanford Site's ERDF, or other disposal facilities approved in advance by EPA
- Treatment, as necessary, to meet waste acceptance criteria at an acceptable disposal facility

- Recontouring and backfilling of excavated areas and restoring viable habitat by revegetating the impacted area

- Identifying institutional controls to prevent exposure to contamination by limiting land or resource uses if needed

- Demonstrating that residual contamination concentrations are protective of humans and the environment.

The RAOs were met by implementing the selected remedy with an "observational approach." The observational approach consisted of two main steps: compilation of available data and the "characterize-and-remediate-in-one-step" methodology. The first step relied on recorded information from historical process operations and information from investigations addressing the nature and extent of contamination. This initial step of characterization was a prerequisite task to field remediation and was used to develop an initial understanding of site conditions. The second methodology consisted of site excavation, field screening, and in-process sampling for contaminants at sites where remedial action and cleanup goals had been selected. Remediation proceeded until it was demonstrated through a combination of field screening, in-process sampling, and verification sampling that cleanup goals were achieved.

The RTD remedy for the waste sites in the 100-BC-2 OU involved removing clean and contaminated soils, debris, and anomalous waste present within waste site boundaries. The materials exposed during excavation were monitored for radiological and hazardous chemical constituents as defined, for example, in DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan* (100 Area SAP). During remediation of known dump sites or burial grounds, extra measures were taken for materials to be sorted for waste disposition. During excavation, soils were monitored for both radiological and chemical constituents. Activities were guided during excavation using data obtained from in situ analytical systems or in-process sampling using quick-turnaround laboratory analyses working concurrently with excavation.

Upon completion of remediation at each waste site, verification sampling and analyses were performed to verify attainment of cleanup criteria for all contaminants of concern (COCs) and contaminants of potential concern (COPCs). Statistical and focused sampling approaches were used in accordance with the applicable SAP. If analytical results indicated that cleanup criteria have not been achieved, then excavation resumed with appropriate analyses as guidance. Remediation proceeded until it was demonstrated through a combination of field screening, in-process sampling, and verification sampling that cleanup goals were achieved.

Specific RAOs associated with the selected remedy and the method for achieving the objectives through remedial actions are discussed in DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP), and summarized in Table 2-2.

Table 2-2. 100 Area Operable Unit Cleanup Objectives.

Remedial Action Objective	Compliance Methods
Protect human and ecological receptors from exposure to contaminants in soils, structures, and debris by dermal exposure, inhalation, or ingestion of radionuclides, inorganics, or organics.	Achieved through excavation to State of Washington WAC 173-340, "Model Toxics Control Act – Cleanup," levels for organic and inorganic chemical constituents in soil to support unrestricted (residential) use. Achieved human health total radiological dose standards of less than 15 mrem/yr above background for radionuclides.
Control the sources of groundwater contamination to minimize the impacts to groundwater resources, protect the Columbia River from further adverse impacts, and reduce the degree of groundwater cleanup that may be required under future actions.	Protection such that contaminant levels in soil after remediation did not result in an adverse impact to groundwater that exceeded any nonzero maximum contaminant level goals under the *Safe Drinking Water Act of 1974* or Method B cleanup levels under WAC 173-340, "Model Toxics Control Act – Cleanup." Protection such that contaminant levels in the soil after remediation did not result in an impact to groundwater and the Columbia River that exceeded the ambient water quality criteria under the *Clean Water Act of 1977* for protection of fish or Method B cleanup levels under WAC 173-340, "Model Toxics Control Act – Cleanup." Because there are no ambient water quality criteria for radionuclides, maximum contaminant levels from national primary drinking water standards were used. The protection of receptors (aquatic species, with emphasis on salmon) in surface waters was achieved by reducing or eliminating further contaminant loadings to groundwater such that receptors at the groundwater discharge in the Columbia River were not subjected to any additional adverse risks.
To the extent practicable, return soil concentrations to levels that allow for unlimited future use and exposure. Where it is not practicable to remediate to levels that will allow for unrestricted use in all areas, institutional controls and long-term monitoring will be required.	This remedial action objective was achieved by removing waste sites to the bottom of the engineered structure and providing institutional controls, as required. Institutional controls include prevention of uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft), and prohibiting irrigation for 140 years.

WAC = *Washington Administrative Code*

2.5 REMEDIAL DESIGN SUMMARY

The general design and approach for remediation of the 100-BC-2 OU waste sites is documented in the 100 Area RDR/RAWP (DOE/RL-96-17). The RDR/RAWPs were prepared and maintained to implement the interim action RODs.

3.0 CHRONOLOGY OF EVENTS

A chronology of major events associated with the implementation of interim remedial action for the sites within the 100-BC-2 OU is presented in Table 3-1. A summary of associated events by waste site is depicted in Figure 3-1.

Table 3-1. 100-BC-2 Operable Unit Chronology. (3 Pages)

Year	Event
1995	*Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford, Site, Benton County, Washington* (EPA 1995)
1996	*Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 0).
1997	*Amendment to the Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA 1997a) *Approved Memorandum for the 100 B/C Ancillary Facilities and the 108-F Building Removal Action* (EPA 1997b) *100 Area Remedial Action Sampling and Analysis Plan* (DOE/RL-96-22, Rev. 0) Waste sites not accepted: 100-C-4 September 124-C-4 September
1998	*Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 1) *100 Area Remedial Action Sampling and Analysis Plan* (DOE/RL-96-22, Rev. 1) *Tri-Party Agreement Handbook Management Procedures* (RL-TPA-90-0001, Rev. 0)
1999	*Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County Washington* (EPA 1999)
2000	*Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2,100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site, Benton County, Washington (100-Area Burial Grounds)* (EPA 2000) *100 Area Burial Grounds Focused Feasibility Study Report* (DOE/RL-98-18) *100 Area Remedial Action Sampling and Analysis Plan* (DOE/RL-96-22, Rev. 2) *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 2) Interim Closed Out: 116-C-2A March 116-C-2B March 116-C-2C March 118-C-3:2 August
2001	*100 Area Burial Grounds Remedial Action Sampling and Analysis Plan* (DOE/RL-2001-35) *100 Area Remedial Action Sampling and Analysis Plan* (DOE/RL-96-22, Rev. 3) *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 3) Waste site not accepted: 600-252 February

Table 3-1. 100-BC-2 Operable Unit Chronology. (3 Pages)

Year	Event
2002	*Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 4) Waste sites not accepted: 100-C-2 April 100-C-5 April Waste site rejected: 100-C-8 March
2003	Interim Closed Out: 100-C-3 July 132-C-1 September 132-C-3 September 116-C-6 January 118-C-4 September 1607-B8 July 1607-B9 August 1607-B10 July 1607-B11 July
2004	*Explanation of Significant Differences for the 100 Area Remaining Sites Interim Record of Decision, 100-BC-1, 100-BC-2 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 2004) *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 5). Waste site rejected: 600-33 December Interim Closed Out: 100-C-6:1 April 100-C-6:2 February 100-C-6:3 February 100-C-6:4 February 118-B-4 May 118-C-2 July No Action: 100-C-9:3 June 100-C-9:4 June
2005	*100 Area Remedial Action Sampling and Analysis Plan* (DOE/RL-96-22, Rev. 4). *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 5) Interim Closed Out: 118-B-2 April 118-B-3 April 128-C-1 August 600-232 January 600-233 December

Table 3-1. 100-BC-2 Operable Unit Chronology. (3 Pages)

Year	Event
2006	Interim Closed Out: 100-B-1 April 118-B-6 June 118-C-3:3 April
2007	*Explanation of Significant Difference for the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units (100 Area Burial Grounds)* (EPA 2007) Interim Closed Out: 100-C-9:1 June 100-C-9:2 July 118-C-1 July
2008	Interim Closed Out: 100-B-23 June 116-C-3 January 118-B-1 January
2009	*Explanation of Significant Differences for the 100 Area Remaining Sites Interim Action Record of Decision* (EPA 2009) *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 6) *100 Area Remedial Action Sampling and Analysis Plan* (DOE/RL-96-22, Rev. 5) Waste sites not accepted: 100-B-30 March
2010	Interim Closed Out: 100-B-31 January 600-345 October 600-346 September
2011	*100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010 – Annual Listing of Waste Sites Plugged into the Remove, Treat and Dispose Remedy in the 1999 Interim Action Record of Decision for the 100 Area* (DOE-RL 2011)
2012	Waste sites not accepted: 100-C-10 November RAGs and RAOs achieved at waste sites: 100-C-7 June
2013	*100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2012 – Annual Listing of Waste Sites Plugged into the Remove, Treat and Dispose Remedy in the 1999 Interim Action Record of Decision for the 100 Area Remaining Sites* (DOE-RL 2013)
2014	No Action: 100-B-35:2 June Interim Closed Out: 100-C-7:1 March
2015	Interim Closed Out: 100-B-35:1 TBD

RAG = remedial action goal
RAO = remedial action objective
TBD = to be determined

Figure 3-1. Summary of Major 100-BC-2 Operable Unit Events. (7 Pages)

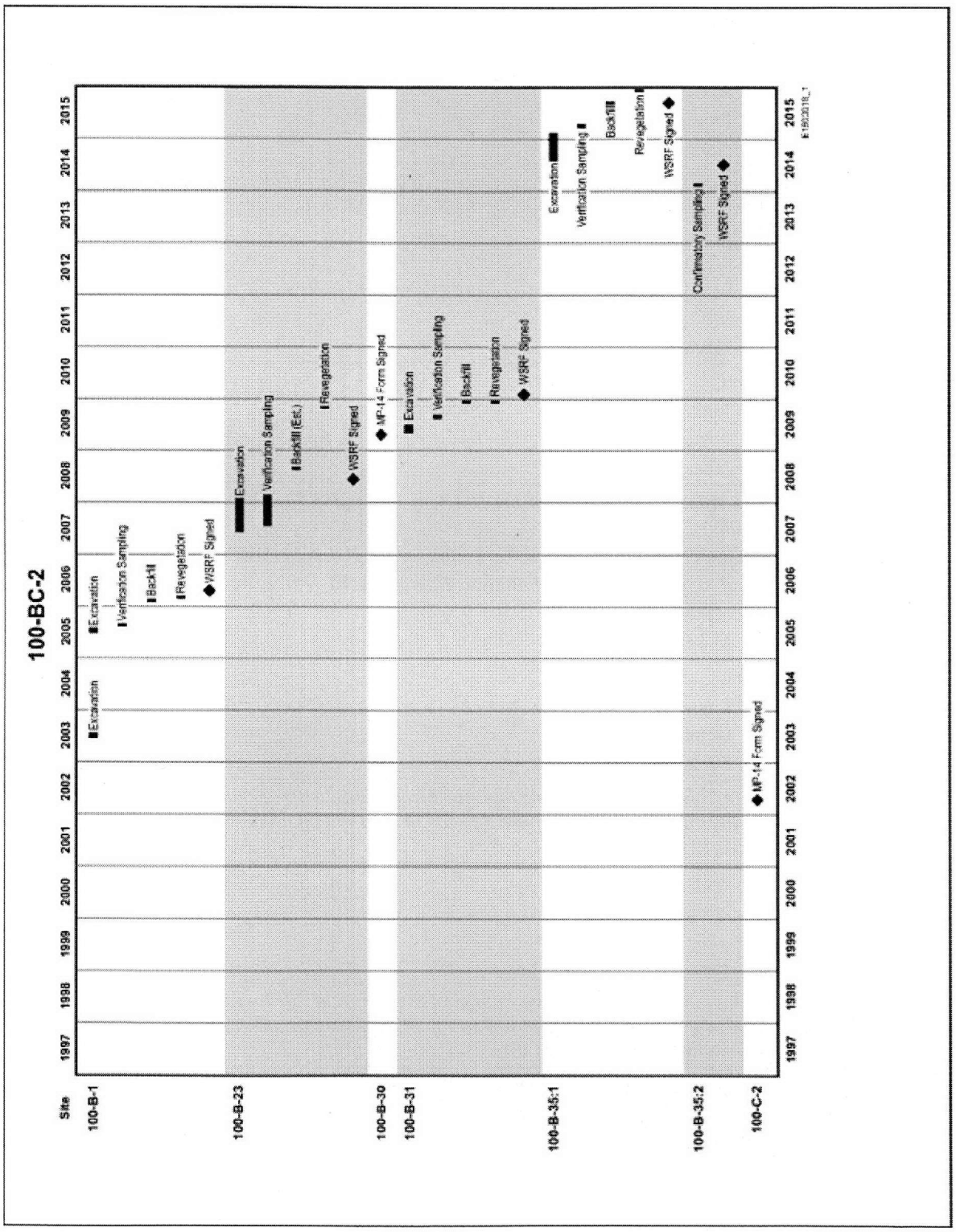


Figure 3-1. Summary of Major 100-BC-2 OU Events. (7 Pages)

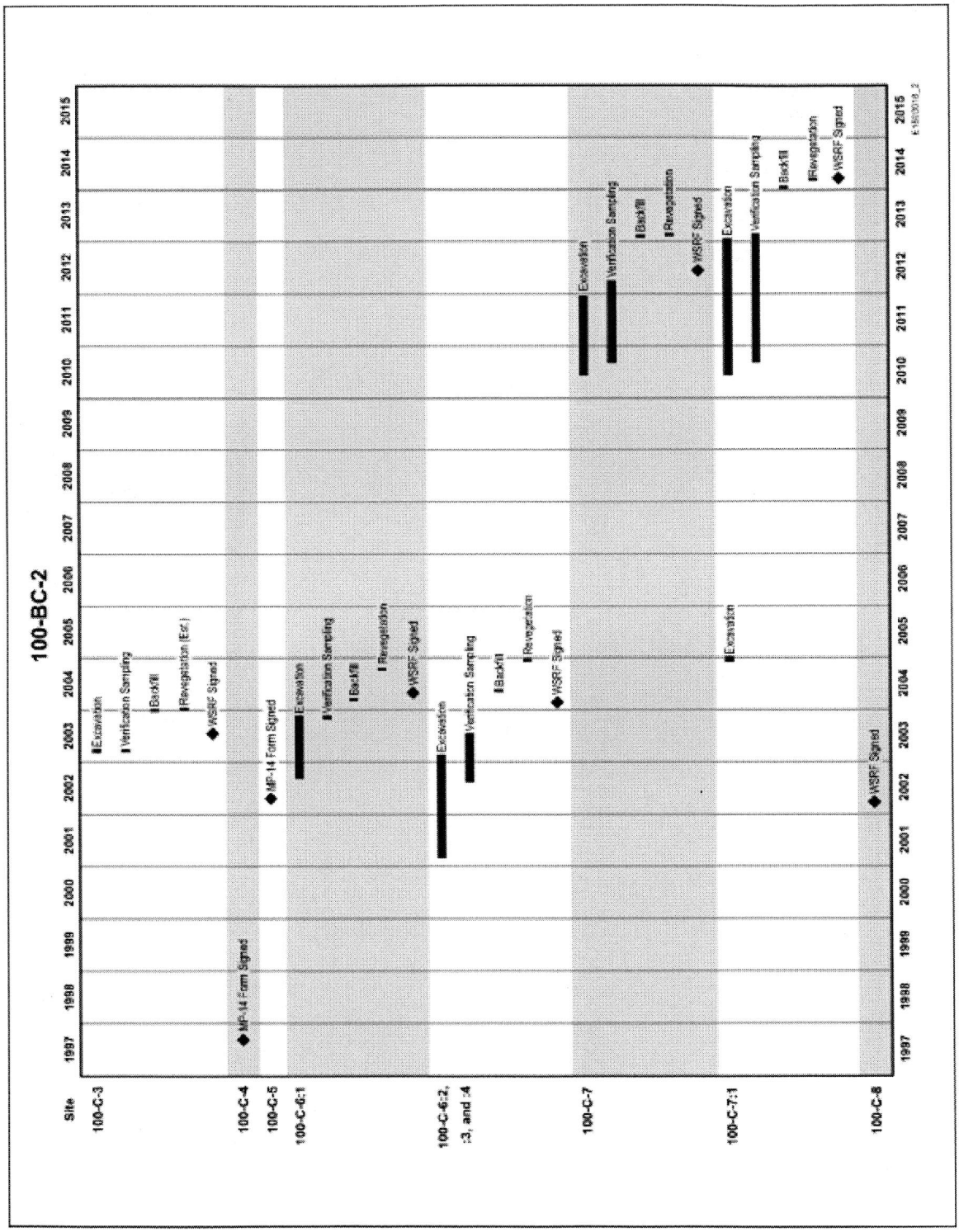


Figure 3-1. Summary of Major 100-BC-2 OU Events. (7 Pages)

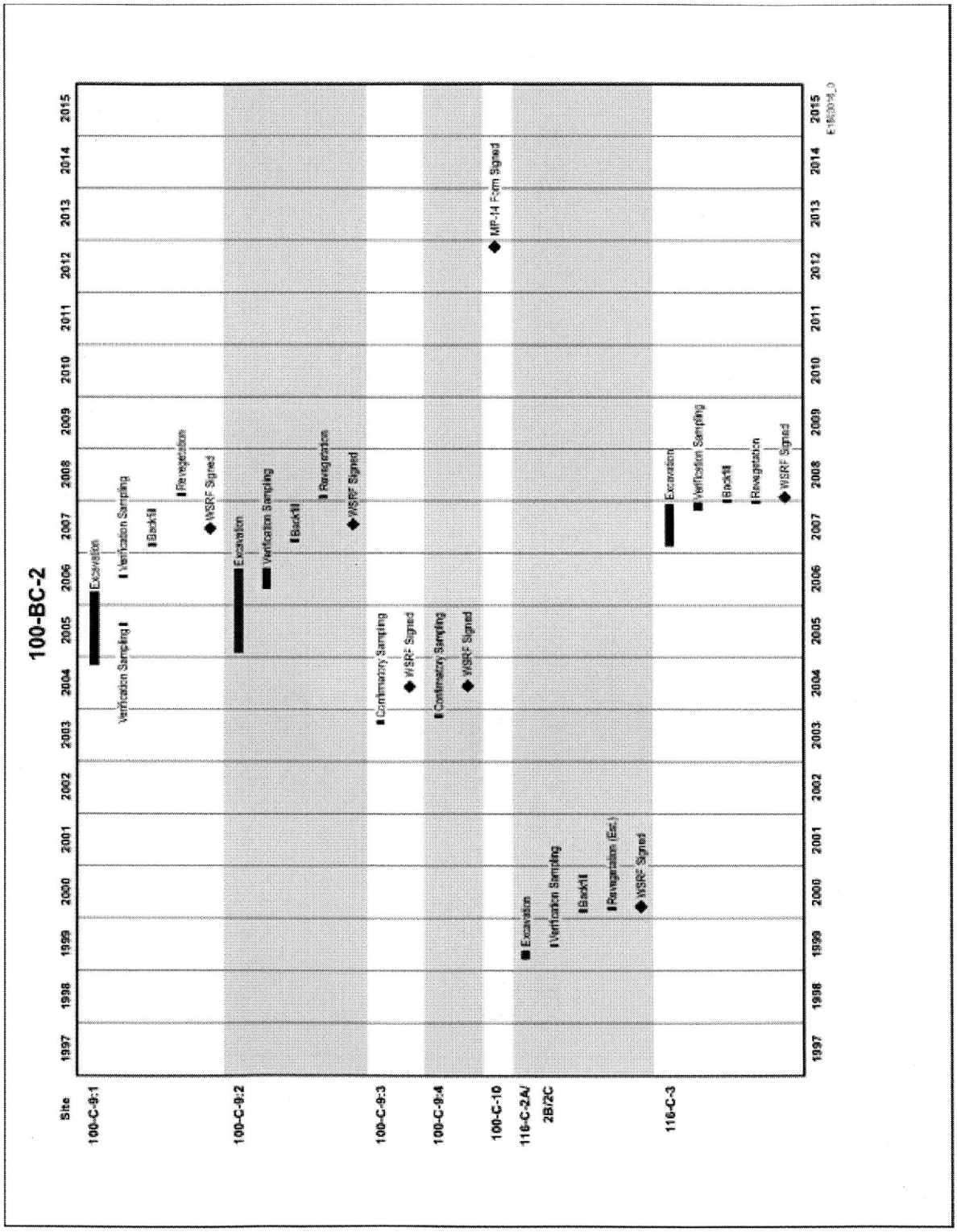


Figure 3-1. Summary of Major 100-BC-2 OU Events. (7 Pages)

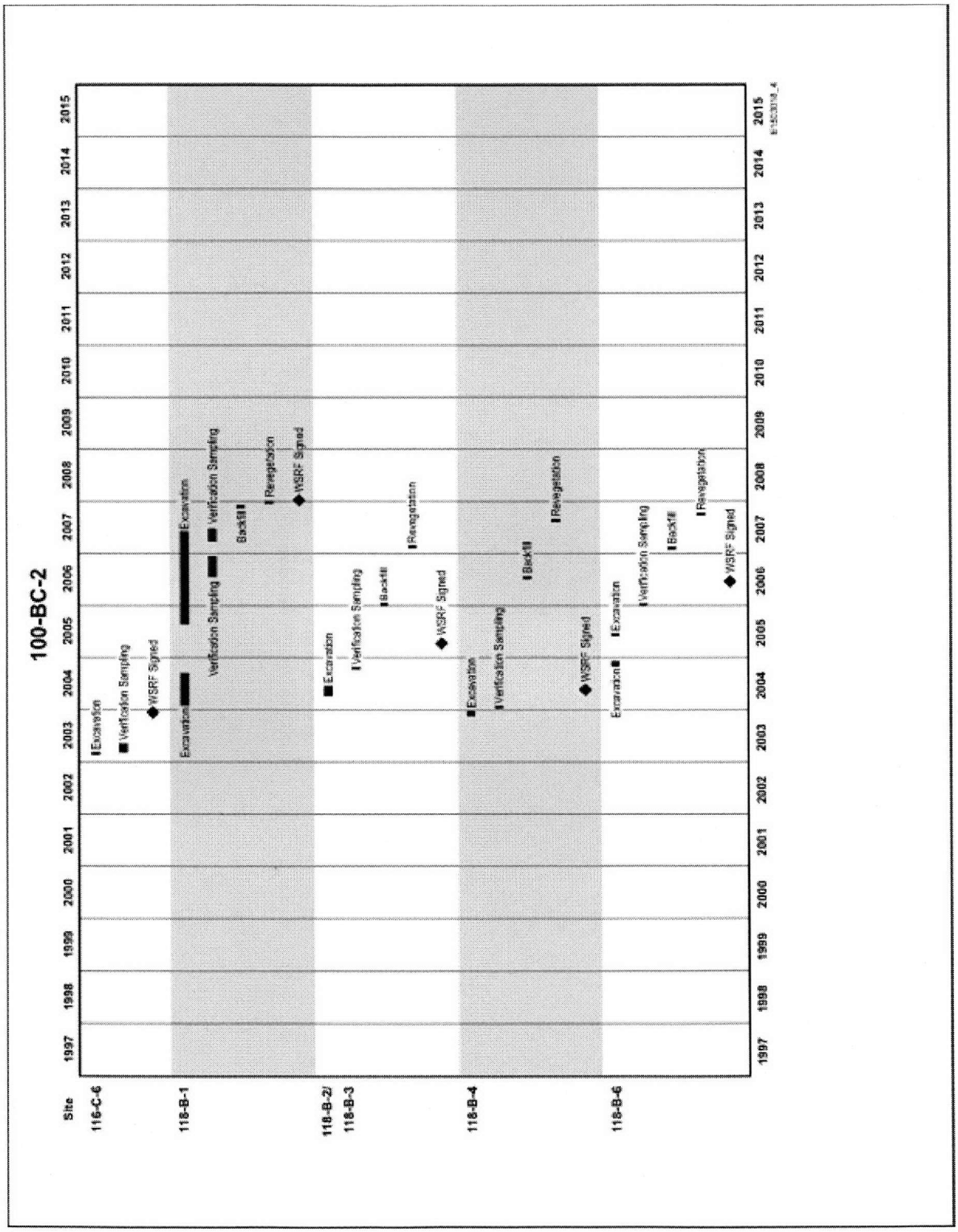


Figure 3-1. Summary of Major 100-BC-2 OU Events. (7 Pages)

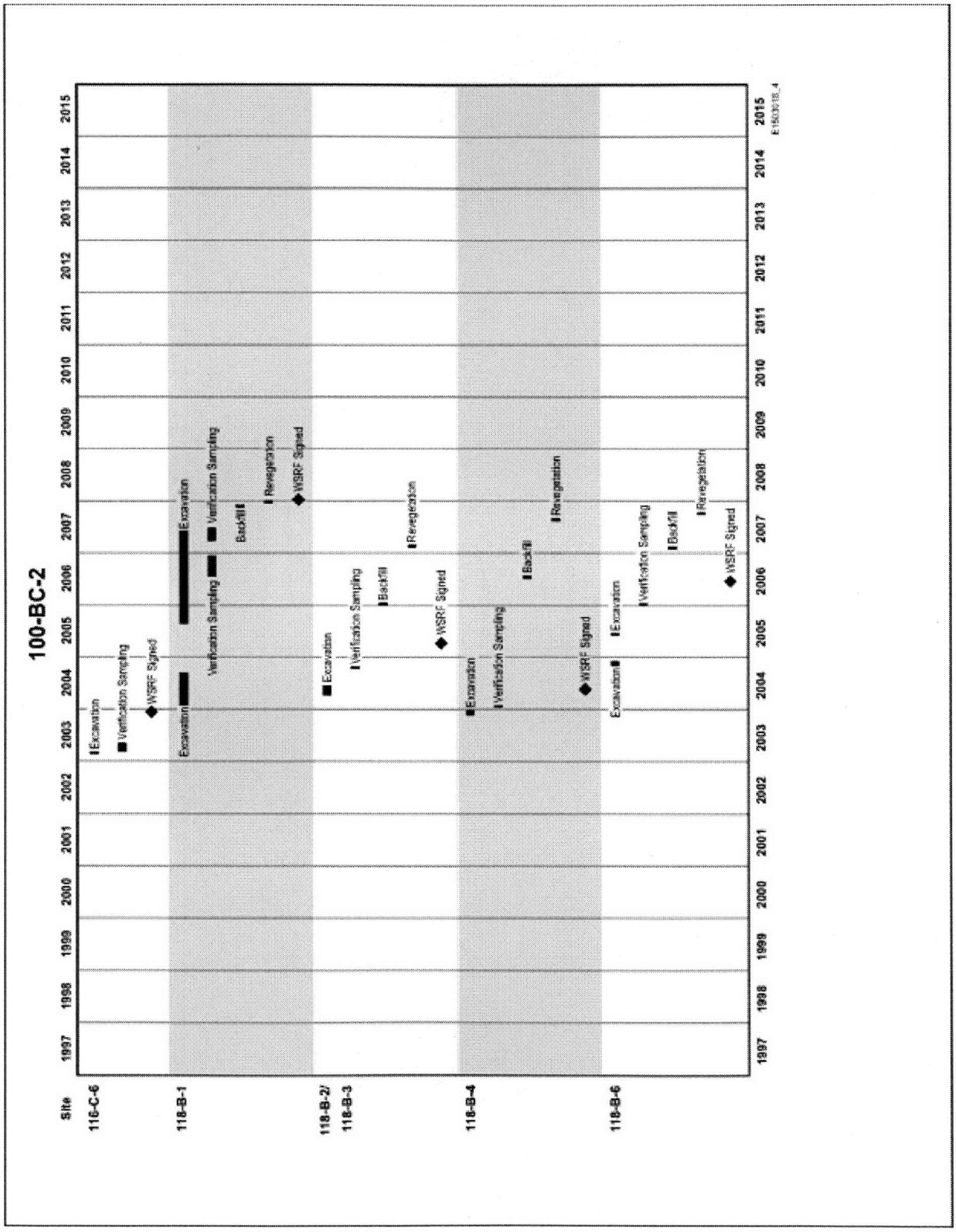


Figure 3-1. Summary of Major 100-BC-2 OU Events. (7 Pages)

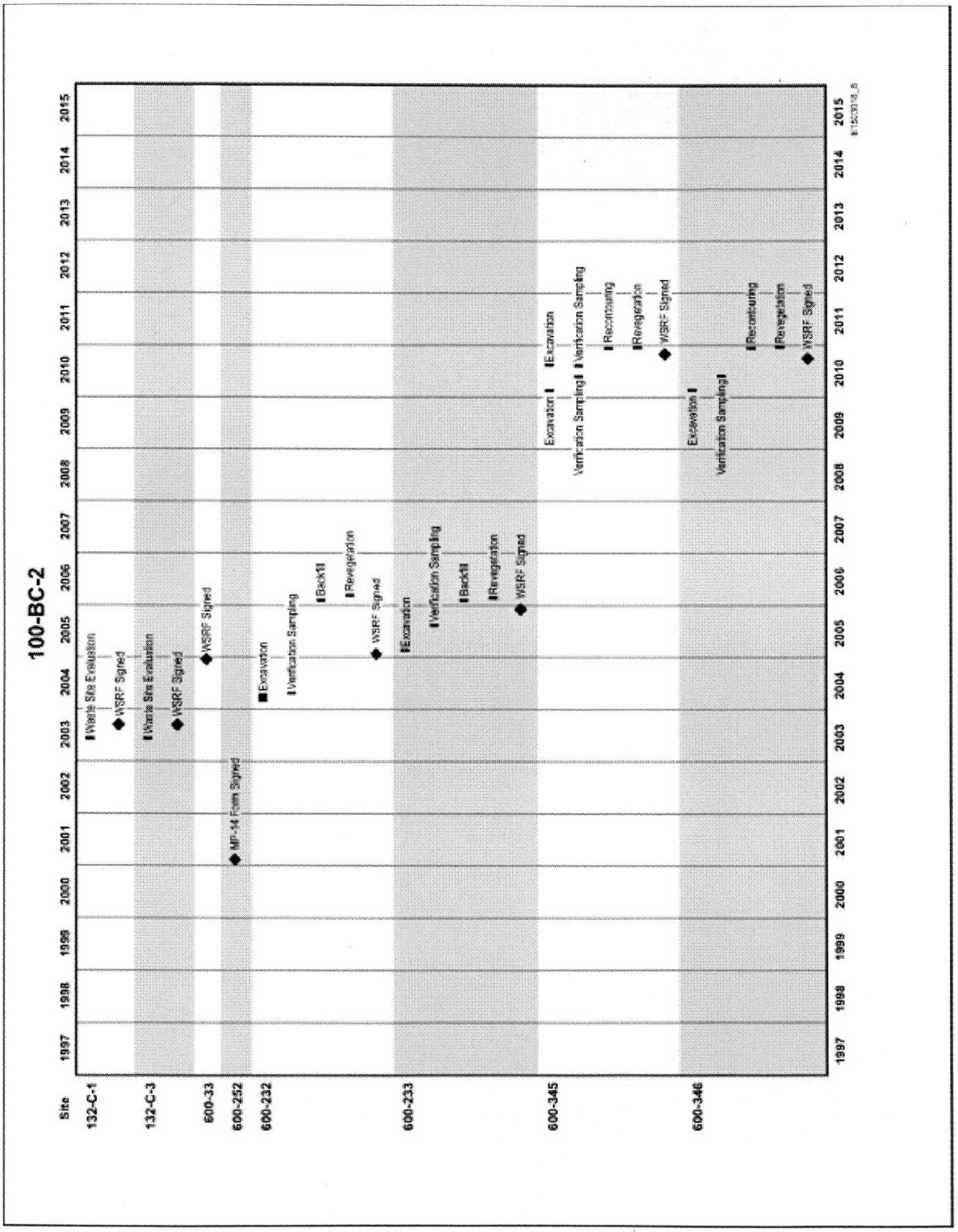
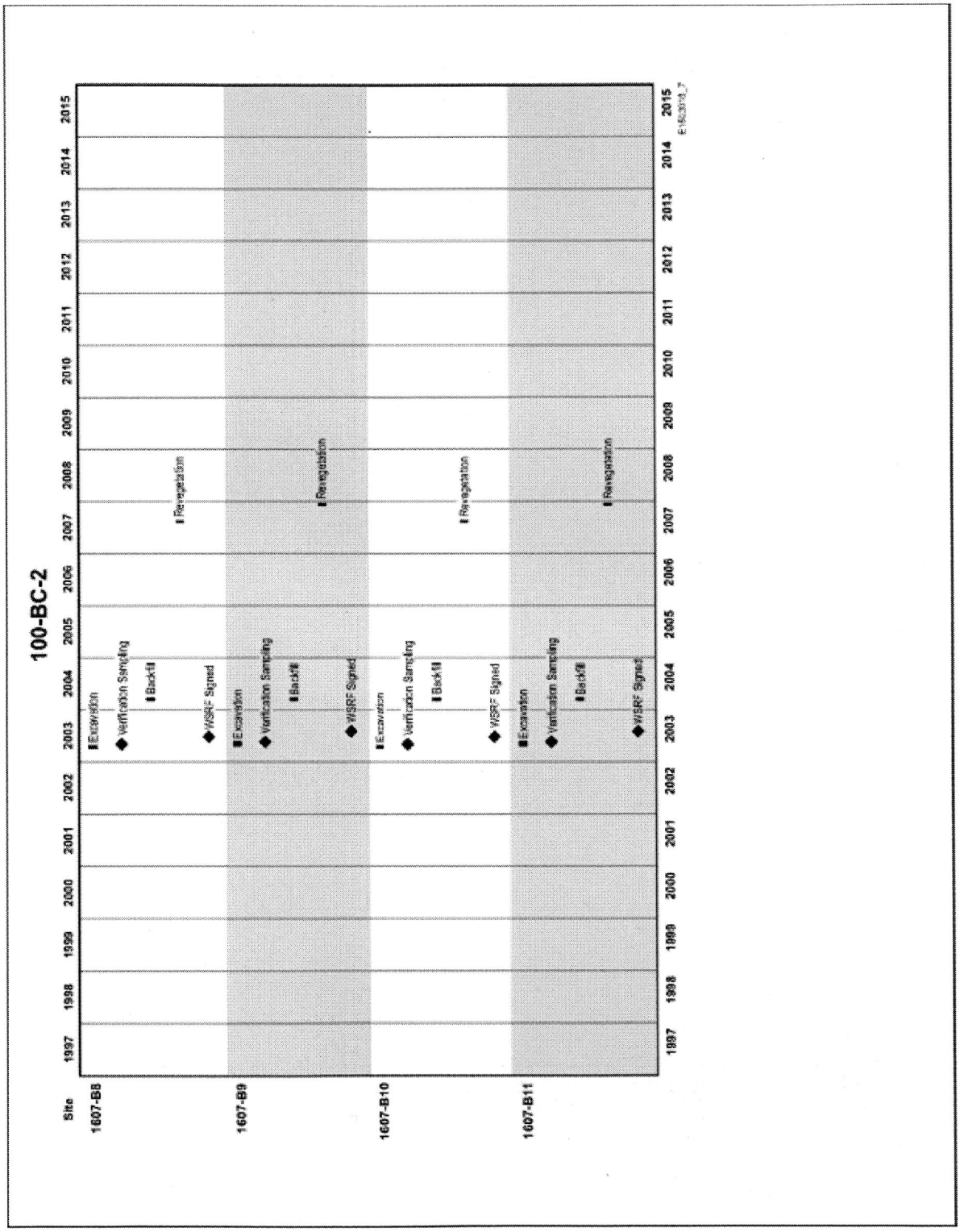


Figure 3-1. Summary of Major 100-BC-2 OU Events. (7 Pages)



4.0 CONSTRUCTION ACTIVITY SUMMARY

Field operations supporting remedial actions in the 100-BC-2 OU began in 1998 and were completed in 2015. The work was performed under several contracts. The cleanup actions resulted in the disposal of 1,631,156 metric tons (1,798,042 US tons) of contaminated soil and debris at ERDF. Summaries of the remedial action approach and waste disposal activities for each waste site are presented in Tables 4-1 and 4-2, respectively. Table 4-3 identifies sites that were not accepted or were rejected as waste sites. Detailed information about each waste site and related construction activities is presented in the following subsections.

Table 4-1. Remedial Action Approach. (3 Pages)

WIDS Site Code	Site Type	WIDS Site Name and Aliases	Excavation Approach	Personal Protective Equipment [a]
100-B-1	Dumping area	Surface Chemical and Solid Waste Dumping Area, Laydown Yard	Excavation, stockpile, loadout	Level D
100-B-23	Dumping area	100-B/C Surface Debris	Direct load	Level D
100-B-31	Dumping area	Garnet Sand at the 183-C Clearwell Pads	Excavation, stockpile, loadout	Level D
100-B-35:1	Electrical substation	151-B Primary Substation	Excavation, stockpile, loadout	Level D
100-C-3	French drain	119-C Sample Building French Drain, 119-C French Drain	Direct load	Level D
100-C-6:1	Radioactive process sewer	100-C Area South Effluent Pipelines	Direct load	Level D
100-C-6:2	Radioactive process sewer	100-C Area North Effluent Pipelines	Direct load	Level D
100-C-6:3	Radioactive process sewer	100-C Retention Basin to Outfalls Effluent Pipelines	Direct load	Level D
100-C-6:4	Unplanned release	B/C Pipelines Discovery Areas	Direct load	Level D
100-C-7	Dumping area	183-C Filter Building/Pumproom Facility Foundation and Demolition Waste	Excavation, stockpile, loadout	Level D
100-C-7:1	Unplanned release	183-C Water Treatment Facility Head House Foundation and Stained Soils	Excavation, stockpile, loadout	Level D
100-C-9:1	Process sewer	100-C Main Process Sewer Collection Line	Direct load	Level D
100-C-9:2	Process sewer	100-C Sanitary Sewer Lines	Direct load	Level D
116-C-2A	Crib	105-C Pluto Crib, 116-C-2, 105-C Crib	Direct load	Level C/D
116-C-2B	Pump station	105-C Pluto Crib Pump Station, 116-C-2-1, 116-C-2B Pump Station	Direct load	Level C/D
116-C-2C	Sand filter	105-C Pluto Crib Sand Filter, 116-C-2-2, 116-C-8	Direct load	Level C/D

Table 4-1. Remedial Action Approach. (3 Pages)

WIDS Site Code	Site Type	WIDS Site Name and Aliases	Excavation Approach	Personal Protective Equipment [a]
116-C-3	Storage tank	105-C Chemical Waste Tanks	Treatment, excavation, stockpile, loadout	Level D
116-C-6	Process pit	105-C Fuel Storage Basin Cleanout Percolation Pit, 105-C Pond	None	None
118-B-1	Burial ground	105-B Burial Ground, 105-B Solid Waste Burial Ground, Operations, Solid Waste Burial Ground, 108-B Burial Ground, Ext. to BG No. 1	Excavation, sort, loadout	Level B/C/D
118-B-2	Burial ground	Construction Burial Ground No. 1, Minor Construction Burial, Ground No. 1	Excavation, stockpile, loadout	Level B/D
118-B-3	Burial ground	Construction Burial Ground No. 2	Excavation, stockpile, loadout	Level B/D
118-B-4	Burial ground	105-B Spacer Burial Ground, 105-B Dummy Burial Ground	Excavation, stockpile, loadout	Level D
118-B-6	Burial ground	108-B Solid Waste Burial Ground, 108-B Solid Waste Burial Ground, No. 2	Excavation, stockpile, loadout	Level D
118-C-1	Burial ground	105-C Burial Ground, 105-C Solid Waste Burial Ground, 118-C-1, Burial Ground	Excavation, sort, loadout	Level B/D
118-C-2	Storage tank	105-C Ball Storage Tank, Ball 3X Storage Tank	Excavation, stockpile, loadout	Level C/D
118-C-3:2	Reactor	105-C Reactor Building Below-Grade Structures and Underlying Soils	[b]	--
118-C-3:3	French drain	105-C French Drains	[b]	--
118-C-4	Storage	105-C Horizontal Control Rod Storage Cave	Direct load	Level D
128-C-1	Burn pit	100-C Burning Pit	Direct load	Level D
600-232	Dumping area	100B Electrical Laydown Area	Direct load	Level D
600-233	Product piping	Vertical Pipe Near 100B Electrical Laydown Area	Direct load	Level D
600-345	Unplanned release	100-BC Vicinity Oil Stain and Filter Area	Direct load	Level D
600-346	Unplanned release	100-BC Vicinity Ash and Debris Area	Direct load	Level D
1607-B8	Septic tank	1607-B8 Septic Tank System, 124-C-2, 1607-B8 Sanitary Sewer System, Septic Tank & Disposal Field for 190-C Pumphouse	Direct load	Level D
1607-B9	Septic tank	1607-B9 Septic Tank System, 1607-B9 Sanitary Sewer System, 124-C-3	Direct load	Level D
1607-B10	Septic tank	1607-B10 Septic Tank System, Sewage Disposal Field	Direct load	Level D

Table 4-1. Remedial Action Approach. (3 Pages)

WIDS Site Code	Site Type	WIDS Site Name and Aliases	Excavation Approach	Personal Protective Equipment [a]
1607-B11	Septic tank	1607-B11 Septic Tank System	Direct load	Level D

[a] Information was not available. The personal protective equipment used during waste site remediation was assumed based on analogous waste site approaches, remedial action descriptions, and photographs of the remedial actions.
[b] Removed as part of 105-C interim safe storage activities.
WIDS = Waste Information Data System

Table 4-2. Environmental Restoration Disposal Facility Waste Disposal Summary for the 100-BC-2 Operable Unit. (2 Pages)

WIDS Site Code	Site Type	Mass Disposed to ERDF (metric tons)
100-B-1	Dumping area	51,099
100-B-23	Dumping area	680
100-B-31	Dumping area	5,243 [a]
100-B-35:1	Electrical substation	139,156 [a]
100-C-3	French drain	49
100-C-6:1	Radioactive process sewer	79,339
100-C-6:2	Radioactive process sewer	244,656
100-C-6:3	Radioactive process sewer	Included in 100-C-6:2
100-C-6:4	Unplanned release	Included in 100-C-6:2
100-C-7	Dumping area	149,371 [a]
100-C-7:1	Unplanned release	661,150 [a]
100-C-9:1	Process sewer	20,490
100-C-9:2	Process sewer	3,701
116-C-2A	Crib	15,939
116-C-2B	Pump station	Included in 116-C-2A
116-C-2C	Sand filter	Included in 116-C-2A
116-C-3	Storage tank	3,767
116-C-6	Process pit	0 – minimal material removed
118-B-1	Burial ground	120,000
118-B-2	Burial ground	9,525
118-B-3	Burial ground	Included in 118-B-2
118-B-4	Burial ground	3,170
118-B-6	Burial ground	577
118-C-1	Burial ground	75,300
118-C-2	Storage tank	470

Table 4-2. Environmental Restoration Disposal Facility Waste Disposal Summary for the 100-BC-2 Operable Unit. (2 Pages)

WIDS Site Code	Site Type	Mass Disposed to ERDF (metric tons)
118-C-3:2	105-C Reactor Ancillary Facilities (Interim Safe Storage)	14,152
118-C-3:3	French drain	0 –excavated as part of 105-C decommissioning activities
118-C-4	Storage	453
128-C-1	Burn pit	19,688 [a]
600-232	Dumping area	9,005
600-233	Product piping	150
600-345	Unplanned release	50 [a]
600-346	Unplanned release	96 [a]
1607-B8	Septic tank	361
1607-B9	Septic tank	3,060
1607-B10	Septic tank	328
1607-B11	Septic tank	131
	Total	**1,631,156 metric tons**

[a] Converted to metric tons from bank cubic meters by multiplying with a factor of 2.25.
[b] Mass included with the 600-29 Dumping Area. The mass from some sites converted from bank cubic meters to metric tons.

ERDF = Environmental Restoration Disposal Facility
WIDS = Waste Information Data System

Table 4-3. Not Accepted and Rejected Waste Sites in the 100-BC-2 Operable Unit. (2 Pages)

WIDS Site Code	WIDS Site Name	Waste Site Reclassification Form	Reclassification Date	Reclassification Status
100-B-30	Pipe South of 100-B/C	--	--	Not Accepted
100-C-2	Possible Building Foundation and Parking Lot, Monitoring Station 1614-B-1	--	--	Not Accepted
100-C-4	Export Water Line Valve Pit	--	--	Not Accepted
100-C-5	100-C Service Water Pipelines, 100-C Clean Water Pipelines	--	--	Not Accepted
100-C-8	105C Hydraulic Oil Release	2002-001	3/13/2002	Rejected
100-C-10	Yellow stained area northwest of the 183-C Headhouse	--	--	Not Accepted
124-C-4	Sanitary Waste Site	--	--	Not Accepted
600-33	105-C Reactor Test Loop Burial Site	2004-132	12/09/2004	Rejected

Table 4-3. Not Accepted and Rejected Waste Sites in the 100-BC-2 Operable Unit. (2 Pages)

WIDS Site Code	WIDS Site Name	Waste Site Reclassification Form	Reclassification Date	Reclassification Status
600-252	Old Tank from RCRA General Inspection #LORIVFY97 Item #8	--	--	Not Accepted

-- = not applicable
WIDS= Waste Information Data System

4.1 100-B-1, SURFACE CHEMICAL AND SOLID WASTE DUMPING AREA, LAYDOWN YARD

4.1.1 History

The 100-B-1 Surface Chemical and Solid Waste Dumping Area was historically used as a laydown area for construction materials (including wood, power poles, light fixtures, wire, broken glass, broken transite, and Plexiglas® filter columns) during the construction of the 100-C Reactor Building. The 100-B-1 waste site was located east of the cocooned 105-C Reactor Building. Another area located 100 m (300 ft) northeast of the laydown yard contained areas of distressed vegetation and oil-contaminated soil. Both of these areas were combined into the 100-B-1 waste site.

4.1.2 Excavation Operations

Remediation activities began in June 2003, with three additional excavations in 2005 due to elevated total petroleum hydrocarbon (TPH) concentrations in two sample areas. The total material excavated was 51,099 metric tons (56,327 US tons) and was disposed at ERDF.

4.1.3 Verification Sampling

Cleanup verification sampling was conducted on August 22, 2005. The 100-B-1 waste site was divided into two decision units for the purposes of the verification sampling effort. Decision Unit 1 consisted of the excavation within the waste site boundaries associated with sample areas 1 and 2. Decision Unit 2 was composed of the area where overburden material was stockpiled. A systematic grid was used for verification soil sample collection. A total of 23 soil samples (11 from Decision Unit 1 and 12 from Decision Unit 2) were collected on a random-start, triangular grid.

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4.1.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations at the 100-B-1 waste site do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep), and the waste site has been classified as "Interim Closed Out." The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. This site does not have residual contaminant concentrations that would require any institutional controls.

4.2 100-B-23, 100-B/C SURFACE DEBRIS

4.2.1 History

The 100-B-23 waste site consisted of multiple locations of surface debris and chemical stains. The waste site covered the entire 100-B/C Area and consisted of various sizes and forms of surface debris that were identified as CERCLA wastes. The various forms of scattered surface debris were thought to be created during the construction, operating, and decontamination and decommissioning of the 100-B/C Area. Evaluation of the information for the surface debris features yielded four generic waste groupings: asbestos-containing material (ACM), lead debris, oil and oil filters, and treated wood. A few of the wood debris items included in the waste site, however, were determined to be pre-Hanford upon closer inspection and did not warrant further remedial action.

4.2.2 Excavation Operations

Remediation activities were performed from June 2007 to January 2008 and included the removal of additional stained soils caused by leaking batteries in February 2008. In total, 680 metric tons (750 US tons) of debris and stained soils was removed from the 100-B-23 waste site and disposed at ERDF. All nonfriable ACM material and inert wood material was left in place at the site.

4.2.3 Verification Sampling

Cleanup verification sampling was performed between July 2007 and February 2008 and consisted of a focused approach from soils underlying remediated oil-stained sites and any stained soil associated with treated wood. All soils underlying removed lead debris were field screened using x-ray fluorescence (XRF) to verify that no release to the soil had occurred. For soils underlying a cache of leaking batteries, the sampling approach included the use of XRF to locate areas of elevated lead or mercury. If one soil area was observed to have significantly higher readings, then a single discrete grab sample was to be collected from that location. Otherwise, up to three aliquots were to be collected from the locations with the highest relative measurements and combined into one sample for analysis purposes.

4.2.4 Statement of Protectiveness

The verification sampling results demonstrate that the remedial actions at the 100-B-23 waste site achieved the RAOs and corresponding RAGs established in the interim action ROD, and the waste site has been reclassified as "Interim Closed Out." The results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use and are protective of groundwater and the Columbia River. This site does not have residual contaminant concentrations that would require any institutional controls.

4.3 100-B-30, PIPE SOUTH OF 100-B/C

The site is located south of the 100-B/C perimeter road and north of the railroad tracks, and consists of an 0.08-m (3-in.) carbon steel pipe, over 4 m (13 ft) long, with a coupling joint on one end. The carbon steel pipe appears to be lined with concrete with one end severed and the other end partially buried below grade. The pipe is not part of an intact system, and the presence of vegetation at that end suggests that the pipe has been at this location for an extended period of time. There is no evidence of staining or any additional pipe or piping systems in the area. The pipe is believed to be surficial debris only, resulting in a classification of "Not Accepted."

4.4 100-B-31, GARNET SAND AT THE 183-C CLEARWELL PADS

4.4.1 History

The 100-B-31 waste site was south of Bells Street and east of Tank Avenue in the south-central portion of the 100-B/C Area. The waste site was an area of scattered garnet sand on the 183-C Clearwell concrete pads and surrounding soils. The garnet sand was suspected to be the result of sandblasting operations at the former clearwell tanks. The site measures 134 m (440 ft) in length by 122 m (400 ft) in width, for a total area of 16,400 m^2 (176,000 ft^2).

4.4.2 Excavation Operations

Remedial action at the 100-B-31 waste site was performed from May to July 2009. Remediation included scraping along the edge of the clearwell pads and removing garnet sand, asphalt, and contaminated soil from the area. Initially, an area 0.3 m (1 ft) deep was scraped around the perimeter of the 183-C Clearwell pads, removing 1,500 bank cubic meters (BCM) (1,960 bank cubic yards [BCY]) of contaminated material. This material, composed of soil and asphalt, was stockpiled on the northeastern and southeastern tank pads while awaiting loadout to ERDF. In-process samples were collected from the scraped area, and data results showed a lead content above the direct exposure RAG. An additional 830 BCM (1,090 BCY) of soil surrounding the clearwell tank pads was removed and staged for loadout.

4.4.3 Verification Sampling

Verification sampling at the 100-B-31 waste site was conducted in August 2009. The sampling design consisted of only one decision unit for the excavation footprint. No overburden material was associated with the site, and all waste material was staged on the intact concrete clearwell pads. Twenty primary soil samples and one duplicate were collected from the excavation footprint.

4.4.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 100-B-31 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." The results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use and are protective of groundwater and the Columbia River. This site does not have residual contaminant concentrations that would require any institutional controls.

4.5 100-B-35:1, 151-B PRIMARY SUBSTATION

4.5.1 History

The 100-B-35:1 subsite consisted of the 151-B Primary Electrical Substation switch yard that was located 305 m (1,000 ft) southwest of the 105-B Reactor. The subsite included a fenced, gravel-surfaced switch yard area, as well as a reinforced concrete block switch house. The 151-B Primary Substation was shut down and deactivated in 1998. However, until 2012, the 230-kV power line connecting the Midway Station with the 100-K Area remained routed overhead across the 151-B substation yard.

4.5.2 Excavation Operations

The 151-B Switch House and the above-grade electrical components and concrete pads protruding from the ground surface at the 151-B Switch Yard were removed by the Deactivation, Decontamination, Decommissioning, and Demolition Project between March 2013 and February 2014.

Remediation of remaining contaminated soil and debris at the 100-B-35:1 subsite was performed by the Field Remediation Closure Project between July 2014 and February 2015. A total of 61,847 BCM (80,892 BCY) of excavated materials was removed and staged for disposal at ERDF. This volume also includes some padding material that was used to support site remediation processes. Excavated materials consisted of concrete, rebar, asbestos, conduit, steel pipe, wire, and stained soil. The depth of the excavation varied between 1 m to 6 m (3.3 ft to 19.7 ft) across the subsite. Significant staining was encountered on the northeast corner of the

100-B-35:1 subsite. To remove the stained soil at this location the excavation was extended into the deep zone (greater than 4.6 m [15 ft]).

4.5.3 Verification Sampling

Cleanup verification sampling of the excavation areas and staging pile area was performed on March 30, 2015. Three decision units were identified for the 100-B-35:1 subsite including the waste staging pile area, and the shallow zone and deep zone excavation areas. Twelve statistical discrete soil samples were collected on the grid within shallow zone and waste staging pile area decision units. The deep zone decision unit was divided into quadrants for verification sampling. One discrete grab soil sample was collected from each quadrant.

4.5.4 Statement of Protectiveness

The 100-B-35:1 subsite has been evaluated in accordance with the interim ROD. Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this subsite meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 100-B-35:1 subsite to "Interim Closed Out." After remediation, residual contamination above direct exposure levels was not observed in the shallow or deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

4.6 100-B-35:2, 152-B1 SECONDARY SUBSTATION

4.6.1 History

The 100-B-35:2 subsite consisted of a small fenced area surrounding utility poles and concrete pads that once supported six transformers. The 152-B1 Secondary Electrical Substation was constructed in 1944 and provided power to the nearby 181-B Building. According to available photographs, there were originally four 1,500-kVA 12,800/2,300V single-phase transformers manufactured by the Kuhlman Electric Company. The 152-B1 Secondary Substation had a primary voltage of 13.8 kV and a secondary voltage of 2.3 kV. In the 1950s, two additional transformers were added to this substation. The above-ground electrical structures, utility poles, and fencing were removed prior to confirmatory sampling.

4.6.2 Investigation

Confirmatory sampling was performed at the 100-B-35:2 subsite on February 20, 2014. A walkdown of the 152-B1 substation was performed, and stained soil was not observed. Two focused soil samples were collected from the 100-B-35:2 subsite. In addition, one concrete scabble sample was collected from the east concrete slab. No suspected ACM was observed and no radiological activity was detected during confirmatory sampling at any of the sample locations.

4.6.3 Statement of Protectiveness

The 100-B-35:2 subsite has been evaluated in accordance with the interim action ROD. Confirmatory sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAGs and associated RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 100-B-35:2 subsite to "No Action." The 100-B-35:2 subsite contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

4.7 100-C-2, POSSIBLE BUILDING FOUNDATION AND PARKING LOT, MONITORING STATION 1614-B-1

The 100-C-2 waste site is the foundation of a general monitoring station located near the southwest corner of the 100-B/C Area, adjacent to the southwest corner of the patrol road. Northwest of the slab is a gravel road with a gravel area on the other side. A few small pieces of asbestos transite, a few dry-cell batteries, and some steel anchoring cable were noted around the site. There is no cleanup required for this site as no CERCLA waste is associated with the site, resulting in a classification of "Not Accepted."

4.8 100-C-3, 119-C SAMPLE BUILDING FRENCH DRAIN

4.8.1 History

The 100-C-3 french drain was located east of the 105-C Reactor. The 100-C-3 french drain was a 0.61-m (2-ft)-diameter gravel-filled pit that received effluent from the 119-C Sample Building through a 5-cm (2-in.)-diameter pipeline. The 119-C Sample Building was built in 1960 and contained water-cooled air sample monitoring equipment. Effluent from the sampling equipment, the building's swamp cooler, and possibly janitorial waste would have been disposed to the 100-C-3 french drain.

4.8.2 Excavation Operations

Remedial action at the 100-C-3 waste site was conducted on March 19, 2003. Excavation of the site involved removing the overburden materials, site debris, and underlying contaminated soil. The depth of the french drain was unknown; however, field evidence during remediation (e.g., change in soil type and amount of debris) indicated that the french drain was no deeper than 3 m (9.8 ft). The majority, if not all, of the 5-cm (2-in.)-diameter inlet piping was removed during remediation. A total of 49 metric tons (54 US tons) of material from the site were disposed at ERDF.

4.8.3 Verification Sampling

Cleanup verification samples were collected on March 27, 2003. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area. The 100-C-3 waste site consisted of only one shallow zone decision unit, which was divided into four sampling areas. One composite cleanup verification sample was collected from each sample area and was submitted to offsite laboratories for analysis.

4.8.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 100-C-3 site achieved the RAOs and corresponding RAGs established in the interim action ROD. In accordance with this evaluation, the sample data support a reclassification of this site to "Interim Closed Out." The residual concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow soil and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

4.9 100-C-4, EXPORT WATER LINE VALVE PIT

The 100-C-4 waste site is a valve pit located along the export water line located 600 m (2,000 ft) east of the 105-C Reactor Building. The 1.8- by 1.8-m (6- by 6-ft) wooden cover is caving into the valve pit and is marked with post and chain. The cover is posted with a "Danger: Cave-In Potential" sign. The site was misidentified in WHC-SD-EN-TI-220, *100-B Area Technical Baseline Report*, as a "Hazardous Site" instead of a safety hazard due to its disrepair. The site has not been used for waste management activities and has a "Not Accepted" site reclassification.

4.10 100-C-5, 100-C SERVICE WATER PIPELINES

The 100-C-5 waste site encompasses the clean water upstream pipelines for the 100-C Area, including underground pipelines used to transport raw, fire, export, and sanitary water from the river pump house to the water treatment facilities and to 100-C Area facilities and fire hydrants. The location is described as underground lines running from the 181-C pump house to the 183-C Water Treatment Facilities, and from there to other 100-C Area buildings, fire hydrants, and north to the 100-B Area. The site has a "Not Accepted" site reclassification.

4.11 100-C-6, 100-C REACTOR COOLING WATER EFFLUENT UNDERGROUND PIPELINES

4.11.1 History

The 100-C-6 waste site includes the underground 105-C Reactor cooling water effluent pipelines. These include effluent pipelines that transported 105-C Reactor cooling water from the reactor to the 116-C-5 (107-C Retention Basin), and from the basin to the 132-B-6 and 132-C-2 outfall structures and/or to the 116-C-1 Liquid Waste Disposal Trench. This waste site includes all associated expansion and valve boxes and excludes the retention basin, outfall structures, and those effluent pipelines that are within the confines of the 105-C Reactor Building or that run from the outfall structures to the bottom of the river. It also excludes all reactor influent pipelines that are upstream of the reactor building. The 100-C-6 waste site was administratively divided into four subsites for decision-making purposes based on geographic location, use of the pipeline, or expected sources of contamination.

4.11.2 100-C Area South Effluent Pipeline (100-C-6:1) Excavation

Remedial action at the south effluent pipelines site began on September 9, 2002, and was completed on November 7, 2003. Excavation of the site involved removing the overburden materials, piping, debris, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. The excavation was 48,260 m^2 (519,466 ft^2) in area with a maximum depth of 8.5 m (28 ft). A total of 79,339 metric tons (87,456 US tons) of material, including soil, debris, and piping, was removed from the south effluent pipelines site and disposed at ERDF.

4.11.3 100-C Area South Effluent Pipeline (100-C-6:1) Verification Sampling

Cleanup verification sampling began on October 24, 2003, and was completed on November 19, 2003. The south effluent pipelines site consisted of shallow zone, deep zone, and overburden decision units. Four composite verification samples were collected from each decision subunit in the shallow zone and overburden soil. The shallow zone decision unit contained 11 decision subunits, which were divided into 44 sampling areas. Three composite samples were collected from each of the deep zone (below 4.6 m [15 ft]) decision subunits. The deep zone decision unit contained three decision subunits that were divided into nine sampling areas. One composite cleanup verification sample was collected from each shallow zone, deep zone, and overburden sample area.

4.11.4 100-C Area North Effluent Pipeline (100-C-6:2, 100-C-6:3, and 100-C-6:4) Excavation

Remedial action at the north effluent pipelines site began on February 26, 2001. Excavation of the site involved removing the overburden materials, piping, debris, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. The excavation was completed on February 6, 2003. The excavation was 135,000 m^2 (443,000 ft^2) in area with a maximum depth

of 7.5 m (25 ft). A total of 244,656 metric tons (269,742 US tons) of material, including soil, debris, and piping, was removed from the north effluent pipelines site and disposed at ERDF.

4.11.5 100-C Area North Effluent Pipeline (100-C-6:2, 100-C-6:3, and 100-C-6:4) Verification Sampling

Cleanup verification sampling began on August 12, 2002, and was completed on July 24, 2003. The north effluent pipelines site consisted of a shallow zone, deep zone, overburden, and discovery areas decision units. The site was excavated to a maximum depth of 7.5 m (25 ft), with the shallow zone consisting of the excavation sidewalls to a depth of 4.6 m (15 ft) and the deep zone consisting of the excavation sidewalls below 4.6 m (15 ft) together with the floor of the excavation. All deep zone samples were collected below 4.6 m (15 ft). The discovery areas were excavated to a depth of less than 4.6 m (15 ft) and are considered shallow zone excavations.

Four composite samples were collected from each shallow zone, overburden, and discovery area decision subunits. The shallow zone decision unit contained 14 decision subunits, which were divided into 56 sampling areas. Three composite samples were collected from each of the deep zone (i.e., below 4.6 m [15 ft]) decision subunits. The deep zone decision unit contained 5 decision subunits, which were divided into 15 sampling areas. One composite cleanup verification sample was collected from each shallow zone, deep zone, and overburden sample area.

4.11.6 Statement of Protectiveness

The verification sample results confirm that remedial action at the 100-C north and south pipeline sites have achieved the RAOs and corresponding RAGs established in the interim actions ROD, and the sites have been reclassified as "Interim Closed Out." The remaining soils at these sites have been sampled, analyzed, and evaluated. The results of this effort indicate that the materials from the 100-C-6:1, 100-C-6:2, 100-C-6:3, and 100-C-6:4 waste sites containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the shallow zone and discovery areas will support future land uses that can be represented (or bounded) by a rural-residential scenario, and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required.

4.12 100-C-7, 183-C FILTER BUILDING/PUMPROOM FACILITY FOUNDATION AND DEMOLITION WASTE

4.12.1 History

The 100-C-7 waste site included the foundations and stained soils associated with the 183-C Filter Building and 183-C Headhouse. The 100-C-7 waste site was located in the

southwestern portion of the 100-B/C Area, 340 m (1,115 ft) west of the 105-C Reactor Building. The 183-C water treatment facilities included the 183-C Headhouse, the 183-C Sedimentation Basins, the 183-C Filter Building Pumproom Facility, the 183-C Clearwells, and the 190-C Pump House. The 100-C-7 waste site consisted of the residual sodium dichromate contamination associated with concrete that was left in place after the 1997 decommissioning of the 183-C Filter Building/Pumproom.

4.12.2 Excavation

Demolition of reinforced concrete substructures associated with the 183-C Headhouse, 183-C Sedimentation Basins, 183-C Filter Building, and 183-C Clearwell pads in the vicinity of the 100-C-7 and 100-C-7:1 waste sites began on June 8, 2010. Demolition of concrete foundations included shearing pipes and rebar and staging concrete rubble to the designated staging areas. Following subsurface concrete demolition, remedial activities to remove contaminated soil and portions of inactive pipeline began on January 27, 2011.

The 100-C-7 excavation extended to a depth of 17 m (55 ft) below ground surface (bgs). However, the remedial design was revised to encompass additional remediation of the 100-C-7 waste site to the north based on the presence of chromium contamination at a depth of 22 m (72 ft) that appeared to be trending to the northeast. Excavation continued until groundwater was encountered at 26 m [85.3 ft] bgs.

The 100-C-7 site remediation was completed on December 13, 2011. A total of 73,780 BCM (96,501 BCY) of concrete and building slab rubble was transported to U-Canyon, located in the 200 West Area. A total of 66,387 BCM (86,831 BCY) of contaminated soil was excavated for disposal to ERDF, and 285,660 BCM (373,629 BCY) of overburden/layback soil was excavated and stockpiled at the 100-C-7 waste site for use as backfill material.

4.12.3 Verification Sampling

Verification sampling of the 100-C-7 waste site overburden stockpiles was continuously performed from September 2010 to December 2011, as material was stockpiled. Verification sampling of the 100-C-7 upper excavation sidewalls was performed on October 19 and 20, 2011, and lower sidewalls were sampled on February 22, 2012. Verification sampling of the staging pile areas was completed on April 2, 2012.

The 100-C-7 waste site consisted of 10 decision units for verification sampling. Decision unit 1 included the upper sidewalls of the 100-C-7 excavation. Decision unit 2 included the lower sidewall of the 100-C-7 waste site excavation. Decision unit 3 included all the staging pile areas. Decision units 4 through 10 included seven overburden stockpiles that surrounded the 100-C-7 excavation.

Two methods for selecting the sampling locations were utilized: statistical sampling designs of decision units 1, 2, and 3; and focused sampling of the overburden during the stockpiling process. Fourteen grab soil samples were collected on the grid within decision units 1, 2, and 3.

Focused samples were collected using a composite sampling approach was for each lift of stockpiled overburden materials.

4.12.4 Statement of Protectiveness

The 100-C-7 waste site has been evaluated in accordance with the interim action ROD. Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 100-C-7 waste site to "Interim Closed Out." Site contamination that extended into the deep zone soils was completely removed; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

4.13 100-C-7:1, 183-C WATER TREATMENT FACILITY HEADHOUSE FOUNDATION AND STAINED SOIL

4.13.1 History

The 100-C-7:1 subsite included a large area (6,600 m^2) of yellow stained soil mostly free of vegetation that was observed in 2002, just north of the 183-C Head House and adjacent to the northwest corner of the 183-C Sedimentation Basins. It was speculated that the stained area may have been the result of transferring sodium dichromate from the head house, where chemicals were received by rail, to the pumproom facility. The 100-C-7:1 subsite was located in the southwestern portion of the 100-B/C Area, 557 m (1,828 ft) west of the 105-C Reactor Building.

4.13.2 Excavation

Remedial action at the 100-C-7:1 subsite was initiated in December 2004 with excavation of the stained soil area located north of the 183-C Head House to a depth of 3.5 m (11.5 ft). Excavation adjacent to the north side of the 183-C Head House, where the outdoor chemical storage tanks were once located, proceeded to a depth of 4.6 m (15 ft) where in-process sampling indicated residual chromium contamination exceeding cleanup criteria. Several potholes and boreholes that were excavated at the 100-C-7:1 subsite to evaluate the distribution of sodium dichromate contamination in the soils showed contamination greater 4.6 m (15 ft).

Further remedial action below 4.6 m (15 ft) began on June 8, 2010, and included the demolition of reinforced concrete substructures associated with the 183-C Head House, 183-C Sedimentation Basins, 183 C Filter Building, and 183-C Clearwell pads in the vicinity of the 100-C-7 and 100-C-7:1 waste sites. The 100-C-7:1 subsite, with the exception of the west sidewall, was excavated to groundwater and remediation was completed on February 27, 2012. A total of 45,000 BCM (58,858 BCY) of concrete and building slab rubble was transported to U-Canyon, located in the 200 West Area, to be used as fill. A total of 261,414 BCM (341,917 BCY) of contaminated soil was excavated for disposal at ERDF.

Additional remedial action at the 100-C-7:1 west sidewall was performed from October 3, 2012, to January 31, 2013. A total of 32,430 BCM (42,417 BCY) of contaminated soil was excavated for disposal at ERDF. The final excavation depth was 27 m (89 ft) bgs.

4.13.3 Verification Sampling

Verification sampling of the 100-C-7:1 subsite overburden stockpiles and layback material within the west sidewall expansion was continuously performed from September 2010 to February 2013 as material was stockpiled or was used to backfill the 100-C-7:1 excavation. Verification sampling of the 100-C-7:1 subsite upper excavation sidewall was performed in October 2011, and the lower sidewalls were sampled in April 2012. Verification sampling of the west sidewall following the plume chase remediation was performed between December 2012 and February 2013. Verification sampling on the staging pile areas was completed between July 2012 and March 2013.

The 100-C-7:1 subsite consisted of 13 decision units for verification sampling. Decision unit 1 included the upper sidewalls of the 100 C-7:1 excavation. Decision unit 2 included the lower sidewalls of the 100 C 7:1 waste site excavation. Decision unit 3 included the west sidewall of the 100-C-7:1 waste site excavation. Decision units 4 through 7 included staging pile areas 1 through 4. Decision unit 8 included the composite sample from the staging pile area 2. Decision units 9 through 12 included four overburden stockpiles that surrounded the 100-C-7:1 excavation. Decision unit 13 included west sidewall overburden material.

Two methods for selecting the sampling locations were utilized: statistical sampling designs of decision units 1 through 7, and focused sampling of the staging pile area adjacent to decision unit 5, overburden stockpiles, and west sidewall overburden material. Thirteen grab soil samples were collected on the sampling grids within decision unit 1. Twelve grab soil samples were collected on the sampling grids within decision units 2, 3, 6, and 7. Fifteen and 13 grab soil samples were collected on the sampling grids within decision units 4 and 5, respectively.

4.13.4 Statement of Protectiveness

The 100-C-7:1 subsite has been evaluated in accordance with the interim action ROD. Verification sampling was performed, and the analytical results indicate that the residual concentrations of COCs at this site meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 100-C-7:1 subsite to "Interim Closed Out." Site contamination that extended into the deep zone soils was completely removed; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

4.14 100-C-8, 105-C HYDRAULIC OIL RELEASE

The site consisted of a spill from a broken main hydraulic line from an excavator during demolition of a concrete pad at the 105-C Reactor. The spill was located in the vicinity of the

former rod control room of the 105-C Reactor Building and covered a large area because the hydraulic system was under pressure. The area in which the nonhazardous oil was spilled was removed as part of the 105-C Reactor ISS project, and therefore the site has been reclassified as "Rejected."

4.15 100-C-9, 100-C AREA PROCESS AND SANITARY SEWER UNDERGROUND PIPELINES

4.15.1 History

The 100-C-9 waste site includes the underground sanitary and process sewers and process pipelines associated with the 100-C Area pre-reactor water treatment facilities. The 100-C-9 waste site was administratively divided into four subsites based on intended use of the pipe (e.g., sanitary or process sewer), expected sources of contamination, and potential differing remedial action requirements. The four 100-C-9 subsites are as follows:

- 100-C-9:1 Main Process Sewer Collection Line
- 100-C-9:2 Sanitary Sewers
- 100-C-9:3 Clearwell Pipes
- 100-C-9:4 Cooling Water Transfer Pipelines and Tunnels.

4.15.2 Remedial Action 100-C-9 Subsites

4.15.2.1 100-C-9:1 Excavation Operations. The 100-C-9:1 subsite includes pipelines from the 183-C and 190-C facilities that fed into the main process sewer. Remediation of the 100-C-9:1 Main Process Sewer Collection Line proceeded in two phases.

The first phase addressed the northern portion and the second phase the southern portion of the 100-C-9:1 waste site. Remedial action in the northern section of 100-C-9:1 was initiated in November 2004 and continued into February 2005. A total of 14,639 metric tons (16,137 US tons) of contaminated soil and concrete was removed for disposal to ERDF. The north section of the 100-C-9:1 twin box culvert was excavated from the remediation boundary of the former 132-C-2 outfall south to the beginning of the southern portion of the 100-C-9:1 subsite. Concrete from the twin box culvert and a minimum of 0.3 m (1 ft) of underlying soil was removed and disposed at ERDF.

Remedial action at the southern portion of the 100-C-9:1 subsite was initiated in December 2004 and completed in April 2006. A total of 5,851 metric tons (6,450 US tons) of contaminated soil and concrete was removed by direct loadout for disposal to ERDF. The southern portion of the 100-C-9:1 box culvert was excavated to a point 200 m northwest of the 105-C Reactor, where the southern portion of the twin box culvert transitioned from the shallow zone to the deep zone. Concrete from the shallow zone twin box culvert and a minimum of 0.3 m (1 ft) of underlying soil were disposed at ERDF.

4.15.2.2 100-C-9:1 Verification Sampling. Statistical sampling was performed for each of the northern and southern 100-C-9:1 remediation footprints. Statistical sampling was selected because the spatial distribution of potential residual soil contamination over the study area was uncertain. Verification samples were collected from the base of the excavations where the twin box culvert or feeder pipelines were removed. Verification sampling was performed in August 2005 at the northern portion of 100-C-9:1 and in July 2006 at the southern portion of 100-C-9:1. A total of 22 primary soil samples were collected from the base of the northern 100-C-9:1 excavation, and a total of 23 primary soil samples were collected from the southern 100-C-9:1 excavation.

The results demonstrated that residual contaminant concentrations are protective of human health, groundwater, and the Columbia River. In accordance with this evaluation, verification sampling results support an "Interim Closed Out" reclassification of this site.

4.15.2.3 100-C-9:2 Excavation Operations. The 100-C-9:2 sanitary sewer pipelines includes four feeder pipelines associated with the 1607-B8, 1607-B9, 1607-B10, and 1607-B11 septic systems. Each of the systems consisted of a septic tank, vitrified clay sanitary sewer pipe, and a drain field. Remedial action at the 100-C-9:2 subsite began in early 2005 and concluded in September 2006. A total of 3,701 metric tons (4,080 US tons) of sanitary sewer pipeline and soil was removed from the subsite, transported, and disposed at ERDF.

4.15.2.4 100-C-9:2 Verification Sampling. Verification sampling at the 100-C-9:2 subsite was performed between April 25 and September 29, 2006.

The trenches underlying the former pipelines at 1607-B8, 1607-B10, and 1607-B11 were divided into segments of equal size and staked. One verification soil sample was collected within each segment. Each verification soil sample for the 1607-B10 and 1607-B11 pipeline sites consisted of 25 aliquots distributed within the segment and then combined into 1 verification sample. For the 1607-B8 site, 15 aliquots were collected and combined within each segment.

The 1607-B9 pipeline excavation area was a statistically based sample design. The 1607-B9 pipeline verification samples were collected on a random-start, triangular grid with one verification sample collected within each grid. Each verification sample consisted of 25 aliquots. In addition, two focused samples were also collected.

The results demonstrated that residual contaminant concentrations are protective of human health, groundwater, and the Columbia River. In accordance with this evaluation, verification sampling results support an "Interim Closed Out" reclassification of this site.

4.15.3 No Action 100-C-9 Subsites

4.15.3.1 100-C-9:3 Investigation. Confirmatory sampling was conducted at the 100-C-9:3 subsite in October 2003. A focused sampling approach was selected for this site, biased toward worst-case sample locations and locations that were accessible. The sampling approach consisted of collecting four samples, two of soil and two of pipe scale material below

4.6 m (15 ft) from the east junction box. The confirmation sampling results from the scale and soil samples support a "No Action" reclassification of the 100-C-9:3 subsite.

4.15.3.2 100-C-9:4 Investigation. The 100-B-14:4 cooling water lines were used as an analogous site because their construction and use were identical to those at the 105-C Reactor, which were not accessible for sample collection due to previous remedial action. Confirmatory sampling was conducted at the 100-B-14:4 site in November 2003. The sampling approach consisted of collecting one composite sample of scale material from 14 valves in the 105-B valve pit. The valve pit scale sample represents a worst-case sample location for the cooling water pipelines. The sampled valves were associated with the feed cooling water for the 105-B Reactor. The confirmatory sampling results for pipe scale at an analogous site, previous sampling and surveying data associated with the concrete floor of the tunnels, and previous soil sampling from beneath the tunnels support a "No Action" reclassification of the 100-C-9:4 subsite.

Radiological surveys and sample collection were also performed at the 105-C cooling water pipe tunnels during and after decontamination and decommissioning activities at the 100-C Reactor area in order to assess the residual radioactivity associated with the concrete tunnel floor and to assess the potential for contamination in the soil underlying the tunnel structures.

4.15.4 Statement of Protectiveness

The 100-C-9 waste site has been remediated and evaluated in accordance with the interim action ROD. Where remediation occurred, the contamination associated with this site occurred in the shallow zone; the twin box culvert and associated contaminated soils have been removed and disposed at ERDF. It was determined that the deep zone portion of the twin box culvert met the applicable RAOs and was left in place. Sampling to verify the completeness of remedial activities in the shallow zone was performed. The analytical results meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 100-C-9 site to "Interim Closed Out." The deep zone components of the "Interim Closed Out" sites will require institutional controls to prevent uncontrolled drilling/excavation. The "No Action" pipeline sites will also require institutional controls to prevent exposure.

4.16 100-C-10, YELLOW STAINED AREA NORTHWEST OF THE 183-C HEADHOUSE

The site was a yellow stained area that was discovered in the layback of the western end of the 100-C-7:1 subsite while excavating in May 2011. The stained area was visible 65 m (213 ft) west of the 183-C sedimentation basins just north of the head house. The discovery was later determined to be inclusive of the existing 100-C-7:1 subsite and therefore has a "Not Accepted" site classification.

4.17 116-C-2A, 105-C PLUTO CRIB; 116-C-2B, 105-C PLUTO CRIB PUMP STATION; AND 116-C-2C, 105-C PLUTO CRIB SAND FILTER

4.17.1 History

The 116-C-2A Pluto Crib was 6.8 m (22 ft, 3 in.) in length, 4.7 m (15 ft) wide, and 5.1 m (17 ft) deep. The pluto crib was constructed of concrete ties that were notched and stacked in a log cabin formation. The 116-C-2A Pluto Crib was initially used for the disposal of reactor cooling water effluents after fuel cladding failures. The 116-C-2A Pluto Crib also received unknown quantities of liquid wastes from the decontamination of dummy fuel elements on the 105-C wash pad, from the 105-C Metal Examination Facility, and from the 100-C Reactor rear face. A 0.2-m (8-in.) well casing extended through the crib and ended 36 m (118 ft) below grade. The well was installed during construction of the pluto crib to monitor groundwater contamination.

The 116-C-2B Pump Station was 3 m (10 ft) long, 3 m (10 ft) wide, and 8.9 m (29 ft) deep. The pump station had been described as a rectangular-shaped concrete sump. A diamond-plate steel access hole cover was located in the northwest corner, and a vent was located at the east end. Contamination of the soil at this site was expected to be relatively insignificant because it would have only been caused by leakage from the pump station (i.e., opposed to liquid waste disposal).

The 116-C-2C Sand Filter was 12.7 m (41 ft) long, 5.5 m (18 ft) wide, and 5.5 m (18 ft) deep. It was a below-grade, sand-filled concrete box with removable concrete shielding covers. The sand filter received an estimated 7.5 million L (2 million gal) of mixed wastes during operations.

4.17.2 Excavation

The remedial action excavation of the 116-C-2A site (including the 116-C-2B and 116-C-2C sites) began on March 3, 1999, and was completed on May 7, 1999. At the completion of the remedial action, the area of the excavation was 2,516 m^2 (27,728 ft^2) at a maximum depth of 9.15 m (30 ft). A total of 15,939 metric tons (17,570 tons) of material was disposed at ERDF.

4.17.3 Verification Sampling

Cleanup verification sampling began on June 16, 1999, and was completed on June 29, 1999. Each verification sample was a composite formed by combining soil collected at four randomly selected nodes within each sampling area. The 116-C-2ABC sites were divided into two decision units. The shallow zone decision unit was divided into eight sampling areas, and the deep zone decision unit was divided into three sampling areas.

4.17.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial action at the 116-C-2ABC sites has achieved the RAOs and corresponding RAGs established in the approved interim action ROD and supports a reclassification of the 116-C-2ABC waste sites to "Interim Closed Out."

Materials from the 116-C-2ABC sites that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario. This scenario assumes multiple exposure pathways (e.g., ingestion, inhalation, direct exposure) for shallow zone soils and no contact with or exposure to deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls will be required to prevent drilling or excavation into the deep zone without appropriate measures to protect human health and the environment. The evaluations also demonstrate that residual COC concentrations pose no threat to groundwater or the Columbia River.

4.18 116-C-3, 105-C CHEMICAL WASTE TANKS

4.18.1 History

The 116-C-3 waste site consisted of two below-grade chemical waste storage tanks located 100 m (330 ft) northeast of the 105-C Reactor safe storage enclosure. The tanks were designed to receive and store highly radioactive mixed chemical waste from the 105-C Reactor Metals Examination Facility (MEF) dejacketing process. Each of the 116-C-3 waste tanks was 3.5 m (11.5 ft) in diameter and 10.9 m (36 ft) in length, with a nominal capacity of 102,200 L (27,000 gal). The long axis of each tank was oriented east-west on a horizontal plane, with one tank located north of the other. Waste was discharged to the tanks from the 105-C MEF via a 5-cm (2-in.) stainless-steel pipeline connected to top-feed distribution piping at the tanks.

4.18.2 Excavation

Remediation of the 116-C-3 waste site was performed from February through December 2007. Initially, the overburden and surrounding soils were removed sufficiently to provide a subgrade staging and operations area for waste treatment activities.

Remediation of the 116-C-3 tanks was accomplished in two phases: (1) a proof-of-principle demonstration for the waste treatment process in the empty northern tank, followed by demolition and removal of the northern tank; and (2) treatment of the southern tank contents, followed by demolition and removal of the southern tank. Excavation at the site extended to a maximum depth of 8.5 m (28 ft) bgs. A total of 3,767 metric tons (4,152 US tons) of treated waste, debris, and soil was removed from the site and disposed at ERDF.

4.18.3 Verification Sampling

Verification sampling was performed for the 116-C-3 waste site in October and December 2007. Verification sampling was performed to collect data to make a decision whether the RAOs had been reached. Initial verification sampling results for the south tank footprint indicated residual hexavalent chromium concentrations above soil RAGs and elevated radiological activity; therefore, additional material was removed and a complete set of replacement samples was collected.

4.18.4 Statement of Protectiveness

The sample results confirm that remedial action at the 116-C-3 waste site achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." The results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are sufficiently protective of groundwater and the Columbia River to preclude further remedial action. The acceptability of direct exposure to residual deep zone contamination has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are required.

4.19 116-C-6, 105-C FUEL STORAGE BASIN CLEANOUT PERCOLATION PIT

4.19.1 History

The 116-C-6 site was located east of the 105-C Reactor Building. The site was an unlined, L-shaped, open excavated pit roughly 1.8 m (6 ft) deep, 30 m (100 ft) long, and 30 m (100 ft) wide. It was active from December 1984 to August 1985, during which time it received processed water from the 105-C Fuel Storage Basin (FSB). The water from the basin was processed through an ion-exchange system and sampled before being discharged to the 116-C-6 pit from which the water percolated into the vadose zone soil.

4.19.2 Excavation

Confirmatory sampling activities were conducted in March 2003. A statistical sampling approach was selected for this site, using a systematic "hot spot" design to locate four test pits from which soil samples were collected. Field screening using the Laser-Assisted Ranging and Data System was conducted to detect areas of elevated activity. Sample results from test pit #3 showed elevated levels of cesium-137. Per agreement with EPA, the area of the hot spot was excavated and contaminated soil removed and disposed at ERDF.

4.19.3 Verification Sampling

As discussed above, process knowledge, field observations, and radiological survey instruments were used to identify locations to collect confirmatory samples of underlying soil at locations of the 116-C-6 waste site with the greatest potential for residual contamination. These confirmatory samples along with data from the resampling of test pit #3 in May 2003 after removal and disposal of soil at ERDF were used as the verification samples.

4.19.4 Statement of Protectiveness

The results of the evaluation for the 116-C-6 waste site demonstrate that the site meets the RAOs and corresponding RAGS established in the interim action ROD, and the site has been

reclassified as "Interim Closed Out." Residual soil concentrations at the site support future land uses that can be represented (or bounded) by a rural-residential scenario and pose no threat to groundwater or the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]) are not required.

4.20 118-B-1, 105-B BURIAL GROUND

4.20.1 History

The 118-B-1 Burial Ground was located 900 m (3,000 ft) east of the 105-C Reactor Building. This waste site operated from 1944 to 1973, receiving general radioactive and nonradioactive wastes from the 105-B and 105-N Reactors, construction wastes from modification of the 105-B Reactor Building, and process wastes from the P-10 Tritium Separation Project.

The original burial ground consisted of 6 to 8 trenches oriented in an east-west direction, but was expanded over its operational lifetime to 21 east-west trenches and 2 north-south trenches on the west side of the burial ground. During remediation of the site, it was discovered that 2 of the 23 trenches had not been used for waste disposal. The burial ground also consisted of several spline silos constructed from 3- to 3.7-m (10- to 12-ft)-diameter metal culvert piping and three spacer pits shored with railroad ties.

4.20.2 Excavation

Remedial action at the 118-B-1 Burial Ground began on February 2, 2004, with overburden removal. Excavation and sorting of material that had been disposed in the burial ground began on March 16, 2004, and was suspended on September 15, 2004, due to the discovery of suspect spent nuclear fuel (SNF). Loadout operations resumed on April 11, 2005, for previously sorted and segregated material. All remedial activities (excavation, sorting, and loadout) resumed on August 24, 2005, and were completed on June 7, 2007.

Waste forms encountered in the 21 trenches included several thousand perforated and nonperforated spacers, spline cases, piping and tubing, miscellaneous metal, tritium furnaces, wax, lead items, mineral oil, reactor parts and hardware, SNF, hydraulic hoses and parts, degraded personal protective equipment, glassware, compressed gas cylinders, friable and nonfriable ACM, gaskets, metal lathe turnings, dried paints, tar, electrical components, suspect pipe joint compound, and other miscellaneous debris.

Over 120,000 metric tons (132,300 US tons) of debris and contaminated soil from the 118-B-1 Burial Ground was removed and disposed at ERDF. At the conclusion of remediation activities, the excavated area was 10 m (33 ft) deep.

4.20.3 Verification Sampling

Verification sampling was conducted in July 2006 and October through December 2006. Additional focused verification samples were collected from March to June 2007. For statistical verification sampling at the 118-B-1 Burial Ground, the footprints of the 21 trenches containing waste and surrounding land were grouped into 1 shallow zone decision unit with 7 separate areas based on similarity of the waste forms observed during remediation. Each verification sample was a composite formed by combining soil collected at four randomly selected nodes within each sampling area.

Nineteen focused soil verification samples were collected, in addition to the statistical cleanup verification samples. Eleven of the focused samples were collected within the footprints of anomalous waste items or where high in-process sampling results occurred within the remediation footprint. Two of the focused samples were collected from soil underlying the SNF bunkers located in the staging pile area. The remaining six samples were collected at the locations of special waste staging areas.

4.20.4 Statement of Protectiveness

The sample results demonstrate that remedial action at the 118-B-1 Burial Ground has achieved the RAOs and corresponding RAGs established in the interim action ROD, and the burial ground has been reclassified as "Interim Closed Out." The remaining soils at this site have been sampled, analyzed, and modeled. The results of verification sampling indicated that vadose zone soils beneath the burial ground contained residual tritium concentrations in excess of RAOs for the protection of groundwater. The burial ground ESD (EPA 2007), approved by DOE and EPA, allowed residual tritium-contaminated soil to be left in place based on consideration of balancing factors with institutional controls to prohibit future irrigation at the 118-B-1 waste site for 140 years. The results of verification sampling show that residual concentrations of contaminants other than tritium do not preclude any other future uses (as bounded by the rural-residential scenario) of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). With institutional controls to prevent irrigation, the results also demonstrate that further mobilization of residual tritium contamination to groundwater and the Columbia River will be minimized. Residual concentrations of nontritium contaminants are also protective of groundwater and the Columbia River. The acceptability of direct exposure to residual tritium contamination in the deep vadose zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required.

4.21 118-B-2, CONSTRUCTION BURIAL GROUND NO. 1, AND 118-B-3, CONSTRUCTION BURIAL GROUND NO. 2

4.21.1 History

The 118-B-2 Burial Ground was originally reported to be located immediately west of the 118-B-3 Burial Ground. However, geophysical surveys and test pits identified the actual

location to be within the western portion of the 118-B-3 Burial Ground footprint. Therefore, the sites were combined in closure documentation and collectively referred to as the 118-B-3 Burial Ground. The 118-B-2 Burial Ground received dry waste from 107-B Basin repairs and 115-B Gas Recirculation Facility alterations. The 118-B-2 Burial Ground began operation in 1952 and ended operations in 1956.

The 118-B-3 Burial Ground was located 160 m (525 ft) northeast of the 105-B Building. Historical records indicated that the site operated from 1956 until 1960. It was used for the disposal of solid waste from effluent pipeline modifications and for the disposal of reactor-generated solid waste during various modification programs. The 118-B-3 Burial Ground was 917 m (3,009 ft) south of the Columbia River.

4.21.2 Excavation

Remedial action at the 118-B-2 and 118-B-3 Burial Grounds began with overburden removal on April 19, 2004. Waste was not distributed uniformly in the excavated trenches. Soil was mixed with the solid waste material, and portions of the trenches were backfilled between "pockets" of waste. The types of waste material observed in the trenches included steel, stainless steel, lead, ACM, nozzles, one semi-intact drum with unknown liquid, several crushed drums, one fire extinguisher, one skiff holding an oxygen/acetylene tank combination, personal protective equipment, nonasbestos-based filters, pipes of varying diameters, valves, concrete, rebar, wood, and solidified paint.

The excavation was completed on June 24, 2004. The excavation had an average depth of 4.6 m (15 ft), and 9,525 metric tons (10,700 US tons) of material was removed from the combined 118-B-2 and 118-B-3 Burial Grounds and disposed at ERDF.

4.21.3 Verification Sampling

Cleanup verification sampling began and was completed on October 19, 2004. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area. The 118-B-2 and 118-B-3 Burial Grounds consisted of one shallow zone decision unit, which was divided into four sampling areas.

4.21.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial action at the 118-B-2 and 118-B-3 Burial Grounds have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the burial grounds have been reclassified as "Interim Closed Out." The remaining soils at the burial grounds (including the overburden and staging pile areas) have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 118-B-2 and 118-B-3 Burial Grounds containing COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site are protective of

groundwater and the Columbia River. Shallow zone soil cleanup criteria have been applied to the entire vadose zone underlying the excavation; therefore, institutional controls to prevent drilling or digging are not required for this site.

4.22 118-B-4, 105-B SPACER BURIAL GROUND

4.22.1 History

The 118-B-4 Burial Ground was located 90 m (300 ft) northeast of the 105-B Reactor Building. The site was used for disposal of irradiated 105-B Reactor aluminum fuel spacers, splines, and lead-cadmium "poison pieces." The lead-cadmium poison pieces were encased in aluminum, thus eliminating the risk of soil contamination. The materials were disposed at the 118-B-4 Burial Ground from 1956 to 1958, in a series of wood- and metal-constructed caissons. The wooden caissons were 1.8 m (6 ft) in diameter and 3.7 m (12 ft) deep, and the metal caissons were 1.2 m (4 ft) in diameter and 1.5 m (5 ft) deep. The total volume of solid waste in the caissons was less than 60 m^3 (2,100 ft^3).

4.22.2 Excavation

Remedial actions at the 118-B-4 Burial Ground site began on November 14, 2003. Excavation of the site included removing burial ground caisson structures and buried debris. The excavated waste was temporarily staged adjacent to the site excavation prior to disposal at ERDF. The excavation was completed on December 22, 2003, and 3,170 metric tons (3,495 US tons) of material, including soil and burial ground debris, was disposed at ERDF. The excavation was 3.9 m (13 ft) in depth.

4.22.3 Verification Sampling

Cleanup verification sampling began and was completed on January 15, 2004. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area. The 118-B-4 waste site consisted of one shallow zone decision unit that was divided into four sampling areas.

4.22.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial action at the 118-B-4 Burial Ground has achieved the RAOs and corresponding RAGS established in the interim action ROD, and the burial ground has been reclassified as "Interim Closed Out." The remaining soils at this site have been sampled, analyzed, and modeled. The results indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. Institutional controls are not required for the site to prevent drilling or excavation into deep zone soils.

4.23 118-B-6, 108-B SOLID WASTE BURIAL GROUND

4.23.1 History

The 118-B-6 Burial Ground was located 107 m (350 ft) northeast of the 105-B Reactor. The site consisted of two concrete pipes 5.5 m (18 ft) long by 1.8 m (6 ft) in diameter that were buried vertically in the ground. One of the concrete caissons was filled with waste and capped, while the other was partially filled with waste, covered with a thin layer of concrete, and left for future use. The caissons were covered by a concrete pad, measuring 4.6 m (15 ft) by 3 m (10 ft), with two pear-shaped steel lids that provided access to the concrete burial pipes. The site was used for the disposal of wastes such as spent lithium-aluminum alloy, lead from pots, mercury from manometers and Toepler pumps, aluminum cladding, and wastes generated as a result of the P-10 Tritium Production Project.

4.23.2 Excavation

Remedial action at the 118-B-6 Burial Ground began in November 2004. Excavation of the site involved removing the uncontaminated overburden, caissons, concrete pad, buried materials, and underlying contaminated soil. In December 2004, the majority of excavation was completed. However, leach tests done on soil samples taken from the bottom of the excavation showed levels of tritium that required an additional 1.5 m (5 ft) of soil removal. This additional excavation was completed in June 2005. The excavation had a total depth of 7 m (23 ft). A total of 577 metric tons (636 US tons) of material from the site was disposed at ERDF.

4.23.3 Verification Sampling

Final cleanup verification samples were collected on January 9, 2006. Each verification sample was a composite formed by combining soil collected at four randomly selected nodes within each sampling area. The 118-B-6 site consisted of both a shallow and a deep zone decision unit.

4.23.4 Statement of Protectiveness

The sampling results demonstrate that remedial action at the 118-B-6 site has achieved the RAOs and corresponding RAGS established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." The remaining soils at the 118-B-6 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 118-B-6 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. Institutional controls are required for the site to prevent drilling or excavation into deep zone soils.

4.24 118-C-1, 105-C BURIAL GROUND

4.24.1 History

The 118-C-1 waste site was located 150 m (500 ft) southeast of the 105-C Reactor Building. This waste site was the primary burial ground for general wastes from the operation of the 105-C Reactor. The burial ground was in operation between 1953 and 1969 and received process tubes, aluminum fuel spacers, control rods, reactor hardware, SNF, and soft wastes. The C-Area Land Burial Log (1962-1965) identifies additional waste including trash, poison splines, dummies, hot laundry, fan filters, irradiated balls, ceramic samples, thimbles, gun barrels, and hoses that were deposited in the site. The 118-C-1 Burial Ground was estimated to contain 86 metric tons (94.8 US tons) of boron, 1.1 metric tons (1.2 US tons) of graphite, 0.51 metric tons (0.56 US tons) of lead, 21.6 metric tons (23.8 US tons) of lead/cadmium, and 96 metric tons (105.9 US tons) of other materials.

4.24.2 Excavation

Remedial action at the 118-C-1 waste site began on February 2, 2004. Excavation of the site involved removing the uncontaminated overburden, the buried contaminated debris, and the underlying contaminated soil. On March 31, 2004, excavation and sorting of the burial ground was initiated. Spent nuclear fuel was discovered during the waste debris sorting operation on September 27, 2004, and the operations were temporarily shut down. Loadout operations were reestablished on April 11, 2005, for previously sorted and segregated material. All remedial activities (excavation, sorting, and loadout) resumed on October 25, 2005, and were completed on May 27, 2006. More than 75,300 metric tons (83,000 US tons) of waste and contaminated soil from the 118-C-1 Burial Ground was disposed at ERDF. The excavation had a maximum depth of 5 m (17 ft).

Buried waste from the 118-C-1 Burial Ground that was disposed included several thousand perforated and nonperforated spacers, piping and tubing, vertical control rods, sheet metal, boron balls, boron ball vacuums, bismuth, paint, high-dose piping, wax, casks, tar, tar paper, miscellaneous metal, mercury tubes, lead items, reactor parts and hardware, SNF, hydraulic hoses and parts, degraded drums, glassware, concrete, electrical components, and other miscellaneous debris.

4.24.3 Verification Sampling

Final cleanup verification samples were collected in August and September 2006 and May 2007. For closeout verification sampling of the 118-C-1 remediation footprint, the 10 trenches and surrounding land were grouped into 4 separate sampling decision units based on similarity of the waste forms observed during remediation. The number of verification samples collected for each of the decision units was four composite samples. Each statistical verification sample was a composite formed by combining soil collected at four randomly selected nodes within each sampling decision subunit.

4.24.4 Statement of Protectiveness

The verification sample results confirm that remedial action at the 118-C-1 waste site has achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site been reclassified as "Interim Closed Out." The remaining soils at the 118-C-1 waste site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 118-C-1 waste site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. Institutional controls are required for the site to prevent uncontrolled drilling or excavation into deep zone soils.

4.25 118-C-2, 105-C BALL STORAGE TANK

4.25.1 History

The 118-C-2 waste site was located 1,346 m (4,416 ft) from the Columbia River and 10 m (33 ft) north of the 105-C Reactor Building. The site operated during 1969, supporting the Ball 3X System at the 105-C Reactor Building. During the Ball 3X Project, the 118-C-2 Ball Storage Tank received irradiated nickel-plated boron-steel and carbon-steel balls for temporary storage, to be radiologically decayed prior to burial. A total of 9,070 kg (20,000 lb) of highly activated balls were held in the storage tank. Approximately 70% of these balls were boron steel and 30% were carbon steel. The storage tank was buried under several feet of clean fill material.

4.25.2 Excavation

Remedial action at the 118-C-2 waste site began on November 10, 2003. Excavation involved removing the overburden materials, debris, and underlying contaminated soil. Both the collection tank and loose boron balls exposed during the excavation were removed. Soil was placed in the roll-off waste box, then balls, then soil, etc., to keep the balls from moving around in transit to ERDF. The tank was flattened, crumpled up, and hauled off with the soil waste for disposal at ERDF. The excavation was completed on December 3, 2003, to a maximum depth of 3.14 m (10.3 ft). A total of 470.4 metric tons (463 US tons) of material, including soil and burial ground debris, were removed and disposed at ERDF.

4.25.3 Verification Sampling

Cleanup verification sampling was conducted on January 14, 2004. The excavated 118-C-2 waste site consisted of a shallow zone decision unit divided into four verification sample areas. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area.

4.25.4 Statement of Protectiveness

The verification sample results confirm that remedial action at the 118-C-2 waste site has achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." The contaminated materials from the 118-C-2 waste site have been excavated, removed, and disposed at ERDF. The remaining soil at the site has been sampled, analyzed, and modeled. The analytical and modeling results also indicate that residual concentrations at the 118-C-2 waste site will support future land uses that can be represented (or bounded) by a rural-residential scenario, and that residual concentrations throughout the site are protective of groundwater and the Columbia River. Institutional controls are not required for the site to prevent drilling or excavation into deep zone soils.

4.26 118-C-3, 105-C REACTOR BUILDING

4.26.1 History

The 118-C-3 waste site is the inactive 105-C plutonium production reactor building that has been placed in ISS. Construction of the 105-C Reactor began in 1951 and was completed in 1952. After the reactor was shut down in 1969, it remained in a state of surveillance and maintenance until 1996. Beginning in 1996, decommissioning activities removed the ancillary portions of the building, leaving only the reactor core and shield walls. Three subsites were designated for the 105-C Reactor. The 118-C-3:1 subsite consisting of the 105-C Reactor core and ISS facility is currently the only subsite that remains as "Accepted" in WIDS. The 118-C-3:2 subsite consisted of 105-C Reactor below-grade structures and underlying soils. The 118-C-3:3 subsite consisted of four french drains located at each of the four corners of the 105-C Reactor Building.

4.26.2 118-C-3:2 Excavation

The remedial actions for the 118-C-3:2 subsite involved the decommissioning and decontamination of associated structures and soils at the 105-C Reactor to the extent required leaving only the reactor core to be placed in ISS. Decommissioning activities included removing radiological contaminated equipment and hazardous material, and demolition of most above-grade structures. The below-grade structures and FSB were partially dismantled, removed, and disposed at ERDF. Parts of the 118-C-3:2 underground structures remain, primarily below 4.6 m (15 ft). A total of 14,152 metric tons (15,600 US tons) of contaminated materials was disposed at ERDF. Specific areas are discussed below.

- **Region A – Below-Grade Structures and Soils.** The Region A structures included the FSB, attached MEF, and the north and south cask storage pits. The upper 4.6 m (15 ft) of these structures was removed and disposed. The lower portion of the FSB (below 4.6 m [15 ft]) was left intact.

  The Region A soils included the soils adjacent to and underlying the 105-C FSB. The soils adjacent to the FSB are in the shallow zone, while the underlying soils are entirely within the

deep zone (>4.6 m [>15 ft] below grade). No remedial action was required for the soils under the FSB floor.

- **Region B – Below-Grade Structures.** The structures in Region B included tunnel sections 1, 2, 3, 4, 5, 7, 9, 13S, and 20; the battery room; the electrical equipment room; and the large storage area. The floors and walls in Region B were entirely within the shallow zone (<4.6 m [<15 ft] below grade). Two contaminated floor drains in tunnel sections 7 and 9 were determined to be the source of contamination for three of the 1-m^2 (10.8-ft^2) grid sections. The floor drains and contaminated grid areas were removed from the floor and disposed in ERDF. A 1-m^2 (10.8-ft^2) grid was also removed from the tunnel floor of section 5 and disposed in ERDF. The entire floor of the battery room was removed and disposed in ERDF.

- **Region C – Below-Grade Structures.** The Region C below-grade structures included tunnel sections 13E, 13W, and 13N; the room attached to tunnel section 13N; the compressor room; and the vacuum system room. The Region C below-grade rooms and tunnels were within both the shallow and deep zones. Two grid squares on the wall shared with the vacuum room and one grid square on the east wall were removed and disposed in ERDF. In addition, one area with piping passing through a wall in the vacuum room was removed and disposed in ERDF. The piping was also removed with the wall demolition.

- **Region D – Below-Grade Structures.** The Region D below-grade structures included the lift station cells 1, 2, 3, and 4. The lift station structure is within both the shallow and deep zones. No remedial actions occurred in Region D. EPA agreed that release of the lift station could be based entirely on the results of the radiological surveys.

4.26.3 118-C-3:2 Verification Sampling

Verification sampling for the 118-C-3:2 subsite was performed from March through August 1998. Specifics regarding the types and number of verification samples collected for each region are provided below.

- **Region A – Below-Grade Structures and Soils.** Concrete core samples, 5 cm (2 in.) in diameter, were collected from the floor of the FSB at five randomly selected locations. Samples were collected at three depths from each core location. Soil underlying the FSB was sampled through the core holes in the FSB floor. Samples were collected at a variety of depths and were grouped into three depth intervals. The three intervals are 0 to 0.3 m, 0.3 to 1.4 m, and 1.4 to 3.2 m (0 to 1 ft, 1 to 4.5 ft, and 4.5 to 10.5 ft).

  Radiological surveys were not performed in the FSB because the background radiation levels were too high to obtain meaningful data.

- **Region B - Below-Grade Structures.** Concrete verification samples were collected from each of the Region B rooms and tunnels by drilling into the concrete floor surface to a depth

of 0.6 cm (0.25 in.). In addition, two verification samples were collected from the floor of the battery room.

- **Region C - Below-Grade Structures.** Concrete verification samples were collected from each of the Region C rooms and tunnels by drilling into the concrete floor surface to a depth of 0.6 cm (0.25 in.).

- **Region D - Below-Grade Structures.** No sampling was performed in Region D. EPA agreed that release of the lift station could be based entirely on the results of the radiological surveys.

4.26.4 118-C-3:3 Investigation

The 118-C-3:3 subsite consisted of four french drains that received condensate from the sealed steam heating system that would not have been subject to contamination from within the reactor building. The area around all four drains was disturbed and/or excavated during 105-C Reactor decommissioning activities. The entire area was backfilled and smoothed to grade after various excavations. No visual surface indicators of the french drains remain.

4.26.5 118-C-3:3 Confirmatory Sampling

Confirmatory sampling was conducted at the 118-C-3:3 subsite on January 4, 2005. Excavations at the four french drain locations found three partially intact. The fourth drain was not found in the excavations. The three french drains found were excavated and sampled just below the bottom of the drain. The fourth location was excavated to 4.6 m (15 ft) bgs and sampled at the bottom of the excavation.

Examination of the data has led to the conclusion that the 118-C-3:3 subsite meets the RAGS without further remedial action. In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 118-C-3:3 subsite to "Interim Closed Out."

4.26.6 Statement of Protectiveness

The 118-C-3:2 and 118-C-3:3 subsites meet the RAOs specified in the interim action ROD and have been reclassified as "Interim Closed Out." The results demonstrate that residual contaminant concentrations do not preclude any future land uses (as bounded by a rural-residential scenario) and allow for unrestricted future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The results also show that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Institutional controls at the 118-C-3:2 subsite are required to prevent excavation/drilling into the deep zone. The 118-C-3:3 subsite met all shallow zone cleanup criteria and did not extend into the deep zone; therefore, no deep zone institutional controls are required.

4.27 118-C-4, 105-C HORIZONTAL CONTROL ROD STORAGE CAVE

4.27.1 History

The 118-C-4 waste site was located 100 m (328 ft) south of the 105-C Reactor Building. The 118-C-4 site consisted of the soils underlying the former 118-C-4, 105-C Horizontal Control Rod Cave (rod cave) building. The rod cave operated from 1950 to 1969. The structure consisted of two steel plate tunnels grouted onto a concrete floor and covered with 1.2 m (4 ft) of soil and gravel, as well as asphalt emulsion for moisture protection. Three french drains were also located along the center of the structure floor for the removal of precipitation runoff that could potentially collect between the tunnels. The tunnels were used for temporary storage of radiologically contaminated horizontal control rod tips from the 105-C Reactor.

4.27.2 Excavation

Remedial action at the 118-C-4 waste site was conducted in March 2003. Excavation of the site involved removing the soil and gravel covering the rod cave, removal of the structure and slab floor, and removal of underlying soil to a depth of 0.85 m (2.8 ft). A total of 453 metric tons (500 US tons) of contaminated materials was transported and disposed at ERDF.

4.27.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling was conducted on May 15, 2003. Four final verification samples were collected from the shallow zone decision unit. Each verification sample was a composite formed by combining soil collected at four randomly selected nodes within each sampling area.

4.27.4 Statement of Protectiveness

The verification sample results confirm that remedial action at the 118-C-4 waste site has achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." The remaining soils at the 118-C-4 waste site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 118-C-4 waste site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site are protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]) are not required.

4.28 124-C-4, SANITARY WASTE SITE

The 124-C-4 waste site was included in the *Radiation Area Remedial Action FY 1995 Summary Report* (BHI-00621), but the site and its location could not be identified and it was not believed

to exist. The site therefore has a "Not Accepted" waste site classification. The site was thought to be either the 1607-B10 or 1607-B11 septic system, as they were the only septic systems in the 100-B/C Area that contained the 124 alias site code.

4.29 128-C-1, 100-C BURNING PIT

4.29.1 History

The 128-C-1 Burn Pit was historically used for the disposal of combustible and noncombustible wastes, including office wastes, paint, vegetation, chemical solvents, uncontaminated machinery, and hardware. The site was located east of the 105-C Reactor Building and west of the eastern leg of the 100-B/C perimeter road and was bounded on the north by an export water line and on the east by a soil berm.

4.29.2 Excavation

Remedial action at the 128-C-1 waste site was initiated on September 16, 2004, and completed on November 9, 2004. A total of 8,750 BCM (11,440 BCY) was excavated for disposal, including contaminated ash and soil, concrete, tar, mastic, and ACM (e.g., transite). All excavated material was disposed at ERDF.

4.29.3 Verification Sampling

Verification sampling for the 128-C-1 waste site was performed on February 2, 2005. Sampling locations were distributed over the entire remediation footprint on a grid basis in an effort to determine the residual presence of contamination. A total of 14 soil samples were collected on a random-start, triangular grid.

4.29.4 Statement of Protectiveness

The 128-C-1 Bum Pit waste site has been evaluated and remediated in accordance with the interim action ROD. Statistical sampling to verify the completeness of remediation was performed, and analytical results were shown to meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 128-C-1 waste site to "Interim Closed Out." Residual contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

4.30 132-C-1, 116-C REACTOR EXHAUST STACK SITE

4.30.1 History

The 116-C stack, also identified as the 132-C-1 waste site, was used to dispose of exhaust air that originated from work areas within the 105-C Reactor Building beginning in 1952. Operation of the stack was shut down in 1969. The 116-C stack and foundation were demolished by explosives in September 1983. The trench containing the stack rubble and the foundation base were covered with clean fill to a depth of at least 1 m (3.3 ft) and the area was graded to conform to the natural area topography.

4.30.2 Investigation

RESidual RADioactivity (RESRAD) modeling was performed in 2003. The contaminated material was modeled as a 0.013-m (0.5-in.)-thick layer as buried in the 61-m by 9.1-m (200- by 30-ft) waste site beneath 1 m (3.3 ft) of clean soil fill and above two uncontaminated, unsaturated zone layers of concrete and soil, respectively. The RESRAD modeling accounts for radioactive decay from 1983 (the year of demolition) to 2003 and predicts that none of the contaminants will reach groundwater within 1,000 years.

4.30.3 Statement of Protectiveness

Based on this evaluation, the historical data support a "No Action" interim closure reclassification for the 132-C-1 waste site. The site achieved the RAOs and corresponding RAGs established in the interim action ROD. Residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario and pose no threat to groundwater or the Columbia River based on RESRAD modeling. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]) are not required.

4.31 132-C-3, 117-C FILTER BUILDING

4.31.1 History

The 117-C Filter Building began operation in 1961 to filter 105-C Reactor exhaust air before its routing to the 116-C Exhaust Stack. The 117-C Filter Building was shut down in 1969. Phase I decommissioning of the 117-C Filter Building and associated below-grade ductwork was completed in 1984. Contaminated equipment (e.g., high-efficiency particulate air filters, pumps, frames) were removed from the facility, packaged, and shipped to the 200 West Area burial grounds for disposal as low-level radioactive waste.

Demolition and site grading were performed in October and November 1988. The building and ducts were excavated and demolished in situ. The contaminated rubble was buried at least 1 m

(3.3 ft) deep, except for the rubble from the seal pits that were buried under a minimum of 5 m (16 ft) of clean earth.

4.31.2 Investigation

Using the greatest activities from the pre-demolition characterization data to represent residual contamination levels over 100% of the inner surface area of the former facility, RESRAD modeling was performed in 2003 to support the previous decision to demolish and bury the facility in place.

4.31.3 Statement of Protectiveness

Based on this evaluation, the historical data support a "No Action" interim closure reclassification for the 132-C-3 waste site. The site achieves the RAOs and the corresponding RAGs established in the interim action ROD. Residual concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario, and (based on RESRAD modeling) residual contamination at the site poses no threat to groundwater or the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]) are not required.

4.32 600-33, 105-C REACTOR TEST LOOP BURIAL SITE

The 600-33 waste site was a burial site for the 105-C Reactor test loop. Five areas were identified as possible locations including one that indicated the original burial site was 90 to 120 m (300 to 400 ft) south of the 105-C Reactor fan room and just outside the perimeter/exclusion area fence. The burial site was thought to be near two concrete piers with a wooden railing connecting them. The railing may have been installed during construction of the 105-C Reactor facilities and placed as a barricade to protect a sewage line from heavy equipment movement. The markers are also of a type used in the past to designate burial sites.

The five areas identified as possible locations for the site were trenched and inspected for evidence of the waste site. No radioactivity was detected and no buried material was found at any of the locations. Historical records in WIDS indicate that the 105-C test loop was eventually disposed to the 118-C-1 Burial Ground and was not permanently buried at the suspect waste site location. Based on this evidence, the 600-33 waste site was reclassified as "Rejected."

4.33 600-232, 100B ELECTRICAL LAYDOWN AREA

4.33.1 History

The 600-232 waste site was located 200 m (656 ft) south of the 105-C Reactor Building and north of Route 6. Railroad tracks run east-west through the site. The 600-232 waste site covered

19,500 m^2 (210,000 ft^2) within a 700- by 120-m (2,300- by 400-ft) corridor, including an area 50 by 50 m (164 by 64 ft) to the northeast.

This surface debris site was a former electrical laydown yard. The site contained utility poles in various conditions ranging from poor to good. The site also contained various electrical utility materials such as steel cable, aluminum beams, aluminum poles, and insulators as well as several utility pole storage racks constructed of railroad rails and ties. Pieces of tar were also observed throughout the area.

4.33.2 Excavation

For the 600-232 waste site, a cleanup action was initiated on February 19, 2004. The poles were size reduced and removed for disposal to ERDF. A layer of soil underlying the poles and in areas with visible tar was excavated and disposed due to the presence of TPH associated with the tar. In areas where the poles appeared to have been treated, a 30-cm (12-in.) layer of soil was removed. Where there were isolated, scattered small tar droppings, 8 cm (3 in.) of soil was removed. The cleanup action also included a very small area to the east of the 50- by 50-m (164- by 164-ft) area that contained similar surface contamination. A total of 9,005 metric tons (9,905 US tons) of debris were sent to ERDF for disposal.

4.33.3 Verification Sampling

Verification sampling was conducted at the 600-232 waste site on April 27, 2004. Sampling locations were distributed over the entire 700- by 120-m (2,300- by 400-ft) site on a grid basis in an effort to determine the residual presence of contamination. Twelve soil samples were systematically collected on a random-start, triangular grid.

4.33.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 600-232 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." The verification sampling results were used to demonstrate the site meets the cleanup objectives for direct exposure, groundwater protection, and river protection. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]) are not required.

4.34 600-233, VERTICAL PIPE NEAR 100B ELECTRICAL LAYDOWN AREA

4.34.1 History

The 600-233 waste site was located within the 600-232 waste site (100-B Electrical Laydown Yard) on the northern side of the railroad tracks. The area was 250 m (820 ft) southeast of the 105-C Reactor Building, outside of the exclusion fence. The 600-233 waste site was a 0.064-m

(2.5-in.)-diameter steel pipe extending 1.5 m (4.9 ft) vertically above the ground surface with an elbow and valve at the top.

4.34.2 Excavation

Remediation of the 600-233 waste site consisted of the removal of the 0.064-m (2.5-in.) steel pipeline via excavation of a 23-m (75-ft)-long, 0.5-m (1.6-ft)-deep trench. The eastern end of the pipeline was discovered to terminate with a pipe cap, and the pipeline was removed for disposal at ERDF. During excavation of the primary 0.064-m (2.5-in.) pipeline, two small-diameter (0.019 m [0.75 in.] and 0.025 m [1 in.]) pipelines were uncovered at the eastern end of the trench that was determined to have historically been used for diesel fuel supply.

4.34.3 Verification Sampling

Verification sampling for the 600-233 waste site was performed on August 9, 2005. Two soil sample locations were identified for verification sampling. One soil sample was taken at each location by collecting 15 aliquots from soils at the excavation floor and combining into 1 sample.

4.34.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 600-233 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD and has been reclassified as "Interim Closed Out." The verification sampling results were used to demonstrate that the site meets the cleanup objectives for direct exposure, groundwater protection, and river protection. Residual contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

4.35 600-252, OLD TANK FROM RCRA GENERAL INSPECTION 3LORIVFY97 ITEM #8

The site was an old, rusty, corrugated steel tank lying on its side. During a site inspection on October 8, 1997, the tank was measured with a tape measure to be 2.44 m (8 ft) long and 1.07 m (3.5 ft) in diameter. The site was located 1.5 km (0.9 mi) west, northwest of the 100-B/C Area just north of Route 6. It has been reclassified as "Not Accepted."

4.36 600-345, 100-BC VICINITY OIL STAIN AND FILTER AREA

4.36.1 History

The 600-345 waste site was a stained area with oil filters. It was suggested that petroleum liquid may have been released to the ground during an automobile engine oil change, or a container of

petroleum liquid may have been dumped. The area had a diameter of 6 m (20 ft). The 600-345 waste site was located just south of the 100-BC Vernita Road.

4.36.2 Excavation

Remediation occurred on February 10, 2010, and August 6, 2010, and all oil filters and apparent stained soil were removed. Following remediation on February 10, 2010, the excavated area measured 4 by 5 m (12 by 15 ft) and was 46 cm (18 in.) deep. However, due to TPH levels exceeding cleanup criteria in one quadrant, an additional 0.6 m (2 ft) of material was removed in that quadrant on August 6, 2010. A total of 22 BCM (29 BCY) of material was removed from the waste site. The waste material was directly loaded into containers for shipment to ERDF.

4.36.3 Verification Sampling

Verification sampling of the 600-345 waste site was conducted in May and August 2010. Professional knowledge and the laboratory results of previous waste characterization sampling were used to develop the verification sampling design for the 600-345 waste site. The excavation area was divided into four quadrants. Within each quadrant, sampling consisted of the collection of 25 aliquots of soil distributed across the surface of the soil and combined into one sample.

4.36.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 600-345 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." The results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Residual contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

4.37 600-346, 100-BC VICINITY ASH AND DEBRIS AREA

4.37.1 History

The 600-346 waste site was originally described as four small fly-ash dump areas with metal debris. All of the dump areas were within a 5- by 30-m (16- by 100-ft) area and were unvegetated. During preparation for remediation, the waste site was determined to contain six separate dump areas. The 600-346 waste site was located east of the 100-B/C Area, along an old railroad bed. There is no process history associated with the 600-346 waste site.

4.37.2 Excavation

Remediation occurred on February 11, 2010. The six remediated areas ranged in size from 1.8 by 2.4 m (6 by 8 ft) to 6 by 9 m (20 by 30 ft). All excavations extended to 46 cm (18 in.) bgs. A total of 42.5 BCM (55.6 BCY) of material was removed from the waste site. The waste material was directly loaded into containers for shipment to ERDF.

4.37.3 Verification Sampling

Verification sampling for the 600-346 waste site was conducted in May 2010. Professional knowledge and the laboratory results of waste characterization sampling were used to develop the verification sampling design for the 600-346 waste site. A statistical sampling design was used to collect 12 statistical verification soil samples from the single decision unit.

4.37.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 600-346 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." The results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Residual contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

4.38 1607-B8, 1607-B8 SEPTIC TANK SYSTEM

4.38.1 History

The 1607-B8 waste site was located east of the 190-C Process Pump House, 120 m (394 ft) west of the 105-C Reactor. The 1607-B8 septic tank and associated tile field were used for disposal of sanitary sewer waste from the 190-C Pumphouse. The septic system received sanitary sewer waste from 1951 until 1969. The vertical tank was constructed of steel and had a 1,325- L (350-gal) capacity. The tile field was oriented in a north-south direction and was located to the south of the septic tank. The tile field was constructed of 20-cm (8-in.)-diameter vitrified clay pipe laid with open joints.

4.38.2 Excavation

Remedial action at the 1607-B8 site began in March 2003. Excavation of the site involved removing the overburden materials, septic system (septic tank and drain field), and underlying contaminated soil. Contaminated materials including the septic tank and drain field piping were

disposed at ERDF. The 1607-B8 septic system inlet pipe was removed to the extent of the site excavation. The excavation depth was 2.5 m (8.2 ft), and 361 metric tons (397 US tons) of material from the site was disposed at ERDF.

4.38.3 Verification Sampling

Final cleanup verification samples were collected on March 31, 2003. The 1607-B8 waste site consisted of only one shallow zone decision unit, which was divided into four sampling areas. One composite cleanup verification sample was collected from each sample area.

4.38.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 1607-B8 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." Materials that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and evaluated to show that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site do not pose a threat to groundwater or the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [915 ft]) are not required.

4.39 1607-B9, 1607-B9 SEPTIC TANK SYSTEM

4.39.1 History

The 1607-B9 waste site was located 180 m (690 ft) to the southeast of the 105-C Reactor Building. The 1607-B9 waste site was a septic tank, effluent pipeline, and tile field that were used to dispose of sanitary sewer waste from the 105-C Reactor Building. The 1607-B9 septic tank was 3 m (10 ft) deep, constructed of reinforced concrete, and had a 9,085-L (2,400-gal) capacity. The septic tank had two 0.8-m (2.5-ft)-diameter manholes that were accessible at the ground surface. Effluent from the tank was routed a short distance (16 m [52 ft]) through a pipeline to the tile field. The tile field located southeast of the tank was constructed of 20-cm (8-in.)-diameter vitrified clay pipe.

4.39.2 Excavation

Remedial action at the 1607-B9 waste site was conducted in April and May 2003. Excavation of the site involved removing the overburden materials, septic system (septic tank, effluent pipeline, and tile drain field), and underlying contaminated soil. Contaminated materials including the septic tank, piping, and drain field piping were disposed at ERDF. The 1607-B9 septic system inlet pipeline was removed to the extent of the site excavation. The remainder of the pipeline between the 105-C Reactor Building and the 1607-B9 site was included in the 100-C-9 pipelines

waste site. The excavation depth was 3.5 m (11.5 ft), and 3,060 metric tons (3,370 US tons) of material from the site was disposed at ERDF.

4.39.3 Verification Sampling

Final cleanup verification samples were collected in April and May 2003. The 1607-B9 waste site consisted of only one shallow zone decision unit, which was divided into two subunits and eight sampling areas. One composite cleanup verification sample was collected from each sample area.

4.39.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 1607-B9 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." Materials that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and evaluated to show that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site do not pose a threat to groundwater or the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]) are not required.

4.40 1607-B10, 1607-B10 SEPTIC TANK SYSTEM

4.40.1 History

The 1607-B10 septic tank system was located south of the former site of the 183-C Head House and 580 m (1,900 ft) west of the 105-C Reactor. The drain field was located immediately south of the septic tank. The 1607-B10 septic system was used for disposal of sanitary sewer waste from the 183-C Head House. The septic system received sanitary sewer waste from 1952 until 1969. The vertical-type tank was constructed of steel and had a 1,325-L (350-gal) capacity.

4.40.2 Excavation

Remedial action at the 1607-B10 site was conducted in March 2003. Excavation of the site involved removing the overburden materials, septic system (septic tank and drain field), and underlying contaminated soil. Contaminated materials including the septic tank and drain field piping were disposed at ERDF. The depth of the excavation was 2.5 m (8.2 ft), and 328 metric tons (361 US tons) of material from the site was disposed at ERDF.

4.40.3 Verification Sampling

Final cleanup verification samples were collected in April 2003. The 1607-B10 waste site consisted of only one shallow zone decision unit, which was divided into four sampling areas. One composite cleanup verification sample was collected from each sample area.

4.40.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 1607-B10 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." Materials that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and evaluated to show that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site do not pose a threat to groundwater or the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]) are not required.

4.41 1607-B11, 1607-B11 SEPTIC TANK SYSTEM

4.41.1 History

The 1607-B11 septic tank system was located immediately north of the 183-C Filter Building and 360 m (1,180 ft) west of the 105-C Reactor Building. The 1607-B11 site was a septic tank and associated drain field that were used for disposal of sanitary sewer waste from the 183-C Filter Building. The septic system received sanitary sewer waste from 1952 to 1969. The vertical tank was constructed of steel and had a capacity of 1,325 L (350 gal).

4.41.2 Excavation

Remedial action at the 1607-B11 waste site was conducted in March 2003. Excavation of the site involved removing the overburden materials, septic system (septic tank and drain field), and underlying contaminated soil. Contaminated materials including the septic tank and drain field piping were disposed at ERDF. The depth of the excavation was 3 m (9.8 ft), and 131 metric tons (144 US tons) of material from the site was disposed at ERDF.

4.41.3 Verification Sampling

Final cleanup verification samples were collected on April 2, 2003. The 1607-B11 waste site consisted of only one shallow zone decision unit, which was divided into four sampling areas. One composite cleanup verification sample was collected from each sample area.

4.41.4 Statement of Protectiveness

The verification sampling results demonstrate that remedial actions at the 1607-B11 waste site have achieved the RAOs and corresponding RAGs established in the interim action ROD, and the site has been reclassified as "Interim Closed Out." Materials that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and evaluated to show that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site do not pose a threat to groundwater or the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]) are not required.

5.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

This section addresses the process for demonstrating achievement of performance standards including attainment of RAOs and RAGs and maintaining the required quality controls during remedial activities.

5.1 ATTAINMENT OF PERFORMANCE STANDARDS

The remedial actions described in Section 4.0 of this report were performed to identify and reduce potential threats to human health and the environment from waste site contamination. Following interim remedial actions at a waste site, an evaluation against identified performance standards (the RAOs in the interim action RODs) is conducted in order to verify that the residual contamination does not pose an unacceptable health risk to future users of the site.

5.1.1 Performance Standard Documentation

Attainment of the specific RAO performance standards in the interim action RODs and interim closure of individual 100-BC-2 OU waste sites are documented in the cleanup verification packages, remaining sites verification packages, or similar supporting documentation. These documents provide remediation information as described in Section 2.3 to support the formal reclassification in the WSRFs. Table 5-1 identifies "No Action" waste sites in the 100-BC-2 OU where remedial action was not required based on evaluation of process history and/or confirmatory sampling data. Table 5-2 provides information to support the "Interim Closed Out" reclassification for sites where contamination was present above RAGs and remediation consisting of RTD was required.

Table 5-1. No Action Waste Sites in the 100-BC-2 Operable Unit. (2 Pages)

WIDS Site Code	WIDS Site Name	WSRF	Reclassification Date	Reclassification Status	Closure Document
100-B-35:2	152-B1 Secondary Substation	2014-054	06/23/2014	No Action	*Remaining Sites Verification Package for the 100-B-35:2, 152-B1 Secondary Substation Subsite*
100-C-9:3	183-C Clearwell Pipelines	2004-014	06/03/2004	No Action	*Remaining Sites Verification Package for the 100-C-9:3, 183-C Clearwells Site*
100-C-9:4	100-C Cooling Water Transfer Pipelines and Tunnels	2004-015	06/03/2004	No Action	*Remaining Sites Verification Package for the 100-C-9:4, Cooling Water Pipe Tunnels Site*

Table 5-1. No Action Waste Sites in the 100-BC-2 Operable Unit. (2 Pages)

WIDS Site Code	WIDS Site Name	WSRF	Reclassification Date	Reclassification Status	Closure Document
132-C-1	116-C Reactor Exhaust Stack Site, 105-C Reactor Stack Site	2003-026	09/11/2003	No Action	0100B-CA-V0130, *Waste Site Evaluation for 132-C-1, 116-C Reactor Exhaust Stack Site*
132-C-3	117-C Filter Building	2003-024	09/11/2003	No Action	0100B-CA-V0131, *Waste Site Evaluation for 132-C-3, 117-C Filter Building*

WIDS = Waste Information Data System
WSRF = waste site reclassification form

Table 5-2. Summary of 100-BC-2 Operable Unit Waste Site Closure Documentation. (4 Pages)

WIDS Site Code	WIDS Site Name	WSRF	Reclassification Date	Reclassification Status	Closure Document
100-B-1	Surface Chemical and Solid Waste Dumping Area, Laydown Yard	2006-003	04/24/2006	Interim Closed Out	*Remaining Sites Verification Package for the 100-B-1 Surface Chemical and Solid Waste Dumping Area*
100-B-23	100-B/C Surface Debris	2008-027	06/16/2008	Interim Closed Out	*Remaining Sites Verification Package for the 100-B-23, 100-B/C Area Surface Debris, Waste Site*
100-B-31	Garnet Sand at the 183-C Clearwell Pads	2009-046	01/13/2010	Interim Closed Out	*Remaining Sites Verification Package for the 100-B-31 Garnet Sand Located at the 183-C Clearwell Pads*
100-B-35:1	151-B Primary Substation	2015-015	06/15/2015	Interim Closed Out	*Remaining Sites Verification Package for the 100-B-35:1, 151-B Primary Substation*
100-C-3	119-C Sample Building French Drain, 119-C French Drain	2003-017	07/28/2003	Interim Closed Out	CVP-2003-00009, *Cleanup Verification Package for the 100-C-3 French Drain*
100-C-6:1	100-C Area South Effluent Pipelines	2004-020	04/20/2004	Interim Closed Out	CVP-2003-00022, *Cleanup Verification Package for the 100-B-8:1 and 100-C-6:1 100-B/C South Effluent Pipelines*
100-C-6:2	100-C Area North Effluent Pipelines	2003-050	02/17/2004	Interim Closed Out	CVP-2003-00019, *Cleanup Verification Package for the 100-B-8:2, 100-C-6:2, 100-C-6:3, and 100-C-6:4 100-B/C North Effluent Pipelines*

Table 5-2. Summary of 100-BC-2 Operable Unit Waste Site Closure Documentation. (4 Pages)

WIDS Site Code	WIDS Site Name	WSRF	Reclassification Date	Reclassification Status	Closure Document
100-C-6:3	100-C Retention Basin to Outfalls Effluent Pipelines	2003-050	02/17/2004	Interim Closed Out	CVP-2003-00019, *Cleanup Verification Package for the 100-B-8:2, 100-C-6:2, 100-C-6:3, and 100-C-6:4 100-B/C North Effluent Pipelines*
100-C-6:4	B/C Pipelines Discovery Areas	2003-050	02/17/2004	Interim Closed Out	CVP-2003-00019, *Cleanup Verification Package for the 100-B-8:2, 100-C-6:2, 100-C-6:3, and 100-C-6:4 100-B/C North Effluent Pipelines*
100-C-7	183-C Filter Building/Pumproom Facility Foundation and Demolition Waste	2012-029	06/14/2012	Interim Closed Out	*Remaining Sites Verification Package for the 100-C-7, 183-C Filter Building/Pumproom Facility Foundation and Demolition Waste*
100-C-7:1	183-C Water Treatment Facility Head House Foundation and Stained Soils	2013-031	03/11/2014	Interim Closed Out	*Remaining Sites Verification Package for the 100-C-7:1, 183-C Water Treatment Facility Head House Foundations and Stained Soils Subsite*
100-C-9:1	100-C Main Process Sewer Collection Line	2004-012	06/06/2007	Interim Closed Out	*Remaining Sites Verification Package for the 100-C-9:1 Main Process Sewer Collection Line*
100-C-9:2	100-C Sanitary Sewer Lines	2004-013	07/11/2007	Interim Closed Out	*Remaining Sites Verification Package for the 100-C-9:2 Sanitary Sewer Pipelines*
116-C-2A	105-C Pluto Crib, 116-C-2, 105-C Crib	99-098	03/15/2000	Interim Closed Out	CVP-99-00019, *Cleanup Verification Package for the 116-C-2A Pluto Crib, 116-C-2B Pump Station, 116-C-2C Sand Filter, and Overburden Soils from Group 3 Sites at the 100-B/C Area*
116-C-2B	105-C Pluto Crib Pump Station, 116-C-2-1, 116-C-2B Pump Station	99-099	03/15/2000	Interim Closed Out	CVP-99-00019, *Cleanup Verification Package for the 116-C-2A Pluto Crib, 116-C-2B Pump Station, 116-C-2C Sand Filter, and Overburden Soils from Group 3 Sites at the 100-B/C Area*
116-C-2C	105-C Pluto Crib Sand Filter, 116-C-2-2, 116-C-8	99-100	03/15/2000	Interim Closed Out	CVP-99-00019, *Cleanup Verification Package for the 116-C-2A Pluto Crib, 116-C-2B Pump Station, 116-C-2C Sand Filter, and Overburden Soils from Group 3 Sites at the 100-B/C Area*

Table 5-2. Summary of 100-BC-2 Operable Unit Waste Site Closure Documentation. (4 Pages)

WIDS Site Code	WIDS Site Name	WSRF	Reclassification Date	Reclassification Status	Closure Document
116-C-3	105-C Chemical Waste Tanks	2008-002	01/31/2008	Interim Closed Out	*Remaining Sites Verification Package for the 116-C-3, 105-C Chemical Waste Tanks*
116-C-6	105-C Fuel Storage Basin Cleanout Percolation Pit, 105-C Pond	2003-034	12/08/2003	Interim Closed Out	0100B-CA-V0121, *Waste Site Evaluation for 116-C-6 105-C Fuel Storage Basin Cleanout Percolation Pit*
118-B-1	105-B Burial Ground, 105-B Solid Waste Burial Ground, Operations, Solid Waste Burial Ground, 108-B Burial Ground, Ext. to BG No. 1	2007-032	01/09/2008	Interim Closed Out	CVP-2007-00006, *Cleanup Verification Package for the 118-B-1, 105-B Solid Waste Burial Ground*
118-B-2	Construction Burial Ground No. 1, Minor Construction Burial, Ground No. 1	2005-002	04/05/2005	Interim Closed Out	CVP-2005-00001, *Cleanup Verification Package for the 118-B-3 (and 118-B-2) Burial Ground*
118-B-3	Construction Burial Ground No. 2	2005-001	04/05/2005	Interim Closed Out	CVP-2005-00001, *Cleanup Verification Package for the 118-B-3 (and 118-B-2) Burial Ground*
118-B-4	105-B Spacer Burial Ground, 105-B Dummy Burial Ground	2004-016	05/24/2004	Interim Closed Out	CVP-2004-00002, *Cleanup Verification Package for the 118-B-4 Spacer Burial Ground*
118-B-6	108-B Solid Waste Burial Ground, 108-B Solid Waste Burial Ground, No. 2	2006-005	06/08/2006	Interim Closed Out	CVP-2006-00002, *Cleanup Verification Package for the 118-B-6, 108-B Solid Waste Burial Ground*
118-C-1	105-C Burial Ground, 105-C Solid Waste Burial Ground, 118-C-1, Burial Ground	2006-063	07/19/2007	Interim Closed Out	CVP-2006-00011, *Cleanup Verification Package for the 118-C-1, 105-C Solid Waste Burial Ground*
118-C-2	105-C Ball Storage Tank, Ball 3X Storage Tank	2004-019	07/30/2004	Interim Closed Out	CVP-2004-00005, *Cleanup Verification Package for the 118-C-2 Burial Ground*
118-C-3:2	105-C Reactor Building Below-Grade Structures and Underlying Soils	2000-099	08/07/2000	Interim Closed Out	CVP-98-00009, *Cleanup Verification Package for the 105-C Reactor Building Below-Grade Structures and Underlying Soils*

Table 5-2. Summary of 100-BC-2 Operable Unit Waste Site Closure Documentation. (4 Pages)

WIDS Site Code	WIDS Site Name	WSRF	Reclassification Date	Reclassification Status	Closure Document
118-C-3:3	105-C French Drains	2006-016	04/24/2006	Interim Closed Out	*Remaining Sites Verification Package for the 118-C-3:3, 105-C French Drains*
118-C-4	105-C Horizontal Control Rod Storage Cave	2003-042	09/11/2003	Interim Closed Out	CVP-2003-00015, *Cleanup Verification Package for the 118-C-4, 105-C Horizontal Control Rod Cave*
128-C-1	100-C Burning Pit	2005-019	08/10/2005	Interim Closed Out	*Remaining Sites Verification Package for the 128-C-1 Burn Pit Waste Site*
600-232	100B Electrical Laydown Area	2004-066	01/27/2005	Interim Closed Out	*Remaining Sites Verification Package for the 600-232, 100B Electrical Laydown Area*
600-233	Vertical Pipe Near 100B Electrical Laydown Area	2005-041	12/08/2005	Interim Closed Out	*Remaining Sites Verification Package for the 600-233 Waste Site, Vertical Pipe Near 100-B Electrical Laydown Area*
600-345	100-BC Vicinity Oil Stain and Filter Area	2010-068	10/21/2010	Interim Closed Out	*Remaining Sites Verification Package for the 600-345, 100-BC Vicinity Oil Stain and Filter Area*
600-346	100-BC Vicinity Ash and Debris Area	2010-055	09/27/2010	Interim Closed Out	*Remaining Sites Verification Package for the 600-346, 100-BC Vicinity Ash and Debris Area*
1607-B8	1607-B8 Septic Tank System, 124-C-2, 1607-B8 Sanitary Sewer System, Septic Tank & Disposal Field for 190-C Pumphouse	2003-013	07/29/2003	Interim Closed Out	CVP-2003-00005, *Cleanup Verification Package for the 1607-B8 Septic Tank System*
1607-B9	1607-B9 Septic Tank System, 1607-B9 Sanitary Sewer System, 124-C-3	2003-014	08/28/2003	Interim Closed Out	CVP-2003-00006, *Cleanup Verification Package for the 1607-B9 Septic Tank System*
1607-B10	1607-B10 Septic Tank System, Sewage Disposal Field	2003-015	07/29/2003	Interim Closed Out	CVP-2003-00007, *Cleanup Verification Package for the 1607-B10 Septic Tank System*
1607-B11	1607-B11 Septic Tank System	2003-016	07/29/2003	Interim Closed Out	CVP-2003-00008, *Cleanup Verification Package for the 1607-B11 Septic Tank System*

WIDS = Waste Information Data System
WSRF = waste site reclassification form

5.1.2 Remedial Action Objectives and Goals

As applicable, RAO performance standard attainment involves comparisons of soil analytical data to RAGs (Table 5-3) and is evaluated using the following general steps:

- Identify the units within a site for cleanup verification and conduct sample collection and analysis for COCs and COPCs
- Calculate the summary statistics or determine maximum values for the residual contaminants in the identified units
- Identify the appropriate RAGs to be applied to the units
- Evaluate the summary statistics or maximum values, as appropriate, for the identified units against the decision rules for achieving the appropriate RAGs.

Remedial action goals are specific numeric targets developed to ensure achievement of the RAOs identified in the interim action RODs. The RAGs applicable to the applicable 100-BC-2 OU waste sites, along with the process for verifying attainment of the RAGS, are described in detail in the 100 Area RDR/RAWP (DOE/RL-96-17) and are summarized in Table 5-3.

Table 5-3. Summary of Achieved Performance Standards for Unrestricted Land Use. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Evaluation Method
Direct Exposure – Radionuclides	Attained <15 mrem/yr dose rate above background over 1,000 years. Final closeout sampling is to demonstrate attainment of the CERCLA risk range of 10^{-4} to 10^{-6}.	Compared dose and risk goals to RESRAD model outputs based on unrestricted land use assumptions and verification data set values.
Direct Exposure – Nonradionuclides	Attained individual COC RAGs (MTCA Method B cleanup levels for unrestricted land use). Passed the WAC 173-340-740(7)(e) three-part test.	Compared goals with verification data set values.
Risk – Nonradionuclides	Achieved hazard quotient of <1 for noncarcinogens.	Compared goal with individual hazard quotients calculated from verification data set values.
	Achieved cumulative hazard quotient of <1 for noncarcinogens.	Compared goal with cumulative hazard quotients calculated from verification data set values.
	Achieved excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	Compared goal with individual carcinogen risks calculated from verification data set values.
	Attained a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	Compared goal with cumulative carcinogen risks calculated from verification data set values.

Table 5-3. Summary of Achieved Performance Standards for Unrestricted Land Use. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Evaluation Method
Groundwater/River Protection – Radionuclides	Attained individual radionuclide groundwater and river cleanup requirements. Attained National Primary Drinking Water Standards <4 mrem/yr (beta/gamma) dose rate.	Compared goals to RESRAD model outputs based on unrestricted land-use assumptions and verification data set values.
Groundwater/River Protection – Nonradionuclides	Attained individual nonradionuclide groundwater and river cleanup requirements.	Compared the RAGs of the 100 Area RDR/RAWP (DOE/RL-96-17) with verification data set values.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COC = contaminant of concern
MTCA = *Model Toxic Control Act*
RAG = remedial action goal
RDR/RAWP = Remedial Design Report/Remedial Action Work Plan
RESRAD = RESidual RADioactivity dose model
WAC = *Washington Administrative Code*

5.1.3 Contaminant Identification

As applicable, the COPCs and COCs for some waste sites were initially identified in the interim action RODs based on historical and field investigation information and were further refined during development of the 100 Area RDR/RAWP (DOE/RL-96-17), the 100 Area SAP (DOE/RL-96-22), and the *100 Area Burial Grounds Remedial Action Sampling and Analysis Plan* (100 Area Burial Grounds SAP) (DOE/RL-2001-35).

The final lists of relevant COCs are documented in the closure document for each waste site and may include additional constituents identified during the remediation and characterization process (Table 5-4), pursuant to the interim action ROD "observational approach" or other supporting documentation. Following the process described in this section, residual soil concentrations at all of the sites addressed in this report were shown to meet the RAO performance standards established for unrestricted surface use. The waste sites individually meet the cleanup objectives for eventual unrestricted surface use summarized in Table 5-3. Closeout of individual waste sites was based on the evaluation of analytical laboratory results from verification or confirmatory soil samples that were analyzed by contract laboratories using approved EPA methods. The resulting data for each waste site were subjected to a data quality assessment and determined to be suitable for their intended use to support closure decisions.

Table 5-4. Summary of Waste Site Contaminants of Concern and Potential Concern. (2 Pages)

Waste Site	Americium-241	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Nickel-63	Plutonium-238	Pu-239/240	Pu-241 and Silver-108m	Strontium-90	Technetium-99	Tritium	Uranium-233/234	Uranium-235, -238	Anions	Antimony	Arsenic	Barium	Boron	Beryllium	Cadmium	Cobalt	Copper	Chromium	Lead	Hexavalent Chromium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Vanadium	Zinc	Asbestos	PAH	PCBs	Pesticides	TPH	VOCs	SVOCs
100-B-1																																				X	X	X		X
100-B-23																X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X			X	X	X		X
100-B-31																X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							
100-B-35:1																X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X		X		
100-C-3			X	X	X																					X														
100-C-6:1	X		X	X	X		X	X		X				X										X	X	X		X												
100-C-6:2	X		X	X	X		X	X		X				X										X	X	X		X												
100-C-6:3	X		X	X	X		X	X		X				X										X	X	X		X												
100-C-6:4	X		X	X	X		X	X		X				X										X	X	X		X												
100-C-7																								X		X		X												
100-C-7:1																								X		X		X												
100-C-9:1																X					X		X	X	X	X	X	X												
100-C-9:2			X	X	X					X						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X			X
116-C-2A	X		X	X	X		X	X		X				X												X														
116-C-2B	X		X	X	X		X	X		X				X												X														
116-C-2C	X		X	X	X		X	X		X				X												X														
116-C-3	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
116-C-6	X	X	X	X	X	X	X	X		[a]	X	X	X	X			X	X			X			X	X	X		X			X	X				X				
118-B-1	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	[b]	X	X	X
118-B-2			X	X	X	X	X	X		X															X	X		X												

Table 5-4. Summary of Waste Site Contaminants of Concern and Potential Concern. (2 Pages)

Waste Site	Americium-241	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Nickel-63	Plutonium-238	Pu-239/240	Pu-241 and Silver-108m	Strontium-90	Technetium-99	Tritium	Uranium-233/234	Uranium-235, -238	Anions	Antimony	Arsenic	Barium	Boron	Beryllium	Cadmium	Cobalt	Copper	Chromium	Lead	Hexavalent Chromium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Vanadium	Zinc	Asbestos	PAH	PCBs	Pesticides	TPH	VOCs	SVOCs
118-B-3			X	X	X	X	X	X		X															X	X		X												
118-B-4				X																						X														
118-B-6												X													X			X												
118-C-1	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X
118-C-2				X		X																																		
118-C-3:2	X	X	X	X	X	X	X	X		X	X		X	X											X	X		X								X					
118-C-3:3	X		X	X	X								X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X				X
118-C-4	X		X	X	X		X	X		X			X	X			X	X			X			X	X	X		X			X	X					X			X	X
128-C-1																	X	X	X		X		X	X	X			X	X			X		X	X		X		X		X
600-232																X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X			X		X		X
600-233																	X				X			X	X					X							X		X		X
600-345																									X	X		X								X			X		
600-346																								X	X	X		X								X	X	X	X		X
1607-B8			X	X	X																				X	X										X	X			
1607-B9			X	X	X																				X	X											X				
1607-B10			X	X	X																			X	X	X											X				
1607-B11			X	X	X																				X	X															X

[a] Only total strontium was analyzed for the 116-C-6 waste site.
[b] Herbicides were also analyzed for the 118-B-1 waste site.
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOC = semivolatile organic compound
TPH = total petroleum hydrocarbons
VOC = volatile organic compound

5.2 FUTURE ATTAINMENT OF FINAL REMEDIAL ACTION PERFORMANCE STANDARDS

Cleanup of waste sites in accordance with the interim action RODs is expected to continue in the River Corridor until interim remedial action decisions are replaced by final RODs. Final RODs are required (40 *Code of Federal Regulations* [CFR] 300, "National Oil and Hazardous Substances Pollution Contingency Plan") for the 100-B/C Area in order to identify the final remedy decision, including any adjustments to the remedy identified in the interim action RODs, if necessary, to ensure protection of human health and the environment.

In addition to the information and data that originally established the basis for remedial actions under the interim action RODs, final remedial action decisions will incorporate new information acquired through characterization of interim closed waste sites. Development of the final remedy RODs will also incorporate data and information collected during the final source and groundwater RI/FS.

The final ROD development process will also incorporate evaluation of emerging ecological protection requirements, although the interim action RODs included general objectives for protection of ecological receptors based on meeting the unrestricted land-use cleanup levels.

The final RODs will integrate historical and current characterization information, as well as current applicable or relevant and appropriate requirements. Waste sites remediated under interim action RODs will ultimately be evaluated by the lead agency and lead regulatory agency against the decisions and requirements documented in the final RODs. Upon satisfactory completion of the final remedial actions for the 100-BC-2 OU, EPA will issue a certificate of completion to DOE.

5.3 QUALITY CONTROL

The quality assurance and quality control programs used throughout the remediation activities are identified in the 100 Area RDR/RAWP (DOE/RL-96-17), the 100 Area SAP (DOE/RL-96-22), and other supporting documentation (e.g., DOE/RL-2001-35, *100 Area Burial Ground Remedial Action Sampling and Analysis Plan*; BHI-01249, *Data Quality Objectives Summary Report for 100/300 Area Remaining Sites Analytical Sampling Effort*), as applicable. Samples that were used to demonstrate achieving the cleanup objectives for individual waste sites were collected and analyzed in accordance with these documents, which were approved by the Tri-Party agencies. The SAP documents contained a quality assurance project plan to establish the objectives, functional activities, methods, and quality assurance/quality control measures associated with the sampling and analysis activities. Verification data sets that were used to support waste site closure underwent a data quality assessment to ensure suitability for their intended use. Results of the data quality assessment are documented in the closure documents for individual waste sites.

6.0 FINAL INSPECTION AND CERTIFICATIONS

Based on evaluation of the approved closeout documentation referenced in Tables 5-1 and 5-2 and final inspection of the 100-BC-2 OU waste sites, interim remedial actions have been completed and RAOs have been achieved. Pursuant to the scope of the 100 Area interim action ROD and RAOs, this means that contaminated soil was excavated and disposed at ERDF and waste sites were backfilled and revegetated, as needed.

The results of confirmatory and verification sampling at interim closed out and no action 100-BC-2 OU waste sites show that residual contaminant concentrations do not preclude future uses (as bounded by the rural-residential scenario) and allow for unrestricted surface use (i.e., ground surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. If deemed necessary, final inspections of the interim remedial actions will be conducted in the future and include the DOE-RL, EPA, and contractor representatives. The inspections would include only the waste sites where remedial actions occurred to verify that the sites had been backfilled with clean materials and revegetated as required by the applicable interim action RODs. The waste sites have been reclassified as "Interim Closed Out," "No Action," or "Rejected" (RL-TPA-90-0001).

DOE/RL-2001-41, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions and RCRA Corrective Actions*, describes institutional controls for the Hanford Site. Institutional controls are required at 12 of the remediated 100-BC-2 OU waste sites (including subsites). Table 6-1 identifies each individual waste site and its associated institutional control. The primary institutional control associated with the waste sites is acceptability of unrestricted direct exposure to deep zone soils. Analyses of deep zone soils at these waste sites have been demonstrated not to meet cleanup levels for unrestricted direct exposure. Hence, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required.

The remaining remediated waste sites in the 100-BC-2 OU are available for unrestricted land use.

Table 6-1. 100-BC-2 Operable Unit Area Sites with Institutional Controls. (2 Pages)

WIDS Site Code	WIDS Site Name	Institutional Control
100-C-6	100-C Reactor Cooling Water Effluent Underground Pipelines	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).
100-C-9:1	100-C Main Process Sewer Collection Line	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).
100-C-9:3	183-C Clearwell Pipelines	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).

Table 6-1. 100-BC-2 Operable Unit Area Sites with Institutional Controls. (2 Pages)

WIDS Site Code	WIDS Site Name	Institutional Control
100-C-9:4	100-C Cooling Water Transfer Pipelines and Tunnels	Institutional controls are required to prevent an inhalation exposure pathway if the currently sealed pipes are breached due to residual concentrations of hexavalent chromium in the pipes.
116-C-2A	105-C Pluto Crib, 116-C-2, 105-C Crib	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).
116-C-2B	105-C Pluto Crib Pump Station, 116-C-2-1, 116-C-2B Pump Station	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).
116-C-2C	105-C Pluto Crib Sand Filter, 116-C-2-2, 116-C-8	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).
116-C-3	105-C Chemical Waste Tanks	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).
118-B-1	105-B Burial Ground, 105-B Solid Waste Burial Ground, Operations, Solid Waste Burial Ground, 108-B Burial Ground, Ext. to BG No. 1	Institutional Control requirements include deed restrictions to prohibit irrigation and prevent uncontrolled drilling or excavation into the deep zone (4.6 meters/15 feet below ground surface).
118-B-6	108-B Solid Waste Burial Ground, 108-B Solid Waste Burial Ground, No. 2	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).
118-C-1	105-C Burial Ground, 105-C Solid Waste Burial Ground, 118-C-1, Burial Ground	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).
118-C-3:2	105-C Reactor Building Below-Grade Structures and Underlying Soils	Institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).

WIDS = Waste Information Data System

7.0 OPERATIONS AND MAINTENANCE ACTIVITIES

There are no CERCLA site-specific surveillance and maintenance activities associated with the 100-BC-2 OU waste sites. The DOE will retain responsibility for operations and maintenance functions of the 100-B/C OU. These functions and associated landlord responsibilities cover the entire general infrastructure and include such things as access roads, facilities, and services. Monitoring at the Hanford Site is conducted in order to evaluate the performance of the remedies and to identify changes in conditions. In remediated areas, monitoring activities help to verify that the remedies remain effective, resources are protected, and contaminant migration is prevented. Monitoring also helps to facilitate the maintenance of remedy systems in working condition and to keep controls in working order. These activities such as maintaining signs, fences, and restrictions on excavations or land use are often defined in an operations and maintenance plan for a site. For the 100-BC-2 OU waste sites, there are no waste-site specific operations and maintenance activities.

The DOE will continue to be responsible for the following general activities:

- Responding to emergency situations or off-normal conditions such as the deterioration of a physical control beyond predicted levels, an error that results in a "near-miss," or the discovery of previously unidentified sources of contamination.

- Notifying the appropriate regulatory agencies of regulatory threshold exceedances, releases of hazardous substances in excess of quantities reportable under CERCLA, and spills or discharges of hazardous substances or dangerous wastes to the environment.

- Requiring long-term monitoring for source sites where residual contaminants preclude unrestricted use.

Multiple resource management plans have been developed at the Hanford Site to protect and provide the policies, goals, and objectives for the management of the site's biological, natural, and cultural resources. These plans address the ongoing surveillance, protection, and controlled use of the resources and guide the management of resources.

CERCLA 5-year reviews will be required to assess the protectiveness of remedial actions where hazardous substances, pollutants, or contaminants are left onsite above levels that allow for unlimited use and unrestricted exposure. In addition to CERCLA, the Tri-Party Agreement (Ecology et al. 1989) allows 5-year reviews to address regulated RCRA units and past-practice units that are regulated under RCRA and/or CERCLA. The third CERCLA 5-year review report for the Hanford Site was completed in November 2011.

7.1 ENVIRONMENTAL MONITORING

The 100 Area of the Hanford Site includes significant natural resources including habitat for numerous endangered, protected, and listed species. In addition to the cleanup conducted under CERCLA, environmental monitoring and reporting on the 100-BC-2 OU is conducted annually in accordance with DOE O 231.1B, Admin Change 1, *Environment, Safety, and Health Reporting*. DOE/RL-2013-47, *Hanford Site Environmental Report for Calendar Year 2013,* includes a summary of cleanup performance and compliance relative to applicable federal, state, and local environmental laws and regulations; DOE orders; Secretary of Energy Notices; and DOE Headquarters and site operations office directives, policies, and guidance. It summarizes specific requirements, actions, plans, and schedules identified in the Tri-Party Agreement (Ecology et al. 1989) and other compliance or consent agreements. Although the report is written each year primarily to meet DOE reporting requirements and guidelines, it is also intended to provide a broad spectrum of environmental information to DOE managers, the public, the Tribes, public officials, regulatory agencies, Hanford Site contractors, and elected representatives.

Each annual report provides an overview of activities at the site; demonstrates the status of the site's compliance with applicable federal, state, and local environmental laws and regulations, executive orders, and DOE policies and directives; and summarizes environmental data that characterize Hanford Site environmental management performance. The report also highlights significant environmental and public protection programs and efforts.

The monitoring includes many Hanford Site activities including decommissioning, demolition, remediation, restoration, waste management, closure activities, environmental occurrences, pollution prevention, waste minimization, and monitoring activities for environmental resources. Media included in the monitoring activities are air emissions, facility effluents, surface water, river sediment, drinking water, groundwater, food/farm products, vegetation, fish and wildlife (including threatened and endangered species), radiation, and cultural resources.

There are no site-specific CERCLA monitoring requirements associated with the 100-BC-2 OU waste sites.

7.2 GROUNDWATER MONITORING

Groundwater monitoring at the Hanford Site is guided by DOE/RL-2002-59, *Hanford Site Groundwater Strategy: Protection, Monitoring, and Remediation*, and fulfills requirements for monitoring according to the *Atomic Energy Act of 1954*, RCRA, CERCLA, and WAC 173-303. The strategy focuses on protecting groundwater, groundwater monitoring, and groundwater remediation. Sampling and analysis in the 100-BC-5 OU, which is the groundwater beneath the 100-BC-2 OU, is performed according to the*100-BC-5 Operable Unit Sampling and Analysis Plan* (DOE/RL-2003-38). Monitoring results are presented in annual Hanford Site groundwater monitoring reports.

Groundwater monitoring is performed in the 100-BC-5 OU by collecting samples from groundwater monitoring wells, and aquifer tubes and hyporheic sampling points adjacent to the Columbia River. Groundwater contaminants of concern are hexavalent chromium, strontium-90, and tritium. Groundwater remediation is not currently being performed in the 100-BC-5 OU.

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