U.S. Department of Energy
Hanford Site

20-PFD-0054 September 30, 2020

Ms. Alexandra K. Smith, Program Manager
Nuclear Waste Program
Washington State Department of Ecology
3100 Port of Benton Boulevard
Richland, Washington 99354

Dear Ms. Smith:

M-091 TRANSURANIC MIXED/MIXED LOW-LEVEL WASTE PROJECT MANAGEMENT PLAN, HNE-19169, REVISION 22

This letter transmits the annual revision of the M-091 Transuranic Mixed/Mixed Low-level Waste Project Management Plan, HNF-19169, Revision 22, to the Washington State Department of Ecology (Ecology) for review and approval.

This plan is submitted as a primary document under the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Action Plan, Section 9.0, Documents and Records. Transmittal of this document completes the requirement for Tri-Party Agreement Interim Milestone M-091-03N, annual submittal of the Project Management Plan due September 30, 2020. Additionally, submittal of this Project Management Plan completes our commitment for milestones M-091-44T, "Establish a schedule for achieving the offsite shipment of all TRUM waste," and M-091-49A, "Establish a schedule for achieving the retrieval of RSW.

Comments or approval are requested within 45 days of receipt of this letter

If you have any questions, please contact me, or your staff may contact Mark French, of my staff, on (509) 373-9863.

Sincerely,

William F. Hamel, Assistant Manager
for the River and Plateau
Richland Operations Office

PFD:ILC

Attachment

cc: See page 2

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HNF-19169
Revision 22

M-091 Transuranic Mixed and Mixed Low-Level Waste Project Management Plan

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

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company

P.O. Box 1600
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Approved for Public Release;
Further Dissemination Unlimited

HNF-19169
Revision 22

M-091 Transuranic Mixed and Mixed Low-Level Waste Project Management Plan

Document Type: PLAN Program/Project: W&FMP

A. P. Huckleberry
CH2M HILL Plateau Remediation Company

Date Published
September 2020

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

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APPROVED
By Janis D. Aardal at 8:45 am, Sep 09, 2020

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Executive Summary

The Hanford Site, managed by the U.S. Department of Energy (DOE), produced about 60 percent of the United States' plutonium from the mid-1940s to the late 1980s in support of national defense efforts. Much of the waste and contaminated materials from the Hanford Site defense mission remains on the Central Plateau of the Hanford Site.

The *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989a),[1] commonly known as the Tri-Party Agreement, is a legal agreement between the Washington State Department of Ecology (Ecology), the U.S. Environmental Protection Agency, and DOE (hereinafter called the Tri-Parties) that identifies cleanup actions and schedules, referred to as milestones, to manage a portion of this remaining waste and contaminated material. The scope of the M-091 Milestone series (Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*)[2] is to complete removal of the retrievably stored waste from the burial grounds and dispose of the mixed low-level waste (MLLW) and transuranic mixed (TRUM) waste in storage. When these milestones are complete, DOE will have successfully treated the MLLW and shipped the TRUM waste offsite for disposal.

At the time of this writing, the Tri-Parties remain in negotiations over proposed changes to the M-091 Milestone series. The parties neared a consensus on the outstanding points in 2019, with few details left to be agreed upon, as documented in a letter from DOE to Ecology (19-AMRP-0065)[3] on June 27, 2019. The letter contains two Tri-Party Agreement Change Control Forms (M-91-19-02 and M-91-19-03), as attachments. Negotiations continued in 2020 to find resolution to the remaining details. In July 2020, agreements were made and the parties are now in the process of bringing the changes to the M-091 Milestone series forward for public comment. This revision of the M-091 TRUM and MLLW Project Management Plan (PMP) treats the milestones cited in the agreed-to versions of

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[1] Ecology, EPA, and DOE, 1989a, *Hanford Federal Facility Agreement and Consent Order*, State of Washington, Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=81.

[2] Ecology, EPA, and DOE, 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, State of Washington, Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=82.

[3] 19-AMRP-0065, 2019, *Tentative Agreement on Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Revisions in Response to the Milestone M-091 Proposed Milestone Series Change Control Forms.* Available at: https://pdw.hanford.gov/document/AR-02506.

Tri-Party Agreement Change Control Forms M-91-19-02 and M-91-19-03, which were updated as negotiations continued to evolve and are yet to be published in their current form, as the milestones in effect for the M-091 Milestone series. The change control forms present significant changes to the M-091 Milestone series. Most notably, M-091-48, which specifies the date by which offsite shipment of all M-091 TRUM waste must be completed, was adjusted from September 30, 2030 to September 30, 2050. The new completion date aligns with the planned closure date for the Waste Isolation Pilot Plant near Carlsbad, New Mexico. Other milestones in the M-091 series were adjusted to guide progress toward satisfaction of M-091-48, given the adjusted completion date.

This PMP contains the status of work completed and outlines the DOE strategy for completing the remaining work in the M-091 Milestones series.

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Terms

AK	acceptable knowledge
AMWTP	Advanced Mixed Waste Treatment Project
AR	Administrative Record
CBFO	DOE Carlsbad Field Office
CCP	Central Characterization Program
CD	Critical Decision
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CH	contact-handled
CWC	Central Waste Complex
CY	calendar year
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
FY	fiscal year
IRA	Interim Response Action
LDR	land disposal restriction
LLBG	low-level burial ground
LLW	low-level waste
MLLW	mixed low-level waste
MWT	mixed waste trench
NDE	nondestructive examination
OSA	outside storage area
OU	operable unit
PFP	Plutonium Finishing Plant
PMP	project management plan
PUREX	Plutonium Uranium Extraction (Plant)
RAWP	removal action work plan

RCRA	*Resource Conservation and Recovery Act of 1976*
RH	remote-handled
RI/FS	Remedial Investigation and Feasibility Study
ROD	record of decision
RSW	retrievably stored waste
RTD	removal, treatment (as needed), and disposal
SAP	sampling and analysis plan
SLB2	standard large box 2
SWOC	Solid Waste Operations Complex
SWB	standard waste box
TPA	Tri-Party Agreement
Tri-Parties	DOE, EPA, and Ecology
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TRU/M	transuranic and/or transuranic mixed
TRUM	transuranic mixed
TRUPACT-II	Transuranic Package Transporter Model 2
TSD	treatment, storage, and disposal
VPU	vertical pipe unit
WBS	work breakdown structure
WIPP	Waste Isolation Pilot Plant
WMA	waste management area
WRAP	Waste Receiving and Processing (Facility)

1 Project Overview

The Hanford Site, managed by the U.S. Department of Energy (DOE) produced about 60 percent of the United States' plutonium from the mid-1940s to the late 1980s in support of national defense efforts. The 1,518 km^2 (586 mi^2) site is located in southeastern Washington State. The Central Plateau covers approximately 194 km^2 (75 mi^2) in the center of the Hanford Site. Much of the waste and contaminated materials from the Site's defense mission remains on the Central Plateau.

The *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989a), commonly known as the Tri-Party Agreement (TPA), is a legal agreement between the Washington State Department of Ecology (Ecology), the U.S. Environmental Protection Agency (EPA), and DOE (hereinafter the Tri-Parties) that identifies cleanup actions and schedules referred to as milestones. The scope of the M-091 Milestone series (Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, commonly known as the TPA Action Plan) is to complete retrieval and eliminate the backlog of Hanford Site mixed low-level waste (MLLW) and transuranic mixed (TRUM) waste in storage. When these milestones are completed, DOE will have retrieved the retrievably stored waste (RSW) from the burial grounds, treated and disposed of M-091 MLLW, repackaged M-091 TRUM waste into certifiable containers, and shipped M-091 TRUM waste offsite for disposal.

This revision of the M-091 TRUM and MLLW Project Management Plan (PMP) treats the milestones detailed in TPA Change Control Forms M-91-19-02 and M-91-19-03, as agreed to between the Tri-Parties in July 2020, as the milestones in effect for the M-091 Milestone series. These Change Control Forms are being prepared for public comment at the time of this writing, and are not currently in a published form. Their content is, however, summarized in Section 1.4. The most significant change presented in the change control forms is the adjustment to align the completion of the M-091 Milestone series with the closure of the Waste Isolation Pilot Plant (WIPP) in 2050. This schedule adjustment brings the risk profile of the project down by eliminating the need to execute multiple Capital Asset Projects concurrently. Additionally, the revised milestone schedule will allow additional time to develop capabilities for the challenging remote-handled (RH) waste retrieval, processing, and shipping activities that fall under the M-091 purview.

DOE developed this PMP in accordance with the TPA (Ecology et al., 1989a), Section 11.5, "Waste Material Stream Project Management Work Plans," prepared under Milestone series M-090-00, M-091-00, and M-092-00 of the TPA Action Plan (Ecology et al., 1989b). This PMP contains the current status of completed work along with the DOE plan to accomplish the remaining work under the M-091 Milestone series.

A goal of the Tri-Parties is to integrate the Hanford Site cleanup activities to the extent possible to enable efficient and effective management of waste. The three agencies agreed to integrate the plan for managing transuranic (TRU) and TRUM waste under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) cleanup actions, with the plan to manage similar waste forms under the M-091 work scope. This PMP also addresses the acquisition of capabilities necessary to prepare TRU and TRUM waste generated under CERCLA cleanup actions.

Specialized words used in the waste management plan are defined in Appendix A and applicable regulatory requirements are given in Appendix B.

1.1 Goals and Objectives

The goal of the M-091 Milestones series is to complete the treatment to land disposal restriction (LDR) treatment standards for Hanford Site *Resource Conservation and Recovery Act of 1976* (RCRA) MLLW

and repackaging of TRUM waste. The focus of the milestones is on treating and repackaging waste that has been retrieved and stored in drums and boxes aboveground. The milestones also align with a schedule for developing alternative capabilities required for waste treatment, certification, and disposal.

The M-091 Milestone series set a deadline of 2050 to remove TRUM waste from the Hanford Site. When the M-091 Milestones series is completed, the RSW will have been retrieved from the burial grounds, MLLW will have been treated and disposed of, and TRUM waste will have been repackaged, certified, and shipped offsite for disposal.

1.2 Scope

The scope of the M-091 Milestone series includes MLLW and TRUM waste in aboveground storage as of June 30, 2009, and RSW in the low-level burial grounds (LLBGs). Waste in aboveground storage is defined as the waste stored within the Central Waste Complex (CWC), T Plant, and the Waste Receiving and Processing (WRAP) Facility. The RSW is defined as waste that was placed in LLBGs 218-W-4B, 218-W-4C, 218-W-3A, and 218-E-12B after May 6, 1970, and was believed to meet TRU waste criteria when it was placed in one of these burial grounds.

Descriptions and maps of the LLBGs are included in Appendix C. An aerial view of the Hanford Site 200 West Area is presented in Figure 1-1.

The M-091 Milestone series scope is as follows:

- Remove mixed waste containers from Outside Storage Areas (OSAs) A and B (M-091-53A-E, M-091-59).
- Perform an engineering study on the impacts of radiological decay on the cost and schedule for retrieval, processing, certification, and shipment/disposal of RH MLLW and RH TRUM waste (M-091-58).
- Development of capabilities for processing and treatment of TRUM and MLLW waste prior to disposal (M-091-55, M-091-56).
- Complete processing and repackaging activities, resulting in TRUM certification and MLLW treatment (M-091-47 series, M-091-57).
- Retrieval of RSW trench and caisson waste (M-091-54, M-091-49).
- Shipment of TRUM waste to WIPP (M-091-48, M-091-60).

A summary of the CERCLA cleanup actions that have the potential to generate waste with TRU constituents greater than 100 nCi/g, along with projected volumes, is provided in Chapter 7. These wastes are not included within the scope of the M-091 Milestone series.

The currently approved CERCLA cleanup actions generating (or anticipated to generate) transuranic and/or transuranic mixed (TRU/M) waste include the following:

- 100 K Basins
- 221U Facility
- 618-11 Burial Grounds (300-FF-2)
- 200-PW-1 and 200-PW-6 Operable Units (OUs)
- 224B and 224T Plutonium Concentration Facilities

Future CERCLA OUs decisions and facilities with the potential to generate waste with TRU constituents greater than 100 nCi/g during CERCLA actions are summarized in Section 7.3. These OUs and facilities include the following:

- 200-BC-1, B/C Cribs and Trenches OU
- 200-SW-2, Radioactive Landfills Group OU
- 200-WA-1, West Inner Area OU
- 200-DV-1, Deep Vadose Zone OU
- 200-IS-1, Tanks/Lines/Pits/Boxes Waste Group OU
- 200-EA-1, East Inner Area OU
- 200-CP-1, Plutonium Uranium Extraction (PUREX) Plant Canyon and associated past-practice waste site
- 200-CR-1, Reduction and Oxidation Plant Canyon and associated past-practice waste site

Other RCRA actions with potential to generate waste with TRU constituents greater than 100 nCi/g, and are not within the scope of the M-091 Milestone series and not covered in this PMP include the tank farms waste management areas (WMAs) that are covered under the M-045 Milestone series and 11 single-shell tanks. DOE expects to make a classification as to whether the material is TRU waste and to continue Critical Decision (CD) documentation development that will define the technology and infrastructure needed to retrieve, process, and package the waste for disposal. As more information becomes available, any interfaces or impacts to the M-091 scope will be addressed in future revisions of the PMP. The engineering alternative study completed under Milestone M-091-52 (CHPRC-03264, *M-091-52 Alternative Evaluation)* did not consider potential waste from the tank farms.

1.3 Management Plan Overview

This revision of the PMP describes a revised strategy for the completion of the M-091 Milestone series that was adjusted based on the currently proposed TPA change control forms. The strategy reflects the extension of the overall completion date of the M-091 Milestone series. The strategy also emphasizes the need to provide the necessary capabilities to complete M-091 work scope, while continuing to make progress in treatment and processing of MLLW and TRUM with the currently available capabilities. Figure 1-2 is an illustration of the strategy.

Key elements of the DOE strategy for the completion of the M-091 work scope are as follows:

- Prioritize the treatment and processing of MLLW and TRUM waste. Continued utilization of commercial capabilities to reduce the inventory of MLLW and TRUM waste requiring treatment and processing.
- Select and acquire capabilities necessary to complete the retrieval, treatment, and processing of the MLLW and TRUM waste. The M-091-52 Alternatives Evaluation (CHPRC-03264), completed in fiscal year (FY) 2017 provides the necessary foundation for selection of options to move forward. The revisions to the M-091 Milestone series approved in FY 2020 define progress to be made in the acquisition process for retrieval, treatment, and processing in the coming years.

Figure 1-1. Aerial View of Hanford Site Looking South to the 200 West Area (April 2010)

The organization of this PMP follows the DOE strategy, illustrated in Figure 1-2, to complete the M-091 work scope:

- Chapter 2 addresses the capabilities necessary to complete the retrieval, treatment, and processing of the MLLW and TRUM waste.
- Chapter 3 addresses the retrieval of RSW.
- Chapter 4 addresses the generation of certifiable TRUM waste and treatment of MLLW.
- Chapter 5 discusses the certification and shipment of TRUM waste to WIPP.
- Chapter 6 provides a discussion of the storage capacity necessary for the storage of M-091 wastes.
- Chapter 7 provides an estimate of the amount of waste generated from CERCLA cleanup activities. This waste is not within the scope of the M-091 Milestone series. It is described in this PMP to provide an overview of the waste disposition challenges included within the efforts to clean up the Hanford Site.
- Chapter 8 describes the DOE project control elements including funding profile for the planning, managing, and reporting performance necessary to complete the M-091 work scope the retrieval, treatment, and processing of the MLLW and TRUM waste.
- Chapter 9 details the references cited throughout the document

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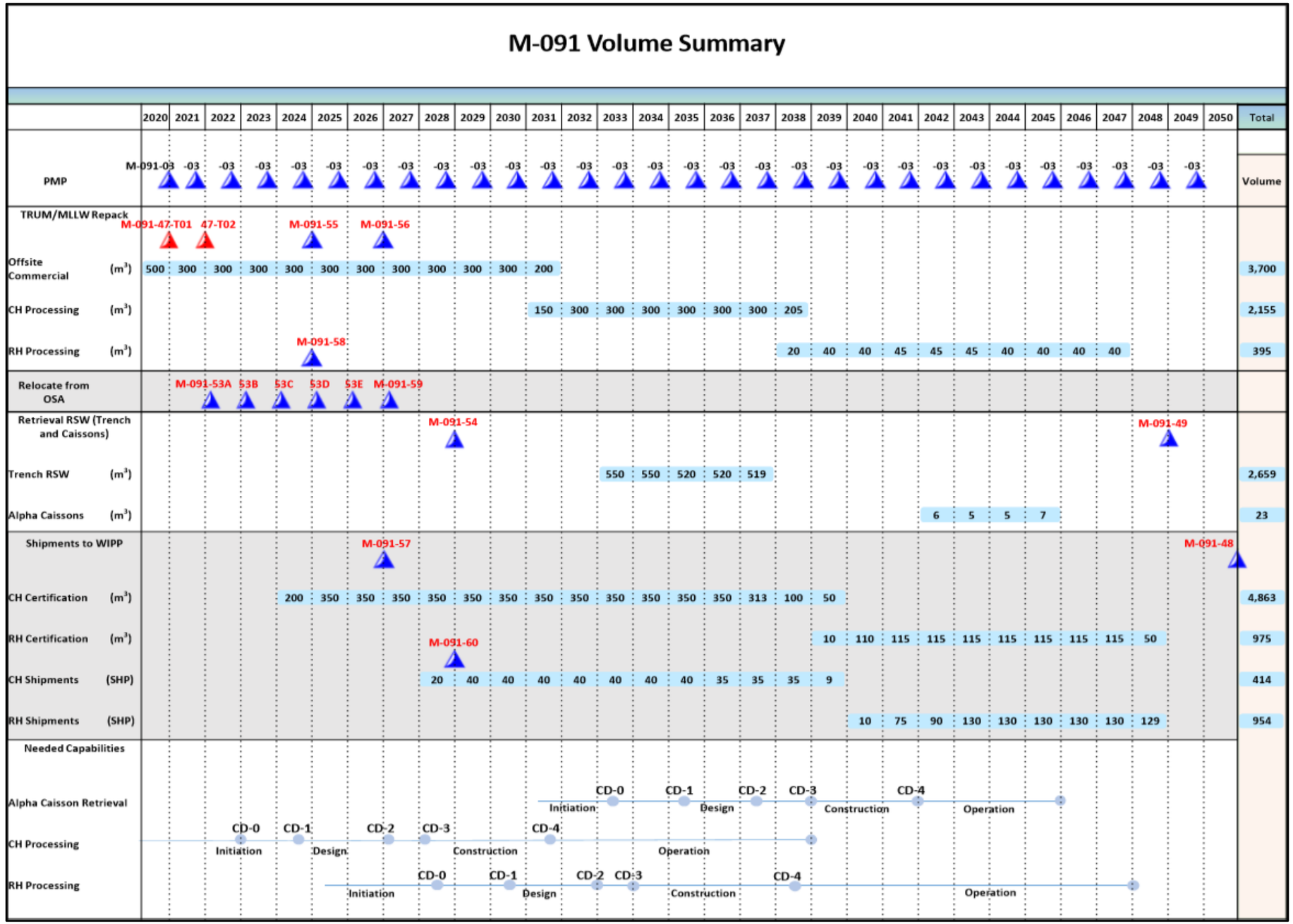

Figure 1-2. DOE Strategy to Complete the M-091 Work Scope

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1.4 Status of Milestones

The status of near-term M-091 Milestones is provided in Table 1-1.

Table 1-1. Status of Near-Term M-091 Milestones

M-091 Milestone	M-091 Milestone Title	Required Completion Date	Status
M-091-53	Submit milestone change request to replace the target milestones in M-091-52 with annual milestones for acquisition of capabilities/ facilities/modifications necessary for retrieval, designation, storage, and treatment/processing for RH TRUM and TRUM waste in large containers.	9/30/2018	Complete
M-091-47D	Certify or treat 280 m^3 (9,888 ft^3) of TRUM/MLLW waste.	9/30/2018	Complete
M-091-47-T01	Certify or treat 280 m^3 (9,888 ft^3) of TRUM/MLLW waste.	9/30/2020	On Schedule
M-091-03N	Submit annual revision of TRUM waste and MLLW PMP to Ecology.	9/30/2020	On Schedule
M-091-47-T02	Certify or treat 280 m^3 (9,888 ft^3) of TRUM/MLLW waste. Submit change control form to establish next two annual target dates for certification or treatment of TRUM/MLLW	9/30/2021	On Schedule
M-091-53A thru M-091-53E	Remove 10 additional mixed waste containers from OSAs-A/B per year. Each year's requirement is due on 11/30 of that year.	11/30/2021 through 11/30/2025	On Schedule
M-091-54	Submit to Ecology an Interim Response Action (IRA) proposal to resume RSW retrieval.	9/30/2028	On Schedule
M-091-55	Submit to Ecology a 30 percent Conceptual Design Report package for the Facility/Capability for CH waste containers.	9/30/2024	On Schedule
M-091-56	Submit to Ecology a permit modification request based on a 90 percent design for the Facility/Capability for CH waste containers.	9/30/2026	On Schedule
M-091-57	Initiate CH certification activities by processing a TRUM container with results meeting the M-091-00 definition of Certification.	9/30/2026	On Schedule
M-091-58	Submit to Ecology an engineering study of the impacts of radiological decay on the cost and schedule for retrieval, processing, certification, and shipment/disposal of all RH MLLW and RH TRUM waste (in aboveground storage as of June 30, 2009 and in retrievable storage).	9/30/2024	On Schedule
M-091-59	Remove all mixed waste containers from OSAs-A/B.	9/30/2026	On Schedule
M-091-60	Initiate treatment to LDR treatment standards for M-091 MLLW & TRUM waste OR initiate certification and shipment of TRUM waste for disposal at WIPP.	9/30/2028	On Schedule

CH	=	contact-handled	PMP	=	project management plan
Ecology	=	Washington State Department of Ecology	RH	=	remote handled
LDR	=	land disposal restriction	RSW	=	retrievably stored waste
MLLW	=	mixed low-level waste	TRUM	=	transuranic mixed
OSA	=	outside storage area	WIPP	=	Waste Isolation Pilot Plant

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2 Acquisition of Necessary Capabilities

The M-091 Milestone series addresses the retrieval, treatment/processing, shipment, and disposal of MLLW and TRUM wastes. To accomplish the work scope under the milestones, additional capabilities are necessary. The preparation of an engineering alternatives study was the first step in the sequence of M-091 Milestones to provide needed capabilities.

M-091-52, Completed Engineering alternatives analysis – CHPRC-03264 was completed under Milestone M-091-52 in August 2017. The alternative evaluation focused on the capability gaps identified in CHPRC-02916, *Engineering Alternatives Study*, for all waste that is currently in, or anticipated to be stored at, the Hanford Site Solid Waste Operations Complex (SWOC). The alternatives analysis provided evaluations of several potential capabilities to address each gap and recommended a comprehensive set of alternatives. Subsequent milestones will not be bound by the recommendations of the alternatives evaluation. Rather, it will be used as a resource for Tri-Party Agreement milestones regarding the design and construction of the needed capabilities.

The following capabilities are necessary to manage the waste and complete the M-091 Milestone series.

Removal of large boxes from OSAs-A/B – M-091 large boxes located in OSAs-A/B must be removed by September 30, 2026, as required by M-091-59. Many of these M-091 large boxes stored in OSAs-A/B will have been removed for treatment at Perma-Fix Northwest pursuant to M-091-53A-F.

Retrieval and characterization of the remaining RSW – M-091-49 dictates that retrieval is to be completed by September 30, 2048. The remaining RSW in belowground storage is both contact-handled (CH) and RH waste. WMP-62505, *M-091 Contact Handled and Classified Waste Retrieval Conceptual Design Report*, identifies and evaluates methods for retrieving and characterizing CH waste from the burial grounds. M-091-54 requires an Interim Response Action (IRA) proposal to resume retrieval by September 30, 2028. The IRA will be in the form of an Engineering Evaluation and Cost Analysis, which will evaluate alternatives for retrieving both CH and RH waste in the burial grounds.

Process noncompliant waste – Milestones M-091-55 and M-091-56 specifically address development of capability to process CH waste containers. M-091-55 requires a 30 percent conceptual design report package by September 30, 2024. M-091-56 continues the design process, calling for a permit modification request to be submitted to ecology based on a 90 percent design by September 30, 2026.

Certification of waste – Certify that waste complies with the disposal site acceptance criteria prior to shipment for disposal. Waste currently in belowground and aboveground storage requires certification. Additionally, any newly generated TRU or TRUM waste will require certification. The capabilities must be able to handle a variety of containers. M-091-057 requires that CH certification activities are initiated, with a processed TRUM container meeting the M-091-00 definition of “Certification” by September 30, 2026.

Shipment to disposal – The TRUM waste will require shipment to WIPP for disposal. MLLW is disposed at the Hanford Site. The WRAP Facility in the 200 West Area of the Hanford Site has previously shipped waste to WIPP in Transuranic Package Transporter Model 2 (TRUPACT-II) shipping containers. It is expected that these capabilities may be suitable to prepare a portion of the future shipments to WIPP. Additional capabilities will likely be needed to complete all shipping operations needed under the M-091 Milestone series. Milestone M-091-60 requires DOE to initiate certification and shipment of TRUM waste for disposal at WIPP by September 30, 2028.

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3 Retrieval and Designation of Retrievably Stored Waste (M-091-49)

DOE has made substantial progress in retrieving RSW included in the scope of the M-091 Milestone series from the burial grounds, which originally contained approximately 15,200 m^3 of RSW. Since retrieval operations began, DOE has successfully retrieved more than 12,700 m^3 of RSW, leaving approximately 2,680 m^3 remaining to be retrieved. The RSW is in designated areas in LLBGs 218-E-12B, 218-W-3A, 218-W-4B, and 218-W-4C. Burial Ground 218-W-4B includes four alpha caissons containing RH RSW. The retrieval of RSW has been completed in the 218-W-4C LLBG. Descriptions and maps of these LLBGs are included in Appendix C.

Legacy trench retrieval capabilities are expected to be sufficient to retrieve a significant amount of the remaining TRU and TRUM waste from the LLBGs; however, experience has shown that container-by-container retrieval will not be feasible for waste stored in some of the trenches. WMP-62505 discusses retrieval methods using heavy equipment and IP-1 sacks for retrieving waste stored in these troublesome trenches. A new capability is needed to retrieve waste from the alpha caissons.

3.1 Status and Annual Volume Projections for Retrieval of Retrievably Stored Waste

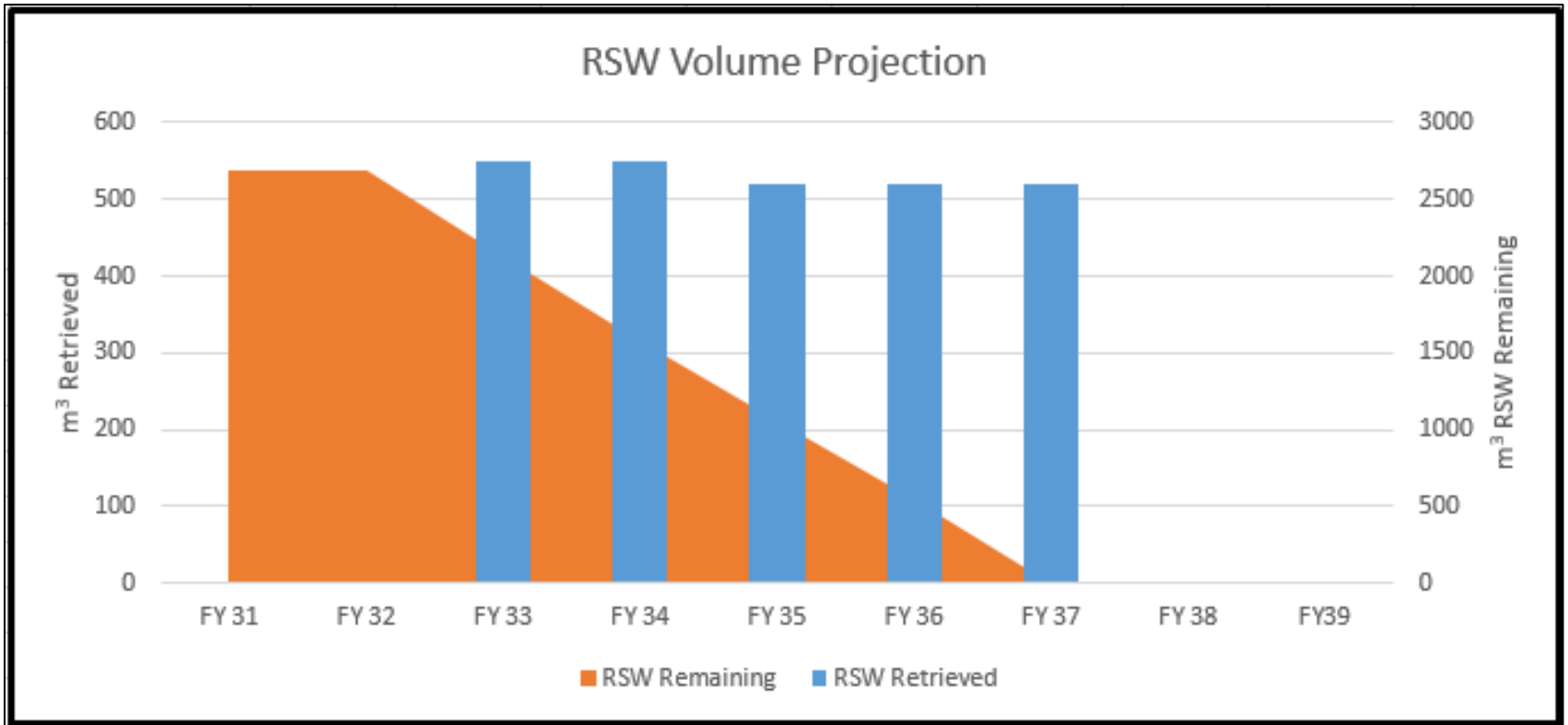
Retrieval operation is in a standby condition.

Figure 3-1 presents a summary of the projected timeline for retrieval of RSW. The bars represent the quantity of RSW that is projected to be retrieved during a fiscal year, and the line represents the cumulative volume remaining at the end of a fiscal year.

Under the projected annual funding profile and the implementation of additional capabilities, retrieval of RSW is not anticipated to occur until approximately FY 2033. Milestone M-091-54 requires completion of an IRA proposal in FY 2028 focused on facilities and capabilities needed to resume retrieval activities. Design and construction of the alpha caisson retrieval project are scheduled to be completed in FY 2042, with retrieval of the caisson RH RSW to be completed by the end of FY 2045.

3.2 Post-Retrieval Activities

Once RSW has been removed from the trenches in the LLBGs, information and photographs regarding as-left trench conditions will be collected. Sampling of the soil will commence per the sampling and analysis plans (SAPs) that have been developed to determine and characterize any contaminants released to the burial grounds where RSW has been retrieved. The sampling results will be documented in the Administrative Record (AR).



	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY39
RSW Retrieved	0	0	550	550	520	520	519	0	0
RSW Remaining	2682	2682	2132	1582	1062	542	23*	23*	23*

*Alpha caisson volume.

See Appendix D of this PMP for information on the basis of the volumes reported in the figure.

Figure 3-1. Volume Projections for RSW Retrieval

The following SAPs are for the four LLBGs:

- DOE/RL-2003-48, *218-W-4C Sampling and Analysis Plan*
- DOE/RL-2004-32, *218-E-12B Burial Ground Sampling and Analysis Plan*
- DOE/RL-2004-70, *218-W-4B Burial Ground Sampling and Analysis Plan*
- DOE/RL-2004-71, *218-W-3A Burial Ground Sampling and Analysis Plan*

For the purposes of this PMP, it is assumed that any soil remediation in the trenches where RSW is removed will be addressed as part of the 200-SW-2 OU CERCLA cleanup actions (M-016 Milestone series). There are opportunities to support the 200-SW-2 investigative process through implementation of the SAPs.

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4 Certifiable TRUM Waste and MLLW Treatment (M-091-47)

This chapter addresses the scope of work under Milestone M-091-47 that focuses on repackaging TRUM waste and treating MLLW that has already been retrieved and stored in drums and boxes aboveground.

4.1 Certifiable TRUM Waste

This section describes the DOE plan to prepare TRUM waste into a form certifiable for offsite shipment. Existing offsite capabilities at Perma-Fix Northwest will be used to continue to make progress with repackaging large containers into a certifiable configuration. WRAP and T Plant are currently in a standby condition. Existing and legacy capabilities are not adequate to process all the waste currently or expected to be managed at SWOC. Alternatives to provide the needed capability include new or modified onsite processing facilities for both CH and RH waste processing and monitored natural attenuation. Subsequent milestones will address the selection of preferred alternatives and the establishment of Tri-Party Agreement milestones for the design and construction of the needed capabilities.

Onsite and offsite transportation of waste is discussed in Section B1.6.

4.1.1 Status of Certifiable TRUM Waste

Table 4-1 updates the volume of TRUM shipped to Perma-Fix Northwest, by year, since last reported. For calendar year (CY) 2016 through May 4, 2020 a total of 3,387 m^3 of TRU/M has been shipped to Perma-Fix Northwest for repackaging into certifiable form. The total TRUM treated in CY 2020 (through May 4), was 185 m^3. Perma-Fix Northwest is the only currently utilized capability for repackaging TRUM waste.

Table 4-1. Certifiable TRUM Volumes

Certifiable TRUM Waste Category	Through CY 16	CY 17	CY 18	CY 19	CY 20 Through May 4
TRUM Waste Made Certifiable*	2,079	353	363	581	189
Cumulative TRUM Made Certifiable*	2,079	2,432	2,795	3,376	3,565
Certifiable Waste Resulting from Repack	1,490	95	90	155	51

Note: all values reported in m^3.

*TRUM volume before size reduction.

CY = calendar year

TRUM = transuranic mixed

Figures 4-1 and 4-2 show similar aerial views of OSA-A. Figure 4-1 is from February 2020, while Figure 4-2 is from September 2013. The majority of progress toward making the M-091 TRUM waste certifiable has been through processing the waste from the OSA at Perma-Fix Northwest. Comparing the two figures provides a visual representation of this progress.

Figure 4-1. OSA-A Aerial View Looking East - February 2020

Figure 4-2. OSA-A Aerial View Looking East - September 2013

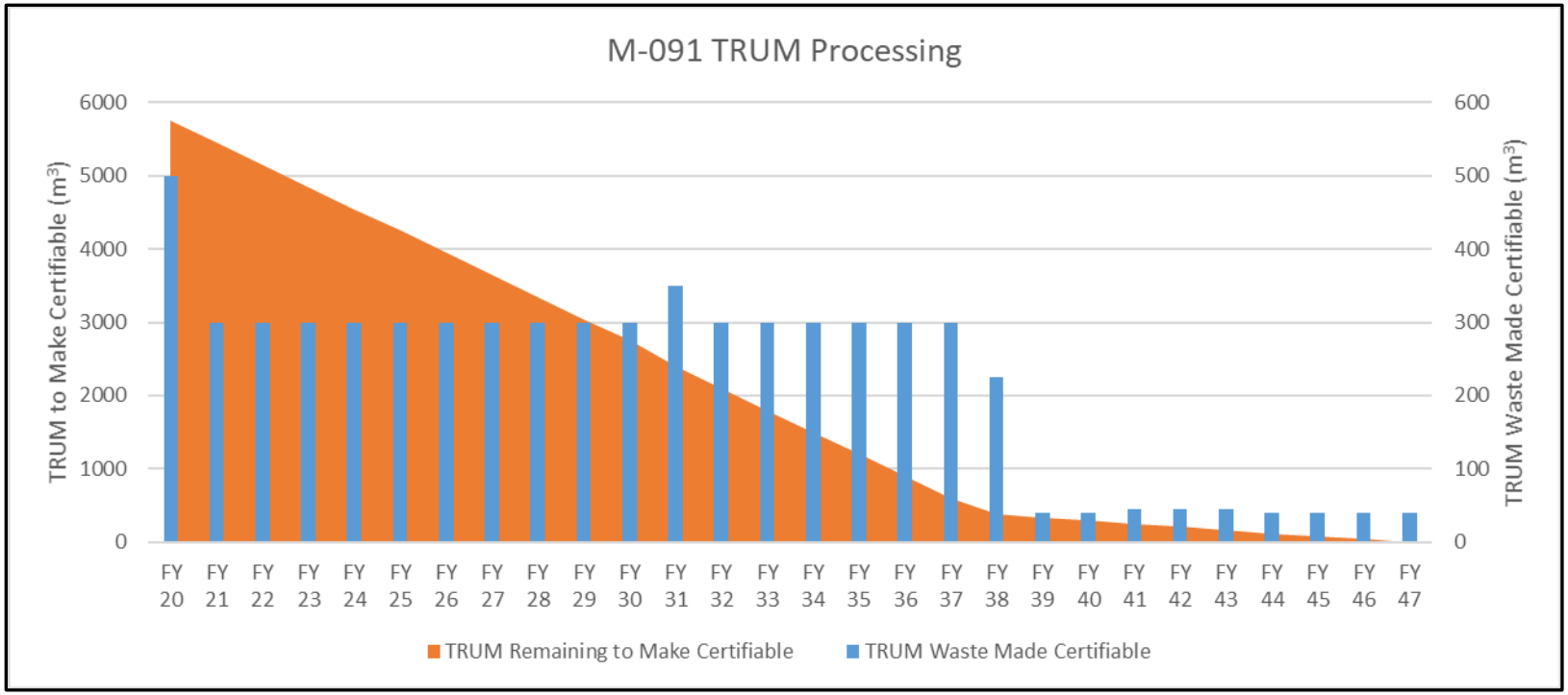
4.1.2 Processing Approach to Create Certifiable Containers of TRUM Waste

This section addresses containers currently in aboveground storage that are being repackaged into a certifiable form at Perma-Fix Northwest, the only available capability today for repackaging TRUM waste. In addition, this section addresses the containers remaining to be retrieved from the LLBGs (RSW) that do not meet the Perma-Fix Northwest acceptance criteria, which was addressed in the engineering alternatives analysis completed under Milestone M-091-51 (see Chapter 2). Figure 4-3 shows an example of repackaging of TRUM waste at Perma-Fix Northwest.

Figure 4-3. Repackaging of TRUM Waste at Perma-Fix Northwest

For the drums and boxes of RSW that have been determined to be TRUM waste, nondestructive examination (NDE) is used to determine whether a WIPP-prohibited item(s) is present. If a prohibited item(s) is found, the container will be appropriately remediated to yield a WIPP-certifiable container. If a container is to be shipped offsite to be processed into a WIPP-certifiable form, the contents will be characterized onsite before the drum is shipped offsite. In the potential case of a box that cannot undergo NDE, acceptable knowledge (AK) based on review and investigation of the waste record is to be used for characterization. This AK will be documented in the operating record and, in the case of offsite treatment, provided to the facility prior to shipment.

Figure 4-4 presents a summary of the volume of M-091 TRUM waste projected to be repackaged into WIPP-certifiable containers. The bars represent the TRUM waste expected to be processed and become certifiable during a fiscal year, and the line represents the remaining inventory that still requires processing in order to be made WIPP certifiable. The projected values are based on existing suspect TRUM waste volumes. The waste currently in aboveground storage that is already in a certified or certifiable form is not included in Figure 4-4. Additional information is provided in Appendix D of this PMP.



*See Appendix D for information on the basis of the volumes reported in this figure.

Figure 4-4. Certifiable Volume Projections of TRUM Waste (M-091 Scope)

Under the M-091-47 Milestone series, at least 280 m^3 of TRUM waste has been repackaged using commercial capabilities from FY 2017 through FY 2020. M-091-47-T02 requires a TPA change control form to be submitted to Ecology by September 30, 2021 to establish the next two annual target dates for certification of TRUM waste and/or treatment and disposal of MLLW. Volumes of TRUM treated or MLLW treated and disposed in excess of the 280 m^3 required by the M-091-47 Milestone series are applied to subsequent years' milestone requirements.

To accomplish this M-091 Milestone work scope, DOE will continue to use existing capabilities and acquire the necessary new capabilities discussed in Chapter 2. Current milestones focused on onsite repackaging to handle CH TRUM waste not treated at an offsite commercial facility are M-091-55 and M-091-56.

4.2 Treatment of MLLW

Substantial progress has been made in recent years in the treatment and disposal of MLLW. Since 1997, over 14,000 m^3 of MLLW has been treated and disposed of. Most of this MLLW has been treated using commercial capabilities and disposed onsite at either the mixed waste trenches (MWTs) or Environmental Restoration Disposal Facility (ERDF).

4.2.1 Status and Annual Volume Projections for Treatment of MLLW

During CY 2019, no processing of M-091 MLLW was performed. The last MLLW processed was four large boxes in CY 2018 (118 m^3). As of May 4, 2020, a total of 83 CH MLLW containers and 51 RH MLLW containers remained in aboveground storage.

After retrieval and assay, a portion of the RSW will be designated as non-TRU waste based on the change in the definition of TRU waste (to 100 nCi/g from the former definition of 10 nCi/g), which occurred after the waste was placed into retrievable storage in the trenches. RSW that designates as MLLW will be disposed at the MWTs or ERDF. It is anticipated that current capabilities are available to process most of the remaining MLLW. Newly generated MLLW will continue to be treated within the one year storage prohibitions specified in 40 CFR 268.50, "Land Disposal Restrictions," "Prohibition on Storage of Restricted Wastes."

4.2.2 MLLW Characterization

This section addresses containers currently in storage and those to be retrieved from the LLBGs.

Drums of RSW that have been determined to be MLLW receive NDE to determine whether a nonconforming item(s) is present before being shipped offsite for treatment. If a nonconforming item(s) is found, the information from the NDE will be included in the operating record for the container and sent to the receiving facility before the drum is sent offsite for treatment.

Boxes of RSW that have been determined to be MLLW will undergo NDE, if capability is available, to determine whether a nonconforming item(s) is present. If a nonconforming item(s) is not found, the box will be sent offsite for treatment. If a nonconforming item(s) is found, the box will be shipped offsite for processing after additional knowledge obtained from the NDE is recorded in the waste package operating record, and the additional knowledge will be sent to the receiving offsite facility prior to shipment.

For boxes of RSW that have been determined to be MLLW where the capability to perform NDE is not available, the waste record of the waste box will be reviewed and investigated to determine the probable contents inventory. This review and investigation will be documented in the operating record. If the box is to be shipped offsite for processing, all available process knowledge about the contents will be presented to Ecology before the package is shipped to the offsite facility.

4.2.3 Overview of MLLW Treatability Groups

The MLLW is categorized by the necessary treatment path to ensure that the waste, once treated, will meet LDR requirements for disposal. The following treatability groups are included in DOE/RL-2015-08, *Calendar Year 2014 Hanford Site Mixed Waste Land Disposal Restrictions Full Report*:

- MLLW-01 "LDR Compliant Waste," Treatment Path: Direct disposal without additional LDR treatment
- MLLW-02 "Inorganic Non-Debris," Treatment Path: Nonthermal (stabilization)
- MLLW-03 "Organic Non-Debris," Treatment Path: Thermal
- MLLW-04 "Hazardous Debris," Treatment Path: Nonthermal (macroencapsulation)
- MLLW-05 "Radioactive Lead Solids," Treatment Path: Nonthermal (macroencapsulation)
- MLLW-06 "Mercury Waste," Treatment Path: Mercury stabilization (that is, amalgamation or grout stabilization)
- MLLW-07 "RH and Large Container," Treatment Path: Multiple types of treatment (e.g., stabilization, macroencapsulation, and thermal destruction)
- MLLW-08 "Unique Wastes," Treatment Path: No treatment capability
- MLLW-09 "Radioactive Batteries," Treatment Path: Macroencapsulation
- MLLW-10 "Reactive Metals," Treatment Path: Deactivation of reactive component

Pursuant to the *Hazardous and Solid Waste Amendments of 1984*, LDRs were promulgated beginning in 1986 for nonradioactive waste. The LDRs later became effective for mixed waste. Beginning in 1990, Tri-Party Agreement Milestone M-26-01 required a plan with subsequent yearly reports on the volume of mixed waste in storage at the Hanford Site. The last report submitted (DOE/RL-2015-08) provides total waste volume for both the currently stored inventory and the waste forecast to be generated during the next 5 years by treatability group. This PMP addresses MLLW LDR Treatability Groups MLLW-02 through MLLW-10. Treatability Group MLLW-01, direct disposal without additional LDR treatment, applies to waste in a LDR-compliant form. There is no waste from Treatability Group MLLW-01 included in this PMP.

4.2.4 Treatment Capabilities for MLLW

Commercial capabilities are used to treat/process inorganic nondebris (MLLW-02), organic nondebris (MLLW-03), hazardous debris (MLLW-04), radioactive lead solids (MLLW-05), mercury waste (MLLW-06), radioactive batteries (MLLW-09), and reactive metals (MLLW-10) in small containers.

Commercial capabilities are used to treat/process most CH MLLW in large containers and RH MLLW (MLLW-07). Onsite and offsite transportation of waste is discussed in Section B1.6.

4.2.4.1 Stabilization (MLLW-02)

The treatment path for inorganic nondebris MLLW is commercial stabilization and is represented in LDR Treatability Group MLLW-02. Waste within this group consists of many different inorganic solids (e.g., particulates, absorbed liquids, sludges, resins, and soils) and lab packs that are contaminated with regulated metals and other inorganics.

The objective of stabilization is to immobilize the hazardous component through chemical and/or physical fixation into low-solubility materials and by encapsulation to reduce the potential for future releases. Usually, stabilization is accomplished by mixing the waste with Portland cement or pozzolanic materials at a preselected ratio, but stabilization can also include mixing with polymer materials. Pretreatment processes may be employed prior to stabilization (e.g., drying, shredding, screening, and chemical treatments).

Several commercial treatment facilities located in the United States can accept most of the Hanford Site's waste in Treatability Group MLLW-02.

4.2.4.2 Thermal Treatment of Organics (MLLW-03)

The treatment path for organic nondebris MLLW is commercial thermal treatment and is represented in LDR Treatability Group MLLW-03. Waste within this group consists of many different inorganic and organic solids (e.g., particulates, absorbed liquids, sludges, resins, and soils) and lab packs that are contaminated with organic regulated dangerous waste constituents. The thermal treatment process destroys organic materials by oxidation, combustion, and/or pyrolysis.

Commercial treatment facilities are located in the United States that can accept the Hanford Site's waste in Treatability Group MLLW-03.

4.2.4.3 Macroencapsulation (MLLW-04, MLLW-05, and MLLW-09)

Waste within Treatability Group MLLW-04 meets the definition of hazardous debris as defined in 40 CFR 268.2, "Definitions Applicable in This Part." The physical characteristics include paper, plastic, wood, rubber, rags, and lesser quantities of metallic and inorganic waste components. This waste may include organic/carbonaceous waste constituents in excess of 10 percent as defined in WAC 173-303-040, "Dangerous Waste Regulations," "Definitions."

Waste within Treatability Group MLLW-05 meets the definition of the radioactive lead solids subcategory as described in 40 CFR 268.40, "Applicability of Treatment Standards." The physical makeup consists of many different forms of radioactive lead solids including bricks, sheets, shot-filled blankets, and lead-lined debris items where the lead comprises more than 50 percent of the waste matrix. The primary treatment path for MLLW debris and radioactive lead solids is commercial macroencapsulation.

Waste within Treatability Group MLLW-09 is, or contains, radioactively contaminated batteries that have the treatment requirements specified in 40 CFR 268.40 (i.e., D006, cadmium batteries; D008, lead acid batteries (drained); D009, mercury batteries; and D011, silver batteries).

The primary treatment path for MLLW debris, radioactive lead solids, and radioactively contaminated batteries is commercial macroencapsulation. Macroencapsulation consists of applying a surface coating of polymeric organics or using a jacket of inert inorganic materials (e.g., cement) to allow substantial reduction of surface exposure to potential leaching media. Portland cement-based grouts have mainly been used to macroencapsulate this waste on the Hanford Site. The waste is typically sent through one or more size-reduction steps (e.g., sorting, cutting/shearing, compaction, and/or super compaction) prior to macroencapsulation.

Commercial treatment facilities are located in the United States and can accept the Hanford Site's waste in the MLLW-04, MLLW-05, and MLLW-09 Treatability Groups. Onsite and offsite transportation of waste is discussed in Section B1.8.

4.2.4.4 Mercury Stabilization and Amalgamation (MLLW-06)

Radioactively contaminated mercury waste requires either stabilization or amalgamation. Commercial capability is available. The Hanford Site inventory of mercury-bearing waste is currently zero (represented in LDR Treatability Group MLLW-06). The last report submitted (regulated constituents table, including treatment requirements and underlying hazardous conditions (if applicable) in Section 3.3.1 of DOE/RL-2015-08) does reflect that high inorganic mercury is present in the PUREX tunnels.

4.2.4.5 RH and Large-Container MLLW (MLLW-07)

Waste that falls into the MLLW-07 Treatability Group includes very large packages that, when treated, pose a transportation concern and/or waste packages that have a significant radiological inventory that pose a worker protection concern. The waste will be limited to hazardous debris. Chemical stabilization and macroencapsulation under 40 CFR 268.45, "Treatment Standards for Hazardous Debris," will be used to render the waste LDR compliant. In addition, the mixed waste containers will meet the 90 percent full container requirements following treatment. Treatment would be limited to those technologies that can be employed for containerized mixed waste only.

Commercial facilities will be used to treat most CH MLLW in large containers and some RH MLLW. Waste within Treatability Group MLLW-07 consists of large containers of MLLW, RH MLLW packages, and RH MLLW that is shielded down to contact-handling levels for safe handling and storage. DOE has implemented significant commercial capability with firms in Washington and Utah to disposition a significant portion of this LDR treatability group.

4.2.4.6 Disposition Path for MLLW-08

Waste within Treatability Group MLLW-08 is a unique waste, for which no permitted treatment capability exists in the United States, or the capability exists but the capability is very limited.

4.2.4.7 Deactivation (MLLW-10)

Reactive metals containing radioactive contamination require deactivation as the specified treatment technology under RCRA. Waste within Treatability Group MLLW-10 has water reactive materials, including sodium metal.

4.2.5 Disposal of MLLW

On the Hanford Site, MLLW is disposed at the MWTs and ERDF. The MWTs (LLBG 218-W-5, Trenches 31 and 34) are RCRA compliant, meet Subtitle C disposal requirements, and provide permanent disposal of low-level waste (LLW) and MLLW. They have a double-liner system with leachate collection. The combined capacity of the two MWTs is approximately 22,300 m^3. Approximately half of each disposal unit has been filled with waste.

ERDF is authorized to dispose of waste under CERCLA and meets substantive requirements for RCRA landfills (e.g., double liner and leachate collection). The landfill is used for disposal of environmental restoration waste being generated from cleanup activities. ERDF is designed to provide permanent disposal capacity to accommodate projected Hanford Site LLW and MLLW.

In 2007, an amendment to the ERDF Record of Decision (ROD) (EPA et al., 2007, *Amendment to the Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility*) was approved, authorizing treatment and disposal at ERDF of specific Hanford Site-only waste that is not covered in other existing Hanford Site CERCLA authorizations or RODs. Examples of Hanford Site-only waste include waste from surveillance and maintenance at Hanford Site facilities, environmental research and development activities, sample analyses, liquid effluent waste treatment, and environmental monitoring programs.

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5 Certification and Shipment of TRUM Waste

DOE has made considerable progress in removing TRUM waste from the Hanford Site. Over 4,400 m^3 of TRUM waste has been shipped to WIPP for disposal, either directly from the Hanford Site or via the Advanced Mixed Waste Treatment Project (AMWTP) in Idaho. This chapter presents the DOE plan to complete final certification and shipment of TRUM waste by continuing to use existing capabilities and, where necessary, acquiring new capabilities to prepare and manage the remaining containers of CH TRUM and RH TRUM wastes for offsite disposal (see Chapter 2).

Equipment previously used on the Hanford Site to certify CH TRUM waste in 55-gal drums and SWBs is not in a condition to support certification efforts. This equipment still exists; however, refurbishment or replacement is necessary in order to restore these capabilities. A new capability is needed to certify the CH TRUM waste in standard large box 2 (SLB2) containers. The capability to perform the dose-to-curie method is needed to certify RH TRUM waste in 30-gal and 55-gal drums.

Existing and legacy capabilities are adequate to load CH TRUM waste in 55-gal drums and SWBs into Transuranic Package Transporter Model (TRUPACT)-II casks for shipment to WIPP. A new capability is needed to load CH SLB2 containers into TRUPACT-III casks. A new capability will be needed to load RH TRUM containers into casks for shipment to WIPP.

Subsequent milestones will address the selection of preferred alternatives for the design and construction of the needed capabilities to certify and ship the remaining TRUM waste to WIPP.

5.1 Status and Annual Volume Projections for Certification and Shipment of TRUM Waste

From the start of CY 2017 through May 4, 2020, final certifications of TRUM waste were not performed by the Central Characterization Program (CCP), nor were shipments of TRUM waste made to WIPP.

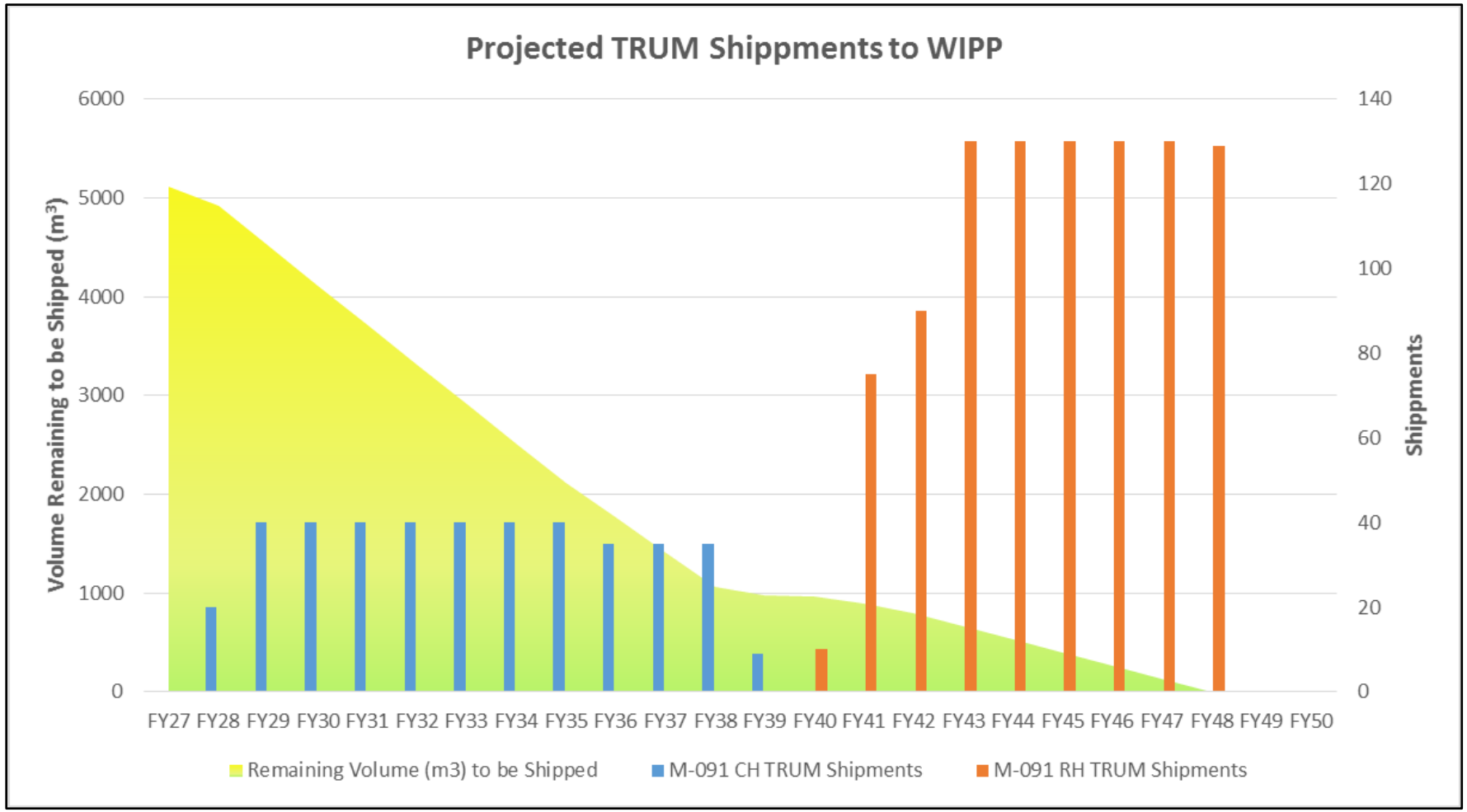
5.2 Certification and Shipment of TRUM Waste to WIPP

WIPP was reopened to receive TRUM waste on December 23, 2016 after an extended shutdown due to the radiological incident that occurred on February 14, 2014. Shipments of TRU waste to WIPP from other DOE sites recommenced in April 2017.

It is anticipated certification of TRUM waste will continue to be done by CCP, although details for redeployment of certification/shipping capability at the Hanford Site have not been finalized. It is anticipated that the TRUM certification program will resume in FY 2024, with shipments resuming in FY 2028.

Figure 5-1 presents a summary of the volume and number of shipments of M-091 TRUM waste projected to be shipped to WIPP. The bars represent the projected number of CH TRUM and RH TRUM waste shipments to WIPP during a fiscal year, and the line represents the remaining inventory to be shipped to WIPP at the end of a fiscal year. Shipments of TRUM waste to WIPP are expected to be completed by September 30, 2050.

The following sections describe the certification program for shipment of TRUM waste to WIPP for disposal.



*See Appendix D for information on the basis of the volumes reported in this figure.

Figure 5-1. Projection of TRUM Waste Shipments to WIPP

5.2.1 CCP Certification Program

The DOE Carlsbad Field Office (CBFO) is responsible for characterization, certification, and shipment of TRU/M waste to WIPP for disposal through CCP. These activities at the Hanford Site will be established through milestone agreements.

To support DOE in the packaging and disposal of TRU/M wastes, CCP provides characterization services in accordance with NM4890139088-TSDF, *Waste Isolation Pilot Plant Hazardous Waste Permit* (Attachment C, "Waste Analysis Plan"), and DOE/WIPP-02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*.

The waste acceptance criteria applicable to the treatment, storage, and disposal (TSD) of CH TRU/M and RH TRU/M waste at WIPP are defined in DOE/WIPP-02-3122. These criteria serve as DOE instructions for ensuring that CH TRU/M and RH TRU/M waste are managed and disposed in a manner that protects human health and safety and the environment.

5.2.2 CH TRUM Waste Shipments to WIPP

DOE has previously used the WRAP Facility to load drums and SWBs of CH TRUM waste into TRUPACT-II containers for shipment to WIPP. An assessment is needed to determine necessary investments to restore the equipment to a functional state. Each stainless-steel TRUPACT-II (Figure 5-2) is approximately 2.4 m (8 ft) in diameter, 3 m (10 ft) high and constructed with leak-tight inner and outer containment vessels. TRUPACT-II can hold up to fourteen 55-gal waste drums or two SWBs. The TRUPACT-II containers are typically shipped three at a time to WIPP (Figure 5-3).

Figure 5-2. Loading a TRUPACT-II with TRUM Waste Drums at WRAP

Figure 5-3. TRUPACT-II Shipment of TRUM Waste to WIPP

5.2.3 RH TRUM Waste Shipments to WIPP

DOE currently does not have the onsite capability necessary to load and ship the RH TRUM waste to WIPP (see Chapter 2). Alternatives to provide the needed capabilities to ship RH TRUM waste were identified in CHPRC-02916 and are further evaluated in CHPRC-03264, which recommends alterations be made to the WRAP shipping facility to accomodate HalfPACT loading and shipment. A HalfPACT is similar to a TRUPACT-II, except for being 30 inches shorter, and is suitable for accomodating heavy loads. Specially designed shielded containers, approximately the same size as a 55-gal drum, are utilized to ship RH waste in HalfPACT casks. Each HalfPACT can accomodate three shielded containers, and a shipment can accommodate three HalfPACT casks, for a total of nine shielded containers.

Another approved method for shipping RH TRUM, detailed in CHPRC-03264, is use of RH 72B casks. This method has not been utilized at the Hanford Site and would require modifications to an existing facility, a new facility, or utilization of a mobile loading configuration. The RH 72B cask was not selected as the preferred RH TRUM shipping method in CHPRC-03264, however remains a potential option for consideration as planning continues.

6 Storage Capacity

CWC, T Plant, and WRAP provide storage for containers managed under the M-091 Milestone series. Table 6-1 lists the storage capacities as stated in DOE/RL-2015-74, *Hanford Facility Dangerous Waste Part B Permit Application; Low-Level Burial Grounds Trenches 31-34-94, T Plant Complex, and Central Waste Complex-Waste Receiving and Processing Facility*. The maximum volume of waste that would require storage at one time is projected to be 14,000 m^3 with potentially an additional 6,800 m^3 from CERCLA cleanup activities (Chapter 7). With a storage capacity of 33,225 m^3, the need for additional storage capacity is not expected. As the out-year schedule for the management of waste containers is refined, the impact on storage capacity will be reevaluated.

Table 6-1. Facility Storage Capacity

Facility	Capacity(m^3)*
CWC/WRAP	24,949
T Plant	8,276
Total	**33,225**

Source: DOE/RL-2015-74, *Hanford Facility Dangerous Waste Part B Permit Application; Low-Level Burial Grounds Trenches 31-34-94, T Plant Complex, and Central Waste Complex-Waste Receiving and Processing Facility*.

*The storage capacity is based on the latest Hanford Facility Dangerous Waste Part B Permit Application. It is recognized that final storage capacities will be determined during the application review/approval process.

CWC = Central Waste Complex
OU = operable unit
WRAP = Waste Receiving and Processing Facility

The following assumptions were used to determine the adequacy of the current storage capacity:

- TRUM waste will remain in aboveground storage until the waste is treated/processed and shipped to WIPP.
- After retrieval, TRUM will be designated and stored while awaiting treatment/processing.
- After treatment/processing, TRUM waste will be stored while awaiting final certification and shipment to WIPP.

6.1 CWC/WRAP Storage

CWC, located in the 200 West Area, provides storage for mixed waste. The following waste management activities are associated with storage:

- Loading and unloading of containers for shipments
- Transferring containers from one building or storage area to another area
- Relocating a container from storage for treatment
- Performing required facility, equipment, and container inspections and maintenance

The CWC storage areas provide space for various sized waste containers. Storage structures include physical features that provide segregated storage areas that can be used when needed to maintain appropriate separation between containers of incompatible waste (incompatibility is defined in

WAC 173-303-040). Secondary containment has been incorporated into the design of the Flammable and Alkali Waste Storage Modules, the 2404WA Building, and the 2402/2403-series buildings.

The main WRAP building (2336W) is divided into administrative, shipping and receiving, waste characterization, and processing areas. Storage of mixed waste occurs in several areas as follows:

- Shipping and receiving area
- Characterization area
- Room 152 of the administrative area
- Process area

Two large container storage buildings are part of WRAP (2404WB and 2404WC) and include secondary containment. The container storage areas at WRAP also include outdoor storage that is intended to facilitate the WRAP waste management activities such as the loading and unloading of containers for shipment, transferring containers from one building to another area or TSD unit, or relocating a container for storage awaiting treatment or characterization.

The WRAP storage/treatment areas provide space for the management and storage of various sized waste containers. Storage structures and areas are operated to maintain appropriate separation between containers of incompatible waste (incompatibility is defined in WAC 173-303-040).

6.2 T Plant Storage

T Plant storage structures and areas use a variety of engineered and administrative controls to provide and maintain the appropriate segregation/separation of incompatible wastes. Storage of dangerous and/or mixed waste in various-sized containers could take place in the 221T Canyon, 221T Railroad Tunnel, 2706T, 214T Storage Building, other support structures and storage areas, or other authorized Dangerous Waste Management Units located within the T Plant Operating Unit Group.

7 TRU and TRUM Waste Generated from CERCLA Cleanup Actions

A goal of the Tri-Parties is to integrate the Hanford Site cleanup activities to the extent possible to enable efficient, effective management of waste. The Tri-Parties have agreed to integrate the plan for managing TRU and TRUM waste under the CERCLA cleanup actions, with the plan to manage similar waste forms under the M-091 Milestone work scope. As a result, this M-091 PMP addresses the acquisition of capabilities necessary to prepare TRU and TRUM waste within the scope of the M-016 Milestone series for disposal at WIPP. This PMP reflects retrieval decisions, projected waste volumes, and schedules for CERCLA cleanup actions authorized in RODs and action memoranda at the Hanford Site. The remedial actions for all nontank farm and noncanyon OUs are to be completed by September 30, 2042, per Milestone M-016-00.

Currently, it is expected that other TRU and TRUM waste generated during Hanford Site cleanup activities (e.g., 618-11 and 100 K Basins) will be compliantly packaged at the point of generation. If, at the time of conceptual design, this is not the case (e.g., K Basin sludge), the scope of the new capability or the time to use the new capability may be expanded to accommodate the repackaging of other TRU or TRUM waste beyond M-091 scope. Similarly, conceptual design of the alpha caisson processing capability will explore treatment of noncaisson RH TRUM waste and incorporate the necessary accommodations if this is deemed appropriate.

Schedules for CERCLA cleanup actions are established through the following CERCLA decision documentation:

1. **Prepare Remedial Investigation and Feasibility Study (RI/FS).** The remedial investigation presents data collected during the investigation and other characterization activities (analogous to the RCRA facility investigation). The feasibility study develops and evaluates alternatives for remediation comparable to the RCRA corrective measures study.

2. **Prepare Proposed Plan.** This plan is based on the detailed information contained in the RI/FS reports.

3. **Receive Public Input.** The Tri-Parties will solicit input from the Tribal Nations and the public regarding the preferred remedial alternatives, which are described in the proposed plan.

4. **Select Preferred Alternative.** Comments received from the Tribal Nations and the public regarding the preferred alternatives will assist the Tri-Parties in selecting a final decision on the preferred alternatives that will be taken to clean up the contamination associated with the OUs described in the proposed plan.

5. **Prepare ROD.** After the Tri-Parties consider the comments received, a ROD will be issued identifying the final cleanup remedies selected for implementation, including a summary of the responses to comments.

6. **Post-ROD Activities.** The selected remedial alternative is implemented after the final ROD is approved. This stage may involve remedial design and design verification studies, construction, remediation process optimization, and operation and maintenance of the implemented processes (comparable to the RCRA corrective measure implementation stage).

The OUs and facilities that may generate TRU waste are at different stages in the CERCLA decision process.

Table 7-1 summarizes the OUs and facilities that will or will not be addressed in this PMP. Those to be included have the potential to generate waste with TRU constituents greater than 100 nCi/g during

CERCLA cleanup actions and are within the scope of the M-016, M-083, and M-085 Milestone series. The groundwater OUs and the tank farm WMAs are not addressed in this PMP.

Table 7-1. Summary of OUs and Facilities

OU or Facility	Comment
300-FF-2, PFP, 221-U Facility, 100 K Basins, 300-FF-2, 200-PW-1, and 200-PW-6, 224B, and 224T	• Potential waste with TRU constituents greater than 100 nCi/g is generated during cleanup/closure actions at these OUs and facilities. • Approved CERCLA cleanup actions under RODs or action memoranda. • Addressed in this PMP (Sections 7.1 and 7.2).
200-BC-1, 200-SW-2, 200-WA-1, 200-DV-1, 200-IS-1, 200-EA-1, 200-CP-1, and 200-CR-1	• Potential waste with TRU constituents greater than 100 nCi/g is generated during cleanup/closure actions at these OUs and facilities. • Future CERCLA cleanup actions. • Only summary presented in this PMP (Sections 7.3 and 7.4, and Appendix E).
100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-NR-1, 100-IU-2, 100-IU-6, 100-KR-1, 100-KR-2, 100-HR-1, 100-HR-2, 200-CW-1, 200-CW-3, 200-CW-5, 200-PW-3, 200-CB-1, and 209E (Remaining)	• No waste with TRU constituents greater than 100 nCi/g is expected to be generated during CERCLA cleanup actions at these OUs. • Not addressed in this PMP.
200-BP-5, 200-PO-1, 100-NR-2, 100-FR-3, 100-KR-4, 100-HR-3, 100-FF-5, 200-UP-1, and 200-ZP-1	• No waste with TRU constituents greater than 100 nCi/g is expected to be generated during CERCLA cleanup actions at these groundwater OUs. • Not addressed in this PMP.
WMA Series	• Tank farm WMAs are covered under the M-045 Milestone series. • Not addressed in this PMP.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
OU = operable unit
PFP = Plutonium Finishing Plant
PMP = project management plan
ROD = record of decision
TRU = transuranic
WMA = waste management area

7.1 Status of Approved CERCLA Cleanup Actions Generating TRU and TRUM Waste

DOE is currently implementing several major CERCLA cleanup actions on the Hanford Site in accordance with approved RODs and action memoranda that have or are projected to generate TRU or TRUM waste. Table 7-2 presents the forecast volumes of these cleanup actions and represents a forecast subject to time changes. The following sections discuss these cleanup actions.

Table 7-2. TRU and TRUM Waste Forecast from CERCLA Cleanup Actions

Generator	Forecast Total TRU/M Waste	
	CH (m^3)	RH (m^3)
100 K*	0	51
618-11*	20	80
200-PW-1, 200-PW-6 OUs*	6,625	0
224B, 224T	To be determined	

*Projected volumes (m^3) are from the Solid Waste Information and Tracking System.

CH = contact-handled
OU = operable unit
RH = remote-handled
TRU/M = transuranic and/or transuranic mixed

7.1.1 100 K Basin

According to the 100-K ROD Amendment (EPA, 2005, *U.S. Department of Energy 100 K Area K Basins Hanford Site – 100 Area Benton County, Washington Amended Record of Decision, Decision Summary and Responsiveness Summary*), the sludge will be treated, packaged for disposal, interim stored pending shipment, and shipped to a national repository for disposal. Sludge from the 105KW Basin originated primarily from the 105KE Basin floor and pits, fuel canisters, and fuel washing. Sludge has been packaged in casks and transferred to T Plant, where it will remain in storage until sludge treatment and packaging capabilities are available. K Basin remediation is being performed in accordance with the 100-K ROD Amendment (EPA, 2005).

During K Basin cleanup, an estimated 10 m^3 filter media (sand and garnet) with TRU constituents greater than 100 nCi/g may also be generated.

7.1.2 U Plant

TRUM waste generated during the CERCLA cleanup actions at U Plant is a tank heel. During FY 2011, DOE removed Tank D-10, located in Cell 30 of the 221U Facility, from the canyon and transferred it to CWC for interim storage until capability is available to repackage the waste in a WIPP-certifiable container, as described in DOE/RL-2010-106, *90% Design Remedial Design Report Addendum for the Disposition of Tank D-10 from Cell 30 within the 221-U Plant Canyon Facility*. The waste package contains approximately 1,893 L (500 gal) of waste that has been designated as RH TRUM waste. U Plant decontamination and decommissioning is being performed in accordance with EPA et al., 2005, *Record of Decision 221-U Facility (Canyon Disposition Initiative) Hanford Site, Washington.*

DOE will disposition the waste package with the future large-package/RH capability. There is a possibility that the waste package could be dispositioned at the same future facility used to disposition the K Basin sludge; however, design of this treatment and packaging system is not mature enough to determine whether the solidification and packaging system could be used for packaging of other RH TRUM sludge.

7.1.3 618-11 Burial Ground (300-FF-2)

The 618-11 Burial Ground is a challenging CERCLA cleanup action that is part of the 300-FF-2 OU at the Hanford Site. Incomplete operational records and history associated with past waste disposal practices of the 300 Area waste streams complicate these actions. The burial grounds contain waste that the 300 Area of the Hanford Site generated while developing and manufacturing reactor fuel and conducting laboratory research during the Hanford Site's plutonium production mission.

The 618-11 Burial Ground is located about 7 miles from the 300 Area and adjacent to the Energy Northwest Columbia Generating Station, the commercial nuclear power plant located on the Hanford Site. The 618-11 Burial Ground contains vertical pipe units (VPUs), consisting of approximately 4.6 m (15 ft) long pipes up to 0.6 m (22 in.) diameter with open ends. Highly radioactive containers of waste were disposed in many of these VPUs and covered with fill material. The 618-11 Burial Ground also includes caissons that were used for similar disposal, but differ in construction. The caissons are approximately 3 m (10 ft) long pipes up to 2.4 m (8 ft) in diameter installed vertically in the subsurface with open bottoms. An angled chute extended from each caisson toward the surface for disposal access. Waste forms within some of these VPUs and caissons may be considered principal threat waste. DOE is performing the 618-11 Burial Ground remediation in accordance with EPA/ROD/R10-01/119, *EPA Superfund Record of Decision: Hanford 300-Area (USDOE), Benton County, Washington*; and DOE/RL-2014-13-ADD1, *Remedial Design Report/Remedial Action Work Plan for 300-FF-2 Soils*.

Characterization of the burial ground began in the spring of 2011. The remedial actions for the 618-11 Burial Ground is to be completed by September 30, 2021, under Tri-Party Agreement Milestone M-016-86; however, remediation of the 618-11 Burial Ground is impacted by Columbia Generating Station, which may cause a delay in the schedule.

7.1.4 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 OUs

The ROD for the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 OUs (EPA et al., 2011, *Record of Decision Hanford 200 Area Superfund Site 200-CW-5 and 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units*) was signed by the Tri-Parties in October 2011. The selected remedy of these OUs addresses soils and subsurface disposal structures, two settling tanks, and associated pipelines contaminated primarily with plutonium and cesium.

From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. Operations at the Hanford Site included nuclear fuel manufacturing, reactor operations, fuel reprocessing, chemical separation, plutonium and uranium recovery, processing of fission products, and waste partitioning. Large volumes of liquid wastes were generated from the processing of plutonium at various facilities in the 200 East and 200 West Areas. This process wastewater was discharged to waste sites in the 200-PW-1, 200-PW-3, and 200-PW-6 OUs. The processes were intended to recover as much plutonium as possible prior to discharge of the waste liquids, but the waste streams still contained low levels of plutonium and other contaminants. Cooling water and steam condensate were discharged to the 200-CW-5 OU waste sites. The cooling waste and steam condensate systems were designed to isolate those systems from potential contamination sources but, occasionally, became contaminated because of minor leaks due to corrosion pinholes or cracks and process upsets. The liquid waste that contained low levels of plutonium and other contaminants discharged to the waste sites in these OUs infiltrated the ground and contaminated the underlying soil. Over time, this facilitated the accumulation of contaminants to form localized areas of concentrated contaminants.

Removal, treatment (as needed), and disposal (RTD) of soil and debris to the specified depths or specified cleanup levels will be used to address plutonium-contaminated soils and subsurface structures and debris. This consists of removing a portion of the contaminated soil, structures, and debris; treating these

removed wastes as required to meet disposal requirements at ERDF or waste acceptance criteria for offsite disposal at WIPP, and disposal at ERDF or WIPP. The selected pipelines associated with these OUs will also be excavated and disposed at ERDF. Cleanup levels have been selected that are protective of groundwater and the current and reasonably expected future industrial land use.

- Three 200-PW-1 OU waste sites (216-Z-1A, 216-Z-9, and 216-Z-18), also known as the High-Salt Waste Group, will use the RTD approach to excavate contaminated soils and debris located to a minimum of 0.6 m (2 ft) below the bottom of the disposal structure, with disposal at ERDF or WIPP, as appropriate. After the excavations are filled, an evapotranspiration barrier will be constructed over the remaining waste in these waste sites. The 216-Z-9 waste site is scheduled to be stabilized in 2020.

- The 200-PW-6 OU and four 200-PW-1 OU waste sites (216-Z-5, 216-Z-1&2, 216-Z-3, and 216-Z-12), also known as the Low-Salt Waste Group, will use the RTD approach to excavate contaminated soils and debris to a depth of 6.7 to 10 m (22 to 33 ft) below ground surface, with disposal at ERDF or WIPP, as appropriate. After excavations are filled, an evapotranspiration barrier will be constructed over the remaining waste in these waste sites. The 216-Z-2 waste site is scheduled to be stabilized in 2020.

Conceptually, the RTD approach consists of the following steps: remove and stockpile clean overburden for use in backfilling; remove contaminated soils and debris using conventional excavation technology, and place in waste containers; dispose waste at ERDF or WIPP; backfill excavation with clean fill and compact; and construct an evapotranspiration barrier as necessary, and replant surface with native vegetation. Stabilization may be required prior to removal.

The 241-Z-361 Settling Tank is an underground, reinforced-concrete structure with a 0.95 cm (3/8 in.) steel liner. The tank has inside dimensions of 7.9 m (26 ft) long and 4 m (13 ft) wide. The bottom slopes, resulting in an internal height variation between 5.2 and 5.5 m (17 and 18 ft). The top of the tank is 0.6 m (2 ft) belowgrade. The tank served as the primary solids settling tank for low-salt liquid from PFP from 1949 to 1973, and then was taken out of service in May 1973, when discharge of contaminated waste streams to the ground from the Plutonium Finishing Plant (PFP) was discontinued as a matter of policy. All available information indicates that the settling tank has not leaked. The 241-Z-361 Settling Tank is scheduled to be stabilized in 2020.

The 241-Z-8 Settling Tank is a cylindrical tank that is 12.1 m (40 ft) long and 2.4 m (8 ft) in diameter. It is constructed of steel or wrought iron plate and oriented horizontally at about 1.8 m (6 ft) belowgrade. The tank was in service from 1955 to 1962, receiving pH neutral effluent waste from back flushes of the PFP feed filters.

The sludge removal and tank stabilization of the two settling tanks require the following:

- Removal of sludge from the tanks to the extent necessary to facilitate removal of the tanks.

- Packaging of the sludge to meet waste disposal criteria for disposal at WIPP.

- Screening of waste in container to confirm it meets the requirements for disposal at WIPP. Waste in containers that do not meet WIPP disposal criteria will be treated if necessary and sent to ERDF for disposal.

It is expected that the tanks will be removed, and the excavation areas will be sampled in accordance with the SAP, backfilled, and revegetated. The sludge and tank debris are expected to be TRU waste.

Associated pipelines covered under the 200-PW-1 and 200-PW-6 OUs are expected to be TRUM and will be shipped to WIPP for disposal. The pipelines are constructed of various materials, primarily stainless steel or vitrified clay.

An estimated 6,625 m^3 of TRU/M soil/rock/gravel waste is anticipated to be generated during the RTD of these OUs, of which an estimated 140 m^3 of TRU/M sludge is anticipated to be generated from the two settling tanks. It is expected that any TRU/M waste generated during the remediation of the 200-PW-1 and 200-PW-6 OUs will be packaged in WIPP-certifiable containers at the point of generation, and no new capabilities will be required.

7.1.5 224B Plutonium Concentration Facility

The 224B Building, located in the 200 East Area of the Hanford Site, was used to purify and concentrate diluted plutonium nitrate solution that was the product of the 221B Building bismuth-phosphate process. The building consists of a single canyon-type building, constructed of reinforced concrete and concrete block. There are six hot cell areas within the 224B Building. Most of the radioactive inventory exists within the process cell equipment and piping.

The 224B Building is designated as a Tier 1 Facility. Final demolition of the 224B Building will be in accordance with DOE/RL-2004-36, *Action Memorandum for the Non-Time Critical Removal Action for the 224-B Plutonium Concentration Facility*. Under Tri-Party Agreement Milestone M-085-72, DOE is to submit as a primary document a removal action work plan (RAWP) to implement the approved action memorandum for 224B (DOE/RL-2004-36) by September 30, 2020.

7.1.6 224T Plutonium Concentration Facility

The 224T Facility, located adjacent to the T Plant Complex in the 200 West Area of the Hanford Site, was used to purify and concentrate diluted plutonium nitrate solution that was the product of the 221B Building bismuth-phosphate process. In addition, a portion of the facility was later used as a RCRA TSD container storage unit known as the 224T Transuranic Waste Storage and Assay Facility. The building consists of a single canyon-type building, constructed of reinforced concrete and concrete block. There are six hot cell areas. Most of the radioactive inventory exists within the process cell equipment and piping.

The 224T Building is designated as a Tier 1 Facility. Final demolition of the 224T Building will be in accordance with DOE/RL-2004-68, *Action Memorandum for the Non-Time-Critical Removal Action for the 224-T Plutonium Concentration Facility*. Under Tri-Party Agreement Milestone M-085-100, DOE is to submit an RAWP to implement the approved action memorandum for 224T (DOE/RL-2004-68) by September 30, 2020.

7.2 CERCLA TRU and TRUM Shipments to WIPP

WIPP was reopened to receive TRUM waste on December 23, 2016, after an extended shutdown due to the radiological incident that occurred on February 14, 2014. Shipments of TRU waste to WIPP recommenced in April 2017. It is projected that shipments of CERCLA TRU and TRUM waste to WIPP will not begin until after FY 2030.

7.3 Status of Future CERCLA Cleanup Decisions with the Potential to Generate TRU and TRUM Waste

Table E-1 in Appendix E describes the OUs and facilities with the potential to generate waste with TRU constituents greater than 100 nCi/g during CERCLA cleanup actions. To date, no regulatory cleanup decisions have been made for these OUs. A range of plausible alternatives and reasonable upper-bound cleanup volumes have been estimated. Completion schedules will be established with the CERCLA

remedial action work plans. Table E-1 in this document gives the waste unit name, waste type, estimated volume, and schedule. The volume projections are based on currently available information and will be updated as the CERCLA process for a given OU progresses. The sources of the estimated volumes are referenced in the table.

Although a significant volume of material with TRU constituents greater than 100 nCi/g has been identified, most the CERCLA decisions have not been made regarding cleanup. This results in a significant level of uncertainty regarding the remedy selection and potential volumes and time of TRU/M waste generation.

7.4 Summary of Disposition Approaches per Waste Form

The form of waste with the potential for TRU constituents greater than 100 nCi/g generated during CERCLA cleanup actions fall into three general categories: soil/gravel/rock, debris, and sludge. The following sections outline the waste disposition approach of each of these categories.

7.4.1 Soil, Gravel, and Rock

During the future CERCLA cleanup actions of contaminated cribs, trenches, and tile fields, an upper-bound estimate of 4,170 m^3 of soil/gravel/rock waste could be generated that has a potential to have TRU constituents greater than 100 nCi/g. This estimated volume is based on current available data and is dependent on the area and depth of soil excavated in accordance with the CERCLA RODs. It is expected that this waste would be packaged in WIPP-certifiable containers at the point of generation.

Cleanup actions could include removal and stockpiling of clean overburden for use in backfilling once the contaminated area has been removed; removal of contaminated soil/gravel/rock using conventional excavation technology and placement into WIPP-certifiable containers (SWB or drums); and assay of containers to determine whether they are TRUM waste or LLW/MLLW. The TRUM waste containers will be certified by CCP and shipped to WIPP, and the LLW/MLLW containers will be shipped to ERDF. Specific cleanup actions are as follows:

1. Remove and stockpile clean overburden for use in backfilling.
2. Remove contaminated solids and debris, and place in waste containers.
3. Haul waste containers to assay/screening station and then to ERDF or WIPP for disposal.
4. Backfill excavation with clean fill, and compact.
5. Construct evapotranspiration barrier as necessary, and replant surface with native vegetation.

7.4.2 Debris

During the CERCLA cleanup actions of facilities and burial grounds, an upper-bound estimate of 36,310 m^3 of contaminated debris waste could be generated that has the potential to have TRU constituents greater than 100 nCi/g. Most debris waste generated during the cleanup actions at facilities would be packaged into WIPP-certifiable containers at the point of generation.

There may be occasions that waste cannot be repackaged into WIPP-certifiable containers. Waste in this category could include a portion of the 34,510 m^3 of debris waste potentially removed from the 200-SW-2 Landfills. It is anticipated that this will be dispositioned at an offsite treatment facility or possible future capabilities acquired under M-091.

7.4.3 Sludge

During the CERCLA cleanup actions of facilities, an estimated 280 m^3 of sludge waste could be generated that has a potential to have TRU constituents greater than 100 nCi/g. Typically, sludge removal from tanks would employ a power fluidics system to loosen and homogenize the sludge and transfer to WIPP-certifiable drums or SWBs at the point of generation. Material (e.g., cement or absorbents) would be added to the SWB to absorb residual liquid and stabilize the sludge. These waste containers would be certified by CCP and shipped to WIPP.

8 Project Control Elements

The sections in this chapter identify DOE project control elements for the planning, managing, and performance reporting necessary to complete the M-091 Milestone work scope. These project control elements are consistent with DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, and related project management activities.

8.1 Funding Profile and Project Work Breakdown Structure

The funding profile to support activities necessary to complete the M-091 Milestone series is given in Figure 8-1. This funding profile is based on the DOE/RL-2018-45, *2019 Hanford Lifecycle Scope, Schedule and Cost Report*, under M-036-01, which reflects all those actions necessary for DOE to meet all applicable environmental obligations including those under the Tri-Party Agreement (Ecology et al., 1989a). The funding profile does not include the funding necessary to support the CERCLA cleanup actions discussed in Chapter 7.

Work that is part of this PMP is divided into discrete, defined units of scope. DOE uses this breakdown for planning, estimating, and scheduling the performance of work. This breakdown, known as the work breakdown structure (WBS), is developed to organize, define, and display work required to complete a project. The specific WBS element numbers are described in the following paragraphs.

WBS 013.01 Project Management – This scope includes overall project management, safety, health, and quality technical support, and oversight to support implementation of key programs such as the Integrated Safety Management System, Corrective Action Management, Occurrence Reporting, and Quality Assurance Program. In addition, this WBS provides support staff for the overall project including waste support services to Hanford Site generators, human relations, buyer/procurement staff, and project controls (e.g., schedulers/cost analysts). Technical support includes environmental and nuclear/criticality safety engineering to oversee development and implementation of regulatory permits, safety bases, procedure reviews, hazard analysis generation, and criticality safety evaluation report development.

Strategic planning and integration is another critical scope element that provides onsite interface between DOE contractors and subcontractors to ensure that mission needs are met. Also included in this scope is the maintenance of the transportation and packaging program, in accordance with applicable requirements for onsite and offsite shipments of regulated waste and materials and nonregulated materials.

WBS 013.05 TRU Retrieval – This scope provides for retrieval of suspect TRU waste from the LLBGs (218-W-3A, 218-W-4C, 218-W-4B, and 218-E-12B) under Milestone M-091-49. Included is retrieval activity to be completed according to the IRA for M-091-54, and new capabilities necessary for the retrieval of the remaining RSW including the caisson RH RSW. Retrieval consists of the following activities:

- Removing soil over RSW containers within the trenches
- Removing the RSW containers from the trenches
- Assaying containers and venting containers as required
- Designating waste
- Shipping containers to the appropriate TSD facility
- Sampling of the LLBG trench substrate

Fiscal Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
013.01 - Project Management -PBS RL-13	11,400	11,600	11,800	12,100	12,400	12,300	12,700	12,800	13,100	13,600
013.05 - TRU Retrieval	60,400	62,200	63,500	64,300	65,900	67,800	69,800	45,800	45,400	42,800
013.06 - TRU Repackaging	71,700	68,800	73,600	80,700	61,000	62,800	64,600	66,400	67,600	69,400
013.07 - Waste Receiving and Processing Facility (WRAP)	10,600	9,700	13,300	16,600	17,000	17,500	18,000	18,300	18,800	19,600
013.08 - T-Plant	56,500	66,100	67,400	186,900	193,400	222,800	100,800	39,800	40,700	42,600
013.09 - Central Waste Complex	17,900	19,300	18,900	19,200	20,100	12,300	14,000	13,600	14,300	14,600
013.10 - Environmental Restoration Disposal Fac (ERDF)	31,200	34,600	32,300	33,000	34,000	35,000	37,400	60,300	61,500	0
013.12 - Integrated Disposal Facility	16,500	10,000	13,000	7,000	7,200	7,400	7,600	7,700	7,900	8,300
013.15 - TRU Disposition	8,400	8,600	8,700	17,200	23,300	24,000	24,700	25,100	25,700	26,900
013.21 - Mixed Waste Disposal Trenches	1,100	1,100	1,700	1,700	2,000	1,800	2,100	2,100	2,100	2,200
Cost and/or Schedule Uncertainty	25,843	41,522	38,093	67,018	52,149	58,779	39,028	82,378	70,185	59,916
Level 2 Total	**311,543**	**333,522**	**342,293**	**505,718**	**488,449**	**522,479**	**390,728**	**374,278**	**367,285**	**299,916**
Fiscal Year	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**
013.01 - Project Management -PBS RL-13	14,100	14,300	14,800	15,100	15,200	15,400	16,200	16,500	17,200	17,500
013.05 - TRU Retrieval	0	0	0	0	0	0	0	0	0	0
013.06 - TRU Repackaging	67,900	62,600	63,700	65,600	66,900	67,400	68,600	71,800	50,200	0
013.07 - Waste Receiving and Processing Facility (WRAP)	20,200	8,200	0	0	0	0	0	0	0	0
013.08 - T-Plant	43,800	16,500	16,900	17,200	17,300	17,700	41,300	42,200	0	0
013.09 - Central Waste Complex	15,300	12,400	12,300	12,600	12,600	13,300	13,400	13,800	14,300	14,600
013.10 - Environmental Restoration Disposal Fac (ERDF)	0	0	0	0	0	0	0	0	0	0
013.12 - Integrated Disposal Facility	8,500	8,700	8,900	9,100	9,200	19,700	9,800	10,000	10,400	10,600
013.15 - TRU Disposition	27,800	28,200	29,100	29,700	29,900	30,400	31,800	28,600	13,300	13,500
013.21 - Mixed Waste Disposal Trenches	2,300	1,400	1,400	1,500	1,500	1,500	1,600	1,600	1,600	1,700
Cost and/or Schedule Uncertainty	67,990	62,621	63,736	42,245	32,399	32,331	35,393	45,678	47,375	53,185
Level 2 Total	**267,890**	**214,921**	**210,836**	**193,045**	**184,999**	**197,731**	**218,093**	**230,178**	**154,375**	**111,085**

Fiscal Year	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	Total
013.01 - Project Management -PBS RL-13	18,200	19,000	19,000	19,400	20,100	20,500	21,000	22,000	23,000	23,600	24,000	**509,900**
013.05 - TRU Retrieval	0	0	0	0	0	0	0	0	0	0	0	**587,900**
013.06 - TRU Repackaging	0	0	0	0	0	0	0	0	0	0	0	**1,271,300**
013.07 - Waste Receiving and Processing Facility (WRAP)	0	27,700	0	0	0	0	0	0	0	0	0	**215,500**
013.08 - T-Plant	0	0	0	0	0	0	0	0	0	0	0	**1,229,900**
013.09 - Central Waste Complex	15,100	15,900	15,800	16,200	16,700	17,100	17,500	18,300	19,100	19,700	20,100	**490,300**
013.10 - Environmental Restoration Disposal Fac (ERDF)	0	0	0	0	0	0	0	0	5,200	5,200	0	**369,700**
013.12 - Integrated Disposal Facility	11,000	11,500	11,500	11,800	12,100	12,400	12,700	13,300	13,900	14,300	14,600	**336,600**
013.15 - TRU Disposition	14,100	400	0	0	0	0	0	0	0	0	0	**469,400**
013.21 - Mixed Waste Disposal Trenches	1,800	1,800	1,800	1,900	1,900	2,000	2,100	2,100	2,200	2,300	2,300	**56,200**
Cost and/or Schedule Uncertainty	62,933	67,424	48,100	36,818	19,562	10,590	11,585	16,483	10,017	6,060	9,897	**1,317,331**
Level 2 Total	**123,133**	**143,724**	**96,200**	**86,118**	**70,362**	**62,590**	**64,885**	**72,183**	**73,417**	**71,160**	**70,897**	**6,854,031**

Figure 8-1. RL-0013 Annual Funding Profile

WBS 013.06 TRU Repackaging – This scope provides repackaging of TRU/M waste at a commercial facility (e.g., Perma-Fix Northwest), existing onsite facilities (e.g., WRAP), and new onsite capability for TRU/M waste such that it can be processed and repackaged to meet the WIPP waste acceptance criteria.

WBS 013.07 WRAP – This scope provides activities for the safe and compliant operation of WRAP and maintaining WRAP in its current dormant condition until it is required to support waste repackaging.

WBS 013.08 T Plant – This scope provides activities for the safe and compliant operation of T Plant and maintaining T Plant in a minimum safe condition and Base Operation (ready to serve) to support scope such as storage of sludge and TRU waste repackaging.

WBS 013.09 CWC/LLBGs – This scope provides for the safe and compliant operation of CWC and maintaining CWC in a ready-to-serve condition. It includes the safe and compliant operation of LLBGs.

The LLBGs contain two lined MWTs (218-W-5 LLBG, Trenches 31 and 34) that are within the boundaries of the LLBGs. Operations and maintenance of these trenches is included in WBS 013.21.

WBS 013.10 ERDF – This scope provides activities for the safe operation of ERDF and to support ERDF expansion, construction of interim covers, and long-term stewardship (leachate management and monitoring).

WBS 013.12 IDF – This scope provides for a minimum level of required maintenance of the facility prior to initiation of operations and operational startup activities.

WBS 013.15 TRU Disposition – This scope includes support to CCP certification activities and shipment of TRU/M waste to WIPP. It is expected that CCP will provide the capability to load/ship M-091 waste to WIPP.

WBS 013.21 Mixed Waste Trenches – This scope provides activities for the safe and compliant operation of the MWTs and maintaining the MWTs in a ready-to-serve condition.

8.2 Project Schedule

Figure 1-2 depicts the schedule for completing the requirements of the M-091 Milestone series. The following tasks are included on the schedule:

- The schedule includes acquisition of new capabilities necessary to complete the M-091 Milestone series. DOE is required to follow the requirements of DOE O 413.3B when carrying out projects that qualify as a capital asset project. DOE O 413.3B requires the projects be completed in phases, referred to as critical decisions (CDs). The phases include initiation (CD-0), design (CD-1, CD-2), construction (CD-3), and project closeout and turnover to operations (CD-4). Typically, each CD point will require approvals before the project is allowed to transition to the next phase. In some cases, CDs can be combined and approved concurrently. The new capabilities included in the M-091 schedule are:
  - Alpha Caisson Retrieval Capability
  - CH Processing Capability
  - RH Processing Capability
- Retrieval of RSW (Milestone M-091-49) will generate CH and RH wastes in a variety of packages. This waste will be characterized, resulting in designation for disposal as MLLW or TRUM waste. Once characterized, the waste will then follow the appropriate treatment pathway toward ultimate disposal.

- Generation of certifiable TRUM waste and treatment/processing of MLLW is covered under Milestone M-091-47-T01/T02. Waste requiring treatment and processing is from both the RSW retrieval operations and waste already in aboveground storage.
- The certification and shipment of TRUM waste is covered under Milestones M-091-48, M-091-57, and M-091-60.

8.3 Project Constraints

The following sections identify constraints and uncertainties associated with the ability to accomplish the M-091 Milestone work scope.

8.3.1 Budget

The schedule of activities presented in this PMP assumes that funding levels are available as given in Figure 8-1 and that the rough order of magnitude values are adequate for the identified scope. To accomplish the work scope under the M-091 Milestones, additional capabilities are necessary (see Chapter 2). As the strategy matures, there is a risk that the current budget profile may need to be adjusted in order to ensure acquisition of new capabilities required to accomplish the M-091 Milestone work scope.

8.3.2 Delay in Retrieval or Processing Operations

Retrieval of RSW supplies additional inventory to the TRUM waste that requires processing, certification, and shipment to WIPP. The schedule, as constructed, includes CERCLA documentation development (e.g., Action Memorandum and RAWP) as well as physical retrieval. Significant delays in the retrieval start date could result in schedule compression, which in turn would increase the potential for the budget profile to increase to an untenable level.

8.3.3 New Capabilities

Current capabilities and processing methods at the Hanford Site are not adequate to retrieve and process the alpha caisson RH RSW, process all the CH TRUM and RH TRUM wastes, or load waste for shipment of RH TRUM to WIPP. The alternative evaluation completed in FY 2017 (CHPRC-03264) recommends capabilities necessary to complete the M-091 Milestone series (see Chapter 2).

8.3.4 Higher Contamination Levels than Expected

There is a risk that RSW retrieval operations will be impacted by higher-than-expected contamination levels, container degradation, or container location. RSW retrieval is moving into the higher-risk trenches where waste records may be less complete, and waste packaging may be more degraded than encountered to date. Although retrieval planning considers the most likely waste contamination/ exposure scenario in developing the retrieval approach, there is a possibility that contamination levels (radiological or chemical) may be greater than expected, or that container degradation may be more significant than expected, requiring in-trench overpacking prior to retrieval. There is also a risk that some containers will be buried at depths that require trench shoring during retrieval. These retrieval complexities would result in schedule impacts.

8.3.5 Increase in RSW Volume

There is a risk that RSW retrieval operations encounters waste that is either not identified in records or is commingled with non-RSW due to inaccurate records or soil contamination. Based on inspections of previously excavated waste containers in the trenches and handling the waste at the point of generation, the volume of waste to be retrieved is uncertain. Inability to identify the specific containers may result in the

retrieval of increased volumes of waste before determining that the RSW waste sought has been retrieved. The volumes and characteristics of RSW waste to be processed are based upon existing records.

8.3.6 Increase in Volume of TRUM Waste to Be Shipped to WIPP

There is a risk that volumes could increase if smaller quantities of waste must be placed into the waste packages to meet WIPP requirements. Additional size reduction, as an example, increases the amount of processing time and increases the number of shipments to WIPP. The WIPP acceptance criteria allows for a limited number of waste packages that exceed a surface contact radiological activity of 100 R/hr. Much of the RH RSW waste that will be generated as part of the alpha caisson retrieval could exceed the 100 R/hr activity limit. This would result in the need for additional size reduction and separation into separate waste containers or incorporation of shielding into the waste package, thus increasing the total number of RH TRUM packages and, consequently increasing the number and duration of shipments to WIPP.

8.3.7 Final Certification and Shipment

Final certification and shipment of TRUM waste to WIPP is dependent on support from CCP and WIPP. CCP has been contracted by CBFO to characterize and certify TRU/M waste packaged at the Hanford Site, as well as other DOE sites. Shipments to WIPP are dependent upon several factors, including the availability of shipping casks, overall shipping priorities established by CBFO, timely WIPP approvals of new waste forms, and the availability of CCP resources to certify wastes. These factors could impact the ability to meet planned shipping schedules and cause prolonged storage at CWC.

8.4 Key Deliverables/Products

Key deliverables/products that will be developed in support of the M-091 work scope include the submittal of annual revisions of this PMP on June 30 each year until the M-091 Milestones are completed (M-091-03 submittal was moved to September 30 for 2020 due to the timeframe for milestone revision negotiations). The PMP will include the funding profile, which includes a lifecycle projection of annual funding required to accomplish project scope in accordance with the top-level WBS and schedule (Figure 8-1). The PMP will detail project objectives, work schedules, expected outputs, integration with other programs and projects, and project management alternatives consistent with established agreements and other project constraints. The PMP will also contain information on the status of the milestones within the M-091 series that have come due since the last revision or are approaching their due date.

8.5 Performance Measurement

DOE conducts a performance measurement of the M-091 Milestones to provide an objective assessment of work accomplishments and progress against the baseline plan (scope, schedule, and budget) to manage the baseline effectively and to provide data for management of decision making and reporting. The project performance is measured by comparing the amount of work planned with actual accomplishments and costs to determine whether cost and schedule performance is consistent with the baseline plan. DOE monitors the project performance monthly by comparing the budgeted cost of work schedule to actual work performed and the cost of that work.

8.6 Project Interface Control

DOE controls project interfaces through contract requirements, statements of work, interface control documents, and/or memoranda of agreement/understanding. These documents define the interface and/or service, roles and responsibilities, accountabilities, and authorities.

Interface among the M-091-00 Milestone TRUM waste and MLLW activities and other projects, including waste generating programs for inventory tracking and capacity configuration purposes, is essential for successful project execution. The following waste activities, projects, facilities, and organizations require integration for successful project execution:

- CH2M HILL Plateau Remediation Company
- Mission Support Alliance, LLC
- Hanford Site waste generators of TRU/M waste
- CCP and WIPP
- MWTs 31 and 34
- WRAP
- T Plant
- CWC
- RSW retrieval
- ERDF
- Commercial processing facilities

All Hanford Site generators of TRU/M solid waste that is destined for disposal at WIPP are required to meet the current requirements of HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*. The requirements include the responsibility of the generator to provide TRU/M waste that is WIPP certifiable and acceptable knowledge to support waste certification at the point of generation.

For TRU/M waste that cannot be packaged into WIPP-certifiable containers at the point of generation, the future large-container CH and RH capabilities being acquired under the M-091 work scope could be used to repackage this waste, along with commercial facilities. Currently, it is assumed that TRU/M waste generated during Hanford Site cleanup activities will be compliantly packaged at the point of generation. If, at the time of conceptual design for the future capability under M-091, this is not the case, the scope of the new capability may be expanded to accommodate the repackaging of other TRU/M waste beyond M-091 scope.

The annual sitewide solid waste forecast includes Hanford Site generator TRU/M waste projections. At this time, no impacts to the M-091 work scope are anticipated because of the additional volume of CERCLA TRU/M waste to be certified and shipped to WIPP. Potential impacts are evaluated as waste volume projections are updated.

8.7 Reporting

Reporting requirements are described in Chapter 4, “Agreement Management,” of the Tri-Party Agreement (Ecology et al., 1989a). The primary interface for reporting and notification is from DOE Project Managers to their regulatory counterparts or through the Interagency Management and Integration Team. DOE typically provides a status on the M-091 Milestones to the Ecology Project Manager monthly, which is documented in the AR. In addition, monthly M-091 Milestone Project Manager Meetings are held. The roles and responsibilities for the Project Manager and the Integration Team are contained in Tri-Party Agreement Sections 4.1 and 4.2, respectively (Ecology et al., 1989a).

8.8 Change Management

Tri-Party Agreement (Ecology et al., 1989a) and baseline change management are discussed in the following sections.

8.8.1 Tri-Party Agreement Change Management

Tri-Party Agreement (Ecology et al., 1989a) change management is described in the Tri-Party Agreement Action Plan, Section 12.0, "Changes to the Agreement" (Ecology et al., 1989b). The appropriate authority level for approval of a change is based on the content of the change. All changes will be processed using the change control form provided in Section 12.3.1, "Change Control Form," of the Tri-Party Agreement Action Plan.

Changes to the M-091 Milestone PMP will be in accordance with the Tri-Party Agreement Action Plan, Section 9.0, "Documentation and Records," and Section 9.3, "Document Revision" (Ecology et al., 1989b). Changes will be documented in the AR. Changes or revisions to the PMP may also result in the need to modify Tri-Party Agreement milestones. Such changes are subject to the requirements of Section 12.0, "Changes to the Agreement," of the Tri-Party Agreement Action Plan.

DOE will submit revisions to this PMP as required by the M-091 Milestones. The PMP revision will include DOE plans and schedules for addressing all requirements set forth in the M-091 Milestone series. Each revision of the M-091-03 Milestone PMP will, after approval by Ecology, supersede previous M-091-03 Milestone PMPs.

DOE will submit the PMP revision to Ecology for review and approval as primary documents pursuant to the Tri-Party Agreement Action Plan, Section 9.2.1 (Ecology et al., 1989b). DOE will implement the PMP, as approved.

8.8.2 Baseline Change Management

DOE maintains a contract budget log under configuration control and management that reconciles to the current contract target costs. Changes are controlled and formally reviewed and approved. DOE requires the contractor to maintain a baseline change process that is approved by DOE.

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Appendix A

Glossary

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Contents

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Terms

DOT	U.S. Department of Transportation
LLW	low-level waste
MLLW	mixed low-level waste
RH	remote-handled
RSW	retrievably stored waste
SLB2	standard large box 2
SWB	standard waste box
SWIFT	Solid Waste Integrated Forecast
SWITS	Solid Waste Information and Tracking System
TRU	transuranic
TRUM	transuranic mixed
WIPP	Waste Isolation Pilot Plant

A1 Glossary

Specialized words used in the waste management plan are defined in this appendix.

Caissons, as used within the M-091 Milestone series (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order Action Plan*), are the four concrete retaining structures containing retrievably stored waste (RSW) in the 218-W-4B Burial Ground.

Certification, as used within the M-091 Milestone series, is defined as follows:

- All activities necessary for waste to be packaged, in order to meet the Waste Isolation Pilot Plant (WIPP) acceptance criteria, are completed. The volume of waste certified is the volume of waste given to the Central Characterization Project for certification verification. If subsequent WIPP certification reveals that the waste cannot be shipped to WIPP, this waste will not count toward meeting the milestone volume requirements (and will be subtracted from meeting such requirements) until it has been determined to meet the WIPP waste acceptance criteria.
- The transuranic mixed (TRUM) waste shipped to Idaho may also count toward certification based upon actual shipment to Idaho and contingent upon the waste not returning to Hanford Site.
- The waste has been treated to meet land disposal restriction treatment standards.

Contact-Handled waste is a waste container with a surface dose rate less than or equal to 200 mrem/h.

Designation is the process of determining whether a waste is regulated under the dangerous waste lists (WAC 173-303-080, "Dangerous Waste Regulations," "Dangerous Waste Lists," through 173-303-082, "Dangerous Waste Sources"), characteristics (WAC 173-303-090, "Dangerous Waste Characteristics"), or criteria (WAC 173-303-100, "Dangerous Waste Criteria"). The process for designating wastes is described in WAC 173-303-070, "Designation of Dangerous Waste." Waste that has been designated as dangerous may be either dangerous waste or extremely hazardous waste. These regulations allow the use of acceptable knowledge, surrogate sampling, and other measures for designation to minimize radiation exposure to workers and to reduce costs.

Low-Level Waste (LLW) is defined as radioactive waste that is not spent fuel, high-level waste, transuranic (TRU) waste, byproduct material, or naturally occurring radioactive material.

Mixed Waste is a waste that contains a nonradioactive hazardous component and, as defined by 10 CFR 20.1003, "Standards for Protection Against Radiation," "Definitions," source, special nuclear material, or byproduct material subject to the *Atomic Energy Act of 1954*.

Retrievably Stored Waste (RSW), as used within the M-091 Milestone series, is or was believed to meet the TRU waste criteria when it was placed in the 218-W-4B, 218-W-4C, 218-W-3A, and 218-E-12B Burial Ground trenches after May 6, 1970. RSW does not include waste in containers that have deteriorated to the point that they cannot be retrieved and stabilized (e.g., placed in overpacks) in a manner that would allow them to be transported and designated without posing significant risks to workers, the public, or the environment. With respect to any such containers, and with respect to any release of RSW, how to move forward will be determined through the cleanup process set forth in the *Resource Conservation and Recovery Act of 1976*; RCW 70.105, "Hazardous Waste Management;" or the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, as appropriate. Those processes may result in additional requirements for the remediation of such wastes.

The Atomic Energy Commission (U.S. Department of Energy predecessor agency) initially defined TRU waste as "waste with known or detectable contamination of transuranium nuclides." In March 1970,

the Atomic Energy Commission directed field sites to segregate TRU waste and place it in retrievable storage that would allow the waste to be retrieved within 20 years. Before this date, this waste was disposed as LLW.

In 1973, the TRU waste segregation limit was established at 10 nCi/g of TRU isotopes. In 1982, the limit was changed to 100 nCi/g. Congress enacted this limit in 1992. Because of the changing definition of TRU waste, waste generated and stored between 1970 and 1982 could contain less than the current threshold of 100 nCi/g for defining TRU waste. This waste has been termed suspect TRU waste because some of it will be designated as LLW following radiological characterization.

Remote-Handled (RH) waste is a waste container with a surface dose rate greater than 200 mrem/h. The RH waste volumes are based on the sum of all containers listed in Solid Waste Information and Tracking System (SWITS) with a cumulative contact dose rate greater than 200 mrem/h, or have a SWITS shielding code of lead, steel, or concrete, and coded in SWITS as RH.

Small and Large Containers have different meanings, depending on whether they are used in reference to mixed low-level waste (MLLW) or TRUM waste. When referring to MLLW, small containers are less than 10 m^3 (353.2 ft^2), including 208.2 L (55 gal) drums. When referring to TRUM waste, small containers are 208.2 L (55 gal) drums or small containers, even if overpacked in 321.75 L (85 gal) drums and WIPP standard waste boxes (SWBs). A large container is anything that is not defined as a small container, and vice versa.

Standard Large Box 2 (SLB2) is a steel rectangular container with an external width of 2.5 m (8.2 ft) and an external length of 4.3 m (14 ft). The internal cavity dimensions are 1.8 m (6 ft) wide, 2 m (6.6 ft) high, and 2.8 m (9.2 ft) long. The SLB2 was qualified in 2004 as meeting the U.S. Department of Transportation (DOT) requirements for specification 7A Type A packaging.

Standard Waste Box (SWB) is a 1.8 m^3 (63.57 ft^3) steel container that is approximately 0.94 m (3.1 ft) high, 1.8 m (5.9 ft) long, and 1.4 m (4.6 ft) wide. The SWB was qualified in 1988 as meeting DOT requirements for specification 7A Type A packaging.

Solid Waste Integrated Forecast (SWIFT) database contains estimates of future waste volumes and characteristics forecast by waste-generating units. The waste generating units provide basic information that is incorporated into the SWIFT database. This forecast is updated annually and published in the SWIFT report.

Solid Waste Information and Tracking System (SWITS) is a Hanford Site database containing records of waste containers stored at Hanford and contains data (e.g., volume; container information; and radiological, physical, and dangerous waste characteristics) about each container of stored waste considered within the scope of the M-091 Milestone series. SWITS is a dynamic database that is updated frequently to reflect waste receipts, processing, and shipment volumes; as a result, data presented in this revision of the Project Management Plan may differ from previous versions.

Transuranic (TRU) waste meets the definition, in the *Waste Isolation Pilot Plant Land Withdrawal Act* (Section 2.18), of radioactive waste containing more than 100 nCi of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years.

A2 References

10 CFR 20.1003, "Standards for Protection Against Radiation," "Definitions," *Code of Federal Regulations*. Available at: https://www.nrc.gov/reading-rm/doc-collections/cfr/part020/part020-1003.html.

Atomic Energy Act of 1954, Pub. L. 83-703 as amended, 42 USC 2011, et seq., 68 Stat. 919. Available at: https://www.govinfo.gov/content/pkg/STATUTE-68/pdf/STATUTE-68-Pg919.pdf#page=30.

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Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order Action Plan*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=82.

RCW 70.105, "Hazardous Waste Management," *Revised Code of Washington*, Olympia, Washington. Available at: http://apps.leg.wa.gov/RCW/default.aspx?cite=70.105.

Resource Conservation and Recovery Act of 1976, Pub. L. 94-580, 42 USC 6901, et seq. Available at: https://www.govinfo.gov/content/pkg/STATUTE-90/pdf/STATUTE-90-Pg2795.pdf.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.

303-070, "Designation of Dangerous Waste."

303-080, "Dangerous Waste Lists."

303-081, "Discarded Chemical Products."

303-082, "Dangerous Waste Sources."

303-090, "Dangerous Waste Characteristics."

303-100, "Dangerous Waste Criteria."

Waste Isolation Pilot Plant Land Withdrawal Act, Pub. L. 102-579. Available at: http://www.wipp.energy.gov/library/CRA/BaselineTool/Documents/Regulatory%20Tools/10%20WIPPLWA1996.pdf.

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Appendix B

Applicable Regulatory Requirements

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B1.1 *National Environmental Policy Act of 1969* B-1

B1.2 *Resource Conservation and Recovery Act of 1976, as Amended by the Hazardous and Solid Waste Amendments of 1984* B-1

B1.3 *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* B-1

B1.4 “Washington State Hazardous Waste Management Act of 1976" (RCW 70.105) B-1

B1.5 “Washington Clean Air Act” (RCW 70.94) B-2

B1.6 U.S. Department of Transportation B-2

B2 References B-2

Terms

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
RCRA	*Resource Conservation and Recovery Act of 1976*
ROD	record of decision
TRU	transuranic
WDOH	Washington State Department of Health
WGA	Western Governors' Association

B1 Applicable Regulatory Requirements

Mixed waste management activities will consider the requirements described in the following sections, as well as any other applicable regulations or U.S. Department of Energy (DOE) requirements.

B1.1 *National Environmental Policy Act of 1969*

DOE/EIS-0391, *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)*, was issued in December 2012. A record of decision (ROD) has been issued (78 FR 240, "Record of Decision for the Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington").

B1.2 *Resource Conservation and Recovery Act of 1976,* as Amended by the *Hazardous and Solid Waste Amendments of 1984*

Federal regulations, implementing the *Resource Conservation and Recovery Act of 1976* (RCRA) and RCRA corrective action, address the requirements for hazardous wastes, including treatment, storage, disposal, and transportation (40 CFR 260, "Hazardous Waste Management System: General" through 40 CFR 271, "Requirements for Authorization of State Hazardous Waste Programs").

The U.S. Environmental Protection Agency (EPA) has authorized the Washington State Department of Ecology (Ecology) to administer the State statute and regulations (RCW 70.105, "Hazardous Waste Management;" WAC 173-303, "Dangerous Waste Regulations"), in lieu of federal RCRA regulations.

B1.3 *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*

The *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) addresses spill cleanups and hazardous substances left at past practice waste sites. DOE performs investigation and response actions for release of hazardous substances at the Hanford Site as the lead agency delegated authority under CERCLA Section 104, "Response Authorities," by Executive Order 12580, *Superfund Implementation*. In 1989, pursuant to CERCLA Section 120, "Federal Facilities," DOE executed an agreement with EPA and Ecology governing execution of CERCLA response actions and measures to bring the Hanford Site into compliance with RCRA treatment, storage, and disposal unit and corrective action requirements. The agreement is called the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*). Either EPA or Ecology will assume responsibility as lead regulatory agency for various response actions at the Hanford Site.

In September 2012, DOE submitted an M-016-93 implementation work plan (DOE/RL-2009-130, *M-16-93 Work Plan*) to EPA proposing the acquisition of capabilities necessary to prepare transuranic (TRU) mixed waste generated by CERCLA cleanup actions at the Hanford Site for disposal at the Waste Isolation Pilot Plant. This work plan reflected retrieval decisions, projected waste volumes, and schedules from all CERCLA cleanup actions authorized in RODs and action memoranda at the Hanford Site. As part of the approval process for RODs and action memoranda, EPA and the DOE Richland Operations Office will obtain Ecology concurrence to ensure that wastes from CERCLA operable units for which Ecology is the lead regulatory agency, are properly planned.

B1.4 "Washington State Hazardous Waste Management Act of 1976" (RCW 70.105)

RCW 70.105 authorizes Ecology to regulate the treatment, storage, disposal, and transportation of dangerous waste in Washington State. Mixed waste is dangerous waste that is mixed with

radioactive elements. Chemical characteristics of mixed waste are regulated under RCRA and WAC 173-303, while radioactive characteristics are regulated by DOE under the *Atomic Energy Act of 1954*. Ecology has promulgated dangerous waste regulations in WAC 173-303. Mixed waste generation activities are subject to generator requirements. Mixed waste management activities that cannot use generator provisions must be conducted according to dangerous waste permits under WAC 173-303 in order to operate.

B1.5 "Washington Clean Air Act" (RCW 70.94)

The Ecology Nuclear Waste Program regulates air toxicity and criteria pollutant emissions from the Hanford Site. Ecology promulgates and enforces the regulations under RCW 70.94, "Washington Clean Air Act." Ecology implementing requirements (e.g., WAC 173-400, "General Regulations for Air Pollution Sources," and WAC 173-460, "Controls for New Sources of Toxic Air Pollutants") specify review of new source emissions, permitting, applicable controls, reporting, notifications, and compliance with general standards for applicable sources of Hanford Site emissions.

The Washington State Department of Health (WDOH) Radiation Protection Division regulates radioactive air emissions statewide, as authorized by EPA and Washington State legislative and regulatory authority. WDOH implements the state requirements, adopts and implements the federal requirements under WAC 246-247, "Radiation Protection—Air Emissions," and enforces the federal requirements under authority delegated by EPA. Before beginning any work that would result in creating a new or modified source of radioactive airborne emissions, a notice of construction application must be submitted for review and approval by WDOH, resulting in issuance of an operating license. Typical license requirements for radioactive air emission sources include ensuring adequate emission controls, emissions monitoring/sampling, and annual reporting of emissions.

B1.6 U.S. Department of Transportation

Onsite transportation of waste is managed by DOE in accordance with DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Transportation of waste offsite is regulated by DOT. A Memorandum of Understanding between the Western Governors' Association (WGA) and DOE (WGA and DOE-CBFO, 2019, *Regional Protocol for the Safe and Uneventful Transfer of Transuranic Waste*) requires that DOE conduct TRU waste shipments through the western states in accordance with the protocols contained in WGA and DOE-CBFO, 2017, *WIPP Transportation Safety Program Implementation Guide*. Shipments within the same DOE site, or other TRU waste shipments as agreed to between DOE and the states, are not included. Shipments of TRU waste to local commercial firms using road closures are acceptable when performed in accordance with DOE/RL-2001-36 as authorized under 19-NSD-0045_RL, Contract "Number DE-AC06-08RL14788 – Transmittal of Revision F of the U.S. Department of Energy (DOE) Exemptions DOE-E1403 and DOE-E1405."

The type of packaging required to transport the waste depends, in part, on the form and specific activity of the material, and waste acceptance criteria for the receiving facility. DOE is responsible for determining the appropriate container for the material to be transported. DOE ensures that each waste package being transported offsite meets DOT regulations for design, material, manufacturing methods, and testing.

B2 References

19-NSD-0045_RL, 2019, "Contract Number DE-AC06-08RL14788 – Transmittal of Revision F of the U.S. Department of Energy (DOE) Exemptions DOE-E1403 and DOE-E1405" (letter to L. Ty Blackford, CH2M HILL Plateau Remediation Company from J.C. Connerly), U.S. Department of Energy, Office of River Protection, Richland, Washington, September 19.

40 CFR 260, "Hazardous Waste Management System: General," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol25/xml/CFR-2010-title40-vol25-part260.xml.

40 CFR 271, "Requirements for Authorization of State Hazardous Waste Programs," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol28/pdf/CFR-2012-title40-vol28-part271.pdf.

78 FR 240, "Record of Decision for the Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington," *Federal Register*, Vol. 79, No. 240, pp. 75913-75919, December 13, 2013. Available at: http://www.hanford.gov/files.cfm/TCWM_ROD_FR_pub_12_13_13.pdf.

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DOE/RL-2009-130, 2012, *M-16-93 Work Plan*, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0090566.

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Executive Order 12580, 1987, *Superfund Implementation*, Ronald W. Reagan, January 23. Available at: http://www.archives.gov/federal-register/codification/executive-order/12580.html.

Hazardous and Solid Waste Amendments of 1984, Public Law 98-616, Nov. 8, 1984, 98 Stat. 3221.

National Environmental Policy Act of 1969, 42 USC 4321, et seq. Available at: https://uscode.house.gov/view.xhtml?path=/prelim@title42/chapter55&edition=prelim.

RCW 70.94, "Washington Clean Air Act," *Revised Code of Washington*, Olympia, Washington. Available at: http://apps.leg.wa.gov/RCW/default.aspx?cite=70.94.

RCW 70.105, "Hazardous Waste Management," *Revised Code of Washington*, Olympia, Washington. Available at: http://apps.leg.wa.gov/RCW/default.aspx?cite=70.105.

Resource Conservation and Recovery Act of 1976, Pub. L. 94-580, 42 USC 6901, et seq. Available at: https://www.govinfo.gov/content/pkg/STATUTE-90/pdf/STATUTE-90-Pg2795.pdf.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-400.

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-460.

WAC 246-247, "Radiation Protection—Air Emissions," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=246-247.

WGA and DOE-CBFO, 2017, *WIPP Transportation Safety Program Implementation Guide*, Western Governors' Association, Denver, Colorado, and U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico. Available at: https://westgov.org/images/editor/WIPP_PIG_DOE_March_2017.pdf.

WGA and DOE-CBFO, 2019, *Regional Protocol for the Safe and Uneventful Transfer of Transuranic Waste*, Western Governors' Association, Denver, Colorado, and U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico. Available at: https://rampac.energy.gov/docs/default-source/doeinfo/attachment-2.pdf?sfvrsn=6

Appendix C

Descriptions of Low-Level Burial Grounds with Retrievably Stored Waste

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Terms

LLBG	low-level burial ground
RSW	retrievably stored waste
TRU	transuranic

C1 Descriptions of Low-Level Burial Grounds with Retrievable Stored Waste

Retrievably stored waste (RSW) is/was in designated areas of low-level burial grounds (LLBGs) 218-W-4B, 218-W-4C, 218-W-3A, and 218-E-12B (Figure C-1). These LLBGs are located in the LLBG *Resource Conservation and Recovery Act of 1976* treatment, storage, and/or disposal unit. These LLBGs are also included in the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* 200-SW-2 Radioactive Landfills Group Operable Unit.

The following sections provide background information on each LLBG.

C1.1 218-W-4B

The 218-W-4B LLBG is located in the central portion of the 200 West Area of the Hanford Site. The trenches are 175 m (575 ft) long and 3.7 m (12 ft) deep. Figure C-2 shows the trenches in the 218-W-4B LLBG.

The LLBG received miscellaneous radioactive solid waste from the 100, 200, and 300 Areas and offsite shipments from 1967 to 1990. Solid waste at the site consists of rags, paper, cardboard, plastic, pumps, tanks, process equipment, and other miscellaneous high dose rate transuranic (TRU) waste.

The site contains RSW in Trenches T07 and T11 and four alpha caissons. Trench T07 is divided into two sections that were designed to receive RSW. The east end of the trench is referred to as TV7, a diamond-shaped structure consisting of a concrete lined “V” bottom and metal cover. The cement floor of T07 is a barrier to waste constituent migration, similar to the asphalt pad used in the remainder of Trench T07, except for a known preferred direction of migration along the cement surface.

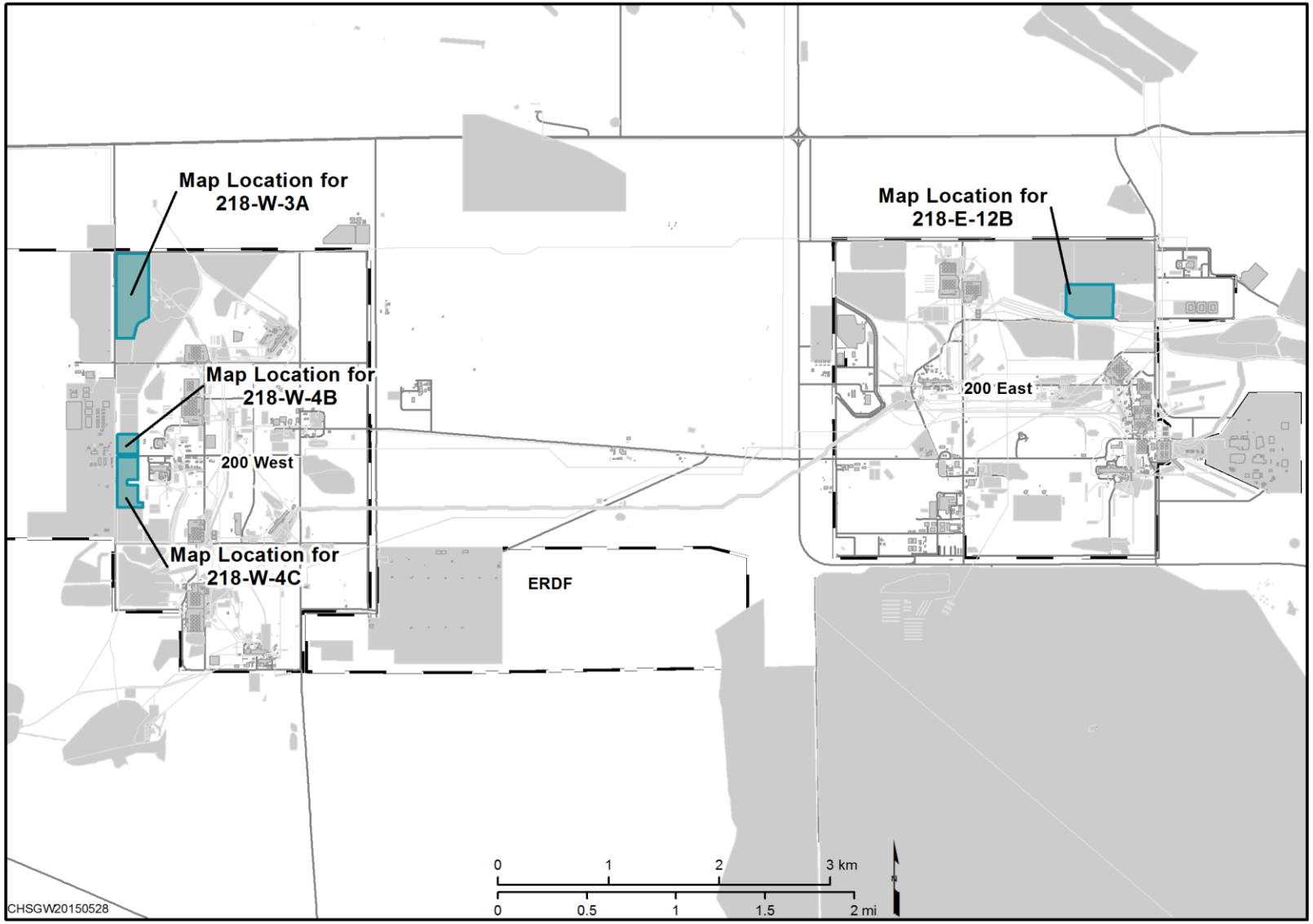
In the fall of 1972, the first asphalt pad was built in the remainder of Trench T07. Drums were arranged in modules, typically 12 drums wide by 12 drums deep by 4 drums high. Flame-retardant plywood sheets were placed to separate the layers of drums and other packages. When modules were completed, they were covered with tarps and plywood sheets.

From 1970 to 1972, Trench T11 received waste drums and boxes that were stacked horizontally and “direct buried” in the ground without tarps or plywood to separate the soil overlying the waste. Other containers, such as concrete or steel burial boxes, ductwork, stainless-steel tanks, and a culvert, were placed in this trench.

C1.2 218-W-4C

The 218-W-4C LLBG is located inside the 200 West Area of the Hanford Site. The trenches ranging from 91 to 219 m (300 to 719 ft) long. Figure C-3 shows the trenches in the 218-W-4C LLBG.

In the 218-W-4C LLBG, Trenches T01, T04, T07, T24, T20, and T29 originally contained RSW. This waste was placed in modules on asphalt pads that contained drums and other packages, including boxes and steel and concrete casks. Drums were arranged in modules, typically 12 drums wide, by 12 drums deep, by 4 drums high. Flame-retardant plywood sheets were placed to separate the layers of drums and other packages. When modules were completed, they were covered with tarps and plywood sheets. The contact-handled RSW has been removed from this LLBG.



ERDF = Environmental Restoration Disposal Facility

Figure C-1. Map Locations for Low-Level Burial Grounds 218-W-4B, 218-W-4C, 218-W-3A, and 218-E-12B

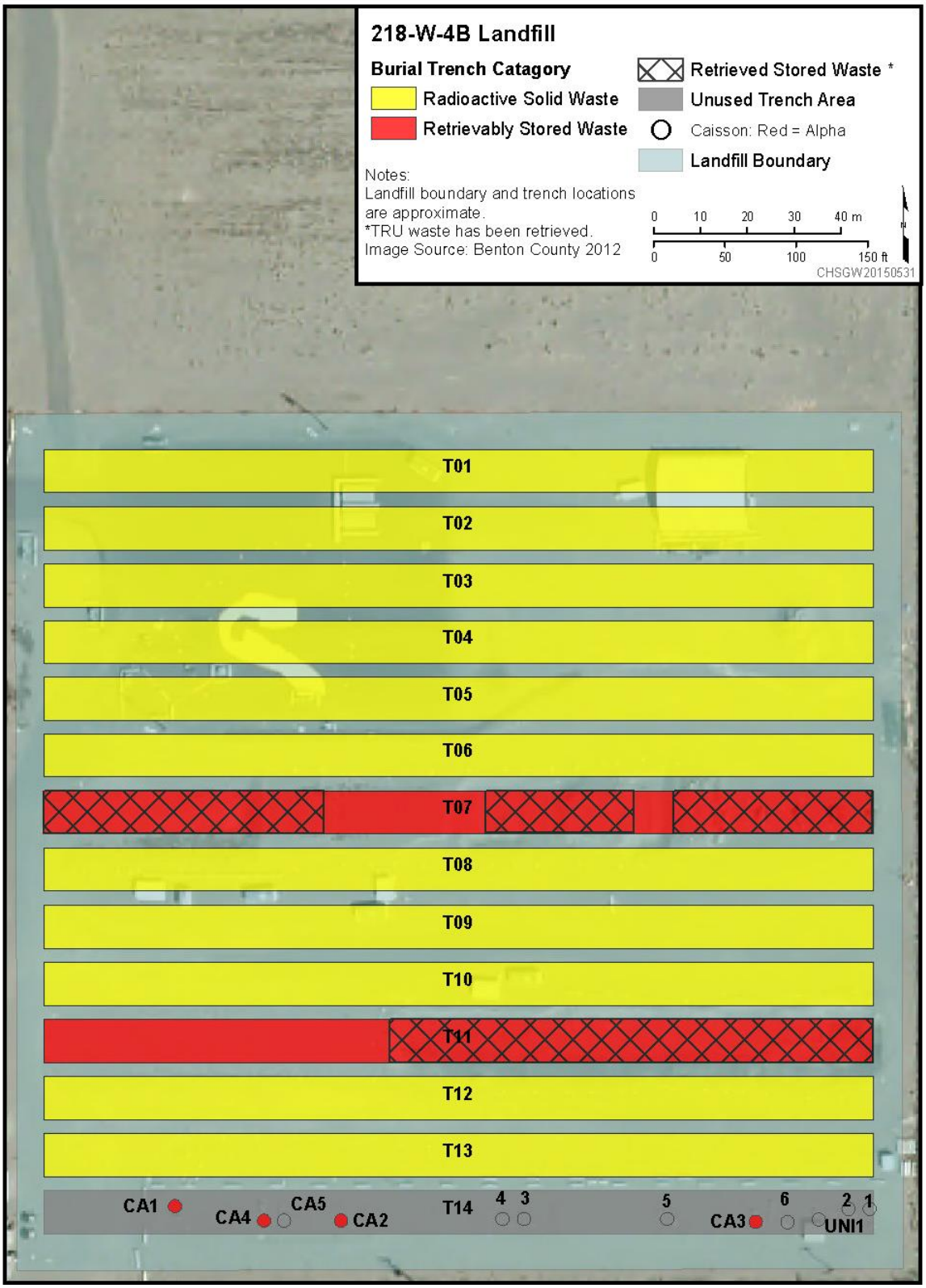


Figure C-2. Trenches in Low-Level Burial Ground 218-W-4B

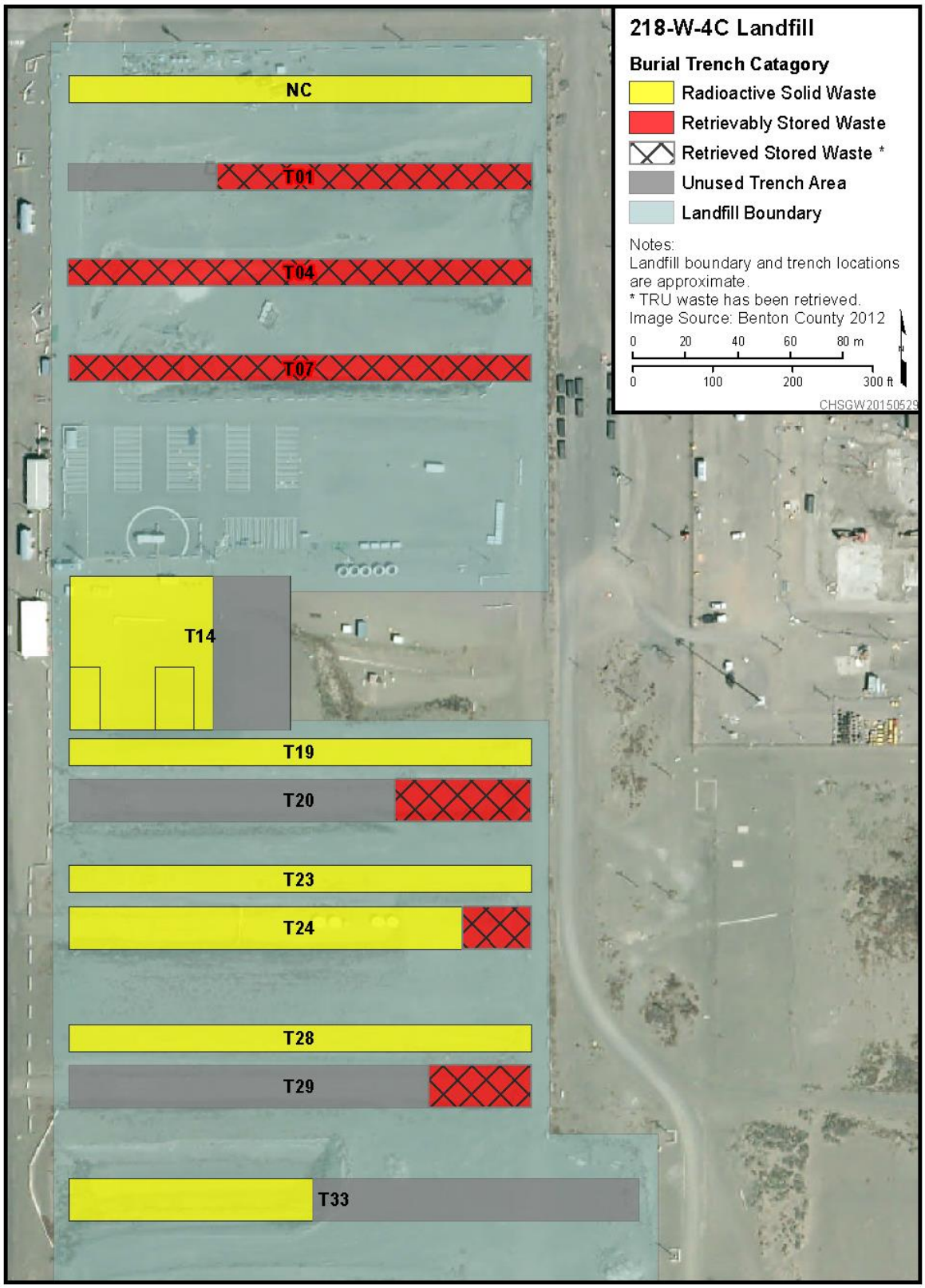


Figure C-3. Trenches in Low-Level Burial Ground 218-W-4C

C1.3 218-W-3A

The 218-W-3A LLBG is located inside the 200 West Area of the Hanford Site. Figure C-4 shows the trenches in the 218-W-3A LLBG. The 218-W-3A LLBG began operating in 1970 and contains solid, dry industrial waste. The RSW is located in 14 trenches: T1, T4, T5, T6, T6S, T8, T9S, T10, T15, T17, T23, T30, T32, and T34. The RSW in Trench 17 has been retrieved.

The 218-W-3A LLBG has no asphalt pads and used only earthen bottom (potentially gravel fill) trenches. Drums were stacked horizontally in earthen trenches from 1970 until approximately 1974. The waste drums were buried directly in the ground without tarps or plywood to separate the soil overlying the waste. Direct contact with the soil increased the probability that containers have corroded and might be breached. The actual date when tarp coverage was initiated has not been established. Later, drums were stacked vertically and placed on plywood, and the completed module waste was covered with nylon tarps and plywood before soil emplacement. RSW in boxes made of various materials (e.g., plywood, concrete, metal, and fiberglass reinforced plywood) were also placed in this burial ground. The 218-W-3A LLBG received RSW until 1987.

C1.4 218-E-12B

The 218-E-12B LLBG is located inside the 200 East Area of the Hanford Site. Figure C-5 shows the trenches in the 218-E-12B LLBG. The RSW is located in two trenches: T17 and T27. The RSW in Trench 27 has been retrieved.

The 218-E-12B LLBG began operating in 1967. The RSW originated from the Plutonium-Uranium Extraction Facility and was placed in 218-E-12B LLBG Trenches T-17 and T-27 between May 1970 and October 1972.

Drums were stacked horizontally in earthen trenches from 1970 to 1972. The waste drums were directly buried in the ground (i.e., not on asphalt pads as they were in the 218-W-4C LLBG) without tarps or plywood to separate the soil overlying the waste. Direct contact with the soil increased the probability that the containers have corroded and might be breached.

C2 References

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: https://www.csu.edu/cerc/researchreports/documents/CERCLASummary1980.pdf.

Resource Conservation and Recovery Act of 1976, Pub. L. 94-580, 42 USC 6901, et seq. Available at: https://www.govinfo.gov/content/pkg/STATUTE-90/pdf/STATUTE-90-Pg2795.pdf.

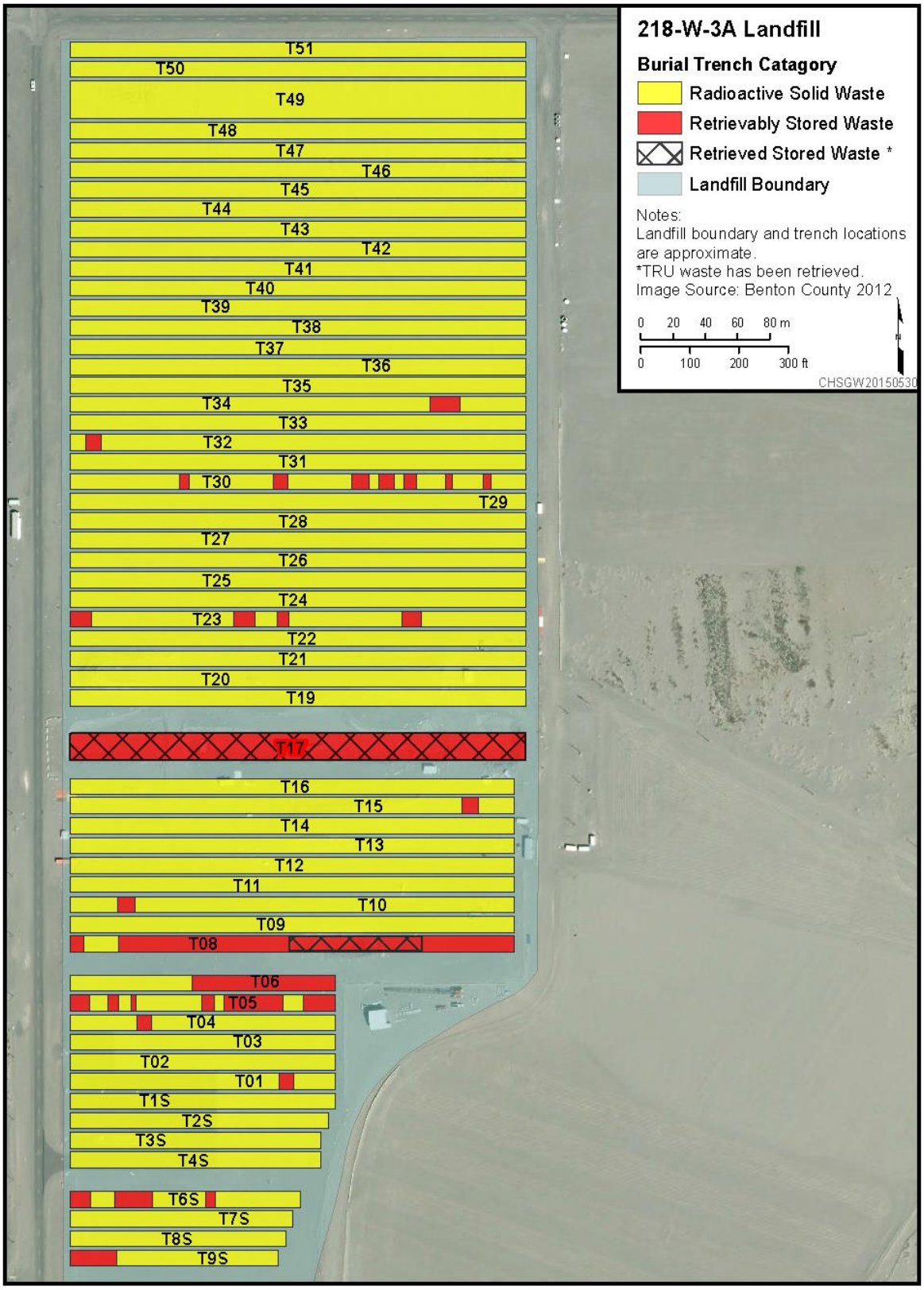


Figure C-4. Trenches in Low-Level Burial Ground 218-W-3A

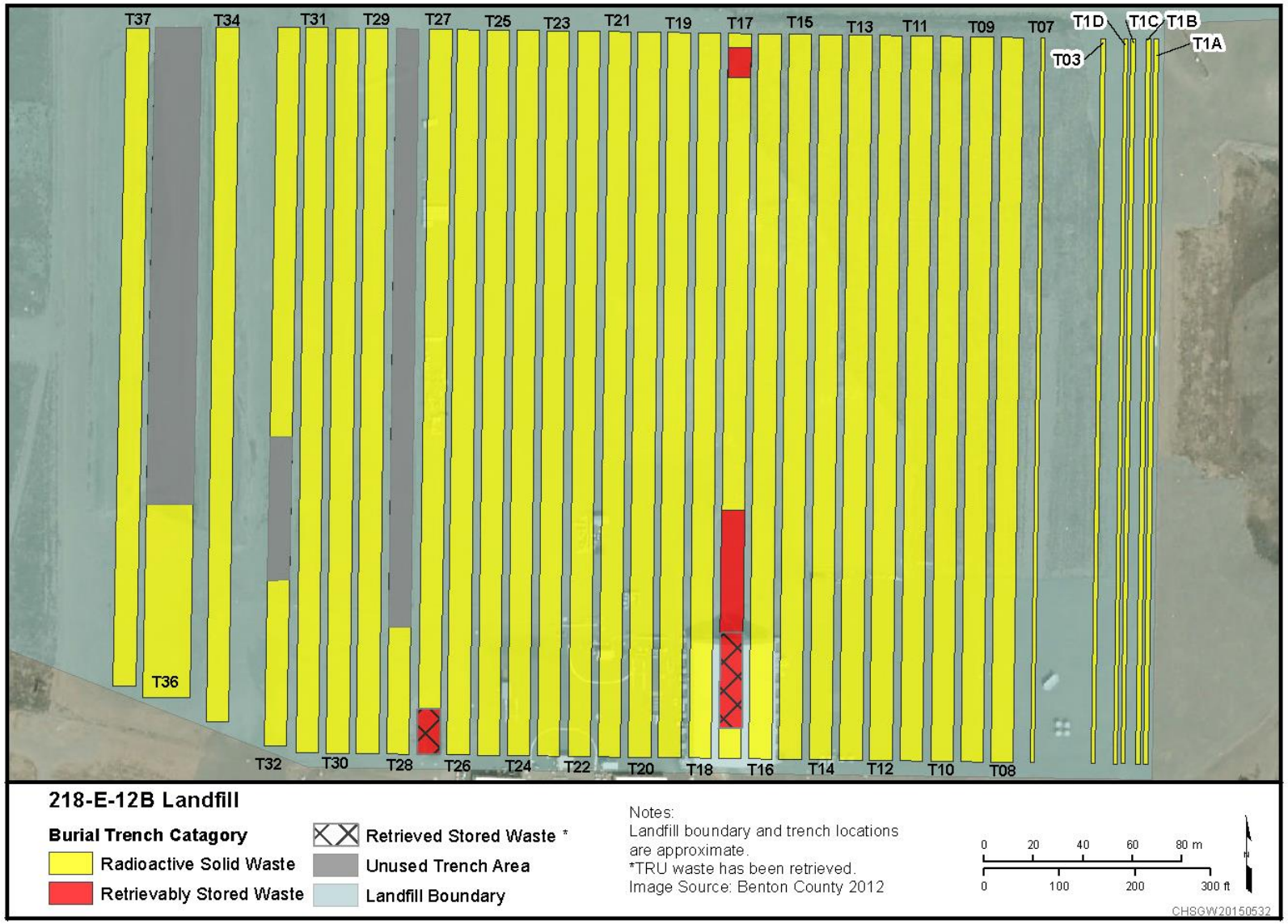


Figure C-5. Trenches in Low-Level Burial Ground 218-E-12B

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Appendix D

Basis for Figures

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Terms

CH	contact-handled
FY	fiscal year
PMP	project management plan
RH	remote-handled
RSW	retrievably stored waste
SWITS	Solid Waste Information and Tracking System
TRU	transuranic
TRUM	transuranic mixed waste
WIPP	Waste Isolation Pilot Plant

D1 Tables

Tables D-1 through D-3 describe the data sources, analytical bases, and underlying assumptions for certain figures included in the main text of this document.

Table D-1. Basis for Figure 3-1

Data Source, Analytical Basis, and Underlying Assumptions	
Data Source	• Retrievably stored waste (RSW) consists of suspect transuranic mixed waste (TRUM) waste in 218-W-3A, 218-W-4B, 218-W-4C, and 218-E-12B Burial Grounds. • The volume of RSW as reported in the Solid Waste Information and Tracking System (SWITS). • Volumes are internal volumes of a waste container (e.g., a 55-gal drum has an internal volume of 0.208 m^3 and an external volume of 0.257 m^3). • SWITS is a dynamic database and is updated frequently to reflect updated information. As a result, data presented in this revision of the project management plan (PMP) may differ from previous volumes as follows: – The volume of RSW retrieved is based on the actual volume measured when the container is removed from the trench. In some instances, the dimension of a container in SWITS does not represent the actual dimensions of a container retrieved. In these instances, SWITS will be updated with the actual volume removed, and this volume will be used to count towards Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*, M-091-49 Milestone. For example, when the culverts (cylinders) are retrieved, the original volume in SWITS was based on a rectangular container. SWITS was updated with the actual volume of the cylinder. – For failed containers that are repacked in the trench prior to retrieval, the waste volume reported in SWITS will be the volume counted towards the milestone.
Analytical Basis	• Projected annual volumes are based on the funding profile given in Figure 8-1 in the main text of this document. • Due to rounding, the total may not equal the sum of individual values.
Underlying Assumptions	• The retrieving and characterizing of the remaining RSW is being addressed under Milestone M-091-54 and subsequent milestones (see Chapter 2 in the main text of this document) in order to ultimately meet Milestone M-091-49. • Retrieval will be completed by September 30, 2048, with completion of all the M-091 milestones by September 30, 2050.

Table D-2. Basis for Figures 4-2 and 5-1

Data Source, Analytical Basis, and Underlying Assumptions	
Data Source	• Inventory based on SWITS data sorts (report created on May 4, 2020). • The volume of an RSW container is as reported in SWITS; volumes will be adjusted based on actual volumes removed during waste retrieval operations. • Volumes are internal volumes of a waste container (e.g., a 55-gal drum has an internal volume of 0.208 m^3 and an external volume of 0.257 m^3).
Analytical Basis	• Projected annual volumes are based on the funding profile given in Figure 8-1 in the main text of this document: – Projections used throughout this PMP are based on level loaded workoff rates. – For fiscal years (FYs) 2021 to 2029, TRUM will be repackaged at a commercial facility in order to satisfy the M-091-47-T01/02 series (280 m^3 of TRUM waste per annum in the most recent M-091 Milestone series). – Additional necessary repack facilities to process waste containers that could not be shipped offsite will be operational by FY 2029 at which time repackaging will shift to the on-site facility. – Shipping operations will transition from contact-handled (CH) TRUM to remote-handled (RH) TRUM during FYs 2038 and 2039. – Number of shipments to the Waste Isolation Pilot Plant (WIPP) is dependent on priority across the U.S. Department of Energy Complex. • Certified and shipped volume is the treated volume. During repackaging of CH TRUM waste, it has been found that for every four drums repackaged, five drums of certified CH waste are generated, on average, resulting in a factor increase of 1.25. This factor is also assumed valid for noncaisson RH TRUM waste. Volume increases can result from activities such as repackaging performed to generate compliant packages ready for final characterization, certification, and shipment to WIPP. • For caisson RH TRUM waste, the cesium-137 Ci content for each caisson was decayed to January 1, 2042 in order to calculate the certified volume. Total number of containers (SC30-G1), and their associated volume, were determined by assuming each container is filled with 2 Ci of cesium-137 waste. • Due to rounding, the total may not equal the sum of individual values.
Underlying Assumptions	• After retrieval and assay, a significant portion of RSW will be designated as non-TRU (transuranic) waste based on the change in the definition of TRU waste (to 100 nCi/g from the former definition of 10 nCi/g), which occurred after the waste was placed into retrievable storage in the trenches. • Retrieval will be completed by the end of FY 2048. • WIPP will be available to receive shipments of TRUM waste by the end of FY 2027, with shipments from the Hanford Site starting in FY 2028 and continuing through FY 2048. • Shipments of TRUM waste (M-091-48 Milestone) will be completed at the end of FY 2050. • Onsite TRUM waste processing will begin in FY 2029 and continue through FY 2047. • Additional capabilities necessary to complete repackaging of TRUM waste and shipments to WIPP are being addressed under Milestone M-091-55and subsequent milestones (see Chapter 2). • Commercial capability will be available to process a portion of TRUM waste.

Table D-3. Basis for Figure 8-1

Underlying Assumptions
• FY 2019 escalated dollars. • Based on DOE/RL-2018-45, *2019 Hanford Lifecycle Scope, Schedule and Cost Report*. Funding levels are subject to change as planning is refined. • Funding profile for *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* activities discussed in Chapter 7 is not included. • Cost and/or schedule uncertainty is allocated based on ratio of M-091 versus total Project Baseline Summary values.

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Appendix E

Out-Year CERCLA Cleanup Actions

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Terms

CCP	coordinated closure proposal
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CMS	corrective measures study
Ecology	Washington State Department of Ecology
FS	feasibility study
LLW	low-level waste
MLLW	mixed low-level waste
OU	operable unit
PMR	permit modification request
PUREX	Plutonium Uranium Extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
RD/RAWP	remedial design/removal action work plan
REDOX	reduction oxidation
RFI	RCRA facility investigation
RI	remedial investigation
SST	single-shell tank
TBD	to be determined
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TSD	treatment, storage, and disposal

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E1 Introduction

Appendix E categorizes the operable units (OUs) and facilities with potential to generate waste with transuranic (TRU) constituents greater than 100 nCi/g during *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) cleanup actions and the scheduled actions.

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Table E-1. Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions

Operable Unit/ Site Name	Description	Potential Waste with Transuranic Constituents Greater Than 100 nCi/g			Schedule
		Waste Unit Name	Waste Form	Volume	
200-BC-1	The 200-BC-1 OU includes sites associated with the BC Cribs and Trenches south of the 200 East Area. The 216-B-53A Trench is 18.3 by 3 m (60 by 10 ft) at the base. The site received waste from the liquid release at the Plutonium Recycle Test reactor in the 300 Area during which secondary cooling waste became contaminated with plutonium and mixed fission products. Of all the specific retention trenches in the BC Cribs and Trenches area, only the 216-B-53A Trench is considered to have the potential to contain concentrations of TRU constituents greater than 100 nCi/g. **References:** DOE/RL-2009-36, *BC Cribs and Trenches Excavation-Based Treatability Test Report*, Rev. 1. DOE/RL-2010-49, *Remedial Investigation/Feasibility Study Work Plan 200-WA-1 and 200-BC-1 Operable Units*, Rev. 0.	216-B-53A, Trench	Soil, Rock, Gravel	38 m^3	*M-015-91B*: Submit FS Report(s) and Proposed Plan(s) for the 200-BC-1/ 200-WA-1 OUs (200 West Inner Area) by 7/31/2023. *M-016-00*: Complete remedial actions for all nontank farm and noncanyon OUs in accordance with schedules established in approved RD/RAWPs by 9/30/2042.
200-SW-2	There are 24 landfills assigned to the 200-SW-2 OU. These landfills consist of excavated trenches that received either LLW or MLLW. Most of the waste disposed in the 200-SW-2 landfills originated from the processing facilities located in the 200 East and 200 West Areas, with some of the waste originating from the 100 and 300 Areas, as well as from offsite sources. There are collocated waste sites within the footprint of several 200-SW-2 landfills. These waste sites include three ponds, a burn pit, and a ditch. Before 1970, LLW was disposed in the same landfill trenches as waste that contained TRU elements and mixed fission products. After 1970, waste that was designated as TRU waste was segregated in either specified low-level burial ground trenches or underground concrete caissons within the landfills for future retrieval. Retrieval of this TRU waste (currently known as retrievably stored suspect TRU waste) is accomplished under Tri-Party Agreement (Ecology et al., 1989) Milestones M-091-49, as discussed in Chapter 3 of this Project Management Plan. Prior to 1960, detailed inventory records were not maintained, and specific information about the early landfills often is not available. **References:** DOE/RL-2004-60, *200-SW-2 Radioactive Landfills Group Operable Unit RCRA Facility Investigation/Corrective Measures Study/Remedial Investigation/Feasibility Study Work Plan*, Rev. 1. DOE/RL-2004-60, Appendix D, "Conceptual Site Models," Rev. 1 provides retrievably stored waste volumes remaining to be retrieved for: 218-E-12B, 218-W-3A, and, 218-W-4B. Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*.	218-E-12B, Landfill	Debris	303 m^3	*M-015-93B*: Submit RFI/CMS, RI/FS Report, and Proposed Corrective Action Decision/Proposed Plan for the 200-SW-2 OU by 1/31/2023. *M-016-00*: Complete remedial actions for all nontank farm and noncanyon OUs in accordance with schedules established in approved RD/RAWPs by 9/30/2042.
		218-E-5, Landfill		140 m^3	
		218-W-1, Landfill		7,100 m^3	
		218-W-2, Landfill		8,200 m^3	
		218-W-2A, Landfill		280 m^3	
		218-W-3, Landfill		5,900 m^3	
		218-W-3A, Landfill		930 m^3	
		218-W-4A, Landfill		12,000 m^3	
		218-W-4B, Landfill		1,564 m^3	
		Total		**36,417 m^3**	
200-WA-1	200 West Inner Area (200-WA-1) is defined as other sites in the 200 West Area not included in 200-CR-1; 200-IS-1; 200-PW-1,-6; 200-BC-1; 200-CW-5; or 200-SW-2. **References:** DOE/RL-2003-64, *Feasibility Study for the 200-TW-1 Scavenged Waste Group, the 200-TW-2 Tank Waste Group, and the 200-PW-5 Fission-Product Rich Waste Group Operable Units*, Draft A. DOE/RL-2005-61, *Remedial Investigation Report for the 200-LW-1 (300 Area Chemical Laboratory Waste Group) and 200-LW-2 (200 Area Chemical Laboratory Waste Group) Operable Units*, Draft A. DOE/RL-2007-02, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Area Central Plateau Operable Units Volume II: Site-Specific Field-Sampling Plan Addenda*, Rev. 0. Table 2-15 in RHO-RE-ST-30 P, *Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Waste-Environmental Impact Statement*. DOE/RL-2010-49, *Remedial Investigation/Feasibility Study Work Plan 200-WA-1 and 200-BC-1 Operable Units*, Rev. 0.	216-S-1, & -2, Crib	Soil, Gravel, Rock	1,700 m^3	*M-015-91B*: Submit FS Report(s) and Proposed Plan(s) for the 200-BC-1/ 200-WA-1 OUs (200 West Inner Area) by 7/31/2023. *M-016-00*: Complete remedial actions for all nontank farm and noncanyon OUs in accordance with schedules established in approved RD/RAWPs by 9/30/2042.
		216-Z-7, Crib		590 m^3	
		241-T-361	Sludge/Liquid	88 m^3	

Table E-1. Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions

Operable Unit/ Site Name	Description	Potential Waste with Transuranic Constituents Greater Than 100 nCi/g			Schedule
		Waste Unit Name	Waste Form	Volume	
200-DV-1	The 200-DV-1 OU includes waste sites with deep vadose zone contamination that may be a potential threat to groundwater and cannot be remediated using typical surface techniques (e.g., excavation and capping). The vadose zone is defined as the unsaturated region of soil between the ground surface and the water table. **References:** Estimated volumes were taken from Table 2-15 in RHO-RE-ST-30 P, *Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Waste-Environmental Impact Statement*. DOE/RL-2011-102, *Remedial Investigation/Feasibility Study and RCRA Facility Investigation/Corrective Measures Study Work Plan for the 200-DV-1 Operable Unit*, Rev. 0.	216-T-3, Injection/Reverse Well	Soil, Rock, Gravel	<10 m^3	*M-015-110B*: Submit CMS, FS, and Proposed Plan/Proposed Corrective Action Decision for 200-DV-1 by 9/30/2023. *M-016-00*: Complete remedial actions for all nontank farm and noncanyon OUs in accordance with schedules established in approved RD/RAWPs by 9/30/2042.
		216-B-5, Injection/Reverse Well		60 m^3	
		216-B-7A & -7B, Crib		430 m^3	
		216-T-32, Crib		460 m^3	
		216-T-18, Crib		590 m^3	
		216-T-5, Trench		TBD	
		216-T-7, Tile Field		TBD	
		216-T-6, Crib		290 m^3	
		Total		**1,840 m^3**	
200-IS-1	The 200-IS-1 OU includes pipelines, diversion boxes, catch tanks, related structures, and RCRA TSD tanks. Potential source of TRU waste is residual sludge/liquid within the structures. Associated pipelines and structures (e.g., diversion boxes, catch tanks, vaults, and storage tanks) are expected to be LLW. The 241-CX-72 Storage Tank is located at the former Hot Semiworks Facility, east of B Plant in the 200 East Area. **Reference:** DOE/RL-2008-51, *241-CX Tank System Closure Plan;* Rev. 0.	241-CX-72, Storage Tank	Sludge/Liquid	9 m^3	*M-015-92C*: Submit RFI/CMS, RI/FS Report, and Proposed Corrective Action Decision/Proposed Plan for the 200-IS-1 by 3/31/2023. *M-016-00*: Complete remedial actions for all non-tank farm and non-canyon OUs in accordance with schedules established in approved RD/RAWPs by 9/30/2042. *M-037-24*: Submit a CCP as a PMR for the TSDs: 241-CX Tank System and Inactive SST Components (200 East/ West) by TBD. *M-015-112:* Submit Draft B 200-IS-1 RFI/CMS/RI/FS Work Plan to Ecology with Schedule Dates by 11/30/2020.
200-EA-1	200 East Inner Area (200-EA-1) and 200-IS-1 sites not included in one of the canyon OUs will remain in the 200-IS-1 OU. Other waste sites not included in 200-CS-1, 200-CP-1, 200-PW-3, or 200-SW-2 are reassigned to the new 200-EA-1 OU. The 200-EA-1 OU includes the 241-B-361 Settling Tank, which was used for waste originating in B Plant. **References:** DOE/RL-2010-114, *200-IS-1 Operable Unit Pipeline System Waste Sites RFI/CMS/RI/FS Work Plan*, Draft. Volume of residual sludge in 241-B-361 is from Table 2-3 in DOE/RL-2003-64, *Feasibility Study for the 200-TW-1 Scavenged Waste Group, the 200-TW-2 Tank Waste Group, and the 200-PW-5 Fission-Product Rich Waste Group Operable Units*, Draft A. DOE/RL-2010-114, *200-IS-1 Operable Unit Pipeline System Waste Sites RFI/CMS/RI/FS Work Plan*, Draft A. RHO-RE-ST-30 P, *Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Waste-Environmental Impact Statement*.		Sludge/Liquid		*M-015-92B*: Submit RFI/CMS, RI/FS Report and Proposed Corrective Action Decision/Proposed Plan for the 200-EA-1 (Central Plateau 200 East Inner Area) by 11/30/2022. *M-016-00*: Complete remedial actions for all non-tank farm and non-canyon OUs in accordance with schedules established in approved RD/RAWPs by 9/30/2042.
		241-B-361, Settling Tank		180 m^3	
		Diversion Boxes, Catch Tanks		TBD	
		Total		**180 m^3**	

Table E-1. Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions

Operable Unit/ Site Name	Description	Potential Waste with Transuranic Constituents Greater Than 100 nCi/g			Schedule
		Waste Unit Name	Waste Form	Volume	
200-CP-1, PUREX Tunnel #1 and Tunnel #2	The PUREX Plant consists of the main fuels reprocessing building (202A) and several ancillary buildings. WHC-IP-0977 (Section 4.0) describes the many process vessels, chemical storage tanks, and other types of equipment that are potential candidates for removal and processing as solid waste. The volume of potential solids waste is estimated at 9,660 m^3 (341,140 ft^3) of which it is estimated that 8 percent is contaminated with transuranic constituents that exceed 100 nCi/g. The PUREX Plant is designated as a Tier 1 facility. Final disposition to be addressed using the CERCLA remedial action coordinated with RCRA closure. Completion schedules to be established with the RI/FS work plans and RD/RAWPs and closure conditions/schedules established in the Hanford Facility Dangerous Waste Permit. **References:** WA7890008967, *Hanford Facility RCRA Permit Dangerous Waste Portion Change Control Log PUREX Storage Tunnels CHAPTER 3.0 WASTE ANALYSIS PLAN* The two PUREX tunnels (Tunnel #1 and Tunnel #2) were used for interim storage to shelter failed or obsolete process equipment. The process equipment, bulky and highly radioactive, could not be removed from the PUREX Plant. The tunnels were both filled with engineered grout to improve tunnel stability, provide additional radiological protection, and increase durability. WHC-IP-0977, *Estimation of PUREX Equipment and Materials That are Candidates for Removal and Waste Processing During PUREX Plant Closure*. Tunnel #1 is filled to capacity with eight railcars that contain approximately 590 m^3 (20,835 ft^3) of unsegregated radioactive waste. Section 3.1 of WHC-IP-0977 describes the equipment stored in Tunnel #1. It is estimated that approximately 45 percent of the waste could be contaminated with transuranic constituents that exceed 100 nCi/g, while the remainder is LLW. Tunnel #2, which currently holds twenty eight railcars, contains approximately 2,200 m^3 (78,000 ft^3) of unsegregated radioactive waste. Approximately 35 percent of the unsegregated radioactive waste is estimated to be contaminated with transuranic constituents that exceed 100 nCi/g.	PUREX Complex	Debris	770 m^3	*M-085-00*: Complete response actions for the canyon facilities/associated past practice waste sites, other Tier 1 Central Plateau facilities not covered by existing milestones, and Tier 2 Central Plateau facilities by TBD. *M-085-80*: Submit RI/FS Work Plan for 200-CP-1 by 9/30/2020.
		PUREX Tunnels		1,030 m^3	
		Total		**1,800 m^3**	
200-CR-1	The REDOX Facility, also called the 202-S Process Canyon Building or S Plant, is a chemical separation facility constructed in 1952 to employ an advanced organic solvent extraction process as a replacement for the B and T Plants. Irradiated rods were transferred to the REDOX Facility where plutonium was extracted and transferred as plutonium nitrate to Z Plant for final processing. As with other canyon buildings, the REDOX Facility is constructed entirely of concrete, and its process equipment is contained in cells. The REDOX Canyon and Service Facility is designated as a Tier 1 facility. Final disposition of the REDOX Facility is to be addressed using CERCLA remedial action. Completion schedules are to be established with RI/FS work plans and RD/RAWPs. **Reference:** BHI-00176, *S Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 00.	REDOX	Debris	~1,200 m^3	*M-085-00*: Complete response actions for the canyon facilities/associated past practice waste sites, other Tier 1 Central Plateau facilities not covered by existing milestones, and Tier 2 Central Plateau facilities by TBD. *M-085-90*: Submit RI/FS Work Plan for 200–CR-1 by 9/30/2021.

Notes: All terms used in in this table are defined in the Terms list page of the front matter. Complete citations for documents referenced in Table E-1 are provided in Chapter E2.

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