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12-AMRC-0002

OCT 07 2011

Mr. D. A. Faulk, Program Manager
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 Hanford Project Office
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Dear Mr. Faulk:

TRANSMITTAL OF THE 100-F/IU-2/IU-6 AREA – SEGMENT 1 INTERIM REMEDIAL ACTION REPORT, DOE/RL-2011-48, REVISION 0

Attached for your use is the “100-F/IU-2/IU-6 Area – Segment 1 Interim Remedial Action Report,” DOE/RL-2011-48, Rev. 0. If you have questions, please contact me or your staff may contact Jamie Zeisloft, of my staff, at (509) 372-0188.

Sincerely,

Mark S. French, Federal Project Director
 for the River Corridor Closure Project

AMRC:JHZ

Attachment

cc w/attach:

C. J. Guzzetti, EPA

Administrative Record, H6-08

cc w/o attach:

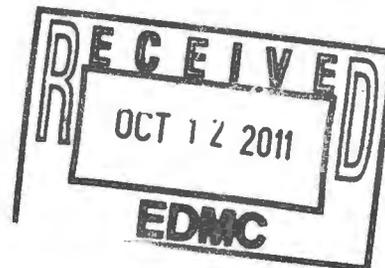
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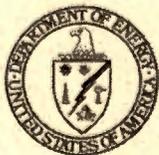
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DOE/RL-2011-48
Rev. 0

100-F/IU-2/IU-6 Area – Segment 1 Interim Remedial Action Report



United States
Department of Energy

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100-F/IU-2/IU-6 Area – Segment 1 Interim Remedial Action Report

September 2011



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ACRONYMS AND ABBREVIATIONS

BCM	bank cubic meter
BCY	bank cubic yard
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
COC	contaminant of concern
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
FS	feasibility study
GPERS	Global Positioning Environmental Radiological Surveyor
NPL	National Priorities List
OU	operable unit
RAG	remedial action goal
RAO	remedial action objective
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RDR/RAWP	remedial design report/remedial action work plan
RI	remedial investigation
RL	U.S. Department of Energy, Richland Operations Office
ROD	record of decision
ROM	rough order of magnitude
RSVP	remaining sites verification package
RTD	remove, treat, and dispose
Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
WAC	<i>Washington Administrative Code</i>
WBS	work breakdown structure
WIDS	Waste Information Data System
WSRF	waste site reclassification form

1.0 INTRODUCTION

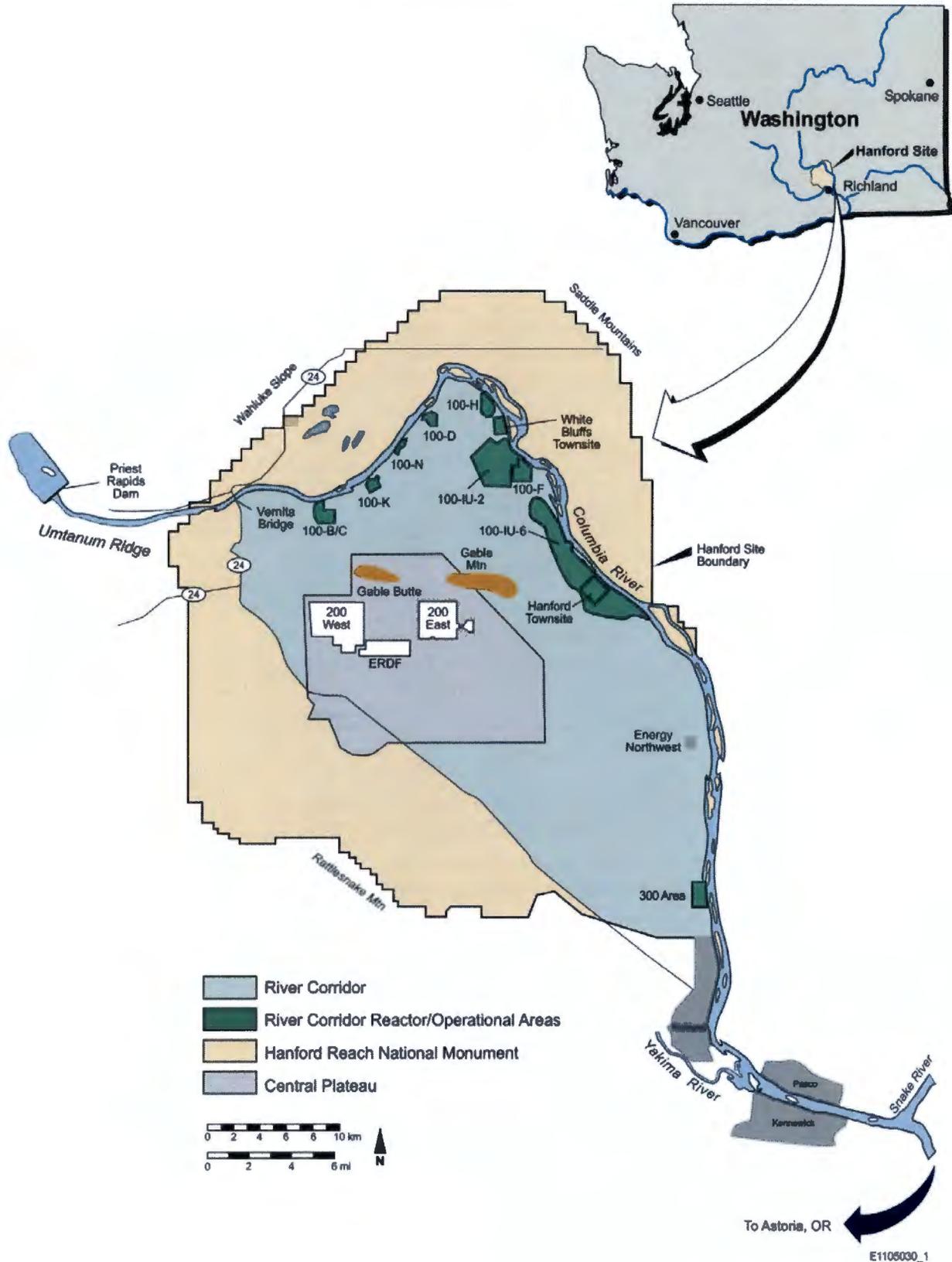
The Hanford Site is a 1,517-km² (586-mi²) federal facility located in southeastern Washington State along the Columbia River (Figure 1-1). From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In 1989, the 100 Area was one of four areas 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 subset of the Hanford Site that encompasses approximately 570 km² (220 mi²) adjacent to the Columbia River. 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 decisions (RODs). These decision areas encompass both the 100 Area and 300 Area NPL sites. Each of the areas includes source and groundwater operable units (OUs). These include the 100-B/C Area, 100-K Area, 100-D/H Areas, 100-N Area, 300 Area, and the 100-F/IU-2/IU-6 Area. The 100-F/IU-2/IU-6 Area includes the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs and five sub-areas. The five sub-areas of the 100-F/IU-2/IU-6 Area are designated as Segments 1 through 5 to facilitate planning and implementation because of the large size of this area (Figure 1-2). This report focuses on 100-F/IU-2/IU-6 – Segment 1, hereafter referred to as “Segment 1.”

1.1 PURPOSE AND SCOPE

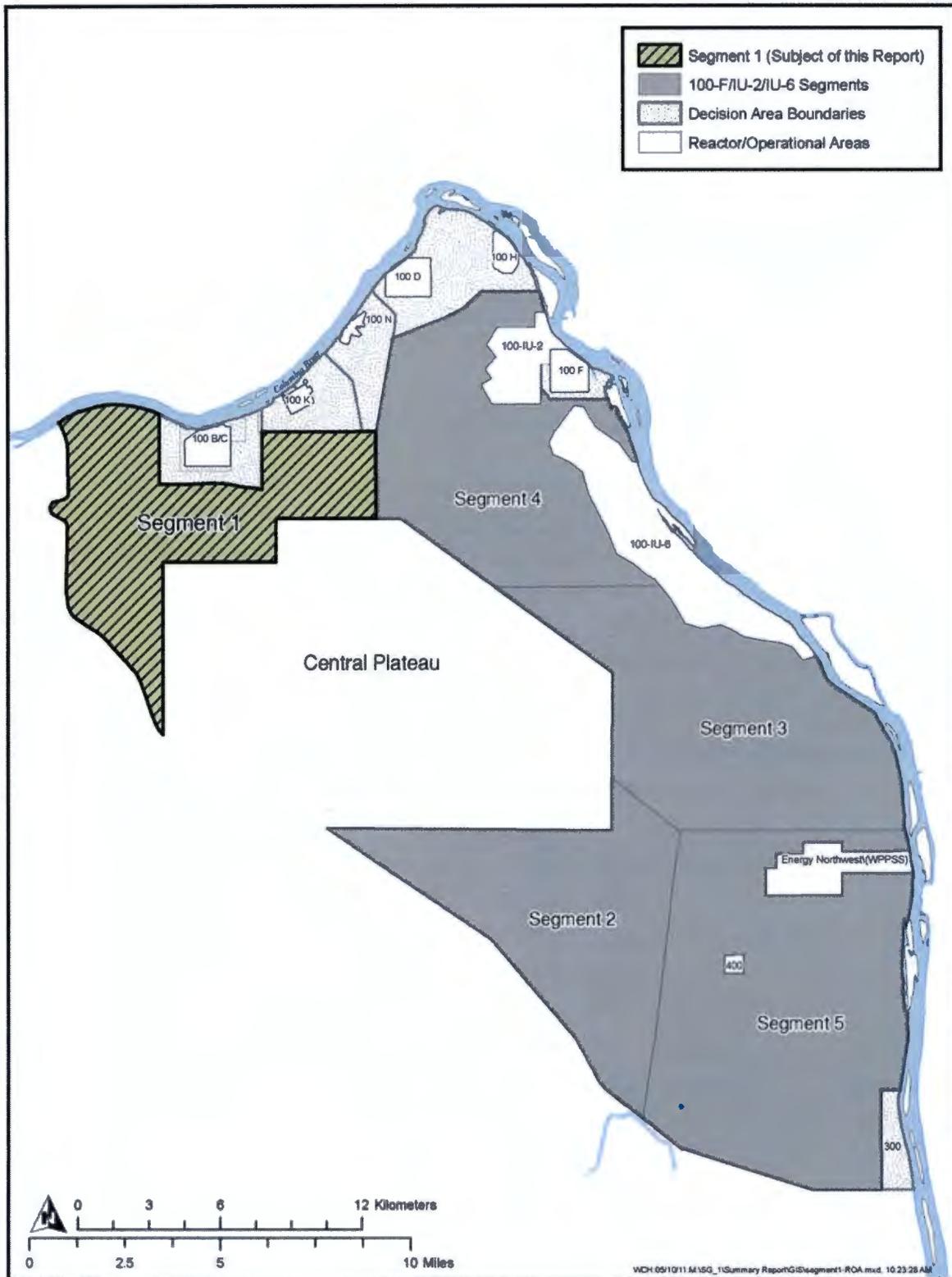
Interim remedial actions in Segment 1 have been implemented to mitigate potential impacts from hazardous chemical and radioactive releases to the soil column. This report has been prepared in accordance with U.S. Environmental Protection Agency (EPA) guidance in OSWER Directive 9320.2-22, *Close Out Procedures for National Priorities List Sites*, and documents cleanup actions performed on the Hanford Site. The report is a remedial action report that is being prepared to document the remedial actions that were conducted under interim action RODs and is not associated with interim remedial action reports that are generally used to document long-term remedies where it is anticipated that remedial action objectives (RAOs) will be achieved over a long period of time. This report also provides a summary of the background and history of the Hanford Site (inclusive of Segment 1), construction information, costs, and performance data.

Figure 1-1. Hanford Site Location Map.



Introduction

Figure 1-2. 100-F/IU-2/IU-6 Area Segments.



Introduction

Information provided herein presents input for future decision making, evaluation of technology, and cost comparison. This report addresses the Segment 1 waste sites identified in the following decision documents, where RAOs and remedial action goals (RAGs) have been achieved:

- EPA, 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-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, 2009, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*
- DOE-RL, 2011, *Fact Sheet: 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.*

The EPA 2009 Explanation of Significant Differences (ESD) authorized that newly discovered waste sites in OUs included in the Remaining Sites ROD that meet the ROD requirements for plug-in or candidate sites should proceed in accordance with the provisions stated in the EPA 2009 ESD without publication of an additional ESD. Additions of plug-in and candidate sites were documented in the Hanford Site Administrative Record and published in a U.S. Department of Energy, Richland Operations Office (RL)-issued annual fact sheet that identified the plug-in and candidate waste sites.

1.2 100-F/IU-2/IU-6 SEGMENT 1

Segment 1 is located in the westernmost portion of the 100-F/IU-2/IU-6 Area and covers approximately 7,349 ha (18,161 ac). As shown in Figure 1-2, Segment 1 is part of the larger 100-F/IU-2/IU-6 geographical area within the River Corridor and does not contain any historical reactor or operational areas. In contrast to reactor/operational areas, the 100-F/IU-2/IU-6 Area segments consist primarily of areas that have no known Hanford Site-related or Manhattan Project-defined areas where past operations occurred except for several military anti-aircraft batteries and encampments. There are no documented or organized waste burial practices, limited below-grade engineered systems and underground piping, and no liquid disposal areas such as ponds and retention basins.

Historical activities that typically occurred within Segment 1 prior to 1943 (pre-Hanford) were limited to homestead and farming activities, mostly along the Columbia River to the west of the 100-B/C Area. Farmstead communities existed from 1880 to 1943, and their locations within the River Corridor are known from historic and current aerial photographs (1941, 1948, and 2002), real estate records, historic documents, personal interviews, and field walkdowns. Pre-Hanford and Hanford-era railroad lines are also present within Segment 1 along with two military anti-aircraft gun sites that operated as part of the Hanford air defense system from 1950 to early 1958 (DOE/RL-97-1047, *The Hanford Site Historic District – Manhattan Project 1943-1946*).

Introduction

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. PNL-10285, *Estimated Recharge Rates at the Hanford Site*, estimated 2.6 to 17.3 mm/yr recharge in the 100 Area.

The 100 Area is located in the northern part of the Hanford Site along the south shore of the Columbia River. The topography within the 100-F/IU-2/IU-6 segments varies widely from relatively flat with areas of sand dunes to large land features that include Gable Butte and Gable Mountain. These features are the highest land forms within the Hanford Site, rising approximately 60 m (200 ft) and 180 m (590 ft) above surrounding land, respectively (DOE/RL-2008-46-ADD4, *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan Addendum 4: 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units*). The landscape is dominated by a semiarid (steppe) environment with a sparse covering of cold-desert shrubs and drought-resistant grasses.

Bedrock beneath the site is basalt of the Columbia River Basalt Group. The top of the basalt in the 100 Areas ranges in elevation from 46 m above sea level near the 100-H Area to 64 m below sea level near the 100-B/C Area (DOE/RL-2008-46-ADD4). The Ringold Formation and Hanford formation cover the basalt throughout the 100 Area. These units are dominated by poorly consolidated, river-deposited, well-drained sands, gravels, cobbles, and boulders. The Ringold Formation is an interstratified sequence of unconsolidated clay, silt, sand, and gravel-to-cobble gravel deposited by the ancestral Columbia River. The Hanford formation (informal designation) consists of uncemented gravels, sands, and silts deposited by Pleistocene cataclysmic flood waters. Groundwater from the Hanford Site discharges to the Columbia River, the dominant surface-water body of the Hanford Site. The uses of the Columbia River include the production of hydroelectric power, irrigation, drinking water, recreation (i.e., hunting and fishing), and natural resources.

Groundwater across the northern part of the 100-F/IU-2/IU-6 Area flows northward between the Gable Mountain and Gable Butte gap, and then towards the river. In the southern part of the 100-F/IU-2/IU-6 Area, the groundwater flows to the east towards the river (DOE/RL-2008-46-ADD4).

2.0 100-F/IU-2/IU-6 AREA - SEGMENT 1 BACKGROUND

In contrast to the reactor/operational areas of the River Corridor, the 100-F/IU-2/IU-6 Area segments consist primarily of land that has no known Hanford Site-related or Manhattan Project-defined areas where past operations occurred, except for several military batteries and encampments. There are no documented or organized waste burial practices, limited below-grade engineered systems and underground piping, and no liquid disposal areas such as ponds or retention basins.

2.1 INTEGRATION WITH CERCLA CLEANUP ACTIONS

Source OU cleanup actions in the River Corridor are performed in accordance with several RODs that provide a regulatory framework, establish cleanup objectives, and identify selected remedies. New waste sites identified and accepted in the Waste Information Data System (WIDS) as waste sites by the Tri-Parties (DOE, EPA, and Washington State Department of Ecology [Ecology]) may be added to the ROD as “plug-in” sites to the 2009 *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2009) if they meet the criteria for ROD sites for subsequent characterization and determination for additional remedial action. For Segment 1, a total of four new waste sites were added via the “plug-in” approach.

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. As mentioned previously, the decision documents authorizing remediation for waste sites in Segment 1 include the following.

- EPA, 1999, *Interim Action Record of Decision for the 100-B/C-1, 100-B/C-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1 and 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, 2009, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*
- DOE-RL, 2011, *Fact Sheet: 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.*

100-F/IU-2/IU-6 Area - Segment 1 Background

The decision documents described above also direct remedial action at waste sites within other 100 Area OUs. However, this report only documents remedial action completed at waste sites in Segment 1.

Candidate sites confirmed not to exceed the RAGs for any constituents are reclassified as “no action” or “rejected” (based on quantitative or qualitative data, respectively) per the waste site reclassification guidelines identified in RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, “Maintenance of the Waste Information Data System [WIDS]”). Regulator approval is documented on a waste site reclassification form (WSRF), which is accompanied by a regulator-reviewed site-specific informal report discussing the reasons and justification for reclassification. The WIDS database serves as formal notification to the public that the site is no longer a candidate for remedial action and does not exceed RAGs and RAOs established in the Remaining Sites ROD (EPA 1999).

Upon demonstration that the RAGs in the applicable interim action ROD have been attained for a given waste site, the status of the waste site is reflected on a WSRF. In cases where a waste site is shown to meet the RAOs without any remedial actions, it is reclassified from an “accepted” to a “no action” site. If a waste site meets the RAGs and RAOs specified in an interim action ROD following remedial actions, then the site is reclassified as “interim closed out.” The use of the term “close out” in this context referring to individual waste sites should not be confused with the “close out reports” used for delisting NPL sites (OSWER Directive 9320.2-22).

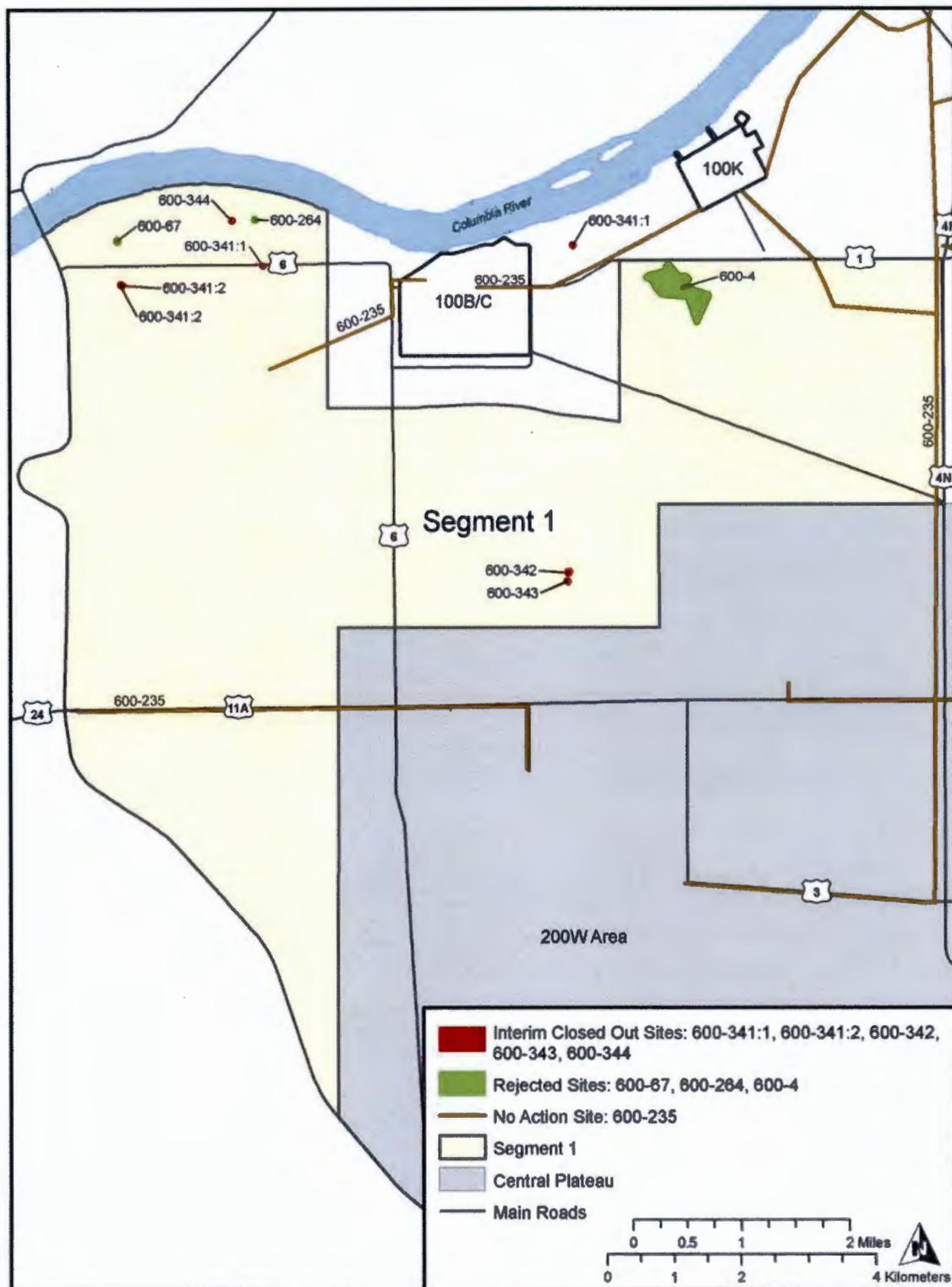
A total of eight waste sites in Segment 1 are specifically identified in the scope of this report and are described in Table 2-1. The locations of the Segment 1 waste sites are shown in Figure 2-1. NOTE: One sub-location for the 600-341:1 waste site was located in the 100-B/C geographic area is also included in this report.

Table 2-1. 100-F/IU-2/IU-6 Segment 1 Waste Sites.

WIDS Site Code/Name
600-4, Howitzer Site
600-67, Bruggeman’s Fruit Storage Warehouse
600-235, Buried Lead-Sheathed Telephone Cables
600-264, Abandoned Oil Drum
600-341, Inter Areas Battery Remnant Area #1
600-342, Inter Areas Contaminated Clothing Area Near Susie Junction
600-343, Inter Areas Burn Site #1
600-344, Inter Areas Stain Area #2

WIDS = Waste Information Data System

Figure 2-1. 100-F/IU-2/IU-6 Segment 1 Waste Sites.



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100-F/IU-2/IU-6 Area - Segment 1 Background

In parallel with continuing the cleanup actions in other parts of the River Corridor as outlined in the existing interim action RODs, the Tri-Parties are conducting the RI/FS process to develop final action cleanup decisions for the River Corridor.

2.3 EXPOSURE AND LAND-USE ASSUMPTIONS

The reasonably anticipated 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 for the 100 Area were issued. In the absence of such decisions, an assumption of “unrestricted use” was used for the 100 Area 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 in the 100 Area.

Under the 100 Area 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 dose 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). The exposure pathway for residual nonradiological contamination is from ingestion of contaminated soil.

The final ROD for the 100-F/IU-2/IU-6 Area will incorporate current exposure and land-use assumptions through an RI/FS. The RI/FS will incorporate applicable or relevant and appropriate requirements contained in current guidance and regulations to support final remedial action decisions that are protective of human health and the environment. As a result, the assumptions that serve as the basis for establishing cleanup goals may be different from those reflected in the interim action RODs. Section 5.2 provides additional discussion on the final remedial action decisions for the River Corridor OUs. Once final RAOs have been met for the OU, a final remedial action report will be prepared.

100-F/IU-2/IU-6 Area - Segment 1 Background

2.4 REMEDIAL ACTION REQUIREMENTS

Implementation of remedial actions at the Segment 1 waste sites in accordance with interim action RODs required implementation of the selected cleanup remedy to address actual or threatened releases. The major components of the selected remedy, “remove, treat as required, and dispose (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
- Removing contaminated soil, structures, and associated debris
- Disposing of contaminated materials at the Hanford Site’s Environmental Restoration Disposal Facility (ERDF); the Waste Isolation Pilot Plant in Carlsbad, New Mexico; or other disposal facilities approved in advance by the 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.

As outlined in the 100 Area interim action RODs, RAOs are met by implementing the selected remedy with an “observational approach.” The observational approach consists of two main steps: compilation of available data and the “characterize-and-remediate-in-one-step” methodology. The first step relies on recorded information from historical process operations and information from investigations addressing the nature and extent of contamination. This initial step of characterization is a prerequisite task to field remediation and used to develop an initial understanding of site conditions. The second step of the observational approach proceeds with characterization (i.e., sampling and analysis) and RTD as needed. The candidate waste sites identified in the Remaining Sites ROD do not proceed to RTD if pre-remediation characterization demonstrates that the waste site conditions meet RAGs.

Remove, treat, and dispose of the waste sites in the Segment 1 involved removing clean and contaminated soils, debris, and anomalous waste present within the site boundaries. The materials exposed during excavation are monitored for radiological and hazardous constituents as defined in DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan*. During remediation of known dump sites or burial grounds, extra measures are taken for materials to be

100-F/IU-2/IU-6 Area - Segment 1 Background

sorted for waste disposition. During excavation, soils are monitored for both radiological and chemical constituents. Activities are guided during excavation from data obtained by the in situ analytical system or in-process sampling using quick-turnaround laboratory analyses working concurrently with excavation.

Upon completion of remediation at each waste site, cleanup verification sampling and analysis are performed to verify attainment of cleanup criteria for all contaminants of concern (COCs) and contaminants of potential concern (COPCs). If analytical results indicate that cleanup criteria have not been achieved, then excavation will resume with appropriate analyses as guidance. Remediation proceeds until it can be demonstrated through a combination of field screening, in-process sampling, and verification sampling that cleanup goals have been achieved.

In focused sampling, process knowledge and professional judgment are used to limit the number of samples from a site and focus sample collection on locations that are expected to have the highest contamination levels. The subsequent evaluation is based on maximum values. Statistical sampling uses composite values and summary statistics for decision making. Based on experience to date, focused sampling is often appropriate for confirmatory sampling at remaining candidate sites, whereas statistical sampling is most often used at radioactive liquid effluent sites and remaining sites that require remedial action.

Specific RAOs associated with the selected remedy and the method for achieving the objectives through 100 Area remedial actions are summarized in Table 2-2.

Table 2-2. 100 Area Operable Unit Cleanup Objectives. (2 Pages)

Remedial Action Objective	100 Area 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 "Model Toxics Control Act – Cleanup" (WAC 173-340) levels for organic and inorganic chemical constituents in soil to support unrestricted (residential) use. Achieve human health standards of less than 15 mrem/yr above background for radionuclides in soil.
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.	Contaminant levels in soil after remediation do not result in an adverse impact to groundwater that could exceed any nonzero maximum contaminant level goals under the <i>Safe Drinking Water Act of 1974</i> or Method B cleanup levels under the <i>Model Toxics Control Act Cleanup Regulations</i> (WAC 173-340). Contaminants levels in the soil after remediation do not result in an impact to groundwater and the Columbia River that could exceed the ambient water quality criteria under the <i>Clean Water Act of 1977</i> for protection of fish or Method B cleanup levels under the <i>Model Toxics Control Act Cleanup Regulations</i> (WAC 173-340). Because there are no ambient water quality criteria for radionuclides, maximum contaminant levels will be used.

Table 2-2. 100 Area Operable Unit Cleanup Objectives. (2 Pages)

Remedial Action Objective	100 Area Compliance Methods
	The protection of receptors (aquatic species, with emphasis on salmon) in surface waters will be achieved by reducing or eliminating further contaminant loadings to groundwater such that receptors at the groundwater discharge in the Columbia River are not subject to any additional adverse risks.
To the maximum extent practicable, provide the highest degree of protection of human health and the environment through removal and disposal of the mass of contamination such that institutional controls and/or long-term monitoring are not required.	If not practicable, public comment will be requested and an explanation of significant differences published.

WAC = Washington Administrative Code

2.5 ESTIMATED COST

A rough-order-of-magnitude (ROM) cost estimate was published in the *Fact Sheet: Annual Listing of Waste Sites Plugged into the Remove, Treat, and Dispose Remedy in the 1999 Interim Record of Decision for the 100 Area* (DOE-RL 2011) for implementation of the selected RTD remedy for the four Segment 1 waste sites that were remediated. The ROM costs were estimated in present-value costs and are considered accurate within a range of plus 50% to minus 30%. Interim action remediation and disposal costs for the waste sites were estimated at \$418,489. Actual remediation costs totaled \$277,800. A discussion regarding the ROM and actual costs is presented in Appendix A of this report.

2.6 REMEDIAL DESIGN SUMMARY

The general design and approach for remediation of the Segment 1 waste sites is documented in DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP). The 100 Area RDR/RAWP describes the approach employed to remediate the Segment 1 and other waste sites. The 100 Area RDR/RAWP was prepared as specified in the 100 Area interim action RODs.

3.0 CHRONOLOGY OF EVENTS

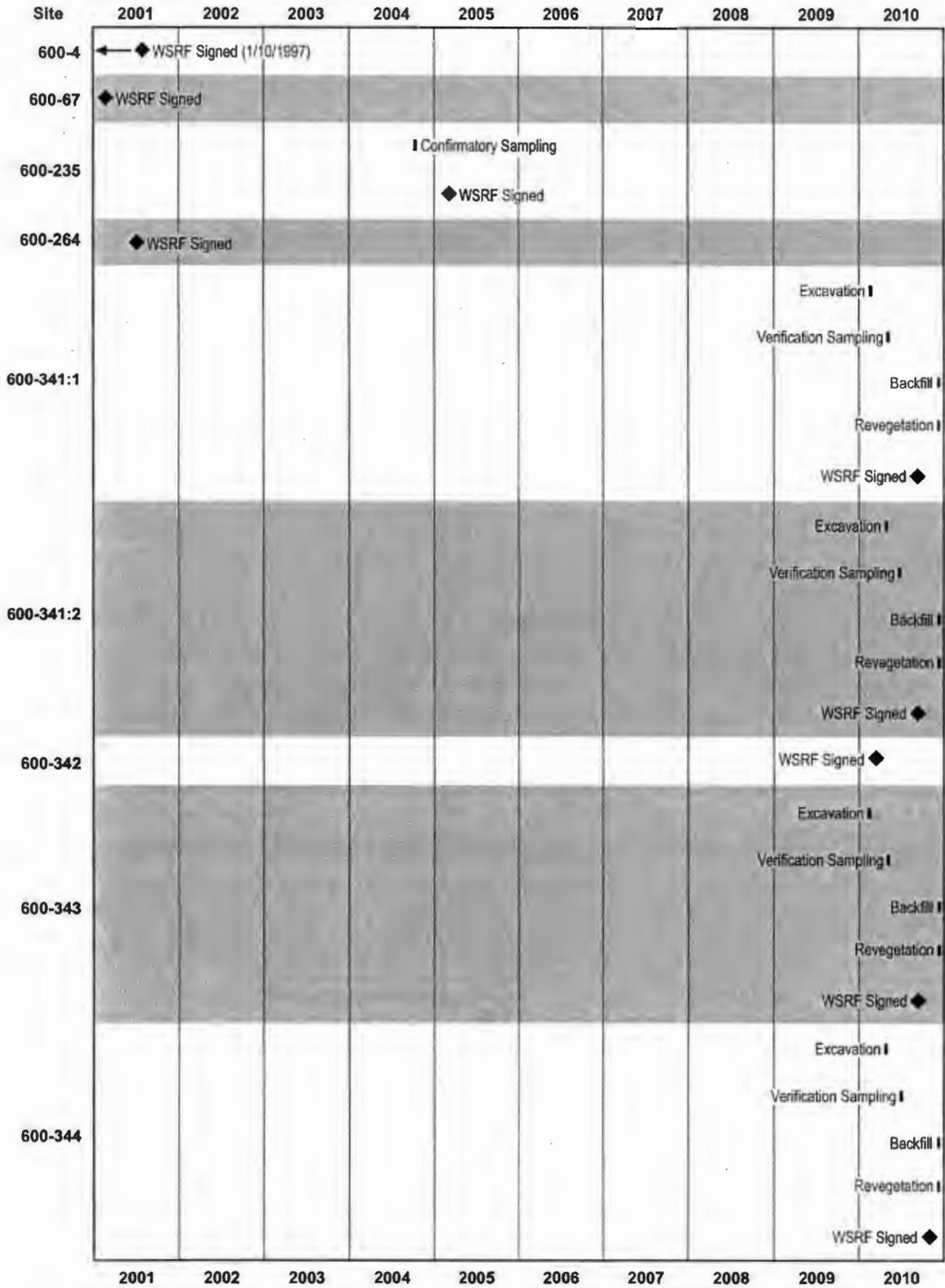
A chronology of major events associated with remediation of the interim remedial action for the sites within Segment 1 is presented in Table 3-1. The chronology includes infrastructure documents, initiation and completion of field operations, and issuance of cleanup verification documents and WSRFs. A summary of the events by waste site is depicted in Figure 3-1.

Table 3-1. Segment 1 Interim Action Chronology.

Date	Event
1999	<i>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 (Interim Action ROD) (EPA 1999)</i>
2004	Confirmatory sampling conducted at the 600-235 waste site
2009	DOE/RL-96-22, Rev. 5, <i>100 Area Remedial Action Sampling and Analysis Plan</i> DOE/RL-96-17, Rev. 6, <i>Remedial Design Report/Remedial Action Work Plan for the 100 Area Explanation of Significant Difference for the 100 Area Remaining Site Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2009)</i>
2010	Excavation operations initiated and completed at the 600-341, 600-343, and 600-344 waste sites Remediation and radiological surveys conducted at the 600-342 waste site <i>Remaining Sites Verification Package for the 600-341:1, Inter Areas Battery Remnant Area #1A issued (WCH 2010a)</i> <i>Remaining Sites Verification Package for the 600-341:2, Inter Areas Battery Remnant Area #1B issued (WCH 2010b)</i> <i>600-342 Waste Site Attachments to Waste Site Reclassification Form 2010-008 issued (WCH 2010c)</i> <i>Remaining Sites Verification Package for the 600-343, Inter Areas Burn Site #1 issued (WCH 2010d)</i> <i>Remaining Sites Verification Package for the 600-344, Inter Areas Stain Site #1 issued (WCH 2010e)</i>
2011	<i>Fact Sheet: Annual Listing of Waste Sites Plugged into the Remove, Treat, and Dispose Remedy in the 1999 Interim Record of Decision for the 100 Area, Hanford Site, Benton County, Washington (DOE-RL 2011)</i>

DOE-RL = U.S. Department of Energy, Richland Operations Office
EPA = U.S. Environmental Protection Agency
ROD = record of decision
WCH = Washington Closure Hanford

Figure 3-1. Summary of Major Segment 1 Interim Action Events.



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4.0 REMEDIATION ACTIVITY SUMMARY

Field operations supporting remedial actions in Segment 1 began and were completed in 2010. The cleanup actions resulted in the disposal of approximately 651 metric tons (359 US tons) of contaminated soil and debris at the ERDF from Segment 1. 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 lists sites that were not accepted as waste sites, did not require remedial action, or were rejected as waste sites. Detailed information about each waste site and related remediation activities is presented in the following subsections. Waste site locations are shown in Figure 2-1.

Table 4-1. Remedial Action Approach.

WIDS Site Code	Site Type	WIDS Site Name and Aliases	Excavation Approach	Personal Protective Equipment
600-341:1 600-341:2	Dumping area	Inter Areas Battery Remnant Areas #1 and #2	Direct Load	Level D
600-342	Dumping area	Inter Areas Contaminated Clothing Area near Susie Junction	NA	NA
600-343	Dumping area	Inter Areas Burn Site #1	Direct Load	Level D
600-344	Unplanned release	Inter Areas Stain Area #1	Direct Load	Level D

NA = not applicable

WIDS = Waste Information Data System

Table 4-2. Environmental Restoration Disposal Facility Waste Disposal Summary for Segment 1. (2 Pages)

WIDS Site Code	Site Type	Mass of Contaminated Soil/Debris Removed (Direct Disposal) (US tons)	Hazardous or Mixed Soil (Stabilization) (US tons)	Hazardous or Mixed Debris (Macroencapsulation) (US tons)	Total Mass Disposed to ERDF ^a (US tons)
600-341	Dumping area	25.3	0	0	25.3
600-342	Dumping area	0	0	0	0
600-343	Dumping area	210.4	0	0	210.4

Table 4-2. Environmental Restoration Disposal Facility Waste Disposal Summary for Segment 1. (2 Pages)

WIDS Site Code	Site Type	Mass of Contaminated Soil/Debris Removed (Direct Disposal) (US tons)	Hazardous or Mixed Soil (Stabilization) (US tons)	Hazardous or Mixed Debris (Macroencapsulation) (US tons)	Total Mass Disposed to ERDF ^a (US tons)
600-344	Unplanned release	123.2	0	0	123.2
Totals		358.9	0	0	358.9

^a Identified waste quantities were obtained from remaining sites verification packages/cleanup verification packages or the Waste Management Information System.

ERDF = Environmental Restoration Disposal Facility

WIDS = Waste Information Data System

Table 4-3. No Action or Rejected Waste Sites in Segment 1.

WIDS Site Code	WIDS Site Name	WIDS Site Reclassification Status
600-4	Howitzer Site	Rejected
600-67	Bruggeman's Fruit Storage Warehouse	Rejected
600-235	Buried Lead-Sheathed Telephone Cables	No Action
600-264	Abandoned Oil Drum	Rejected

WIDS = Waste Information Data System

4.1 600-4, HOWITZER SITE

The 600-4, Howitzer Site was a military encampment in an area covering 6 to 8 ha (15 to 20 ac) and is located between the 100-B/C and 100-K Areas. The site contains various types of solid waste litter including wood, metal, empty containers, and two coal piles. There was no evidence to indicate that hazardous, dangerous, or radioactive waste was disposed of at this site. The site was therefore classified as "rejected."

4.2 600-67, BRUGGEMAN'S FRUIT STORAGE WAREHOUSE

The 600-67, Bruggeman's Fruit Storage Warehouse site is the remaining single-story warehouse, associated foundations, piping, and debris surrounding the site. During field visits in 1998 and 2000, an abandoned fuel tank was identified adjacent to the warehouse. The tank has a 0.6-m (2-ft) filler pipe showing above ground. The tank is buried between the warehouse foundations and has a calculated capacity of 1,600 L (424 gal). The building is considered culturally

Remediation Activity Summary

significant because of its good condition and use of native materials for construction. It is in the process for listing on the National Register of Historic Places.

The underground tank was used to store heating oil and is exempt from CERCLA because of the petroleum exclusion. The tank can also be considered exempt from the "Underground Storage Tank Regulations" (WAC 173-360) because it is a heating oil tank less than 4,164 L (1,100 gal) and no releases are known to have occurred.

Based on its current state and location within the locked fence surrounding the warehouse structure, the tank was determined to not pose a risk to the environment, workers or the public, and no further remediation is required. The site was therefore classified as "rejected."

4.3 600-235, BURIED LEAD-SHEATHED TELEPHONE CABLES

4.3.1 History

The 600-235, Buried Lead-Sheathed Telephone Cables waste site includes lead-sheathed telephone cable that was installed from the 1940s to the mid-1950s and was abandoned when the Integrated Voice Data Telephone System was installed. In some cases the Integrated Voice Data Telephone System reused portions of the old lead-sheathed cables, but in most cases the old cable was abandoned in place. An estimated 204 km (127 mi) of lead-sheathed telephone communications cable buried at a depth of approximately 0.6 to 0.9 m (2 to 3 ft) has been left in place at the Hanford Site. Based on reviews of the site history and confirmatory sampling results, the 600-235 waste site was reclassified as a "no-action" waste site.

4.3.2 Investigation

The 600-235 waste site was sampled on September 8, 16, and 29, 2004, in accordance with BHI-01714, *Sampling and Analysis Plan for Evaluation of Buried Lead-Sheathed Telephone Communications Cable*. Samples of soil below the cable were collected from six sample locations that were selected by DOE and EPA for sampling and represented a variety of environmental conditions. To assess the potential leaching of the lead-sheathed cable into the adjacent soil, samples were collected in the vicinity of the cable at each of the six locations. Two soil horizons were sampled at each location: one immediately beneath/adjacent to the cable to a depth of 15.2 cm (6 in.), and a second from a depth of 15.2 to 30.5 cm (6 to 12 in.) beneath the cable.

4.3.3 Statement of Protectiveness

The confirmatory sampling results for the 600-235 waste site show that the buried lead-sheathed cable does not present a risk to human health or the environment and that current site conditions are consistent with RAOs and the corresponding RAGs for remedial action occurring in the Hanford Site 100 Area. The concentrations of metals detected in the soil associated with the lead-sheathed cable are also below or consistent with Hanford Site background and upstream

Remediation Activity Summary

Columbia River levels. The cable will require management as a dangerous waste if removed at a future date as part of excavation or construction activities.

4.4 600-264, ABANDONED OIL DRUM

The 600-264, Abandoned Oil Drum waste site is located 1,333 m (0.83 mi) northwest of Gravel Pit 24, west of the 100-B/C Area. The site consisted of an old 208-L (55-gal) drum that contained oil sludge inside the drum and a nearby patch of oil on the ground. The drum was removed in April 2000, and the oiled area was removed in June 2001. The quantities of soil removed or volume of debris disposed of were not identified on the WSRF but were likely insignificant. The site was ultimately classified as “rejected” in WIDS; however, several non-oil-stained drums and oil smudge pots in the vicinity remain as cultural artifacts.

4.5 600-341, INTER AREAS BATTERY REMNANT

4.5.1 History

The 600-341:1, Inter Areas Battery Remnant subsite consists of two areas that contained dry cell battery remnants and battery debris. Area 1 was approximately 1 m (3 ft) in diameter. Area 2 was observed to be approximately 0.5 m (1.5 ft) in diameter. There is no process history associated with the 600-341:1 subsite, although Area 1 was thought to be associated with a pre-Hanford farm.

The 600-341:2, Inter Areas Battery Remnant Area #1B subsite, located in the 100-IU-2 OU, consisted of two areas that contained dry cell battery remnants and battery debris. Area 1 and Area 2 were both approximately 2 to 3 m (7 to 10 ft) in diameter within a larger farmstead dump consisting of metal cans and glass. There is no process history associated with the 600-341:2 subsite, although it was thought to be associated with a pre-Hanford farm. Both areas are approximately 0.33 km (0.2 mi) south of Route 6 and 0.84 km (0.5 mi) east of State Route 24.

4.5.2 Excavation Operations

Remediation occurred on April 26, 2010. After excavation, Area 1 was approximately 24 m² (258 ft²) and Area 2 was approximately 12 m² (130 ft²). Each excavation was approximately 0.8 m (2 ft) deep. The vadose zone beneath the excavation is approximately 12.1 m (39.7 ft) thick. A total of approximately 15 bank cubic meters (BCM) (20 bank cubic yards [BCY]) of material was removed from the waste site. All of the excavated waste material was directly loaded into waste shipping containers for disposal at ERDF.

Remediation of Area 2 of the 600-341:1 subsite occurred on February 11, 2010. The excavation was approximately 2.5 by 3.5 m (8 by 12 ft) and approximately 0.5 m (1.5 ft) deep. All of the Area 2 waste was sent to ERDF. Area 1 was remediated on February 16, 2010. Because the characterization sampling of Area 1 showed elevated cadmium levels, it was determined that the

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best disposal pathway was offsite shipment. Area 1 was excavated by hand to an approximate diameter of 1 m (3 ft) and a depth of 0.5 m (1.5 ft). A total of approximately 5 BCM (6.5 BCY) of material was removed from the waste site.

4.5.3 Verification Samples

Cleanup verification sampling for the 600-341:1 subsite was conducted in May 2010. The verification samples were submitted to offsite laboratories for analysis using approved EPA analytical methods, as required per 0600X-WI-G0041, *Work Instruction for Verification Sampling of the 600-341:1, Inter Areas Battery Remnant Area #1A*. The site was divided into two decision units (Area 1 and Area 2), and a focused sampling approach was selected to evaluate the two decision units. Two verification samples were collected from each of the two decision units.

Cleanup verification sampling for the 600-341:2 subsite was conducted in July 2010. The verification samples were submitted to offsite laboratories for analysis using approved EPA analytical methods, as required per 0600X-WI-G0042, *Work Instruction for Verification Sampling of the 600-341:2, Inter Areas Battery Remnant Area #1B*. A composite sampling design was used to collect two verification soil samples from each of the two excavated areas. Each of the two excavations was divided into two sections. Within each section, sampling consisted of the collection of 25 aliquots of soil distributed across the surface of the soil and combined into one sample.

4.5.4 Statement of Protectiveness

The verification sampling data demonstrate that both the 600-341:1 and 600-341:2 waste sites meet the objectives established in the interim action ROD (EPA 1999) and have been reclassified in WIDS as "interim closed out." These 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. The sites do not have a deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the sites are not required. The sites were verified to be remediated in accordance with the interim action ROD (EPA 1999) and were backfilled and revegetated.

4.6 600-342, INTER AREAS CONTAMINATED CLOTHING AREA NEAR SUSIE JUNCTION

4.6.1 History

The 600-342, Inter Areas Contaminated Clothing Area Near Susie Junction waste site is located 520 m (1,710 ft) from the "Susie" railroad junction. The waste site consists of a 20-m (66-ft)-diameter area that contained discarded radiological protective clothing. The clothing debris

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was located approximately 8 m (26 ft) southwest of the rail line. The “Susie” junction was a main route for transfer of irradiated fuel from the 100 Areas to the fuel processing areas in the 200 Areas (HW-28394, *1952 Hanford Expansion Gable-Butte Railroad*). It is unknown why protective clothing was left at this site.

4.6.2 Investigation

When the 600-342 waste site was initially identified, radiological control personnel were notified. The radiological control personnel performed hand-held radiological survey of the site, and removed and properly disposed of the clothing. A subsequent Global Positioning Environmental Radiological Surveyor (GPERS) survey was conducted at the site to support interim close out. The GPERS surveys showed no evidence of radiological contamination at levels above site background.

4.6.3 Statement of Protectiveness

The GPERS radiological survey demonstrates that the 600-342 waste site meets the objectives established in the interim action ROD (EPA 1999), and the site has been reclassified as “interim closed out.” These results support future land uses that can be represented (or bounded) by a rural-residential scenario and support unrestricted future land uses.

4.7 600-343, INTER AREAS BURN SITE #1

4.7.1 History

The 600-343, Inter Areas Burn Site #1 waste site is an area consisting of residual ash from burned material and a trench containing dumped asphalt. The waste site was located approximately 480 m (1,575 ft) west-northwest of the Susie railroad junction. The total area measured approximately 6 by 6 m (20 by 20 ft). The ash-covered area had a diameter of approximately 8 m (26 ft).

4.7.2 Excavation Operations

Remediation of the 600-343 waste site occurred on February 9, 2010. Approximately 1 m (3 ft) of fly ash and asphalt material were removed from the trench area, and all excavated material was directly loaded into containers for shipment to ERDF. The excavation floor depth of 1 m (3 ft) below ground surface, and the vadose beneath the excavation is approximately 45 m (148 ft) thick. A total of approximately 135 BCM (177 BCY) of material was removed from the waste site.

4.7.3 Verification and Focused Sampling

Verification sampling for the 600-343 waste site was conducted in May 2010. The verification samples were submitted to offsite laboratories for analysis using approved EPA analytical

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methods, as required per 0600X-WI-G0035, *Work Instruction for Verification Sampling of the 600-343, Inter Areas Burn Site #1*. A composite sampling design was used to collect four verification soil samples from the single decision unit.

4.7.4 Statement of Protectiveness

The verification sampling data at the 600-343 waste site demonstrate that this site meets the objectives established in the interim action ROD (EPA 1999) and has been reclassified in WIDS as "interim closed out." These 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. This site does not have a deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 600-343 waste site is verified to be remediated in accordance with the interim action ROD (EPA 1999) and was backfilled and revegetated.

4.8 600-344, INTER AREAS STAIN AREA #1

4.8.1 History

The 600-344, Inter Areas Stain Area #1 waste site was an area stained with pre-Hanford metal container lids thought to have been associated with pre-Hanford farmstead. The waste site was located north of Route 6 and measured approximately 11 m (36 ft) across.

4.8.2 Excavation Operations

Remediation of the 600-344 waste site occurred on April 26, 2010. Approximately 1 m (3 ft) of stained soil and metal debris was removed from the area, and all excavated material was directly loaded into containers for shipment to ERDF. The excavation floor depth of 1 m (3 ft) below ground surface. A total of approximately 120 BCM (157 BCY) of material was removed from the waste site.

4.8.3 Verification and Focused Sampling

Verification sampling for the 600-344 waste site was conducted in July 2010. The verification samples were submitted to offsite laboratories for analysis using approved EPA analytical methods, as required per 0600X-WI-G0055, *Work Instruction for Verification Sampling of the 600-344, Inter Areas Stain Site #1*. A composite sampling design was used to collect four verification soil samples from the single decision unit. The excavation was divided into approximate 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.

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4.8.4 Statement of Protectiveness

The verification sampling data at the 600-344 waste site demonstrate that this site meets the objectives established in the interim action ROD (EPA 1999) and has been reclassified in WIDS as "interim closed out." These 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. This site does not have a deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 600-344 waste site is verified to be remediated in accordance with the interim action ROD (EPA 1999) and was backfilled and revegetated.

5.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

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

5.1 ATTAINMENT OF PERFORMANCE STANDARDS

The remedial actions described in Sections 4.1 through 4.8 of this report were performed in order to identify and reduce potential threats to human health and the environment from Segment 1 waste site contamination. Following remediation activities 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 Segment 1 waste sites are documented in remaining sites verification packages (RSVPs). These documents provide remediation information as described in Section 2.3 to support the formal reclassification in the WSRFs listed in Table 5-1. The RSVP documents address the waste sites that are identified in the "Remaining Sites interim action ROD" listed in Section 2.1.

Table 5-1. Summary of Segment 1 Closure Documentation. (2 Pages)

WIDS Site Code	Document Name	WSRF Number	WIDS Site Reclassification Status
600-4	--	97-102	Rejected
600-67	--	2000-125	Rejected
600-235	<i>Report for the 600-235 Lead-Sheathed Telecommunication Cable Sampling (BHI 2005)</i>	2001-091	No Action
600-264	--	2000-124	Rejected
600-341:1	<i>Remaining Sites Verification Package for the 600-341:1, Inter Areas Battery Remnant Area #1A (WCH 2010a)</i>	2010-053	Interim Closed Out
600-341:2	<i>Remaining Sites Verification Package for the 600-341:2, Inter Areas Battery Remnant Area #1B (WCH 2010b)</i>	2010-066	Interim Closed Out

Table 5-1. Summary of Segment 1 Closure Documentation. (2 Pages)

WIDS Site Code	Document Name	WSRF Number	WIDS Site Reclassification Status
600-342	<i>600-342 Waste Site Attachments to Waste Site Reclassification Form 2010-008 (WCH 2010c)</i>	2010-008	Interim Closed Out
600-343	<i>Remaining Sites Verification Package for the 600-343, Inter Areas Burn Site #1 (WCH 2010d)</i>	2010-052	Interim Closed Out
600-344	<i>Remaining Sites Verification Package for the 600-344, Inter Areas Stain Site #1 (WCH 2010e)</i>	2010-067	Interim Closed Out

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

5.1.2 Remedial Action Objectives and Goals

Remedial action objective performance standard attainment involves comparisons of soil analytical data to RAGs (Table 5-2) 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 for the identified units or maximum values
- 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.

Table 5-2. Summary of Achieved Performance Standards for Unrestricted Surface 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. (Corresponds approximately to 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.

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

Regulatory Requirement	Remedial Action Goals	Evaluation Method
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 x 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 x 10 ⁻⁵ for carcinogens.	Compared goal with cumulative carcinogen risks calculated from verification data set values.
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 goals to MTCA WAC 173-340-720; 173-340-730; and 173-201A.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
 COC = contaminant of concern
 MTCA = “Model Toxic Control Act – Cleanup” (WAC 173-340)
 RAG = remedial action goal
 RESRAD = RESidual RADioactivity dose and risk estimating model
 WAC = *Washington Administrative Code*

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 Segment 1 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 5-2.

5.1.3 Contaminant Identification

The lists of relevant contaminants are documented in the RSVP for each waste site to reflect constituents identified during the remediation and characterization process (Table 5-3), pursuant to the interim action ROD “observational approach.” None of the four sites for which soil samples were taken contained radiological COPCs.

Table 5-3. Summary of Waste Site Contaminants, Segment 1.

Contaminant	600-341:1	600-341:2	600-342 ^a	600-343	600-344
Inorganics					
Antimony	X ^b	X ^b		X ^b	X ^b
Arsenic	X ^b	X		X ^b	X ^b
Asbestos					
Cyanides					
IC anions					
ICP metals	X	X		X	X
Barium	X ^b	X ^b		X ^b	X ^b
Beryllium	X ^b	X ^b		X ^b	X ^b
Boron	X ^b	X ^b		X ^b	X ^b
Cadmium	X	X ^b		X ^b	X ^b
Cobalt	X ^b	X ^b		X ^b	X ^b
Copper		X ^b		X ^b	X ^b
Lead	X	X		X	X
Hexavalent chromium	X				
Total chromium	X	X ^b		X	X ^b
Manganese	X ^b	X ^b		X ^b	X ^b
Mercury	X				
Molybdenum	X ^b	X ^b		X ^b	X ^b
Nickel	X ^b	X ^b		X ^b	X ^b
pH					
Selenium	X ^b	X ^b		X ^b	X ^b
Silver	X ^b	X ^b		X ^b	X ^b
Vanadium	X ^b	X ^b		X ^b	X ^b
Zinc	X ^b	X		X ^b	X ^b
Organics					
Sulfide-sulfate					
Herbicides					
PAH	X	X		X	X
Pesticides	X				X
PCBs	X				
SVOCs	X			X	
TPH	X	X			X
VOCs					
Bis (2-ethylhexyl)phthalate					

^a There were no site-specific contaminants of potential concern for this site.

^b Not considered as contaminant of potential concern but were evaluated for by performing analyses for the constituents of the expanded ICP metals analyses.

IC = ion chromatography

ICP = inductively coupled plasma

PAH = polyaromatic hydrocarbons

PCB = polychlorinated biphenyl

SVOC = semivolatile organic compound

TPH = total petroleum hydrocarbons

VOC = volatile organic compound

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 5-2. 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.

5.2 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* 300) for the 100-F/IU-2/IU-6 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. A key element of the RI/FS activities to support final RODs is a comprehensive human health and ecological baseline risk assessment. As discussed in Section 2.0 of this report, interim remedial actions are supported by streamlined qualitative risk assessments that establish a need to perform remedial actions. The River Corridor Baseline Risk Assessment results will be used to evaluate the protectiveness of current remedial actions and in the development of cleanup levels in the final RODs.

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. Finally, exposure assumptions that formed the basis for development of the rural-residential exposure scenario will be evaluated and may be adjusted to reflect current applicable or relevant and appropriate requirements and land-use decisions. Finally, the basis for demonstrating that final remedial actions are protective of groundwater and the Columbia River will be updated according to current applicable or relevant and appropriate requirements.

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-F/IU-2/IU-6 Area, 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) and DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan*. 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 sampling and analysis plan 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 RSVPs for individual waste sites.

6.0 FINAL INSPECTION AND CERTIFICATIONS

Based on evaluation of the approved interim closure documentation referenced in Table 5-1 and final inspections of the Segment 1 waste sites, interim remedial actions have been completed and RAOs have been achieved. Pursuant to the 100 Area interim action RODs and RAOs, this means that contaminated soil at remediated sites was excavated and disposed at the ERDF and the waste sites were backfilled (as needed) and revegetated.

The results of confirmatory and verification sampling at interim closed out and no-action Segment 1 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 RL, EPA, and WCH representatives. The inspections will include only the four 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 in WIDS 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*, describes institutional controls for the Hanford Site. Institutional controls are not required at the remediated Segment 1 waste sites, and the remediated areas will be available for unrestricted land use.

7.0 OPERATIONS AND MAINTENANCE ACTIVITIES

There is no CERCLA site-specific surveillance and maintenance or institutional controls associated with the Segment 1 waste sites. The DOE will continue to retain responsibility for operations and maintenance functions of Segment 1. These functions and associated landlord responsibilities cover all 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 are often defined in an operations and maintenance plan for a site, such as maintaining signs, fences, and restrictions on excavations or land use. For the Segment 1 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
- Long-term monitoring, which will be required 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 *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989) allows 5-year reviews to address regulated *Resource Conservation and Recovery Act of 1976* (RCRA) units and past-practice units that are regulated under RCRA and/or CERCLA. The DOE began the third CERCLA 5-year review report for the Hanford Site in 2010.

Operations and Maintenance Activities

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 including Segment 1 is conducted annually in accordance with DOE O 231.1A, *Environment, Safety, and Health Reporting*. PNNL-19455, the annual *Hanford Site Environmental Report for Calendar Year 2009*, 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, Native Americans, 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. It 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 Segment 1 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, "Dangerous Waste Regulations." The strategy focuses on protecting groundwater resources, along with groundwater monitoring and remediation. Sampling and analysis plans for the Hanford Site including Segment 1 are developed each fiscal year, and monitoring results are presented in annual Hanford Site groundwater monitoring reports.

No active remediation of groundwater is occurring or planned in Segment 1.

8.0 REFERENCES

- 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.
- 0600X-WI-G0035, 2010, *Work Instruction for Verification Sampling of the 600-343, Inter Areas Burn Site #1*, Rev. 0, Washington Closure Hanford, Richland, Washington.
- 0600X-WI-G0041, 2010, *Work Instruction for Verification Sampling of the 600-341:1, Inter Areas Battery Remnant Area #1A*, Rev. 0, Washington Closure Hanford, Richland, Washington.
- 0600X-WI-G0042, 2010, *Work Instruction for Verification Sampling of the 600-341:2, Inter Areas Battery Remnant Area #1B*, Rev. 0, Washington Closure Hanford, Richland, Washington.
- 0600X-WI-G0055, 2010, *Work Instruction for Verification Sampling of the 600-344, Inter Areas Stain Site #1*, Rev. 0, Washington Closure Hanford, Richland, Washington.
- Atomic Energy Act of 1954*, 42 U.S.C. 2011, et seq.
- BHI-01714, 2004, *Sampling and Analysis Plan for Evaluation of Buried Lead-Sheathed Telephone Communications Cable*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.
- BHI, 2005, *Report for the 600-235 Lead-Sheathed Telecommunications Cable Sampling*, Attachment to Waste Site Reclassification Form No. 2001-091, January 2005, Bechtel Hanford, Inc., Richland, Washington.
- Clean Water Act of 1977*, 33 U.S.C. 1251, et seq.
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 U.S.C. 9601, et seq.
- DOE O 231.1A, *Environment, Safety, and Health Reporting*, as amended, U.S. Department of Energy, Washington, D.C.
- DOE/RL-91-40, 1991, *Hanford Past-Practice Strategy*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-96-17, 2009, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-96-22, 2009, *100 Area Remedial Action Sampling and Analysis Plan*, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

References

- DOE/RL-97-1047, 2002, *The Hanford Site Historic District–Manhattan Project 1943-1946*, Rev. 0, U.S. Department of Energy, Richland, Operations Office, Richland, Washington.
- DOE/RL-98-18, 2000, *100 Area Burial Grounds Focused Feasibility Study*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2001-41, 2009, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions*, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2002-59, 2004, *Hanford Site Groundwater Strategy: Protection, Monitoring, and Remediation*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2008-46-ADD4, 2010, *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 4: 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE-RL, 2011, *Fact Sheet: 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*, AR/PIR Accession Number 0084011, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
- EPA, 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-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*, July 1999, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.
- EPA, 2009, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*, August 2009, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.
- HW-28394, 1953, *1952 Hanford Expansion Gable-Butte Railroad*, General Electric, Hanford Works, Richland, Washington.
- OSWER Directive 9320.2-22, 2011, *Close Out Procedures for National Priorities List Sites*, , Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, Washington, D.C.

References

PNL-10285, 1995, *Estimated Recharge Rates at the Hanford Site*, J. J. Fayer and T. B. Walters, Pacific Northwest Laboratory, Richland, Washington.

PNNL-19455, 2010, *Hanford Site Environmental Report for Calendar Year 2009*, Pacific Northwest National Laboratory, Richland, Washington.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

RL-TPA-90-0001, 2007, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Safe Drinking Water Act of 1974, 42 U.S.C. 300f, et seq.

Superfund Amendments and Reauthorization Act of 1986, 42 U.S.C. 9601, et seq.

WAC 173-201A, "Water Quality Standards for Surface Water," *Washington Administrative Code*, as amended, Washington State Department of Ecology, Olympia, Washington.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended, Washington State Department of Ecology, Olympia, Washington.

WAC 173-340, "Model Toxics Control Act -- Cleanup," *Washington Administrative Code*, as amended, Washington State Department of Ecology, Olympia, Washington.

WAC 173-360, "Underground Storage Tank Regulations" *Washington Administrative Code*, as amended, Washington State Department of Ecology, Olympia, Washington.

Waste Site Reclassification Form, Control Number 97-102, 600-4, October 1997, U.S. Department of Energy, Richland, Operations Office, Richland, Washington.

Waste Site Reclassification Form, Control Number 2000-125, 600-67, February 2001, U.S. Department of Energy, Richland, Operations Office, Richland, Washington.

Waste Site Reclassification Form, Control Number 2001-091, 600-235, March 2005, U.S. Department of Energy, Richland, Operations Office, Richland, Washington.

Waste Site Reclassification Form, Control Number 2000-124, 600-264, June 2001, U.S. Department of Energy, Richland, Operations Office, Richland, Washington.

WCH, 2010a, *Remaining Sites Verification Package for the 600-341:1, Inter Areas Battery Remnant Area #1A*, Attachment to Waste Site Reclassification Form No. 2010-053, July 2010, Washington Closure Hanford, Richland, Washington.

References

WCH, 2010b, *Remaining Sites Verification Package for the 600-341:2, Inter Areas Battery Remnant Area #1B*, Attachment to Waste Site Reclassification Form No. 2010-066, September 2010, Washington Closure Hanford, Richland, Washington.

WCH, 2010c, *600-342 Waste Site Attachments to Waste Site Reclassification Form 2010-008*, Attachment to Waste Site Reclassification Form No. 2010-008, March 2010, Washington Closure Hanford, Richland, Washington.

WCH, 2010d, *Remaining Sites Verification Package for the 600-343, Inter Areas Burn Site #1*, Attachment to Waste Site Reclassification Form No. 2010-052, July 2010, Washington Closure Hanford, Richland, Washington.

WCH, 2010e, *Remaining Sites Verification Package for the 600-344, Inter Areas Stain Site #1*, Attachment to Waste Site Reclassification Form No. 2010-067, September 2010, Washington Closure Hanford, Richland, Washington.

APPENDIX A
PROJECT COST SUMMARY

APPENDIX A

PROJECT COST SUMMARY

This section presents a summary of the actual project costs associated with the remedial actions and backfill/revegetation operations performed in 2010, as addressed in Section 4.0 of this report. All cost data are intended to represent the fully burdened cost for the work performed, including all applicable direct and indirect overhead charges. The total cost of work performed for the sites and activities addressed in this report was approximately \$277.8K (Table A-1). Unit rates for work performed (remedial action and waste disposal) averaged \$774/US ton and ranged from \$295/US ton to \$3,178/US ton (Table A-2). The following subsections present additional background, breakdown, and discussion of the project costs.

Table A-1. Summary of Actual Remedial Action and Waste Disposal Costs for Segment 1 Waste Sites.

WIDS Site Name	Site Type	Waste Quantity (US tons)	Excavation (\$K)		Waste Treatment/Disposal (\$K)		Total (\$K)
			RCCC	Subcontract	Soil/Debris	Drums	
600-341	Dumping area	50.5	30.2	49.1	1	0	80.4
600-342	Dumping area	0	0.4	0	0	0	0.4
600-343	Dumping area	420.8	37.7	117.9	5	0	160.6
600-344	Unplanned release	246.3	15.1	18.3	3	0	36.4
Totals		717.6	83.4	185.3	9	0	277.8

RCCC = River Corridor Closure Contract
WIDS = Waste Information Data System

Table A-2. Summary of Actual Remedial Action and Waste Disposal Unit Costs for Segment 1 Waste Sites. (2 Pages)

Site Name	Site Type	Excavation Approach	PPE	Duration (months) ^a	Waste Quantity (US tons) ^b	Total Cost (\$K) ^c	Average Cost (\$/US ton)
600-341	Dumping area	Direct load	Level D	1	25.3	80.4	3,178
600-342	Dumping area	NA	NA	NA	NA	NA	NA
600-343	Dumping area	Direct load	Level D	1	210.4	160.6	763

Appendix A

Table A-2. Summary of Actual Remedial Action and Waste Disposal Unit Costs for Segment 1 Waste Sites. (2 Pages)

Site Name	Site Type	Excavation Approach	PPE	Duration (months) ^a	Waste Quantity (US tons) ^b	Total Cost (\$K) ^c	Average Cost (\$/US ton)
600-344	Unplanned release	Direct load	Level D	1	123.2	36.4	295
Totals					358.9	\$277.8	\$774

^a Excavations and loadout durations rounded to the nearest month.

^b Waste quantities as provided in the RSVP or obtained from WMIS. Includes bulk soil and debris.

^c All values represent fully burdened costs including applicable direct and indirect (General and Administrative) overhead.

NA = not applicable

PPE = personal protective equipment

RSVP = remaining sites verification package

WMIS = Waste Management Information System

A.1 COST COLLECTION METHOD

All costs in the report for work performed under the River Corridor Closure Contract were extracted from data accumulated and maintained in Deltek Cobra[®] program files. A work breakdown structure (WBS) collection system was established early in the project planning process. Actual remedial action project costs were captured by WBS as presented in Figure A-1. Unit rates for transportation/disposal and treatment (stabilization, macroencapsulation) were provided by the ERDF based on its own WBS and the average ERDF operational costs for all projects.

A.1.1 Included Costs

Data presented in this summary are intended to include project and ERDF costs for excavation and loadout, waste transportation and disposal at the ERDF, and backfill and revegetation costs. Costs include fully burdened labor, equipment and materials, and subcontract services.

A.1.2 Excluded Costs

Data presented in this summary exclude up-front costs associated with RI/FS development, initial project conceptual and detailed designs, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE/RL-96-17) development, and subcontract package development.

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Appendix A

Figure A-1. General Work Breakdown Structure for Segment 1 Remediation.

WORK BREAKDOWN STRUCTURE – EXAMPLE WORK SCOPE

1.03 Fld. Rem.-Field Remediation Closure

1.03.07 Fld. Rem.-100 Area Remaining Sites

1.03.07.05 ARRA - 100-IU Segments

1.03.07.05.01 ARRA - 100-IU Segment 1

1.03.07.05.01.01 ARRA - Remediate Waste Site - 600-341

1.03.07.05.01.01.01 ARRA - Excavation Process

1.03.07.05.01.01.02 ARRA - Loadout

1.03.07.05.01.01.03 ARRA - Backfill

1.03.07.05.01.01.04 ARRA - Closeout Smplg & Docum

1.03.07.05.01.01.05 ARRA - Reveg

1.03.07.05.01.02 ARRA - Remediate Waste Site - 600-342

1.03.07.05.01.02.01 ARRA - Excavation Process

1.03.07.05.01.02.02 ARRA - Loadout

1.03.07.05.01.02.03 ARRA - Backfill

1.03.07.05.01.02.04 ARRA - Closeout Smplg & Docum

1.03.07.05.01.02.05 ARRA - Reveg

1.03.07.05.01.03 ARRA - Remediate Waste Site - 600-343

1.03.07.05.01.03.01 ARRA - Excavation Process

1.03.07.05.01.03.02 ARRA - Loadout

1.03.07.05.01.03.03 ARRA - Backfill

1.03.07.05.01.03.04 ARRA - Closeout Smplg & Docum

1.03.07.05.01.03.05 ARRA - Reveg

1.03.07.05.01.04 ARRA - Remediate Waste Site - 600-344

1.03.07.05.01.04.01 ARRA - Excavation Process

1.03.07.05.01.04.02 ARRA - Loadout

1.03.07.05.01.04.03 ARRA - Backfill

1.03.07.05.01.04.04 ARRA - Closeout Smplg & Docum

1.03.07.05.01.04.05 ARRA - Reveg

1.03.07.05.01.05 ARRA - Remediate Waste Site - 600-345

1.03.07.05.01.05.01 ARRA - Excavation Process

1.03.07.05.01.05.02 ARRA - Loadout

1.03.07.05.01.05.03 ARRA - Backfill

1.03.07.05.01.05.04 ARRA - Closeout Smplg & Docum

1.03.07.05.01.05.05 ARRA - Reveg

1.03.07.05.01.06 ARRA - Remediate Waste Site - 600-346

1.03.07.05.01.06.01 ARRA - Excavation Process

1.03.07.05.01.06.02 ARRA - Loadout

1.03.07.05.01.06.03 ARRA - Backfill

1.03.07.05.01.06.04 ARRA - Closeout Smplg & Docum

1.03.07.05.01.06.05 ARRA - Reveg

Appendix A

A.2 COST PRESENTATION

For presentation in this report, actual costs were grouped into the following general categories:

- Remedial action
- ERDF waste treatment and disposal
- Drummed waste treatment and disposal.

Additional information on each of the three general categories is provided in the following subsections.

A.2.1 Remedial Action

Details for remedial action costs are presented in Table A-3. The costs include labor and other (equipment and materials) elements. The subcontract costs include remedial action subcontractors that supported the work, commercial laboratories, and other miscellaneous subcontracts (e.g., engineering support, training, cultural resources). The remedial actions and backfill subcontracts were all lump-sum, fixed-price contracts.

Table A-3. Remedial Action Cost Detail for Segment 1 Waste Sites.

Site Name	Site Type	RCCC (\$K)			Subcontract (\$K)					Total (\$K)
		Labor	Other	Sub-total	Excavation	Backfill/Reveg	Lab	Other	Sub-total	
600-341	Dumping area	13.4	16.8	30.2	6.6	0.2	36.2	6.1	49.1	79.4
600-342	Dumping area	0.2	0.2	0.4	0	0	0	0	0	0.4
600-343	Dumping area	4.3	33.4	37.7	98.5	0.1	16.1	3.2	117.9	155.6
600-344	Unplanned release	6.9	8.2	15.1	9.3	0.3	6.4	2.3	18.3	33.4
Totals		24.8	58.6	83.4	114.4	0.6	58.7	11.6	185.3	268.8

RCCC = River Corridor Closure Contract

RCCC Summary

Labor – includes project management, field engineering, environmental, safety, radcon, sampling, data management, project controls, excavation and loadout, backfill, revegetation and site closeout; excludes project design, subcontract development, mobilization, and work plan development

Other – equipment and supplies.

Subcontract Summary

Excavation – remedial action subcontractor labor (project management, safety, supervision, craft, administration), equipment, supplies, excavation, and loadout

Backfill/Reveg – backfill and revegetation subcontractor labor (project management, safety, supervision, craft, administration), equipment and supplies

Lab – contract laboratory sample analysis and reporting for waste characterization, site closeout, and air monitoring

Other – miscellaneous support subcontract costs (engineering support, training, and cultural resources).

Appendix A

The WBS for remedial action included site-specific and nonsite-specific (e.g., project management, engineering, cost control, administration) at the WBS project level. For presentation in this report, remedial action costs for nonsite-specific WBSs were not included.

A.2.2 Environmental Restoration Disposal Facility Waste Transportation, Treatment, and Disposal

Details for the ERDF transportation and disposal costs are presented in Table A-4. Separate costs for transportation/disposal, stabilization, and macroencapsulation of soil and debris are presented based on average unit rates of \$22.51/US ton, \$142.73/US ton, and \$142.73/US ton, respectively. Soil and debris quantities are based on quantities obtained from the Waste Management Information System.

Table A-4. Environmental Restoration Disposal Facility Transportation, Treatment, and Disposal Cost Detail for Segment 1 Waste Sites.

Site Name	Site Type	Soil and Debris Quantity (US tons)				ERDF Cost (\$K)			
		Nonhazardous Soil/Debris (Direct Disposal)	Hazardous Soil (Stabilization)	Hazardous Debris (Macro)	Total	Transportation/Disposal	Stabilization	Macro	Total
600-341	Dumping area	25.3	0	0	25.3	1	0	0	1
600-342	Dumping area	0	0	0	0	NA	NA	NA	NA
600-343	Dumping area	210.4	0	0	210.4	8	0	0	8
600-344	Unplanned release	123.2	0	0	123.2	7	0	0	7
Totals		358.9	0	0	358.9	\$16	\$0	\$0	\$16

ERDF = Environmental Restoration Disposal Facility

Macro = macroencapsulation

NA = not applicable

A.3 DISCUSSION

As discussed previously the unit costs for the Segment 1 sites varied significantly ranging from \$295/US ton to \$3,178/US ton. Several factors contribute to the unit cost values presented in Table A-2. The major factor in the higher relative unit cost for the 600-341 sites was that the site consisted of numerous small quantity areas that were located through the large geographic footprint of Segment 1. Thus, the remote location, laboratory costs associated with multiple locations, and the small waste quantities resulted in a high unit cost per ton.

A.4 COMPARISON OF ESTIMATED AND ACTUAL COSTS

Recognizing that the ROM cost estimates provided in the interim action RODS and summarized in Section 2.0 have not been escalated to reflect present-value dollars, some general conclusions can be made in comparing ROM costs to the actual costs presented in this report. For the majority of the remediated waste site in Segment 1, the actual costs were lower than those estimated in the factsheet (DOE-RL 2011) and outside the ROM estimate of accuracy (+50% to -30%) for most of the waste site estimates. The total ROM costs for remediation of the four Segment 1 waste sites were estimated at \$418,489. The actual cost as shown in Table A-3 totaled \$277,800. The decrease in actual costs from the estimated costs can be attributed primarily to encountering lower quantities of contaminated soil than was estimated in the factsheet (DOE-RL 2011). The total estimated disposal volume for the Segment 1 waste sites based on estimates was 2,508 metric tons (2,468 US tons), while the actual disposal volume was approximately 365 metric tons (359 US tons). The difference in quantity and cost is directly attributed to the 600-342 waste site where approximately 2,103 metric tons (2,070 US tons) were estimated to be removed and no actual quantity of soil was required to be removed.

A.5 FUTURE USE OF COSTS

Costs presented in this report have not been escalated to reflect present-value dollars. Future users of the cost data should be cautioned that escalation adjustments may be needed to provide meaningful information, depending on the intended use.

A.6 REFERENCES

DOE/RL-96-17, 2009, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2011, *Fact Sheet: 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*, AR/PIR Accession Number 0084011, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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