APPENDIX H.10

MIXED WASTE TRENCHES (CP-OP-8, CENTRAL PLATEAU) EVALUATION UNIT SUMMARY TEMPLATE

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PART I. EXECUTIVE SUMMARY

EU LOCATION

200 West Area

RELATED EUS

CP-LS-12 (200 West Burial Grounds), CP-OP-02 (T Plant), CP-OP-04 (WRAP), CP-OP-01 (CWC)

PRIMARY CONTAMINANTS, CONTAMINATED MEDIA AND WASTES

Low-level waste (LLW), mixed low-level waste (MLLW)

BRIEF NARRATIVE DESCRIPTION

The Mixed Waste Trenches (Trenches 31 & 34) are part of the Solid Waste Operations Complex (SWOC) which includes a combination of treatment, storage, and disposal operating unit groups consisting of the Central Waste Complex (CWC), Waste Receiving and Processing Facility (WRAP), T Plant, and Low Level Burial Grounds (LLBG) Trenches 31 & 34.[1]

Low Level Burial Ground (LLBG) Trenches 31 & 34 and the associated container storage units are located within 218-W-5 Burial Ground in the 200 West Area. LLBG Trenches 31 & 34 and the associated container storage units provide storage and disposal for Land Disposal Restriction (LDR) compliant mixed waste and treatment of certain waste (Low-level waste [LLW] and mixed low-level waste [MLLW]).[2] The LLBG Trenches 31 & 34 do not receive ignitable, reactive, or incompatible waste.[3]

Trenches 31 and 34 are large rectangular excavations in the southwest corner of the 218-W-5 Landfill, currently operated as disposal units for mixed waste and are RCRA TSD landfills. As of 2015, Trench 34 is partially filled and Trench 31 is still unused and awaiting use. [4] The trenches are constructed with polyethylene liners and leachate collection systems. [5]

All waste disposed in the LLBG Trenches 31 & 34 must meet the requirements of the Washington State Department of Ecology Dangerous Waste Regulations, Washington Administrative Code (WAC) 173-303-300, General Waste Analysis and LDR requirements.[6]

The LLBG Trenches 31 & 34 operating organization conducts waste management operations in accordance with the design and engineering requirements of waste management structures and equipment, and with all equipment manufacture specifications and operating processes. Before any storage, treatment, and/or disposal of waste, the LLBG Trenches 31 & 34 processes in place for safe management of the waste are performed by considering actual or potential risks posed by the waste and the storage, treatment, and/or disposal equipment. LLBG Trenches 31 & 34 conducts all waste

[1] CHPRC-01908, Rev 0, page viii
[2] CHPRC-01908, Rev 0, page 1
[3] CHPRC-01908, Rev 0, page 38
[4] DOE-RL-2014-43, Rev 0, Figure 2-5, page 2-15
[5] DOE-RL-2014-43, Rev 0, Page 2-10
[6] CHPRC-01908, Rev 0, page viii

treatment and/or storage according to these processes and complies with requirements for labeling, container management, and inspection requirements. [7]

The LLBG Trenches 31 & 34 waste tracking processes ensure that the waste received at LLBG Trenches 31 & 34 matches the shipping manifest or transfer documents, and that the waste is tracked through LLBG Trenches 31 & 34. The LLBG Trenches 31 & 34 maintains all the waste tracking information. The LLBG Trenches 31 & 34 operating organization tracks the waste through the following processes: storage, treatment; transfers; and/or final disposal. The waste tracking process provides a mechanism for tracking waste using a unique container identification number. The unique number is a barcode (or equivalent) that is recorded in an electronic data tracking system. This mechanism encompasses waste acceptance, movement, processing, and management of waste. This electronic container tracking system identification number links the hard copy or electronic record to the container. These records are maintained with such information as the container identification number records contain information on the location, quantity, and physical and chemical characteristics of the waste.[8]

SUMMARY TABLES OF RISKS AND POTENTIAL IMPACTS TO RECEPTORS

Table H.10-1 provides a summary of nuclear and industrial safety related risks to humans and impacts to important physical Hanford site resources.

Human Health

A Facility Worker is deemed to be an individual located anywhere within the physical boundaries of the LLBG or immediate areas around the outside LLBG; a Co-located Person is an individual located 100 meters from the LLBG boundary; and Public is an individual located at the closest point on the Hanford Site boundary not subject to DOE access control. The nuclear related risks to humans are based on unmitigated (unprotected or controlled conditions) dose exposures expressed in a range of from “low” to “high” according to the consequence levels. The estimated mitigated exposure that takes engineered and administrative controls and protections into consideration, when this information is available, is shown in parentheses.

Groundwater and Columbia River

Direct impacts to groundwater resources and the Columbia River have been rated based on available information for the current status and estimates for future time periods. These impacts are also expressed in a range of from *Not Discernible* (*ND*) to *Very High*.

Ecological Resources[9]

The risk ratings are based on the degree of physical disruption (and potential additional exposure to contaminants) in the current status and as a potential result of remediation options.

Cultural Resources[9]

No risk ratings are provided for Cultural Resources. The Table identifies the three overlapping Cultural Resource landscapes that have been evaluated: Native American (approximately 10,000 years ago to the present); Pre-Hanford Era (1805 to 1943) and Manhattan/Cold War Era (1943 to 1990); and provides

[7] CHPRC-01908, Rev 0, page 5
[8] CHPRC-01908, Rev 0, pages 1-2
[9] References throughout this Evaluation Unit Summary Template supporting analyses related to Ecological Resources and/or Cultural Resources may be found in Appendices J and K, respectively. Refer to the specific EU when searching for the reference.

initial information on whether an impact (both direct and indirect) is KNOWN (presence of cultural resources established), UNKNOWN (uncertainty about presence of cultural resources), or NONE (no cultural resources present) based on written or oral documentation gathered on the entire EU and buffer area. Direct impacts include but are not limited to physical destruction (all or part) or alteration such as diminished integrity. Indirect impacts include but are not limited to the introduction of visual, atmospheric, or audible elements that diminish the cultural resource's significant historic features. Impacts to Cultural Resources as a result of proposed future cleanup activities will be evaluated in depth under Section 106 of the National Historic Preservation Act (16 USC 470, et. seq.) during the planning for remedial action.

Table H.10-1. Risk Rating Summary (for Human Health, unmitigated nuclear safety basis indicated, mitigated basis indicated in parentheses (e.g., "Very High" (Low)).

Population or Resource		Evaluation Time Period Active Cleanup (to 2064) **Current Condition:** Stabilization & Deactivation	**From Cleanup Actions:** Final D&D[c]
Human Health	Facility Worker	***S&D***: High (IS)	***Proposed method***: IS[d]
	Co-located Person	***S&D***: High (IS)	***Proposed method***: IS
	Public	***S&D***: Low (IS)	***Proposed method***: IS
Environmental	Groundwater[a]	Not Discernible (ND)	ND
	Columbia River[a]	ND	ND
	Ecological Resources[b]	ND	Low to Medium
Social	Cultural Resources[b]	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: Known **Manhattan/Cold War** Direct: None Indirect: Known	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: Known **Manhattan/Cold War** Direct: None Indirect: Known

a. Threat to groundwater or the Columbia River from Group A and B primary contaminants (PCs) (Table 6-1, CRESP 2015) remaining in the vadose zone. There are no vadose zone inventories associated with this EU (i.e., burial ground trenches are isolated from the vadose zone during the evaluation period), and thus no threat to the vadose zone, groundwater, or the Columbia River.

b. For both Ecological and Cultural Resources see Appendices J and K, respectively, for a complete description of Ecological Field Assessments and literature review for Cultural Resources. Ecological ratings are described in Table 4-11 of the Final Report.

c. Proposed method: Dependent on D&D Methods yet to be determined. (Unknown)

d. Insufficient information

SUPPORT FOR RISK AND IMPACT RATINGS FOR EACH POPULATION OR RESOURCE HUMAN HEALTH

Current

The following accidents are analyzed in the Hazards Assessment with only qualitative rankings of consequences provided[10]. Two accidents resulted with estimated "high" unmitigated impacts to facility personnel and co-located persons and "low" unmitigated impacts to a member of the public.

Criticality accident: Exposure of worker from radiation due to criticality due to the any of the following postulated occurrences: relocation of fissile material due to movement, addition of reflector; Introduction of moderator; Operator error

Earthquake: Release of radioactive material from containers to environment due to earthquake

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

The risks and potential impacts of the Mixed Waste Trenches post cover placement will depend on the design of the cover, which is not yet determined.

Groundwater, Vadose Zone, and Columbia River

There are no reported vadose zone inventories (i.e., reported inventories are in the burial ground trenches that are considered isolated from the environment during the evaluation period) and thus no significant threats to the vadose zone, groundwater, or the Columbia River for the purposes of this Review.

Ecological Resources

Current

12% of EU and 15% of the buffer area are level 3 or higher resources. EU borders level 2 resources (formerly burned area). Level 3 resources are from past revegetation effort, after large fire in 2000 (24 Command Fire).

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

Uncertainties in the remediation activities make it difficult to predict the extent and magnitude of impacts to the EU and buffer. Medium impacts would occur from truck traffic, introduction of invasive species, compaction of soil, and loss of seed banks.

Cultural Resources

Current

Much of the land within the EU is extensively disturbed. A portion of the EU has been inventoried for cultural resources. Geomorphology indicates a moderate potential to contain intact archaeological resources on the surface and/or subsurface. Traditional cultural places are visible from EU. Three archaeological resources are located within 500 meters of the EU.

The National Register eligible Manhattan Project/Cold War Era significant resource located within 500 meters of the EU has already been mitigated.

[10] HNF 15589, Rev 8, Criticality (pages A-156, A-157), Earthquake (pages A-168, A-169), Fire (pages A-2, A-3), Spill (page A-115)

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

Archaeological investigations and monitoring may need to occur prior to remediation. The geomorphology indicates a moderate potential for intact archaeological resources. Remediation disturbance may result in impacts to archaeological resources if they are present in the subsurface. No cleanup decisions have been selected, however the potential range of impacts could include: Temporary indirect effects during remediation; Permanent indirect effects are possible if contamination remains after remediation and from capping.

The National Register eligible Manhattan Project/Cold War Era significant resource located within 500 meters of the EU has already been mitigated.

Considerations for Timing of the Cleanup Actions

The Mixed Waste Trenches (Trenches 31 and 34) will continue to receive MLLW and some LLW from on-site and off-site generators until the Trench is full. At this time, a cover will be placed on the Trench. No time estimate is provided of when the Trenches will be completely used.

Near-Term, Post-Cleanup Risks and Potential Impacts

The risks and potential impacts of the Mixed Waste Trenches post cover placement will depend on the design of the cover, which is not yet determined.

PART II. ADMINISTRATIVE INFORMATION

OU AND/OR TSDF DESIGNATION(S)

CP-OP-8200-SW-2

COMMON NAME(S) FOR EU

Mixed Waste Trenches, Trench 31 and Trench 34

KEY WORDS

Mixed Waste Trenches, Trench 31 and Trench 34, 200 West LLBG, 218-W-5 Burial Ground, 200-SW-2 OU, mixed low-level waste (MLLW), low-level waste (LLW)

REGULATORY STATUS: (RCRA, CERCLA, ROD IN DISPOSITION TABLE FOR MANY)

Regulatory basis[11]

- 52 FR 15937, "Radioactive Waste, Byproducts Material Final Rule," *Federal Register*, Vol. 52, p. 15937, May 1, 1987.
- *Atomic Energy Act of 1954*, as amended, 42 USC 2011, Pub. L. 83-703, 68 Stat. 919. Available at: http://epw.senate.gov/atomic54.pdf.
- *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 USC 9601, et seq., Pub. L. 107-377. Available at: http://epw.senate.gov/cercla.pdf.

[11] DOE-RL-2014-43, Rev 0, page 4-1

- Hanford Facility RCRA Permit (WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*),
- 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*, 42 USC 6901, et seq. Available at: http://www.epa.gov/epawaste/inforesources/online/index.htm.
- WA7890008967, 2009, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, Class 1 Modification, Washington State Department of Ecology, Richland, Washington.
- WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code,* Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.
    - 303-040 "Knowledge" [12]
    - 303-140 [13]
    - 303-300 [14]
    - 303-610, "Closure and Post-Closure."[15]
    - 303-645, "Releases from Regulated Units." [16]
    - 303-665, "Landfills." [17]
    - 303-64620, "Requirements." [18]
- The current mixed waste disposal trenches receive LLMW and LLW that meets the applicable land disposal restrictions as directed by ROD 69 FR 39449[19]

All waste disposed in the LLBG Trenches 31 & 34 must meet the requirements of the Washington State Department of Ecology Dangerous Waste Regulations, Washington Administrative Code (WAC) 173-303-300, General Waste Analysis and Land Disposal Restriction (LDR) requirements.[20]

When collecting documentation on a waste stream or container, the LLBG Trenches 31 & 34 must determine if the information provided by the generator meets the definition of *Knowledge* in WAC 173-303-040. [21]

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[12] CHPRC-0198, Rev 0, page 2

[13] CHPRC-0198, Rev 0, page 2

[14] CHPRC-0198, Rev 0, page 1

[15] DOE-RL-2014-43, Rev 0, page 4-1

[16] DOE-RL-2014-43, Rev 0, page 4-1

[17] DOE-RL-2014-43, Rev 0, page 4-1

[18] DOE-RL-2014-43, Rev 0, page 4-1

[19] US Department of Energy (DOE) (2004). Record of Decision for the Solid Waste Program, Hanford Site, Richland, WA: Storage and Treatment of Low-Level Waste and Mixed Low-Level Waste; Disposal of Low-Level Waste and Mixed Low-Level Waste, and Storage, Processing, and Certification of Transuranic Waste for Shipment to the Waste Isolation Pilot Plant. Federal Register Vol. 69 Issue No. 125, Wednesday, June 30, 2004. **(URL: https://www.gpo.gov/fdsys/pkg/FR-2004-06-30/pdf/04-14806.pdf)**.

[20] CHPRC-0198, Rev 0, page 1

21 CHPRC-0198, Rev 0, page 2

The Hanford Facility is required to test certain mixed wastes when treatment standards are expressed as concentrations to ensure that the waste or treatment residues are in compliance with applicable LDR requirements (Section 2.1.3.2 and 7.3). Such testing will be performed according to the frequency specified in this WAP, as stated in 40 CFR 268.7(b), incorporated in reference by WAC 173-303-140. [22]

Applicable regulatory documentation

Ecology, 1996, "Concerning the Effective Date for Mixed-Waste Regulation" (letter to Patrick W. Willison, Office of Chief Counsel, U.S. Department of Energy, Richland Operations Office, from Tanya Barnett, Assistant Attorney General), Attorney General of Washington, Ecology Division, Lacey, Washington, September 26.[23]

DOE REG-0271, 2002, *Low-Level Burial Grounds Fact Sheet*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL088-20, Hanford Facility Dangerous Waste Permit Application, LLBG, Chapter 8.0

DOE-STD-3009-94, 2002, *Preparation Guide For U.S Department Of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, U.S. Department of Energy, Washington, D.C.

DOE O 151.1C, *Comprehensive Emergency Management System,*

Applicable Consent Decree or TPA milestones

Ecology, EPA, and DOE, 1989a, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=81.[24]

Ecology, EPA, and DOE, 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, as amended, 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.

TPA Milestone M-015-93B (Submit RCRA Facility Investigation/Corrective Measures Study & Remedial Investigation/Feasibility Study Report and Proposed Corrective Action Decision/Proposed Plan for the 200-SW-2 OU to Ecology)[25]. Ecology is noted as the lead regulatory agency and the TPA milestone date is listed as January 31, 2023 within the TPA milestone list from September 2016.

TPA Milestone M-015-93C (Initiate characterization field work for the 200-SW-2 Operable Unit landfills in accordance with the schedule in the approved RI/FS/RFI/CMS Work Plan) [26]. Ecology is noted as the lead regulatory agency and the TPA milestone date is listed as September 30, 2018 within the TPA milestone list from September 2016.

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22 CHPRC-0198, Rev 0, page 2

23 DOE-RL-2014-43, Rev 0, page 4-1

24 DOE-RL-2014-43, Rev 0, page 4-1

25 http://www.hanford.gov/files.cfm/TPA_PM_List_by_Milestone.pdf, page 1; http://www.hanford.gov/files.cfm/ap-App-D.pdf, page D-2

26 http://www.hanford.gov/files.cfm/TPA_PM_List_by_Milestone.pdf, page 1;

http://www.hanford.gov/files.cfm/ap-App-D.pdf; page D-2

EU Designation: CP-OP-8

RISK REVIEW EVALUATION INFORMATION

Completed

March 10, 2017

Evaluated by

Bethany Burkhardt, Steve Krahn

Ratings/Impacts Reviewed by

Henry Mayer

PART III. SUMMARY DESCRIPTION

The Mixed Waste Trenches (Trenches 31 & 34) are part of the Solid Waste Operations Complex (SWOC) which includes a combination of treatment, storage, and disposal operating unit groups consisting of the Central Waste Complex (CWC), Waste Receiving and Processing Facility (WRAP), T Plant, and Low Level Burial Grounds (LLBG) Trenches 31 & 34.[27] Low Level Burial Ground (LLBG) Trenches 31 & 34 and the associated container storage units are located within 218-W-5 Burial Ground in the 200 West Area. LLBG Trenches 31 & 34 and the associated container storage units provide storage and disposal for Land Disposal Restriction (LDR) compliant mixed waste and treatment of certain waste (Low-level waste [LLW] and mixed low-level waste [MLLW]).[28] The LLBG Trenches 31 & 34 do not receive ignitable, reactive, or incompatible waste.[29] All waste disposed in the LLBG Trenches 31 & 34 must meet the requirements of the Washington State Department of Ecology Dangerous Waste Regulations, Washington Administrative Code (WAC) 173-303-300, General Waste Analysis and LDR requirements.[30]

The LLBG Trenches 31 & 34 operating organization conducts waste management operations in accordance with the design and engineering requirements of waste management structures and equipment, and with all equipment manufacture specifications and operating processes. All waste treatment and/or storage occurring at the Mixed Waste Trenches are performed according to these processes and comply with requirements for labeling, container management, and inspection requirements. [31] The LLBG Trenches 31 & 34 waste tracking processes ensure that the waste received at matches the shipping manifest or transfer documents, and that the waste is tracked through LLBG Trenches 31 & 34. The LLBG Trenches 31 & 34 maintains all the waste tracking information. The LLBG Trenches 31 & 34 operating organization tracks the waste through the following processes: storage, treatment; transfers; and/or final disposal. The waste tracking process provides a mechanism for tracking waste using a unique container identification number. The unique number is a barcode (or equivalent) that is recorded in an electronic data tracking system. This mechanism encompasses waste acceptance, movement, processing, and management of waste. This electronic container tracking system identification number links the hard copy or electronic record to the container. These records

27 CHPRC-01908, Rev 0, page viii

28 CHPRC-01908, Rev 0, page 1

29 CHPRC-01908, Rev 0, page 38

30 CHPRC-01908, Rev 0, page viii

31 CHPRC-01908, Rev 0, page 5

are maintained with such information as the container identification number records contain information on the location, quantity, and physical and chemical characteristics of the waste.[32]

CURRENT LAND USE

The current land use is Industrial for the 200 West Area of the DOE Hanford Site.

DESIGNATED FUTURE LAND USE

The DOE preferred alternative is the Industrial Exclusive Use Category for 200 West area[33].

PRIMARY EU SOURCE COMPONENTS

Groundwater Plumes

Not applicable

Operating Facilities

The Mixed Waste Trenches (Trenches 31 & 34) are part of the Solid Waste Operations Complex (SWOC) which includes a combination of treatment, storage, and disposal operating unit groups consisting of the Central Waste Complex (CWC), Waste Receiving and Processing Facility (WRAP), T Plant, and Low Level Burial Grounds (LLBG) Trenches 31 & 34.[34]

Low Level Burial Ground (LLBG) Trenches 31 & 34 and the associated container storage units are located within 218-W-5 Burial Ground in the 200 West Area. LLBG Trenches 31 & 34 and the associated container storage units provide storage and disposal for Land Disposal Restriction (LDR) compliant mixed waste and treatment of certain waste (Low-level waste [LLW] and mixed low-level waste [MLLW]).[35] The LLBG Trenches 31 & 34 do not receive ignitable, reactive, or incompatible waste.[36]

The LLBG Trenches 31 & 34 operating organization conducts waste management operations in accordance with the design and engineering requirements of waste management structures and equipment, and with all equipment manufacture specifications and operating processes. Before any storage, treatment, and/or disposal of waste, the LLBG Trenches 31 & 34 processes in place for safe management of the waste are performed by considering actual or potential risks posed by the waste and the storage, treatment, and/or disposal equipment. LLBG Trenches 31 & 34 conducts all waste treatment and/or storage according to these processes and complies with requirements for labeling, container management, and inspection requirements. [37]

[32] CHPRC-01908, Rev 0, pages 1-2

[33] DOE-EIS-0222 CLUP-EIS Summary document, Figure S-10 on page 45/131

[34] CHPRC-01908, Rev 0, page viii

[35] CHPRC-01908, Rev 0, page 1

[36] CHPRC-01908, Rev 0, page 38

[37] CHPRC-01908, Rev 0, page 5

LOCATION AND LAYOUT MAPS

The 200 Area LLBGs are located on the Hanford Site in the southeast corner of Washington State. The Hanford Site is located in a structural and topographic depression of the Columbia Plateau called the Pasco Basin. The northern and eastern boundaries of the site generally follow the Columbia River. The western margin of the site is generally bounded by the Rattlesnake Hills. The southern boundary of the site is approximated by the ridgeline of Rattlesnake Mountain and the Yakima River. The Hanford Site covers an area of about 1,500 km^2 (580 mi^2). With the exception of a few natural basalt hills (e.g., Gable Butte and Gable Mountain), the central area of the site is relatively flat, with a topographic low at the Columbia River [about 100 to 120 m (300 to 390 ft) above sea level] and a gradual increase in elevation toward the north-central part of the site. The 200 Area LLBGs are located in this region, commonly referred to as the 200 Area Plateau. The elevation of the burial grounds is about 225 m (738 ft). The nearest population center consists of three small cities (Richland, Kennewick, and Pasco) that are situated to the southeast of the site on the Columbia River. The population living within 80 km (50 mi) of the burial grounds is about 375,000.

Figure H.10-1. CP-OP-8 (Mixed Waste Trenches) Site Location Map and Facility Locations

Trenches 31 and 34 are large rectangular excavations in the southwest corner of the 218-W-5 Landfill, currently operated as disposal units for mixed waste and are RCRA TSD landfills. As of 2015, Trench 34 is partially filled and Trench 31 is still unused and awaiting use. [38] Trenches 31 and 34 are shown in Figure

[38] DOE-RL-2014-43, Rev 0, Figure 2-5, page 2-15

H.10-2 as part of the 218-W-5 Landfill. The green section of Trench 34 denotes mixed waste disposed after August 19, 1987 – which is subject to the RCRA TSD standards. Mixed waste disposed to the RCRA landfills after the effective date of regulation historically have been coded on RCRA Part A Permit application maps with the color green (see Figure H.10-2). These disposal locations have been referred to as "Green Islands." Technically, "Green Islands" are subject to regulation as RCRA landfills. The area where waste was disposed is referred to as Green Islands. These unlined trenches of the landfills were originally designated as containing LLW. After burial, the waste was reclassified as mixed waste for the following reasons:[39]

- Certain waste that was disposed during a three-month period in 1987. The effective date of mixed waste regulation was changed from November 23, 1987 to August 19, 1987. The waste disposed during this period was deemed mixed waste by the U.S. Attorney General's Office on September 24, 1996.
- Mixed waste was disposed to unlined trenches in the landfills in 1988, 1989, and 1993. This practice was administratively discontinued on January 11, 1996, when DOE informed Ecology that mixed waste disposal would comply with all applicable requirements.
- Certain Lawrence Berkeley National Laboratory (LBNL) waste was disposed as LLW in 1990, 1994, and 1995. Subsequent to burial, LBNL informed DOE that additional process knowledge resulted in a mixed waste designation.

[39] DOE-RL-2014-43, Rev 0, Page 3-1

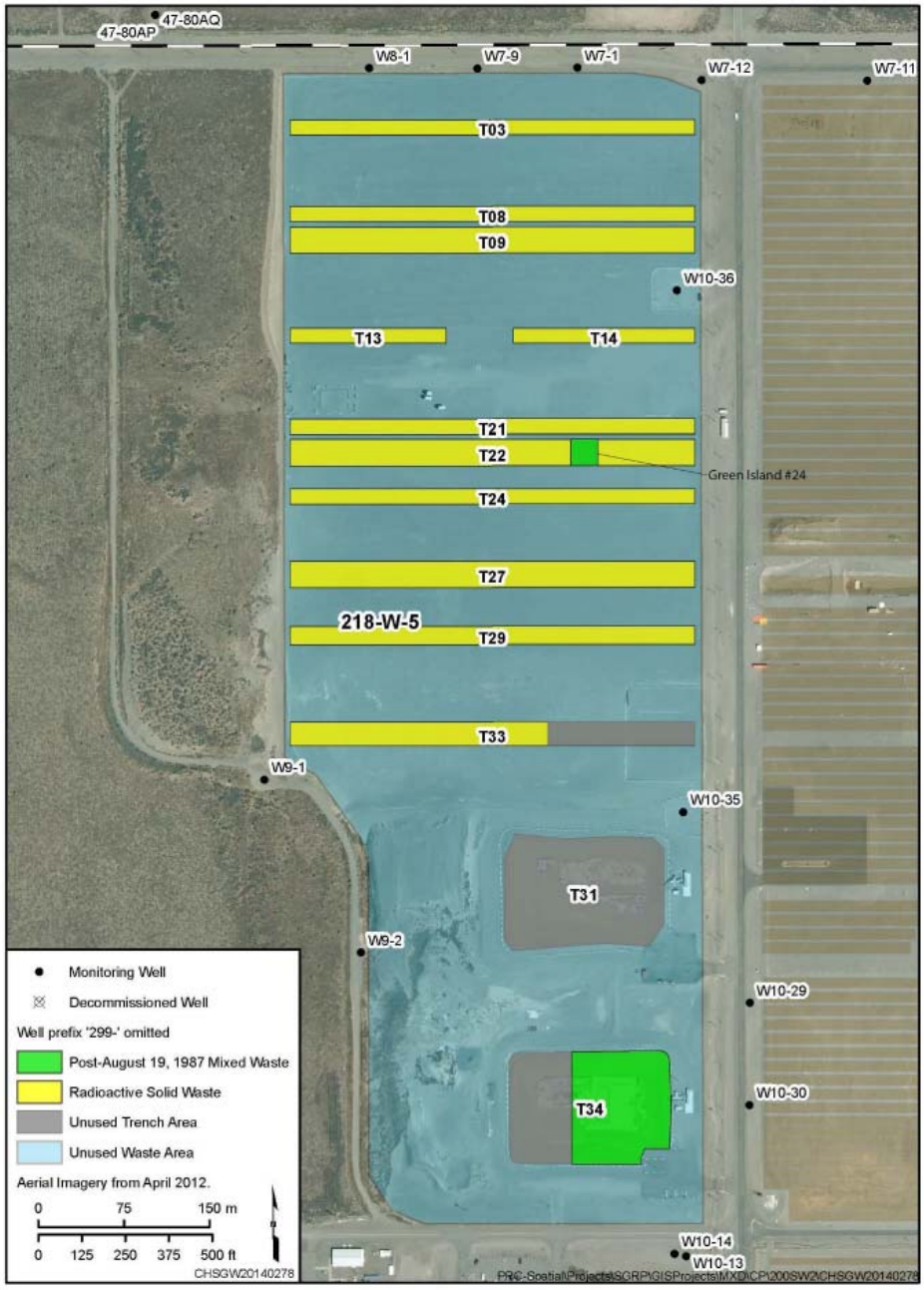

Figure H.10-2. 218-W-5 Landfill[40]

[40] DOE-RL-2014-43, Rev 0, Figure 2-5, page 2-15

Figure H.10-3 shows the location of the LLBGs. Six LLBGs in the 200 Areas received LLW and MLLW after September 26, 1988, and are, therefore, subject to the requirements of DOE O 435.1 Chg 1. These include four LLBGs in the 200 West Area (218-W-5, 218-W-3A, 218-W-3AE, and 218-W-4C, as shown in Figure H.10-4).[41]

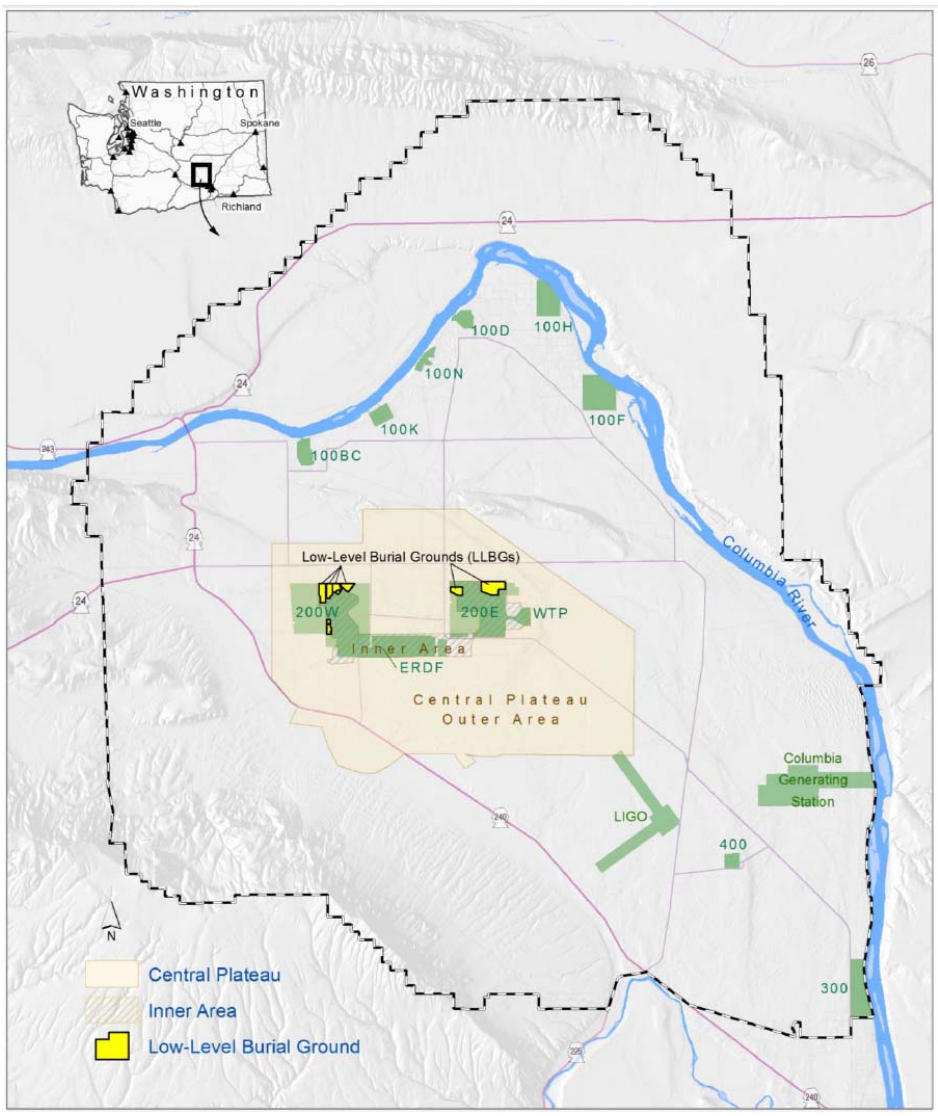

Figure H.10-3. Location of the Low-Level Burial Ground (LLBG)[42]

41 DOE-RL-2014-47, Rev 0, page 1-1

42 DOE-RL-2014-47, Rev 0, Figure 1-1, page 1-2

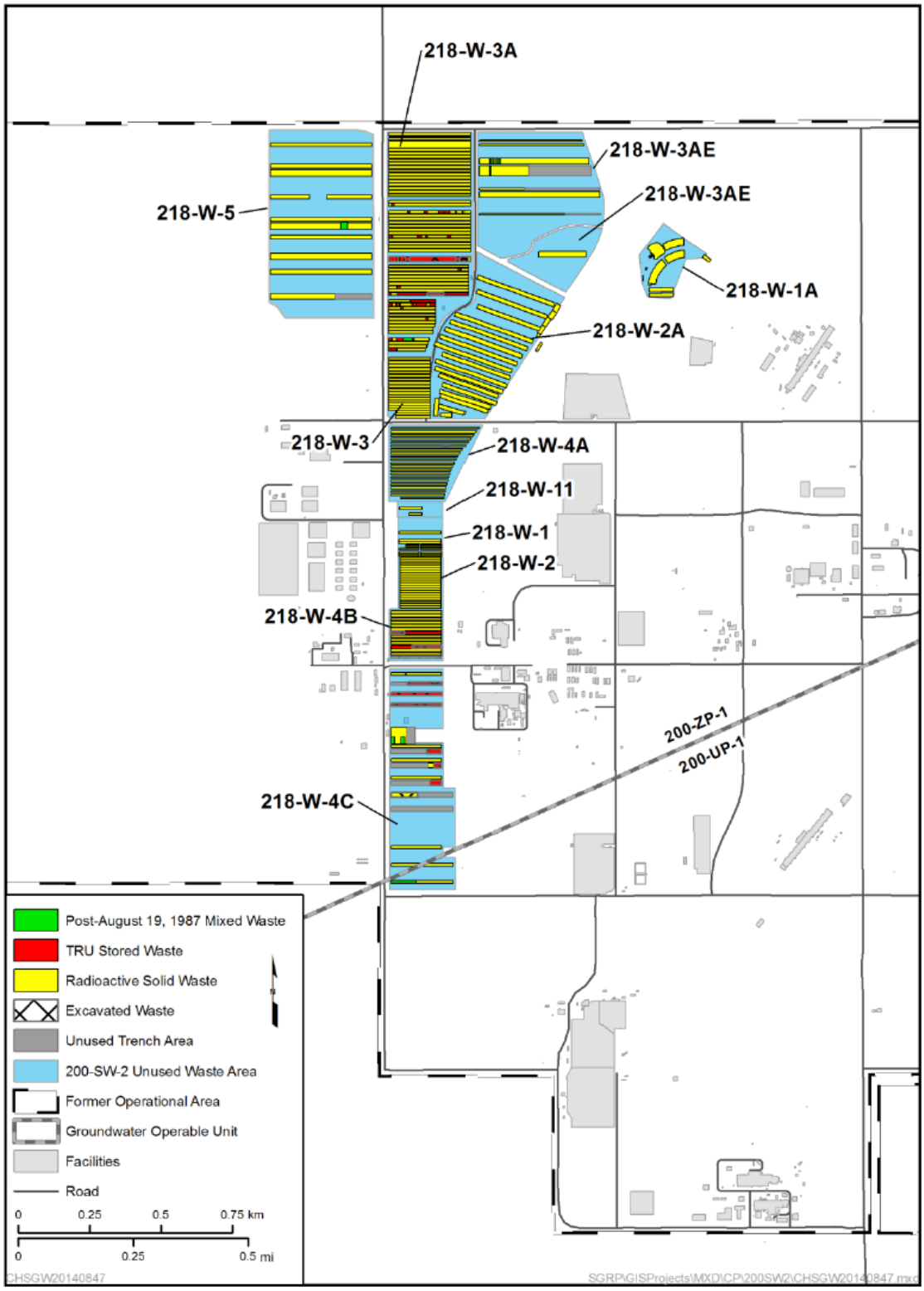

Figure H.10-4. LLBGs in the 200 West Area

PART IV. UNIT DESCRIPTION AND HISTORY

EU FORMER/CURRENT USE(S)

Sites included in the 200-SW-2 OU primarily consist of constructed (e.g., vertical pipe units and caissons) or excavated sites (landfills) that received either low-level waste (LLW) or mixed waste. The sites also were used for the storage of retrievably stored waste (RSW). Large landfills, each consisting of a number of trenches, were used in the 200 East and 200 West Areas. While storage and retrieval activities are ongoing in multiple trenches, only three trenches continue to be used for disposal—the lined Trenches 31 and 34 in the 218-W-5 Landfill and Trench 94 in the 218-E-12B Landfill. The landfills received wastes such as contaminated equipment, solid laboratory or process waste, and clothing. [43]

Active LLBGs began accepting waste in the early 1960s from processing operations on the Hanford Site and are anticipated to continue to receive waste from on-site and off-site generators until approximately 2045.[44]

Before 1970, LLW was disposed to the same landfill trenches as waste that would have contained transuranic elements and/or mixed fission products (MFP). After 1970, waste that was designated as RSW was segregated in either specified landfill trenches or underground concrete caissons in the 200-SW-2 OU landfills. Wastes were largely solid materials and mostly from onsite, but offsite and small quantities of liquid wastes (tightly packed, generally absorbed, and sealed in drums) are known to have been placed in the landfills. The 200-SW-2 OU landfills are among the largest waste sites at the Hanford Site, and some cover many acres.[45]

In 1979, a large area adjacent to the northwest corner of the 200 West Area was annexed and designated the CWC (also known as the 218-W-5 Landfill). The landfills stopped receiving waste in 2004. The landfill is at the southwest corner of the intersection of 27th Street and Dayton Avenue. This landfill began receiving waste in 1985 and covers 38.5 ha (95 ac). Within the large annex, 38 ha (94 ac) currently are permitted as a LLW landfill. Original plans called for the area to contain 18 LLW trenches and 4 mixed waste trenches. The landfill was expanded by annexing land to the west and north and was designed to contain 56 trenches, all oriented east-west. Of these, only 11 LLW trenches were constructed and received waste. [46]

Mixed waste disposed after August 19, 1987, is subject to the RCRA TSD standards. Mixed waste disposed to the RCRA landfills after the effective date of regulation historically have been coded on RCRA Part A Permit application maps with the color green (see Figure H.10-2). These disposal locations have been referred to as “Green Islands” and include a portion of Trench 34 and Trench 22 (which is not evaluated as part of this EU). Technically, “Green Islands” are subject to regulation as RCRA landfills. The area where waste was disposed is referred to as Green Islands. These unlined trenches of the landfills were originally designated as containing LLW. After burial, the waste was reclassified as mixed waste for the following reasons:[47]

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43 DOE-RL-2014-43, Rev 0, Page 1-1

44 DOE-RL-2000-70, Rev 0, page 1-1

45 DOE-RL-2014-43, Rev 0, Page 1-1

46 DOE-RL-2014-43, Rev 0, Page 2-10

47 DOE-RL-2014-43, Rev 0, Page 3-1

- Certain waste that was disposed during a three-month period in 1987. The effective date of mixed waste regulation was changed from November 23, 1987 to August 19, 1987. The waste disposed during this period was deemed mixed waste by the U.S. Attorney General's Office on September 24, 1996.
- Mixed waste was disposed to unlined trenches in the landfills in 1988, 1989, and 1993. This practice was administratively discontinued on January 11, 1996, when DOE informed Ecology that mixed waste disposal would comply with all applicable requirements.
- Certain Lawrence Berkeley National Laboratory (LBNL) waste was disposed as LLW in 1990, 1994, and 1995. Subsequent to burial, LBNL informed DOE that additional process knowledge resulted in a mixed waste designation.

Trenches 31 and 34 are large rectangular excavations in the southwest corner of the 218-W-5 Landfill, currently operated as disposal units for mixed waste and are RCRA TSD landfills. As of 2015, Trench 34 is partially filled and Trench 31 is still unused and awaiting use. [48] The trenches are constructed with polyethylene liners and leachate collection systems. [49]

The activities at these trenches, whether for LLW or LLMW, involve several common steps:

• Waste transfer to a disposal trench area

• Waste receipt

• Container handling

• Inspection and survey

• Staging and disposal

• Trench construction, backfilling, and capping

• Stabilization and grouting

• Waste treatment

LEGACY SOURCE SITES

Not Applicable

GROUNDWATER PLUMES

Not Applicable

D&D OF INACTIVE FACILITIES

Not Applicable

48 DOE-RL-2014-43, Rev 0, Figure 2-5, page 2-15

49 DOE-RL-2014-43, Rev 0, Page 2-10

OPERATING FACILITIES

LLBG Trenches 31 & 34 and the associated container storage units are located within 218-W-5 Burial Ground in the 200 West Area.[50] The first waste receipts were in 1986. Several different trench designs (cross-sections) have been constructed in this burial ground. The 218-W-5 burial ground is approximately 37.2 hectares (91.9 acres) in size and currently contains a total of thirteen trenches. Trenches 31 and 34 at the south end of the facility are RCRA-compliant trenches with liner and leachate collection systems for disposal of MLLW. The facility has received both Category I and Category 3 wastes (unsegregated). Trenches 22 and 24 contain post-August 19, 1987 RCRA and state-regulated MLLW. There is no retrievable TRU in this burial ground.[51]

LLBG Trenches 31 & 34 and the associated container storage units provide storage and disposal for Land Disposal Restriction (LDR) compliant mixed waste and treatment of certain waste in LLBG Trenches 31 & 34.[52] Trenches 31 and 34 are large rectangular excavations in the southwest corner of the 218-W-5 Landfill, currently operated as disposal units for mixed waste and are RCRA TSD landfills. As of 2015, Trench 34 is partially filled and Trench 31 is still unused and awaiting use.[53] The trenches are constructed with polyethylene liners and leachate collection systems.[54]

Five additional trenches are planned for 218-W-5 burial ground. [55] Future trenches are likely to vary in size, shape, and other design details. However, from a safety standpoint, they will be identical in that they will be in compliance with the applicable regulations.[56]

1. Processes that produced the radioactive material and waste contained in the facility

Waste acceptance processes for the LLBG Trenches 31 & 34 and the associated container storage units exist for newly generated waste, SWOC transfers (include T Plant, CWC, and WRAP facilities), WRP waste[57], LLBG Trenches 31 & 34 Generated waste, and off-site generators (Lawrence Berkeley National Laboratory [LBNL] [58]).

2. Primary radioactive and non-radioactive constituents that are considered risk drivers

Primary radioactive constituents: LLW and MLLW

Primary non-radioactive constituents: hazardous (chemical) waste. Some of the chemicals tested for their presence within the MLLW are: cyanide, sulfide, PBCs, total organic carbon, organic halides, total

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50 DOE-RL-2014-43, Rev 0, Figure 2-5, page 2-15

51 DOE-RL-2000-70, Rev 0, page 2-9

52 CHPRC-01908, Rev. 0, page 1-2

53 DOE-RL-2014-43, Rev 0, Figure 2-5, page 2-15

54 DOE-RL-2014-43, Rev 0, Page 2-10

55 DOE-RL-2000-70, Rev 0, page 2-9

56 DOE-RL-2000-70, Rev 0, page 2-7 through 2-8

57 The LLBG Trenches 31 & 34 does not accept Waste Retrieval Project (WRP) waste transfers. WRP waste will be transferred and processed at other SWOC TSD units or an off-site TSD facility. Any acceptance of WRP waste at LLBG Trenches 31 & 34 will occur as newly generated waste or as a SWOC Transfer. CHPRC-01908, Rev 0, page 21

58 DOE-RL-2014-43, Rev 0, Table 205, page 2-13

suspended solids, volatile organic compounds, chlorinated herbicides, arsenic, barium, cadmium, chromium, lead, mercury, silver, selenium, antimony, beryllium, nickel, and thallium.[59]

3. Containers or storage measures are used for radioactive materials at the facility

Low-level mixed waste (MLLW) has been stored and disposed in active LLBGs in various containers including drums and boxes made of steel, wood, and cardboard. Bulk contaminated equipment and soils have also been disposed in LLBG trenches.[60]

The current MLLW disposal trenches receive waste that meets the applicable land disposal restrictions/requirements. MLLW trenches can also be permitted for greater-than-90-day storage prior to going to the disposal mode. Waste forms are containerized, inherently stable, and/or bulk waste. If approved by the LLBG operating contractor, nonstandard waste packages and miscellaneous equipment waste may also be placed in a MLLW disposal trench.[61]

Waste streams received for final disposal in LLBG Trenches 31 & 34 may be stored on the associated container storage units. For waste that meets the applicable LDR requirements, the LLBG Trenches 31 & 34 operating organization maintains all the information to demonstrate how these requirements have been met. The Hanford Facility is required to test certain mixed wastes when treatment standards are expressed as concentrations to ensure that the waste or treatment residues are in compliance with applicable LDR requirements.

4. Classification of radioactive material and waste contained or stored within the facility

Low-level waste (LLW)[62] and mixed low-level radioactive waste (MLLW). [63]

Mixed waste is defined as low level radioactive waste that also contains dangerous and/or hazardous constituents. In anticipation of the potential for mixed waste to be subject to the *Resource Conservation and Recovery Act of 1976* (RCRA), radioactive waste disposal operations undertook the practice of segregating LLW from mixed waste in July 1986.[64]

5. Average and maximum occupational radiation doses incurred at the facility

Annual dosimeter results of individual workers from 2013 and 2014 are shown below in Table H.10-2. The Mixed Waste Trenches are not listed below in Table H.10-2 but it could be estimated that the doses would range from lower to similar to the 200 West area dosimeter results.

59 CHPRC-01908, Rev 0, Table 3, pages 28-30

60 DOE-RL-2000-70, Rev 0, page 1-1

61 DOE-RL-2000-70, Rev 0, page 2-7 through 2-8

62 DOE-RL-2014-47

63 Some of the LLW originally disposed was re-classified as MLLW (post-August 19, 1987, DOE-RL-2014-47, Rev 0, page 3-1)

64 DOE-RL-2014-43, Rev 0, page 1-1

Table H.10-2. Thermoluminescent Dosimeter Results (2013 and 2014) [65]

(millirem/year) [a]

Location	No. of Dosimeters	2013		2014		Percentage Change [e]
		Maximum [b]	Average [c, d]	Maximum [b]	Average [c, d]	
100-K	14	112 ± 12	86 ± 17	177 ± 140	89 ± 52	3
100-N	1	87 ± 13	84 ± 7	91 ± 14	82 ± 14	-2
200-East	42	230 ± 131	105 ± 56	217 ± 256	104 ± 57	0
200-West	24	158 ± 9	104 ± 41	157 ± 14	102 ± 42	-1
200-North	1	91 ± 14	86 ± 14	107 ± 16	91 ± 27	5
300 Area	8	124 ± 9	95 ± 26	114 ± 14	90 ± 20	-4
300 TEDF	6	93 ± 13	91 ± 4	91 ± 14	88 ± 8	-2
400 Area	7	100 ± 58	92 ± 9	98 ± 11	88 ± 11	-3
618-10	4	84 ± 11	83 ± 3	81 ± 8	80 ± 2	-2
CVDF	4	82 ± 13	80 ± 3	78 ± 9	77 ± 2	-2
ERDF	3	91 ± 11	88 ± 6	89 ± 22	84 ± 8	-4
IDF	1	102 ± 15	92 ± 16	97 ± 14	90 ± 13	-1

[a] To convert to international metric system units, multiply millirem/year by 0.01 to obtain millisievert/year.
[b] Maximum values are ± analytical uncertainty.
[c] ± 2 standard deviations.
[d] Each dosimeter is collected and read quarterly.
[e] Numbers indicate a decrease (-) or increase from the 2013 mean.

CVDF = Cold Vacuum Drying Facility (100-K Area).
ERDF = Environmental Restoration Disposal Facility (200-West Area).
IDF = Integrated Disposal Facility (200-East Area).
TEDF = 300 Area Treated Effluent Disposal Facility.

It was estimated that less than 5 percent of MLLW is expected to be Remote Handled (RH) material. RH MLLW will be shielded or backfilled to minimize worker exposure.[66]

6. Processes and operations conducted within the facility

The LLBG Trenches 31 & 34 is located in the 200 West Area of the Hanford Site. LLBG Trenches 31 & 34 is a land based unit within the 218-W-5 Burial Ground. The LLBG Trenches 31 & 34 and the two associated waste storage pads provide storage and disposal for treated and LDR compliant dangerous and/or mixed waste. LLBG Trenches 31 & 34 and the associated waste storage pads waste management capabilities including:[67]

- Receiving.
- Storing of LDR compliant waste awaiting final disposal or non-LDR compliant waste where treatment in the trench will be performed.
- Visual inspection.

These waste processes include (see Figure H.10-5 through Figure H.10-7):

[65] DOE/RL-2014-52, Table 4.1., pg. 4.2

[66] DOE-RL-2000-70, Rev 0, page 2-7 through 2-8

[67] CHPRC-01908 Rev 0, page 1

- Assessment and evaluation of the waste stream information. This process ensures conformance with the LLBG Trenches 31 & 34 and associated container storage units waste acceptance requirements prior to acceptance.
- Receipt and acceptance of dangerous and/or mixed waste.
- Completion and submittal of a waste stream data package.
- The LLBG Trenches 31 & 34 generation of new dangerous and/or mixed waste during processing.
- LLBG Trenches 31 & 34 management of the accepted waste for treatment (macroencapsulation) and/or disposal.

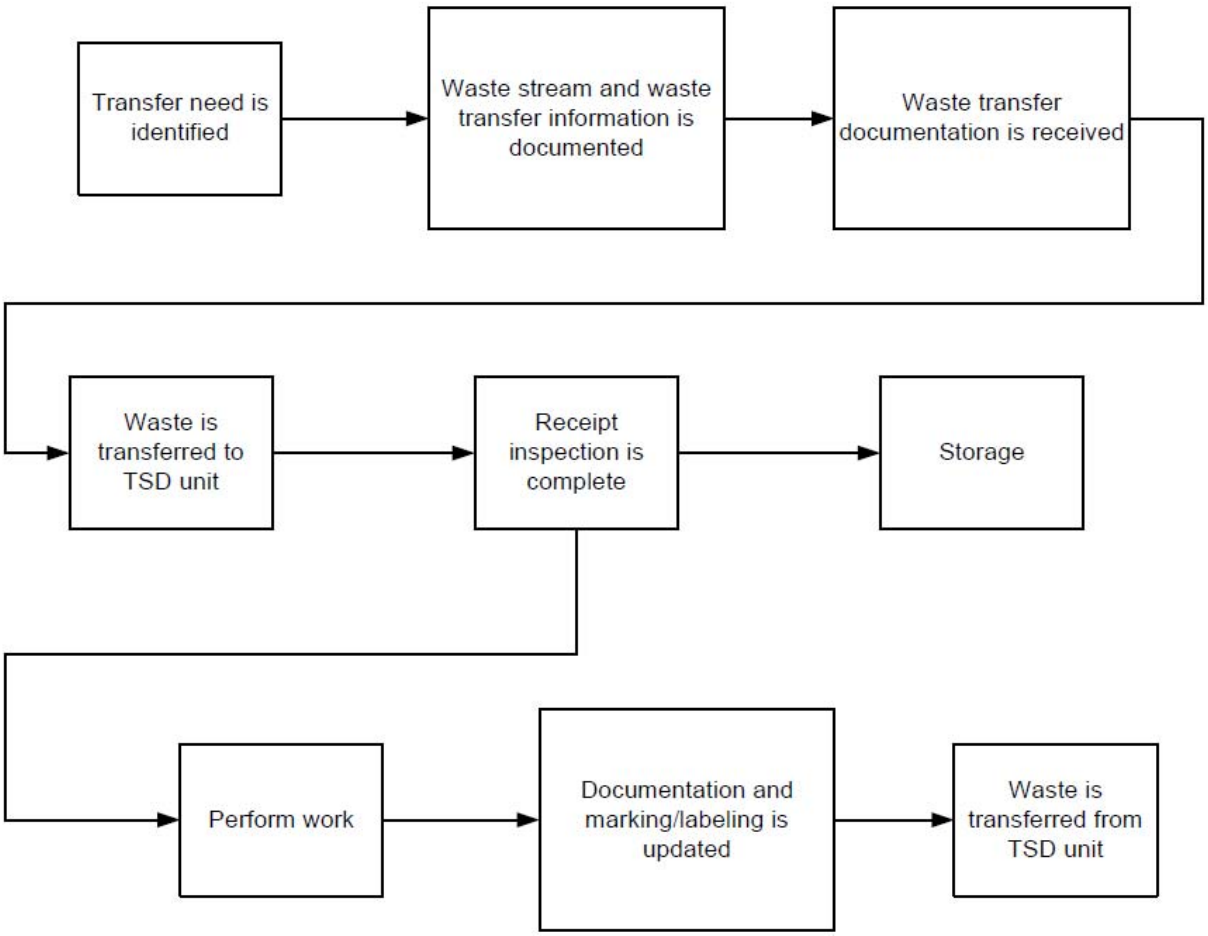

Figure H.10-5. Waste Transfers between Solid Waste Operations Complex (SWOC) Treatment, Storage, and/or Disposal (TSD) Units[68]

[68] CHPRC-01908, Rev 0, Figure 3, page 10

LLBG Trenches 31 & 34 waste management operations are conducted in accordance with the requirements of the WAP. Before a waste is accepted into LLBG Trenches 31 & 34, its properties are evaluated to determine if the waste can be safely managed within LLBG Trenches 31 & 34 (as shown in Figure H.10-6 and Figure H.10-7)

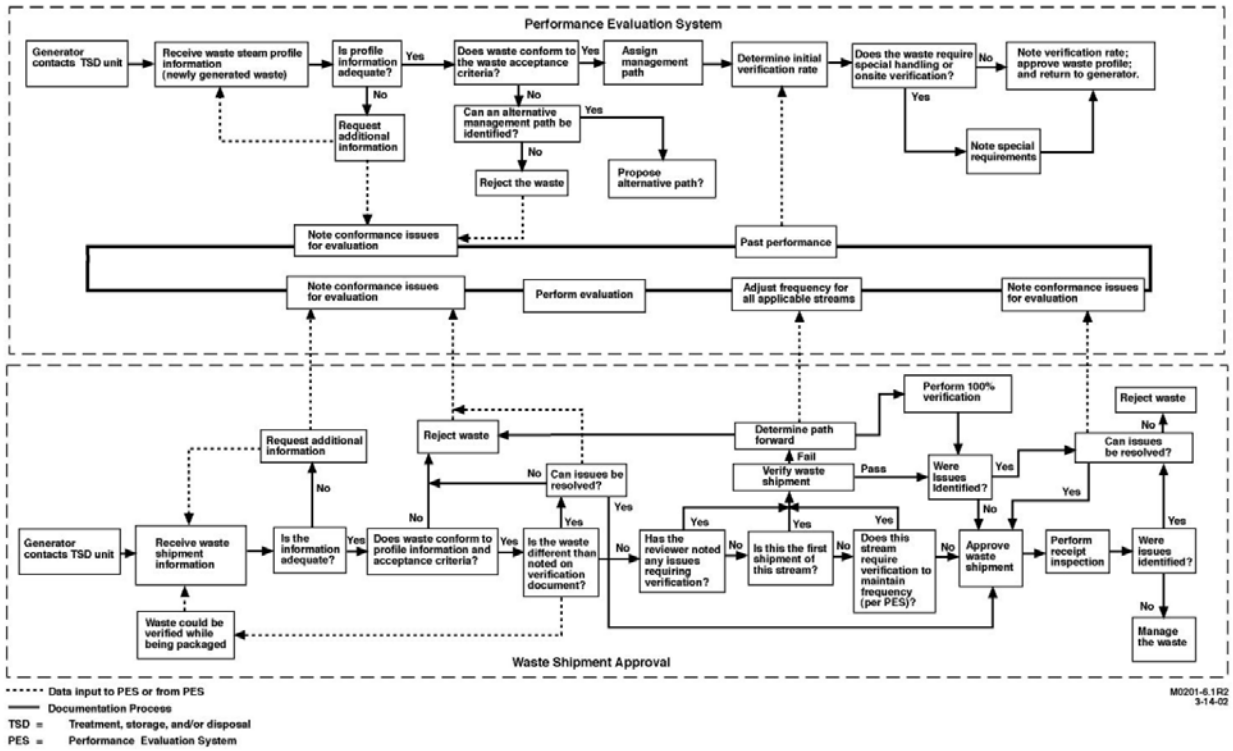

Figure H.10-6. Waste Acceptance Process[69]

[69] CHPRC-01908, Rev 0, Figure 4, page 13

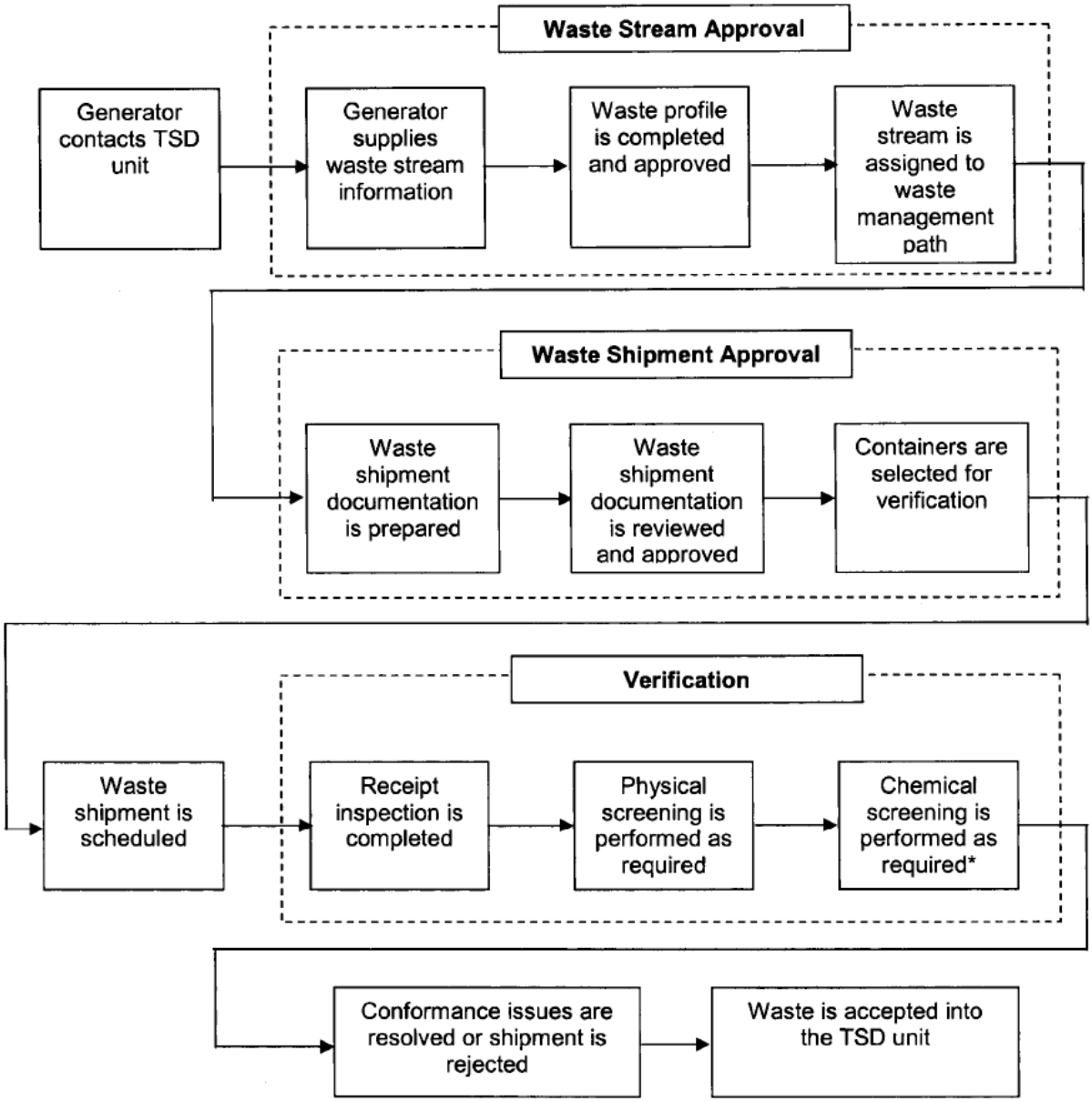

Figure H.10-7. Waste Confirmation and Acceptance Process for Newly Generated Waste[70]

70 CHPRC-01908, Rev 0, Figure 1, page 8

The confirmation process used to meet WAC 173-303-300 requirements includes completing preshipment reviews and verification steps. The four confirmation processes are identified as follows (and as shown in Figure H.10-8)[71]

- Newly generated waste for non-LLBG Trenches 31 & 34 onsite generating locations and offsite generators
- Waste transfers of previously accepted waste between SWOC TSD Units
- Waste Retrieval Project (WRP) waste transfers
- LLBG Trenches 31 & 34 generated waste

The LLBG Trenches 31 & 34 does not accept WRP waste transfers. WRP waste will be transferred and processed at other SWOC TSD units or an off-site TSD facility. Any acceptance of WRP waste at LLBG Trenches 31 & 34 will occur as newly generated waste or as a SWOC Transfer.[72]

In general, mixed waste received from onsite generators is managed the same as waste received from offsite generators. Differences include, but are not limited to the following: (1) physical/chemical screening frequencies for verification (minimum percentages of 5 percent for waste from onsite generators and 10 percent for waste from offsite generators [note that chemical screening frequency depends on the physical screening frequency]), (2) shipping documentation (Uniform Hazardous Waste Manifests are used for waste from offsite generators and shipping documents are used for waste from onsite generators), and (3) LDR documentation requirements for mixed or dangerous waste (notification for waste from offsite generators and equivalent information from onsite generators). Trenches 31 & 34 do not receive ignitable, reactive, or incompatible waste.[73]

Treatment Standards for dangerous wastes must be met before disposal. Waste streams received for final disposal in LLBG Trenches 31 & 34 may be stored on the associated container storage units once ensures that the waste or treatment residues are in compliance with applicable LDR requirements. Such testing will be performed according to the frequency specified in the Waste Acceptance Plan (WAP), as stated in 40 CFR 268.7(b), incorporated in reference by WAC 173-303-140.[74]

71 CHPRC-01908, Rev 0, page 11

72 CHPRC-01908, Rev 0, page 21

73 CHPRC-01908, Rev 0, page 38

74 CHPRC-01908, Rev 0, page 2

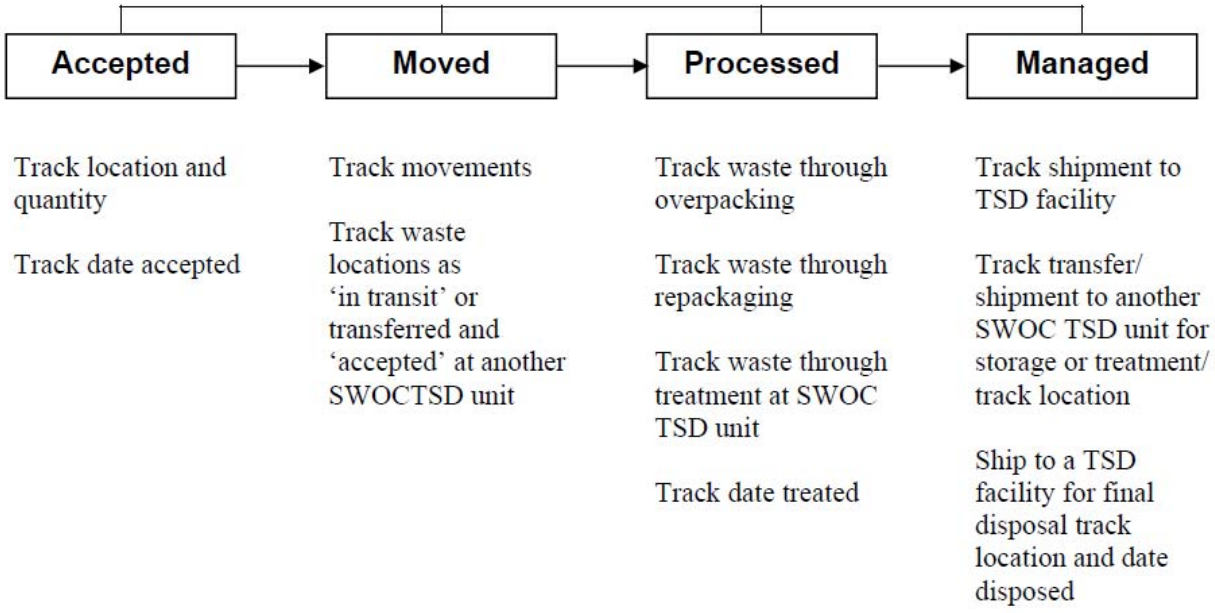

Figure H.10-8. Waste Tracking Procedure[75]

Waste designated within the Waste Acceptance Plan (WAP: CHPRC-01908, Rev 0) are accepted and stored at LLBG Trenches 31 & 34. Waste is designated by their dangerous waste numbers, quantities, and design capacity and is pursuant to WAC 173-303 using manufacturer's product information, MSDS, laboratory analysis, and reference material such as *Registry of Toxic Effects of Chemical Substances* (NIOSH). [76]

When collecting documentation on a waste stream or container, the LLBG Trenches 31 & 34 must determine if the information provided by the generator meets the definition of *Knowledge* in WAC 173-303-040. Knowledge requirements will be met by sampling and analysis, and/or historical data. Historical data consists of detailed information from existing waste analysis data or information on processes similar to those that generated the waste, including the following:[77]

- Mass balance from a controlled process that has a specified input for a specified output.
- Material safety data sheets (MSDSs) on unused chemical products.
- Test data from a surrogate sample.
- Analytical data on the waste.
- Interview information.
- Logbooks.
- Procurement records.
- Processes and/or methods.
- Process flow charts.

75 CHPRC-01908, Rev 0, Figure 2, page 9

76 CHPRC-01908, Rev 0, page 7

77 CHPRC-01908, Rev 0, page 2

- Inventory sheets.
- Vendor information.
- Mass balance from an uncontrolled process (e.g., spill cleanup).
- Mass balance from a process with variable controlled inputs and outputs (e.g., washing/cleaning methods).

All information meeting the definition of Knowledge will be applied to designate waste, quantify constituents, and characterize the waste for its safe management to demonstrate compliance with LLBG Trenches 31 & 34 acceptance requirements. Administrative controls to assess an individual generator's performance for applicable waste received at LLBG Trenches 31 & 34 and provides a mechanism for determining corrective actions, resolving waste acceptance issues, and physical screening frequency adjustments when a conformance issue is discovered.[78]

Precautions are taken when ignitable or reactive waste is stored/treated, and the prevention of accepting incompatible waste. LLBG Trenches 31 & 34 manages waste that has been treated to meet LDR and waste that will be treated to meet LDR requirements as described in Section 7.5. This waste material consists of items such as but not limited to personal protective equipment (PPE), rags, and spent equipment contaminated with dangerous cleaning agents, lubricants, paints, or other dangerous materials. Biological waste could consist of animal remains that were used for experiments.[79]

The LLBG Trenches 31 & 34 do not receive ignitable, reactive, or incompatible waste. Pre-shipment review and/or chemical screening requirements will be used to identify whether the waste is ignitable, reactive, or incompatible. The LLBG Trenches 31 & 34 waste acceptance requirements identifies certain management requirements to ensure ignitable, reactive, or incompatible waste is not received. A compatibility review will be performed on wastes being considered for acceptance into the LLBG Trenches 31 & 34: (1) during the waste acceptance process based upon waste chemical characteristics, and/or (2) when additional information becomes available on waste form or waste constituents. The compatibility review process considers the available characterization data and waste designation. The conditions against which compatibility will be measured include the following:[80]

- Amount of material.
- Stability of components and reactivity.
- Consequence of inner containers breaking.
- Compatibility of waste with absorbent.
- Container material.
- Liner Compatibility.

Examples of the waste types are NOT accepted to be disposed in the LLBG Trenches 31 & 34 are as follows:

- Waste is not accepted for disposal when the waste contains free standing liquid unless all free standing liquid:
- Has been removed by decanting or other methods
- Has been mixed with sorbent or stabilized (solidified) so that free standing liquid is no longer observed

78 CHPRC-01908, Rev 0, pages 3-4

79 CHPRC-01908, Rev 0, page 7

80 CHPRC-01908, Rev 0, page 39

- Has been otherwise eliminated
- Container is very small, such as an ampoule
- Container is a lab-pack and is disposed in accordance with WAC 173-303-161
- Container is designed to hold free liquids for use other than storage, such as a battery or capacitor.

There could be cases in which small amounts of residual liquids are present in mixed waste containers because condensate has formed following packaging or free liquids remain in debris items (e.g., pumps, tubing) even after draining. When it is not practical to remove this residual liquid or impossible to sample to determine if liquids are present, the liquid must be eliminated to the maximum extent practical by draining and placing a quantity of sorbent sufficient to sorb all residual liquids in the bottom of the container or dispersed among the waste. Free liquid is determined by SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Method*, Method 9095 (Paint Filter Liquids Test) [WAC 173-303-140(4)(b)] only for waste that has the potential for free liquid formation and cannot be demonstrated through other means.[81]

- Gaseous waste is not accepted for disposal if the waste is packaged at a pressure in excess of 1.5 atmospheres at 20°C.
- Pyrophoric waste is not accepted for disposal. Waste containing less than 1 weight percent pyrophoric material partially or completely dispersed in each package is not considered pyrophoric for the purposes of this requirement.
- Solid acid waste is not accepted for disposal [WAC 173-303-140(4)(c)].
- Untreated extremely hazardous waste is not accepted for disposal. Extremely hazardous waste that has been treated could be disposed and/or stored in accordance with Revised Code of Washington (RCW) 70.105.050(2), "Hazardous Waste Management".
- Untreated organic/carbonaceous waste is not accepted for disposal [WAC 173-303-140(4)(d)] except as allowed by WAC 173-303-140(4)(d)(iii).
- Waste not meeting the applicable treatment standards is not accepted for disposal [40 CFR 268 and WAC 173-303-140(4)] unless it will be treated to meet LDR in LLBG Trenches 31 & 34.
- Incompatible mixed waste and mixed waste incompatible with the liner system is not accepted in LLBG Trenches 31 & 34 disposal unit. Table 1 provides a list of chemicals that have been shown to be incompatible with the liner material in concentrated form. In general, mixed waste that meets federal and state treatment standards is compatible with the liner system. Waste streams are evaluated during pre-transfer/pre-shipment review to ensure that the waste streams do not contain constituents in sufficient concentrations to be incompatible with the liner system in concentration sufficient to degrade the liner.

[81] CHPRC-01908, Rev 0, pages 5-7

Table H.10-3. Chemicals Incompatible with the High-density Polyethylene Liner.

Table 1 Chemicals Incompatible with the High-Density Polyethylene Liner (in concentrated form)

Chemical	CAS Number
Amyl chloride	543-59-9
Aqua regia	8007-56-5
Bromic acid	15541-45-4
Bromobenzene	108-86-1
Bromoform	75-25-2
Calcium bisulfite	13780-03-5
Calcium sulfide	20548-54-3
Diethyl benzene	25340-17-4
Diethyl ether	60-29-7
Bromine	7726-95-6
Chlorine	7782-50-5
Fluorine	7782-41-4
Ethyl chloride	75-00-3
Ethylene trichloride	79-01-6
Nitrobenzene	98-95-3
Perchlorobenzene	118-74-1
Propylene dichloride	78-87-5
Sulfur trioxide	7446-11-9
Sulfuric acid (fuming)	8014-95-7
Thionyl chloride	7719-09-7
Vinylidene chloride	75-35-4

7. Process flow of material into and out of the facility

See responses to Question 6, above. In addition, the LLBG Trenches 31 & 34 waste tracking processes ensure that the waste received at LLBG Trenches 31 & 34 matches the shipping manifest or transfer documents, and that the waste will be tracked through LLBG Trenches 31 & 34. The LLBG Trenches 31 & 34 maintains all the waste tracking information. The LLBG Trenches 31 & 34 operating organization tracks the waste through the following processes: storage, treatment; transfers; and/or final disposal. The waste tracking process provides a mechanism for tracking waste using a unique container identification number. The unique number is a barcode (or equivalent) that will be recorded in an electronic data tracking system. This mechanism encompasses waste acceptance, movement, processing, and management of waste. This electronic container tracking system identification number links the hard copy or electronic record to the container. These records will be maintained with such information as the container identification number records contain information on the location, quantity, and physical and chemical characteristics of the waste.[82]

8. Potential effects of potential delays on the processes, operations, and radioactive materials in the facility

Near-term Future: Delays in the near-term future may affect the receipt of more LLW and MLLW, or the eventual closure of the burial ground.

[82] CHPRC-01908, Rev 0, pages 1-2

9. Other facilities or processes that are involved in the flow of radioactive material into and out of the facility

Other facilities that are involved in the flow of radioactive material into the mixed waste trenches (trenches 31 and 34) are the on-site generators such as CWC, WRAP, T Plant and off-site generators.

10. Shipping of material

LLW and MLLW are received and disposed in active LLBGs in various containers including drums and boxes made of steel, wood, and cardboard. Bulk contaminated equipment and soils have also been disposed in LLBG trenches. Category 3 waste and waste containing certain mobile radionuclides are currently stabilized by placement in concrete vaults/high-integrity containers (HICs) or encasement in concrete.[83]

11. Infrastructure considered a part of the facility

The trenches are constructed with polyethylene liners (geomembranes) and leachate collection systems. The pumps and associated piping are resistant to leachate corrosion. [84]

ECOLOGICAL RESOURCES SETTING

Landscape Evaluation and Resource Classification

Approximately 61% (28.6 acres) of the Mixed Waste Trenches EU holds the mixed waste trenches, which were carved out of east edge of a hill (Appendix J, Table J.99 and Figure J.113). The trenches and surrounding area are graveled and kept free of vegetation and are characterized as level 0 habitat (Appendix J, Table J.99). The slope on the west between the waste trenches and original land surface is covered by a mixture of native and introduced species with only a few successional shrubs and is classified as resource level 1 (Appendix J, Table J.99 and Figure J.113). The remainder of the area is classified as level 2 habitat, with the south portion being of lower quality than the north portion.

The amount and proximity of biological resources surrounding the Mixed Waste Trenches EU were examined within the adjacent landscape buffer area, which extends 2046 ft (624 m) from the geometric center of the EU. Nearly 65% of the combined EU and adjacent buffer area is level 1 or below. Another 34% has been revegetated and is still in recovery after one or more fires in the past 15 years and is classified as level 2. Areas identified as level 3 resources south of the EU are degraded, with sagebrush shrub cover but an understory dominated by Russian thistle and minimal native grass cover.

Field Survey

Over half of the Mixed Waste Trenches EU is bare ground and is classified as level 0 habitat. On the west side is a slope partially covered with a mix of native grasses and introduced grasses and forbs. The western 25% of the EU burned in 2000 and was revegetated with a mixture of native and introduced species in 2001. The southwest corner burned again this summer, leaving bare ground with skeletons of gray rabbitbrush (*Ericameria nauseosa*) and crested wheatgrass (*Agropyron cristatum*) (Appendix J, Table J.98, Survey Area 2-1).

In the northwest corner combined cover of big sagebrush (*Artemisia tridentata*), gray rabbitbrush (*Ericameria nauseosa*) and a non-native perennial Atriplex species shrub totals about 15% canopy cover with an understory mixture of native and introduced grasses and forbs (Appendix J, Table J.98, patch 3-

[83] DOE-RL-2000-70, Rev 0, page 1-1
[84] DOE-RL-2014-43, Rev 0, Page 2-10

1). Field data records at the end of this EU description in Appendix J, provides a list of observed plant species. No wildlife was observed during the May 2015 survey.

CULTURAL RESOURCES SETTING

A small portion of the CP-OP-8, Mixed Waste Trenches EU has been inventoried for archaeological resources under one archaeological survey, which resulted in negative findings within the EU. It is unknown if an NHPA Section 106 review has been completed specifically for remediation of the CP-OP-8, Mixed Waste Trenches EU. It is unlikely that intact archaeological material is present in the areas that have not been inventoried for archaeological resources (both on the surface and in the subsurface), because the soils in the EU are extensively disturbed.

No cultural resources are known to exist within the CP-OP-8, Mixed Waste Trenches EU. Three archaeological isolates (2 associated with the Native American Precontact and Ethnographic Landscape, and one with the Pre-Hanford Early Settlers/Farming Landscape) have been identified within 500 meters of the CP-OP-8, Mixed Waste Trenches EU. While these isolates have not been formally evaluated for listing in the National Register of Historic Places, it should be noted that isolates are typically considered not eligible. Segments of the National Register-eligible Hanford Site Plant Railroad, a contributing property within the Manhattan Project and Cold War Era Historic District, with documentation required, are located within 500 meters of the CP-OP-8, Mixed Waste Trenches EU. In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan (*DOE/RL-97-56) (DOE-RL 1998), all documentation requirements have been completed for this property

Historic maps and aerial imagery indicate a low potential for archaeological resources associated with the Pre-Hanford Early Settlers/Farming Landscape to be present within the EU. Geomorphology indicates a moderate potential for the presence of archaeological resources associated with the Native American Precontact and Ethnographic Landscape to be present within the CP-OP-8, Mixed Waste Trenches EU. However, extensive ground disturbance within the eastern half of the EU suggests little potential for intact cultural resources at or below ground surface and moderate potential in the western half. It is possible that pockets of undisturbed sediments do exist within the EU. Resources, if present, would likely be limited to areas of intact or undisturbed soils.

Because only portions of the EU have been inventoried for archaeological resources, it may be appropriate to conduct surface (and potentially subsurface) archaeological investigations prior to the initiation of any remediation activities. Indirect effects are always possible when TCPs are known to be located in the general vicinity. Consultation with Hanford Tribes (Confederated Bands of the Yakama Nation, Wanapum, Confederated Tribes of the Umatilla Indian Reservation, and the Nez Perce) and other groups associated with these landscapes (e.g. East Benton Historical Society, the Franklin County Historical Society and the Prosser Cemetery Association, the Reach, and the B-Reactor Museum Association) may be necessary to provide input on indirect effects to both recorded and potential unrecorded TCPs in the area and other cultural resource issues of concern.

PART V. WASTE AND CONTAMINATION INVENTORY

CONTAMINATION WITHIN PRIMARY EU SOURCE COMPONENTS

Vadose Zone Contamination

The reported inventories for CP-OP-8 (Table H.10-4 through Table H.10-6) are contained in the burial ground trenches that are both in operation and isolated from the environment for the period of evaluation. Thus there is no reported vadose zone inventory to be evaluated.

Groundwater Plumes and Columbia River

Not applicable

Operating Facilities

The majority of LLW and MLLW disposal since September 26, 1988, has occurred in the 200 West Area (124,094 m^3 [4,382,342 ft^3]) compared to the 200 East Area LLBGs (31,986 m^3 [1,129,575 ft^3]). Annual waste volume receipts continue to be in the range of about 100 to 1,000 m^3 (10,594 to 35,315 ft^3).[85]

Other inventory information is provided below.

[85] DOE-RL-2014-47, Rev 0, page 2-1

Table H.10-4. Inventory of Primary Contaminants [a]

WIDS	Description	Decay Date	Ref[b]	Am-241 (Ci)	C-14 (Ci)	Cl-36 (Ci)	Co-60 (Ci)	Cs-137 (Ci)	Eu-152 (Ci)	Eu-154 (Ci)	H-3 (Ci)	I-129 (Ci)
All	Sum			14	0.86	0.0055	9100	5800	10	9	6800	0.0064
	Trenches		SWITS	14	0.86	0.0055	9100	5800	10	9	6800	0.0064

a. NR = Not reported

b. SWITS = HNF-9668-2014 (SWITS request 2016 05)

Table H.10-5. Inventory of Primary Contaminants (cont)[a]

WIDS	Description	Decay Date	Ref[b]	Ni-59 (Ci)	Ni-63 (Ci)	Pu (total) (Ci)	Sr-90 (Ci)	Tc-99 (Ci)	U (total) (Ci)
All	Sum			85	9900	310	100000	140	NR
	Trenches		SWITS	85	9900	310	100000	140	NR

a. NR = Not reported

b. SWITS = HNF-9668-2014 (SWITS request 2016 05)

Table H.10-6. Inventory of Primary Contaminants (cont)[a]

WIDS	Description	Ref[b]	CCl4 (kg)	CN (kg)	Cr (kg)	Cr-VI (kg)	Hg (kg)	NO3 (kg)	Pb (kg)	TBP (kg)	TCE (kg)	U (total) (kg)
All	Sum		350	0.82	220	0.044	250	860	470000	1.2	27	830000
	Trenches	SWITS	350	0.82	220	0.044	250	860	470000	1.2	27	830000

a. NR = Not reported

b. SWITS = HNF-9668-2014 (SWITS request 2016 05)

Table H.10-7. Summary of the Evaluation of Current Threats to Groundwater as a Protected Resource from Saturated Zone (SZ) and Remaining Vadose Zone (VZ) Contamination associated with the Evaluation Unit

PC	Group	WQS	Porosity[a]	K_d (mL/g)[a]	ρ (kg/L)[a]	VZ Source M^{Source}	SZ Total M^{SZ}	Treated[c] M^{Treat}	VZ Remaining M^{Tot}	VZ GTM (Mm^3)	VZ Rating[d]
C-14	A	2000 pCi/L	0.23	0	1.84	---	---	---	---	---	ND
I-129	A	1 pCi/L	0.23	0.2	1.84	---	---	---	---	---	ND
Sr-90	B	8 pCi/L	0.23	22	1.84	---	---	---	---	---	ND
Tc-99	A	900 pCi/L	0.23	0	1.84	---	---	---	---	---	ND
CCl4	A	5 µg/L	0.23	0	1.84	---	---	---	---	---	ND
Cr	B	100 µg/L	0.23	0	1.84	---	---	---	---	---	ND
Cr-VI	A	48 µg/L[b]	0.23	0	1.84	---	---	---	---	---	ND
TCE	B	5 µg/L	0.23	2	1.84	---	---	---	---	---	ND
U(tot)	B	30 µg/L	0.23	0.8	1.84	---	---	---	---	---	ND

a. Parameters obtained from the analysis provided in Attachment 6-1 to Methodology Report (CRESP 2015).

b. "Model Toxics Control Act—Cleanup" (WAC 173‑340) Method B groundwater cleanup level for hexavalent chromium.

c. Treatment amounts from the 2015 Hanford Annual Groundwater Report (DOE/RL-2016-09, Rev. 0).

d. Groundwater Threat Metric rating based on Table 6-3, Methodology Report (CRESP 2015).

PART VI. POTENTIAL RISK/IMPACT PATHWAYS AND EVENTS

CURRENT CONCEPTUAL MODEL

Pathways and Barriers

Briefly describe the current institutional, engineered and natural barriers that prevent release or dispersion of contamination, risk to human health and impacts to resources:

1. What nuclear and non-nuclear safety accident scenarios dominate risk at the facility? What are the response times associated with each postulated scenario?

The following accidents are analyzed in the Hazards Assessment with only qualitative rankings of consequences provided[86]

Criticality accident: Exposure of worker from radiation due to criticality due to the any of the following postulated occurrences: relocation of fissile material due to movement, addition of reflector; Introduction of moderator; Operator error

Consequences: CP: High Public: Low

Mitigation:

Administrative: Criticality Safety; Container Management (ACMP, WAP, H&S); Emergency Response Plan; Source Strength Control; Radiation Protection;

Earthquake: Release of radioactive material from containers to environment due to earthquake

Consequences: CP: High Public: Low

Mitigation:

Administrative: Container Management (H&S); Emergency Response Plan; Source Strength Control

Engineered: Container Bands/Straps; Container Design (structure); Overburden (fill dirt); Standard Waste Box (SWB) Design (structure); Tie Downs

Fire: Release of material (solid, liquid, rad, chemical) from waste package to environment due to energetic event caused by waste inside container, energetic reaction due to gas deflagration during void filling

Consequences: CP: Medium Public: Low

Mitigation:

Administrative: Venting Waste Containers Container Management (ACMP, H&S, WAP); Emergency Response Plan; Hoisting and Rigging (Operator Training & Equipment Inspections); Vehicle Access Controls (Barriers, Access): Source Strength Control

Engineered: Container Design (noncombustible); Container Design (structure); Drum Venting System; Overburden (fill dirt); Spark Resistant Tools

86 HNF 15589, Rev 8, Criticality (pages A-156, A-157), Earthquake (pages A-168, A-169), Fire (pages A-2, A-3), Spill (page A-115)

Spill: Release of radiological or hazardous material to the environment due to damaged containers from structure or equipment (crane boom) collapse. Collapse of portable or moveable or fixed (not PC rated) work enclosures used for worker comfort or contamination control or container protection, or crane boom collapse. Could result with airborne release to environment, receptor exposure to hazardous material and radioactive waste, or worker injury

Consequences: CP: Medium Public: Low

Mitigation:

Administrative: Structure design; Container design; Overburden

Engineered: Container Management (H&S, ACMP); Hoisting and Rigging (Operator Training & Equipment Inspections); Emergency Response Plan; Source Strength Control

2. What are the active safety class and safety significant systems and controls?

The active safety class and safety significant systems include the hoisting and rigging equipment inspections, the container management plan, the emergency response plan, and source strength control.

3. What are the passive safety class and safety significant systems and controls?

The passive safety class and safety significant systems include the container band and straps, the container design, the crane and lifting equipment design, the overburden, the tie downs, the compartment weld, and the overpacks.

4. What are the current barriers to release or dispersion of contamination from the primary facility? What is the integrity of each of these barriers? Are there completed pathways to receptors or are such pathways likely to be completed during the evaluation period?

The LLBG Trenches 31 & 34 operating organization conducts waste management operations in accordance with the design and engineering requirements of waste management structures and equipment, and with all equipment manufacture specifications and operating processes. Processes are in place for safe management of the waste during storage, treatment, and/or disposal of waste at the LLBG Trenches 31 & 34. These processes consider actual or potential risks posed by the waste and the storage, treatment, and/or disposal equipment. LLBG Trenches 31 & 34 conducts all waste treatment and/or storage according to these processes and complies with requirements for labeling, container management, and inspection requirements. [87]

Low-level mixed waste (MLLW) has been disposed in active LLBGs in various containers including drums and boxes made of steel, wood, and cardboard. Bulk contaminated equipment and soils have also been disposed in LLBG trenches. Containerized waste is typically stacked in the bottom of each trench using either cranes or forklifts. Bulk soils and debris are typically dumped from the trench lip down a working face for disposal. A minimum of 2.4m (8ft) of backfill is currently placed over disposed waste. Early operations placed as little of 0.6m (2ft) of soil over filled waste trenches but found through experience that 2.4m (8ft) was required to minimize biointrusion concerns. Category 3 waste and waste containing certain mobile radionuclides are currently stabilized by placement in concrete vaults/high-integrity containers (HICs) or encasement in concrete. [88] Lined MLLW trenches are filled in balanced layers to

[87] CHPRC-01908, Rev 0, page 5

[88] DOE-RL-2000-70, Rev 0, page 1-1

ensure the liner is not differentially loaded to the point it is damaged. [89] Mixed waste is disposed in Resource Conversation and Recovery Act of 1976 (RCRA) compliant lined trenches.[90]

5. What forms of initiating events may lead to degradation or failure of each of the barriers?

Earthquake, operational accident (drop, etc.), fire (See response to Question 1, above)

6. What are the primary pathways and populations or resources at risk from this source?

Performance assessments for active burial grounds in the 200 East and West 200 Areas provide current estimates of potential environmental contamination and doses to the "maximum exposed individual" from burial ground operation and closure and compare dose estimates to performance objective dose limits for the facilities. [91] There are two potential pathways to exposure for the Mixed Waste Trenches including the groundwater and dispersion in the air, although air dispersion has a current anticipated dose of Nil from the 200 West Area burial grounds on the whole.[92] The groundwater dispersion could impact the ecological resources, although at present, the performance assessment indicates it is well below the performance objective, and the Mixed Waste Trenches (Trenches 31 and 34) are only a portion of Burial Ground 200-W-5.[93]

7. What is the time frame from each of the initiating events to human exposure or impacts to resources?

The pathway considered for the initiating events is airborne exposure, and the time frame is considered immediate, on the order of hours or days.

8. Are there current on-going releases to the environment or receptors?

There are no known releases to the environment. There is one completed pathway through occupational exposure of workers placing waste (MLLW, LLW) in the burial ground but that is limited through administrative and/or engineering controls (see Part IV, responses to Question 5)

POPULATIONS AND RESOURCES CURRENTLY AT RISK OR POTENTIALLY IMPACTED

Facility Worker

Workers are impacted by the only current completed pathway of occupational radiation exposure. In the instance of the initiating events described above, any exposure would likely be airborne dispersion of containerized waste and exposure via inhalation or external radiation due to proximity to contamination.

Co-Located Person (CP)

Co-located persons could be impacted in the instance of the initiating events described above, any exposure would likely be airborne dispersion of containerized waste and exposure via inhalation or external radiation due to proximity to contamination.

89 DOE-RL-2000-70, Rev 0, page 2-7 through 2-8

90 DOE-RL-2000-70, Rev 0, page 1-1

91 DOE-RL-2000-70, Rev 0, page iii

92 DOE-RL-2014-47 Page 2-13

93 DOE-RL-2014-47 Page 2-13

Public

None of the postulated events have more than a low impact on the public.

Groundwater and Columbia River

Not applicable

Ecological Resources

Summary of Ecological Review:

- Nearly 99% of the habitat in the combined EU and adjacent landscape buffer area is classified as level 2 or below.
- Within the EU, 100% of the resources are level 2 or below. Loss of this habitat is not expected to impact the connectivity between higher quality resources within and those outside the 200-West Area.

Cultural Resources

The CP-OP-8, Mixed Waste Trenches EU is located within the 200-West Area of the Hanford Site, an area known to have low potential to contain Native American Precontact and Ethnographic archaeological resources and Pre-Hanford Early Settlers/Farming resources. Much of the 200 Areas were addressed in a cultural resources report entitled *Archaeological Survey of the 200 East and 200 West Areas, Hanford Site* (Chatters and Cadoret 1990). The focus of this archaeological survey was on inventorying all undisturbed portions of the 200-East and 200-West Areas. This report concluded that much of the 200-East and 200-West Areas can be considered areas of low archaeological potential with the exception of intact portions of an historic/ethnohistoric trail/road corridor which runs through the 200-West Area.

A portion of the CP-OP-8 Mixed Waste Trenches EU has been inventoried for archaeological resources under one archaeological survey, HCRC#96-200-058 (Nickens et al. 1996); which resulted in negative findings within the EU. It is unknown if an NHPA Section 106 review has been completed specifically for remediation of The CP-OP-8, Mixed Waste Trenches EU. It is unlikely that intact previously undocumented archaeological material is present in the EU, both on the surface and in subsurface areas, because the soils in the CP-OP-8, Mixed Waste Trenches EU appear to have been heavily disturbed by Hanford Site activities.

Archaeological sites, buildings and Traditional Cultural Properties (TCPs) located within the EU[94]

- There are no known cultural resources within the CP-OP-8, Mixed Waste Trenches EU.

Archaeological sites, buildings, and TCPs located within 500 meters of the EU

- Three archaeological isolates (2 associated with the Native American Precontact and Ethnographic Landscape, and one with the Pre-Hanford Early Settlers/Farming Landscape) have been documented within 500 meters of the CP-OP-8, Mixed Waste Trenches EU. While these isolates have not been formally evaluated for listing in the National Register of Historic Places, it should be noted that isolates are typically considered not eligible.

94 Traditional cultural property has been defined by the National Park Service as "a property, a place, that is eligible for inclusion on the National Register of Historic Places because of its association with cultural practices and beliefs that are (1) rooted in the history of a community, and (2) are important to maintaining the continuity of that community's traditional beliefs and practices" (Parker and King 1998).

- Segments of the National Register-eligible Hanford Site Plant Railroad, a contributing property within the Manhattan Project and Cold War Era Historic District, with documentation required, are located within 500 meters of the CP-OP-8, Mixed Waste Trenches EU. In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan (*DOE/RL-97-56) (DOE-RL 1998), all documentation requirements have been completed for this property.

Closest Recorded TCP

There are two recorded TCPs associated with the Native American Precontact and Ethnographic Landscape that are visible from the CP-OP-8, Mixed Waste Trenches EU.

CLEANUP APPROACHES AND END-STATE CONCEPTUAL MODEL

Selected or Potential Cleanup Approaches

No cleanup decisions have been made to remediate the 200-SW-2 Operating Unit, including the LLBG Trenches 31 and 34.

DOE-RL-2000-70 (Rev. 0) describes the operational closure plan as a two-phase approach to closure of active LLBGs:

* Increase the bearing capacity of trench fills (consisting of disposed waste and cover soil) to support the weight of a closure cover without excessive long-term settlement or subsidence

* Construct engineered covers as final remedial actions over active LLBGs. Covers will be designed specifically to minimize moisture infiltration, resist natural degradation processes, minimize maintenance, and control releases of radionuclides for a period of at least 500 years after closure.

Measures will be implemented to improve the bearing capacity of trench fills during the Interim Closure period. During the Final Closure period, engineered surface barriers will be constructed over LLBGs. A generic conceptual cover design, which is a development of the ER Program at the Hanford Site, is described DOE-RL-2000-70 (Rev. 0) as the current planning basis for capping LLBGs. The planning basis may change in the future to reflect barrier design developments and remediation strategies for inactive LLBGs within the ER Program. The Modified RCRA Subtitle C barrier design will be effective in controlling releases of radionuclides from the facilities after closure. The barrier will control releases of radionuclides by (1) minimizing infiltration of precipitation into and through disposed waste, (2) preventing biointrusion into buried waste, and (3) minimizing adverse consequences of inadvertent human intrusion in the future if there is a loss of active institutional control. [95]

Out year dates identified in this plan are tentative (as shown in Table H.10-8). A Final Closure Plan will be prepared in the future when the timing and extent of closure-related activities for LLBGs can be established with greater certainty. [96]

95 DOE-RL-2000-70, Rev 0, page 1-2

96 DOE-RL-2000-70, Rev 0, page iii

Table H.10-8. LLBG Areas Closure Schedule[97]

Burial Ground	Interim Closure	Final Closure	Institutional Control
218-W-3A	2035-2041	2042-2044	100 yr min
218-W-3AE	2039-2035	2036-2038	100 yr min
218-W-4B	2050-2052	2053-2054	100 yr min
218-W-4C	2053-2055	2056-2057	100 yr min
218-W-5	2042-2044	2045-2048	100 yr min
218-W-6	2033-2035	2036-2038	100 yr min
218-E-10	2033-2035	2036-2038	100 yr min
218-E-12B	2045-2049	2050-2054	100 yr min

Contaminant Inventory Remaining at the Conclusion of Planned Active Cleanup Period

Insufficient information: Dependent on D&D methodology, yet to be determined.

Risks and Potential Impacts Associated with Cleanup

Insufficient information: Dependent on D&D methodology, yet to be determined.

Populations and Resources at Risk or Potentially Impacted During or as a Consequence of Cleanup Actions

Facility Worker

Dependent on D&D methodology, yet to be determined.

Co-located Person

Dependent on D&D methodology, yet to be determined.

Public

Dependent on D&D methodology, yet to be determined.

Groundwater and Columbia River

Not applicable

Ecological Resources

Remove, Treat and Dispose of waste involves personnel through the target (remediation) area, car and pickup truck traffic through the non-target and target (remediation) area, truck, heavy equipment (including drill rigs) traffic on roads through the non-target and target area, caps (and other containment), soil removal and contamination in the soil, vegetation control, and irrigation (for revegetation) will cause the following disturbance from remediation activities: Carry seeds or propagules (pieces of vegetation or other biological parts that can grow and/or reproduce) on tires of vehicles or blowing from heavy equipment; injure or kill vegetation or small invertebrates or small animals; vehicle traffic can make paths, compact soil, scare or displace animals, can impact animal

[97] DOE-RL-2000-70, Rev 0, Table 4.5., page T4-5

behavior or reproductive success; affect animal dispersion and habitat use (e.g., some birds avoid nesting near roads because of song masking); displacement of animals from near roads due to increased noise or other disturbances; and heavy equipment may permanently destroy areas of the site with intense activity. Soil removal can cause more severe effects because of blowing soil (and seeds). During remediation, radionuclides or other contaminants could be released or spilled on the surface, and depending upon the type and quantity, could have adverse effects on the plants and animals on-site. Use of non-specific herbicides for vegetation control results in some mortality of native vegetation (especially native forbes), and allows exotic species to move in; it may change species composition of native communities, but it also could make it easier for native species to move in; improved methods could yield positive results. Irrigation requires a system of pumps and water, resulting in physical disturbance; repeated irrigation from the same locations could result in some soil compaction, which can decrease plant growth in those areas, decrease abundance and diversity of soil invertebrates, and prevent fossorial snakes or mammals from using the area.

Alternatively, barriers could be the remediation option and involves personnel car and pickup truck traffic through the non-target and target (remediation) area, truck and heavy equipment traffic on roads through the non-target and target area, dust suppression, and irrigation (for revegetation) will cause the following disturbance from remediation activities: Carry seeds or propagules (pieces of vegetation or other biological parts that can grow and/or reproduce) on person (boots, clothes, equipment) or tires of vehicles or blowing from heavy equipment; injure vegetation or small invertebrates or small animals (e.g., insects, snakes); make paths or compact soil; scare or displace animals. Caps and other containment can cause compaction, which can decrease plant growth in those areas, decrease abundance and diversity of soil invertebrates, and prevent fossorial snakes or mammals from using the area. Destruction of soil invertebrates at depths of pits. Potential bringing up of dormant seeds from soil layers; disruption of ground-living small mammals and hibernation sites of snakes and other animals on-site of containment; often disrupts local aquatic environment and drainage; often non-native plants used on caps (which can become exotic/alien adjacent to the containment site). Additional water from dust suppression could lead to more diverse and abundant vegetation in areas that receive water, which could encourage invasion of exotic species; the latter could displace native plant communities; excessive dust suppression activities could lead to compaction, which can decrease plant growth in those areas, decrease abundance and diversity of soil invertebrates, and prevent fossorial snakes or mammals from using the area. Irrigation requires a system of pumps and water, resulting in physical disturbance; repeated irrigation from the same locations could result in some soil compaction, which can decrease plant growth in those areas, decrease abundance and diversity of soil invertebrates, and prevent fossorial snakes or mammals from using the area. These effects will be higher in the EU itself.

Cultural Resources

Potential direct effects are possible from personnel, car, pick-up, truck and heavy equipment traffic/use through both target (remediation) and non-target areas during active cleanup. These activities may inadvertently expose resources close to the surface. Additionally, traffic through these areas may lead to the introduction of invasive species and/or a decrease in the presence of native plants used for medicinal or tribal religious purposes. Heavy equipment use for remedial activities (such as the excavation, treatment and disposal of all waste) may lead to an alteration of the landscape, and the act of soil removal may destroy resources; if resources are not destroyed, then, soil removal may disturb or adversely affect resources. Utilization of caps and/or other containments may destroy resources located close to the surface. If resources are not destroyed, containments may disturb or adversely affect resources. Lastly, during remediation, radionuclides or other contamination released or spilled on the

surface could have long-term effects if the contamination remains and resources become contaminated and/or plants having cultural importance to Tribes do no recolonize or thrive.

Potential indirect effects are possible from personnel traffic through target (remediation) areas as well as car, pick-up, truck and heavy equipment traffic/use through both target (remediation) and non-target areas. It is possible that these activities may decrease viewshed values and/or impact viewshed through the introduction of increased dust, the creation of trails, etc. Heavy equipment use for remedial actions/soil removal and the utilization of caps and/or other containments could potentially cause alterations to the landscape and impacts to viewsheds. Lastly, during remediation, radionuclides or other contamination released or spilled on the surface could have long-term effects if the contamination remains and resources become contaminated and/or plants having cultural importance to Tribes do no recolonize or thrive.

ADDITIONAL RISKS AND POTENTIAL IMPACTS IF CLEANUP IS DELAYED

The Mixed Waste Trenches will continue to receive LLW and MLLW until the Trenches are completely filled and/or the waste streams are completely exhausted. If covering the trench is delayed, the containers may be at a slightly higher risk of degradation.

NEAR-TERM, POST-CLEANUP STATUS, RISKS AND POTENTIAL IMPACTS

LLW and MLLW disposal at Trenches 31 and 34 will continue until the trenches are completely filled and/or the waste streams are completely exhausted.

POPULATIONS AND RESOURCES AT RISK OR POTENTIALLY IMPACTED AFTER CLEANUP ACTIONS (FROM RESIDUAL CONTAMINANT INVENTORY OR LONG-TERM ACTIVITIES)

Table H.10-9. Summary of Populations and Resources at Risk or Potentially Impacted after Cleanup.

Population or Resource		Risk/Impact Rating	Comments
Human	Facility Worker	Insufficient information (IS)	
	Co-located Person	IS	
	Public	IS	
Environmental	Groundwater	*Not Discernible* (*ND*)	Reported inventories are in burial ground trenches (operating facility) isolated from the environment.
	Columbia River	*ND*	
	Ecological Resources[(a)]	ND to Low	Post-cleanup monitoring might pose a risk to level 3 and above resources in the buffer area.
Social	Cultural Resources[(a)]	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: Known **Manhattan/Cold War** Direct: None Indirect: None	Permanent direct effects are possible if residual contamination remains after remediation and from capping. National Register eligible Manhattan Project/Cold War Era significant resources located within 500 meters of the EU will be demolished, but they have already been mitigated.

a. For both Ecological and Cultural Resources see Appendices J and K, respectively, for a complete description of Ecological Field Assessments and literature review for Cultural Resources. Ecological ratings are described in Table 4-11 of the Final Report.

LONG-TERM, POST-CLEANUP STATUS – INVENTORIES AND RISKS AND POTENTIAL IMPACT PATHWAYS

Dependent on D&D Methods, yet to be determined.

PART VII. SUPPLEMENTAL INFORMATION AND CONSIDERATIONS

Not Applicable.

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