APPENDIX G.5.5

T PLANT CRIBS AND DITCHES (CP-LS-6, CENTRAL PLATEAU) EVALUATION UNIT SUMMARY TEMPLATE

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PART I. EXECUTIVE SUMMARY

EU LOCATION

Liquid waste discharge areas in the northeastern part of 200 West associated with T Plant (CP-OP-2) operations.

RELATED EUS

CP-OP-2 and CP-GW-2

PRIMARY CONTAMINANTS, CONTAMINATED MEDIA AND WASTES

The waste sites comprising the CP-LS-6 EU include legacy waste sites (e.g., cribs, trenches, ponds, wells, and unplanned releases (UPRs)) where liquid wastes was discharged, infrastructure buildings, pipelines and associated equipment, and an inactive burial ground. One of the nine waste sites representing pipelines and associated equipment, comprising approximately one-third of the CP-LS-6 waste sites, is part of the Single Shell Tank (SST) System (DOE/RL-2010-114, Draft A, p. A-20 – A-27) and thus is assumed previously treated in the Tank Waste and Farms EU (Appendix E.1 through E.11). Other CP-LS-6 pipelines and associated equipment may have been addressed in the TC&WM EIS and thus Tank Waste and Farms EU (Appendix E.1 through E.11); however, the remaining pipeline and related wastes sites will not be evaluated further due to a lack of inventory information. Of the remaining waste sites, inventory information is reported for three cribs, one ditch, one reverse well, and one MUST) in the Soil Inventory Model (SIM), Rev. 1 (Corbin, et al. 2005), which is used as the basis for analysis.

The primary contaminants listed in the SIM, Rev. 1 (Corbin, et al. 2005) for the CP-LS-6 EU include:[1]

- *Radionuclides*: Am-241, C-14, Co-60, Cs-137/Ba-137m, Eu-154, Ni-63, Sr-90/Y-90, U-All isotopes, Pu-All isotopes
- *Chemicals*: Cr/Cr-VI, Hg, nitrate (NO_3), Pb, and U-Total

BRIEF NARRATIVE DESCRIPTION

One-half of the CP-LS-6 EU legacy waste sites with non-zero reported inventories (Table G.5.5-2 through Table G.5.5-4) are included in the 200-WA-1 OU (where others are in 200-DV-1 and 200-OA-1) and thus the focus here will be on the 200-WA-1 OU. The 200-WA-1 Operable Unit (OU) (where part of the 200-UW-1 OU was assigned to the 200-WA-1 OU but none of the CP-LS-6 EU sites were included in 200-UW-1) is part of the Hanford 200 Area Site, which is on the EPA National Priority List (NPL) (DOE/RL-2011-56, Rev. 1). The 200-WA-1 OU consists of waste sites in the 200 West Inner Area not already assigned to

[1] For radionuclides, those are listed if the total activity from the SIM, Rev. 1 exceeds 0.1 Ci or if they are listed in Table 6.1 (CRESP 2015a) and have a non-zero total activity. Unlike for the Interim Report (CRESP 2015b), the activities for all available uranium and plutonium were summed. For chemicals of potential concern, those are listed if the total mass from the SIM, Rev. 1 exceeds 1 kg or if they are listed in Table 6.1 (CRESP 2015a) and have a non-zero total mass. As indicated above, there were several WIDS codes that were included in the Data Sheets for multiple EUs; those WIDS codes with non-zero inventory were included in only a single EU for evaluation purposes (and to not double count inventory).

other OUs. The CP-LS-6 EU waste sites primarily consist of liquid waste disposal sites associated with T Plant (221-T) operations and a few other waste sites such as infrastructure buildings and pipelines and associated equipment. Liquid waste disposal sites include cribs, ditches, trenches, ponds, wells, and unplanned release sites. The primary radioactive contaminants include Am-241, C-14, Co-60, Cs-137, Eu-154, Ni-63, Sr-90, and isotopes of uranium and plutonium. Primary chemical contaminants include Cr, Hg, NO_3, Pb, and uranium although there is only approximately 1 kg of Hg reported (Table G.5.5-4). All current land-use activities in the 200 West and 200 East Areas (where the CP-LS-6 is located) are *industrial* in nature (Hanford 200-Area ROD[2]). Although none of the CP-LS-6 waste sites are included in the 200-UW-1 OU, the four remedial alternatives considered in the 200-UW-1 Focused Feasibility Study (FFS) are considered reasonable[3]; these alternatives are: i) No Action, ii) Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation, iii) Removal, Treatment, and Disposal, and iv) Engineered Barrier (DOE/RL-2003-23, Rev. 0; DOE/RL-2003-24, Rev. 0). All four (future) land-use scenarios listed in the Comprehensive Land Use Plan (CLUP) indicate that the 200 West and 200 East Areas are denoted *Industrial-Exclusive* (DOE/EIS-0222-F).

SUMMARY TABLES OF RISKS AND POTENTIAL IMPACTS TO RECEPTORS

Table G.5.5-1 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 T Plant Cribs and Ditches Area (CP-LS-6); a Co-located Person (CP) is an individual located 100 meters from the physical boundaries of the T Plant Cribs and Ditches Area; 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 *Not Discernible* (*ND*) to *High*. The estimated mitigated exposure that takes engineered and administrative controls and protections into consideration, is shown in Table G.5.5-1 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*.

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[2] http://www.epa.gov/region10/pdf/sites/hanford/200/hanford_200_rod.pdf

[3] The 200-UW-1 OU included 31 liquid waste disposal sites associated with 221-U Facility (many of which are included in the CP-LS-3 EU (Appendix G.5.3); however, none of these sites are included in the CP-LS-6 EU. Despite this fact, the analysis provided in the 200-UW-1 FFS will also be used here (like it was for the CP-LS-3 and CP-LS-4 EUs) instead of those provided in the Evaluation Unit Disposition Table (Appendix B) because hazards (associated with buried liquid waste legacy sites) are assumed similar enough for the rough order of magnitude analysis provided in this Review. Thus these alternatives (and the quantitative analysis provided in the 200-UW-1 FFS) are used instead of those provided in the Evaluation Unit Disposition Table (Appendix B) for this EU. Note that the basic remedial component activities (No Action, capping, and RTD) are represented in both sets of remedial alternatives.

Ecological Resources[4]

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[4]

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 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.

[4] 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.

Table G.5.5-1. 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: Monitoring and maintenance	Evaluation Time Period: Active Cleanup (to 2064) — From Cleanup Actions: Four alternatives considered
Human Health	Facility Worker	***Not Discernible (ND)-Low*** *(ND-Low)*	***Proposed Alternatives*: *ND-Low (No Action) to Low-High (RTD)*** (*ND-Low to Low (RTD)*)
	Co-located Person	***ND-Low*** *(ND-Low)*	***Proposed Alternatives: ND-Low*** (*ND* to *Low*)
	Public	***ND*** (*ND*)	***Proposed Alternatives*: *ND*** (*ND*)
Environmental	Groundwater (A&B) from vadose zone[a]	*High* – Cr-VI *Medium* – Cr(tot) *ND* – Sr-90 and U(tot)[c] *Low* – other PCs[e] **Overall**: *High*	*High* – Cr-VI *Medium* – Cr(tot) *ND* – Sr-90 and U(tot)[c] *Low* – other PCs[e] **Overall**: *High*
	Columbia River from vadose zone[a]	Benthic and Riparian: *ND* Free-flowing: *ND* **Overall**: *ND*	Benthic and Riparian: *ND* Free-flowing: *ND* **Overall**: *ND*
	Ecological Resources[a]	Low	Estimated to be Low to High. [d]
Social	Cultural Resources[a]	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Known Indirect: Unknown **Manhattan/Cold War** Direct: Known Indirect: Known	Estimated to be:[d] **Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Known Indirect: Unknown **Manhattan/Cold War** Direct: Known Indirect: Known

a. Threat to groundwater or the Columbia River from Group A and B primary contaminants (PCs) (Table 6-1, CRESP 2015a) remaining in the vadose zone. Threats from plumes associated with the T Plant Cribs and Ditches EU are described in **Part V** with additional information provided in Appendix G.6 (CP-GW-2) for the 200-ZP Groundwater Interest Area (GWIA).

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. These ratings are for PCs with reported inventories (Table G.5.5-2 through Table G.5.5-4). (See **Parts V** and **VI** for additional details.) The total uranium and Sr-90 disposed of in the T Plant Cribs and Trenches EU would translate to a *Low* and *Medium* rating, respectively (as shown in Table G.5.5-5); however, there are no current 200-ZP uranium or Sr-90 plumes, and it would likely require more than 150 years to reach groundwater in a sufficient amount to exceed the drinking water standard over an appreciable area (**Part V**). The total uranium and Sr-90 rating at the end of the Active Cleanup period is *Low* to account for uncertainties in the evaluation.

d. No cleanup decisions have been made for this EU.
e. There are no Group C primary contaminant (PC) plumes associated with CP-LS-6, where the highest rating given to Group C PCs would be *Medium* (CRESP 2015a).

SUPPORT FOR RISK AND IMPACT RATINGS FOR EACH POPULATION OR RESOURCE

Human Health

There is no Documented Safety Analysis (DSA) or hazard analysis for the CP-LS-6 waste sites because these sites do not currently satisfy the requirements for performing these types of analyses. Thus evaluations of risk for this type of site (i.e., a legacy site) are often more qualitative in nature than those with a formal safety or hazard analysis. Although none of the CP-LS-6 waste sites are included in the 200-UW-1 OU, the four remedial alternatives considered in the 200-UW-1 Focused Feasibility Study (FFS) are considered reasonable as described above. The human health risk evaluation is thus based on the same information used for CP-LS-3 (Appendix G.5.3).

Current

To summarize, the workforce involved with characterization activities would have an unmitigated *Not Discernible* (*ND*) to *Low* risk rating (as described in **Part VI** and Appendix G.5.3 for CP-LS-3), risk to the Co-located Person would also be rated *ND* to *Low*, and the Public risk is rated as *ND* due to the remote distance to the site, depth from ground surface to soil contamination, and depth to groundwater contamination.

Unmitigated Consequences: Facility Worker – ND to *Low*, CP – *ND* to *Low*; Public – *ND*

Mitigation: To summarize, the Department of Energy and contractor site-specific safety and health planning that includes work control, fire protection, training, occupational safety and industrial hygiene, emergency preparedness and response, and management and organization have proven to be effective in reducing industrial accidents at the Hanford Site to well below that in private industry. (See Appendix G.5.3 for additional details.) Thus resulting Facility worker risks remain rated as *ND* to *Low*; others also remain the same.

Mitigated Consequences: Facility Worker – *ND* to *Low*, CP – *ND* to *Low*; Public – *ND*

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

The cleanup alternatives considered range from no action to significant actions (e.g., removal, treatment, and disposal (RTD)) (DOE/RL-2003-23, Rev. 0). As described in Appendix G.5.3, risk ratings for Facility workers range from *ND-Low* (No Action) to *Low-High* (RTD) based on the action that would be taken. Other ratings would not be impacted.

Unmitigated Risk: Facility Worker – *ND-Low* (No Action) to *Low-High* (RTD); CP – ND to *Low*; Public – ND

Mitigation: As described in Appendix G.5.3, Facility worker risks are rated as *Low* for active cleanup actions and *ND-Low* for other actions; others remain the same.

Mitigated Risk: Facility Worker – *ND-Low* to *Low* (RTD); CP – *ND-Low*; Public – *ND*

Groundwater, Vadose Zone, and Columbia River

Current

The CP-LS-6 EU resides in the 200-ZP groundwater interest area (GWIA) described in the CP-GW-2 EU (Appendix D.6). The saturated zone beneath the vicinity of the CP-LS-6 (T Plant Cribs and Ditches) area has elevated levels of total and hexavalent chromium, carbon tetrachloride (CCl_4), I-129, nitrate, Tc-99,

and trichloroethene (TCE) based on the 2014 groundwater monitoring results (http://phoenix.pnnl.gov/apps/gw/phoenix.html); sites within the CP-LS-6 EU are suspected of being able to contribute mobile contaminants to the saturated zone (DOE/RL-92-16, Rev. 0) although no plumes were associated with the CP-LS-6 waste sites (**Part V**). The current threats to groundwater and the Columbia River from contaminants already in the groundwater are evaluated as part of the CP-GW-2 EU (Appendix D.6). However, current threats to groundwater corresponding to only the CP-LS-6 EU contaminants *remaining* in the vadose zone (Table G.5.5-5) has an overall rating of *High* (based on hexavalent chromium) as described in **Part V**. Contaminated groundwater is treated in the 200-ZP GWIA using the 200 West Pump and Treat (P&T) system[5] (DOE/RL-2016-09, Rev. 0). As indicated in **Part V**, no 200-ZP plumes have been linked to CP-LS-6 waste sites. Threats from contaminated groundwater in the area to contaminate additional groundwater or the Columbia River are evaluated as part of the CP-GW-2 EU (Appendix D.6).

For the 200-ZP GWIA (in 200 West), no plume currently emanating from the CP-LS-6 waste sites intersects the Columbia River at concentrations exceeding the corresponding water quality standard (WQS) as described in **Part V**. Thus current impacts to the Columbia River benthic and riparian ecology would be rated as *Not Discernible* (*ND*). Furthermore, the large dilution effect of the Columbia River on contamination from the seeps and groundwater upwellings also results in *ND* ratings. Thus the overall rating for the Columbia River during the Current period is *ND*.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

As described in **Part VI**, the remedial actions being considered for the CP-LS-6 EU waste sites include i) No Action; ii) Maintain Existing Soil Cover; iii) Removal, Treatment, and Disposal; and iv) Engineered Barrier; however, no final cleanup decisions have been made. Furthermore, no cleanup decisions have been made for the deep vadose zone (200-DV-1), including any CP-LS-6 EU contaminants that may have migrated to the deep vadose zone. Because no final cleanup decisions have been made, there is no way to definitively determine the risks and potential impacts to protected resources (groundwater and Columbia River). However, final cleanup decisions will be made that will be protective of human health and the environment and thus it is likely that at least some vadose contamination will be removed to satisfy remedial goals; a cover will also likely be installed (at least in places) to limit infiltrating water that tends to be the primary motive force to release and mobilize contamination in the vadose zone. Thus even though there are risks to workers associated with the cleanup of the CP-LS-6 waste sites (described above and in **Part VI**), there is unlikely any discernible impact from likely cleanup actions on groundwater or the Columbia River (and thus no changes were made to the current ratings to account for uncertainties).

Contaminants from the CP-LS-6 EU waste sites are currently impacting the vadose zone and may be threatening groundwater (although no plumes have been definitively linked to CP-LS-6 waste sites as indicated in **Part V**); treatment using the treatment processes mentioned in the previous section is not predicted to decrease all concentrations to below thresholds before the Active Cleanup phase commences although there should be significant decreases in contaminant levels. Secondary sources in the vadose also threaten to continue to impact groundwater in the future, including during the Active

[5] Soil vapor extraction was used between 1992 and 2012 to remove carbon tetrachloride vapors migrating through the vadose zone into 200-ZP groundwater (Section 12.10.2, DOE/RL-2016-09, Rev. 0).

Cleanup period[6]. The *High* rating associated with the CP-LS-6 EU waste sites (Table G.5.5-5) is associated with hexavalent chromium that could potentially impact the 200-ZP GWIA (which is part of CP-GW-2, Appendix G.6). As described in the TC&WM EIS and summarized in **Part V**, no ratings were altered based on potential changes in recharge rate, radioactive decay, or expected treatment effectiveness; the ratings are maintained through the end of the Active Cleanup period to account for any uncertainties in the evaluation. There would not be a sufficient impact on peak concentrations in near-shore region of the Columbia River during or after cleanup to modify ratings (which are already *ND*). Thus the ratings for current threats provided in Table G.5.5-5 would not be modified (at the end of the Active Cleanup period) except making those for Sr-90 and total uranium *Low* to address uncertainty as described in **Part V**. This overall rating also remains *High* at the end of the Active Cleanup period.

Ecological Resources

Current

28% of EU and 15% of the buffer is level 3 (there is no level 4 and above resources). Black-tailed jack rabbit and sage sparrow were observed in the EU. Low impact rating is based on minimal activity and herbicide application.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

No cleanup decisions have been made for the deep vadose zone, and as a result, the potential effects of cleanup on ecological resources is uncertain for the active cleanup evaluation period. Cleanup decision for surface may change based on cleanup for deep vadose zone. Multiple remediation actions will be used to address the diversity of waste sites. Remediation has the high potential to impact the resources (black-tailed jack rabbit and sage sparrow) within the EU and adjacent buffer. Protection of sensitive species needs to be considered during remediation activities. Loss of biologically active soil will have long-term effects that impact re-vegetation and biological integrity of the region. Further disruption of the soil will impact the seed bank of high quality species. Construction activity and noise can disrupt loggerhead shrike and other sensitive wildlife. Construction of temporary buildings associated with cleanup will increase pedestrian, car and truck traffic on a daily basis. Revegetation of area after remediation needs to consider the potential for competition with other level 3 resources. High impacts can be minimized by careful placement of remediation support systems away for high quality resources.

Cultural Resources

Current

Area is highly disturbed, however only a very small portion has been inventoried for archaeological resources. Geomorphology indicates a moderate potential to contain intact archaeological resources on the surface and/or subsurface. A National Register eligible historic/ethnohistoric trail/road is located within the EU. Two TCPs are visible from the EU.

National Register eligible Manhattan Project/Cold War Era resources have already been mitigated; T Plant has been identified as eligible for inclusion in the Manhattan Project National Historical Park.

[6] Note that Sr-90 and total uranium, which have somewhat large remaining vadose zone sources (relative to drinking water standards), are not considered significant threats to groundwater due to limited mobility in the Hanford subsurface (uranium and Sr-90) and decay (Sr-90). See **Part V** for details.

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. Permanent indirect effects to viewshed are possible from capping.

National Register eligible Manhattan Project/Cold War Era resources have already been mitigated; T Plant has been identified as eligible for inclusion in the Manhattan Project National Historical Park.

Considerations for Timing of the Cleanup Actions

The saturated zone beneath the CP-LS-6 area (T Plant Cribs and Ditches) currently has elevated levels of total and hexavalent chromium, I-129, nitrate, carbon tetrachloride (CCl_4), and trichloroethene (TCE) based on 2014 groundwater monitoring results (http://phoenix.pnnl.gov/apps/gw/phoenix.html). Sites within the CP-LS-6 EU are suspected of being able to contribute mobile contaminants to the saturated zone (DOE/RL-92-16, Rev. 0) although carbon tetrachloride and TCE were not reported for the CP-LS-6 EU waste sites (Table G.5.5-4) and no plume areas were associated with the CP-LS-6 waste sites (**Part V**). Monitoring and treatment of groundwater is being conducted within the 200-ZP GWIA using the 200 West Pump and Treat Facility, which is described as part of the CP-GW-2 EU (Appendix D.6). Treatment efforts indicate a general downward trend in contaminant concentrations; however, some plume areas have increased and concentrations still exceed maximum contaminant levels. Thus additional cleanup actions may be warranted for this EU.

There is potential for additional contaminant release and migration through the vadose that may eventually impact additional groundwater if cleanup activities are delayed. There is also potential risk from direct radiation to workers (and ecological receptors) from routine maintenance operations. However, there would be no *additional* risk to facility workers, co-located persons, or the public if cleanup is delayed.

Near-Term, Post-Cleanup Risks and Potential Impacts

Groundwater: During the Near-term, Post-Cleanup period (described in **Parts V** and **VI** and Table G.5.5-6), the ratings for the Group A and B primary contaminants range from *Low* (including for Sr-90 and total uranium to address uncertainties) to *High* for hexavalent chromium.

Columbia River: As indicated in **Part V**, no radionuclides or chemicals from the 200 West Area (that includes the CP-LS-6 EU waste sites) are predicted to have concentrations exceeding screening values in this evaluation period. Thus the rating will not be modified and all ratings are *Not Discernible* (*ND*) as is the overall rating (Table G.5.5-6).

PART II. ADMINISTRATIVE INFORMATION

OU AND/OR TSDF DESIGNATION(S)

CP-LS-6 EU. The *Operable Unit Cross-Walk* in Attachment 1 indicates 200-WA-1 and 200-DV-1. Other Operable Units mentioned in Attachment 1 (for WIDS codes included in the evaluation) are 200-SW-2, 200-IS-1, and 200-OA-1.

EU Designation: CP-LS-6

COMMON NAME(S) FOR EU

T Plant Cribs and Ditches

KEY WORDS

T Plant Cribs and Ditches, T Plant, 221-T, Central Plateau, 200 Area, 200-WA-1, 200-ZP, 200-ZP-1

REGULATORY STATUS

Regulatory basis

The Hanford Federal Facility Agreement and Consent Order (also known as the Tri-Party Agreement or TPA) (Ecology et al., 1996) identifies the responsibilities of DOE, EPA, and the Washington State Department of Ecology under Section 120, "Federal Facilities," of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERLCA) to jointly administer remedial actions on the Hanford Site (DOE/RL-2010-49, Draft B). The CERCLA process is clearly established and described in detail at: www.epa.gov/superfund.

The TPA is a living document incorporating the remedial investigations (RIs), decisions, and actions agreed upon by DOE, EPA, and Ecology. DOE is the lead agency responsible for the remedial process at the Hanford Site, involving conducting an RI/FS, developing a plan and record of decision (ROD), and performing the remedial actions. Planning follows EPA guidance for the RI/FS, which are intended to meet RCRA facility investigation/corrective measures study (RFI/CMS) requirements. Finally, the TPA requires that the technical requirements of the Resource Conservation and Recovery Act (RCRA) corrective action process be fulfilled (DOE/RL-2010-49, Draft B).

The CERCLA process for the remediation and closure of the 200-WA-1 (formerly contained within the 200-UW-1 OU and which contains one-half of the CP-LS-6 waste sites) and 200-BC-1 OUs consists of the following major activities (represented as documents):

- Develop an RI/FS work plan and RI/FS report.
- Develop a final proposed plan.
- Develop and approve a ROD.
- Develop a final remedial design/remedial action (RD/RA) work plan.
- Develop a remedial action report.
- Develop and implement a monitoring program (if required).
- Perform a cyclic 5-year review of the remedy effectiveness, as required by CERCLA.

A work plan has been developed identifying the activities needed to complete the RI/FS and make a remedial decision for the 200-WA-1 and 200-BC-1 OU waste sites. A proposed plan summarizing the RI/FS and identifying the preferred remedial alternative will be issued for public review and comment. The Record of Decision (ROD) will be issued by EPA and signed by DOE, EPA, and Ecology.

There are also CP-LS-6 waste sites included in the 200-MG-1 (DOE/RL-2008-44, Rev. 0) and 200-MG-2 OUs (DOE/RL-2008-45, Rev. 0):

- 200-MG-1 waste sites are the 216-T-4A and UPR-200-W-3, -4, -58, -65, and -73 unplanned releases.
- 200-MG-2 waste sites are the 216-T-1, 216-T-4-1D, 216-T-4-2, 216-T-4A, 216-T-9, and 216-T-10.

Action memoranda have been issued for non-time-critical actions for selected sites within the 200-MG-1 and 200-MG-2 OUs (DOE/RL-2009-37, Rev. 0; DOE/RL-2009-48, Rev. 0; DOE/RL-2009-86, Rev. 0). None of the 200-MG-1 waste sites selected for action are in the CP-LS-6 EU. The six 200-MG-2 waste sites in the CP-LS-6 EU are slated for action (DOE/RL-2009-37, Rev. 0).

There is also deep vadose zone contamination associated with CP-LS-6 waste sites (DOE/RL-92-16, Rev. 0) that will be treated as part of the 200-DV-1 OU. However, no remedial decisions have been made for the deep vadose zone and thus no regulatory documents are available (DOE/RL-2014-11, Rev. 0).

Applicable regulatory documentation

- BHI-00177, Rev. 00, T *Plant Aggregate Area Management Study Technical Baseline Report*, Bechtel Hanford, Inc., Richland, Washington.
- DOE/RL-91-61, Rev. 0, *T Plant Source Aggregate Area Management Study Report*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- DOE/RL-92-16, Rev. 0, *200 West Groundwater Aggregate Area Management Study Report*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- DOE/RL-2006-24, Draft A, Remedial Investigation Report for 200-ZP-1 Groundwater Operable Unit, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- DOE/RL-2007-28, Rev. 0, Feasibility Study for the 200-ZP-1 Groundwater Operable Unit, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- DOE/RL-2008-45 Rev. 0, *Engineering Evaluation/Cost Analysis for the 200-MG-2 Operable Unit Waste Sites*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- DOE/RL-2009-37, Rev. 0, *Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- DOE/RL-2010-49, Draft B, *Remedial Investigation/Feasibility Study Work Plan 200-WA-1 and 200-BC-1 Operable Units*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- DOE/RL-2011-102, Draft A, *Remedial Investigation/Feasibility Study and RCRA Facility Investigation/Corrective Measures Study Work Plan for the 200-DV-1 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- DOE/RL-2011-104, Rev. 0, *Characterization Sampling and Analysis Plan for the 200-DV-1 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.
- EPA 2008, 'Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington,' U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://yosemite.epa.gov/r10/CLEANUP.NSF/sites/hanford2/$FILE/Hanford-200-ZP-1-ROD.pdf.

As described in **Part I**, the following two reports are included as analogous information:

- DOE/RL-2003-23, Rev. 0, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

- DOE/RL-2003-24, Rev. 0, *Proposed Plan for the 200-UW-1 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

Applicable Consent Decree or TPA milestones

- Milestone M-015-91B; Lead Regulatory Agency: EPA. *Submit Feasibility Study Report(s) and Proposed Plan(s) for the 200-BC-1/200-WA-1 operable units (200 West Inner Area) to EPA.* Due Date: 07/31/2021.
- Milestone M-015-110B; Lead Regulatory Agency: Ecology. *Submit Corrective Measures Study & Feasibility Study Report and Proposed Plan/Proposed Corrective Action Decision for the 200-DV-1 OU to Ecology.* Due Date: 09/30/2023

RISK REVIEW EVALUATION INFORMATION

Completed

February 24, 2017

Evaluated by

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Ratings/Impacts Reviewed by

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PART III. SUMMARY DESCRIPTION

CURRENT LAND USE

DOE Hanford Site for industrial use. All current land-use activities in the 200 West Area are *industrial* in nature (EPA 2012).

DESIGNATED FUTURE LAND USE

Industrial-Exclusive. All four land-use scenarios listed in the Comprehensive Land Use Plan (CLUP) indicate that the 200 West Area is denoted *Industrial-Exclusive* (DOE/EIS-0222-F). An industrial-exclusive area is “suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, and nonradioactive wastes” (DOE/EIS-0222-F).

PRIMARY EU SOURCE COMPONENTS

Legacy Source Sites

The CP-LS-6 waste sites primarily consist of *liquid waste disposal* sites often associated with 221-T (or T Plant) Facility operations (see CP-OP-2 EU in Appendix H.4). The CP-LS-6 liquid waste disposal sites include legacy waste sites (e.g., cribs, ditches, trenches, ponds, wells, and unplanned releases (UPRs)) where liquid wastes was discharged, infrastructure buildings, pipelines and associated equipment, and an inactive burial ground.

High-Level Waste Tanks and Ancillary Equipment

Note that the CP-LS-6 EU waste sites include nine pipeline and associated equipment waste sites although only one is part of the Single Shell Tank (SST) System (DOE/RL-2010-114, Draft A, p. A-20 – A-27) and assumed treated in the Tank Waste and Farms EU (Appendix E.1 through Appendix E.11). Other CP-LS-6 pipelines and associated equipment may have been addressed in the TC&WM EIS and thus the Tank Waste and Farms EU (Appendix E.1 through Appendix E.11); however, the remaining pipeline and related wastes sites will not be evaluated further due to a lack of inventory information.

Groundwater Plumes

The saturated zone beneath the CP-LS-6 area (T Plant Cribs and Ditches) has elevated levels of total chromium, hexavalent chromium (Cr-VI), I-129, nitrates, carbon tetrachloride (CCl_4), and trichloroethene (TCE) based on 2014 groundwater monitoring results (http://phoenix.pnnl.gov/). Sites within the CP-LS-6 EU are suspected of being able to contribute mobile contaminants to the saturated zone (DOE/RL-92-16, Rev. 0); although CCl_4 and TCE were not reported for the CP-LS-6 EU waste sites (Table G.5.5-4). Monitoring and treatment of groundwater (via the 200 West Pump and Treat Facility) is being conducted within the 200-ZP GWIA, which is described as part of the CP-GW-2 EU (Appendix D.6).

Operating Facilities

Not applicable

D&D of Inactive Facilities

Not applicable

LOCATION AND LAYOUT MAPS

The 200-WA-1 OU (which contains many of the waste sites comprising the CP-LS-6 EU) is located in the Hanford Central Plateau Inner Area (shown in Figure G.5.5-1 and Figure G.5.5-2). The T Plant Cribs and Ditches (Figure G.5.5-3) are located in the northeastern part of 200 West Area.

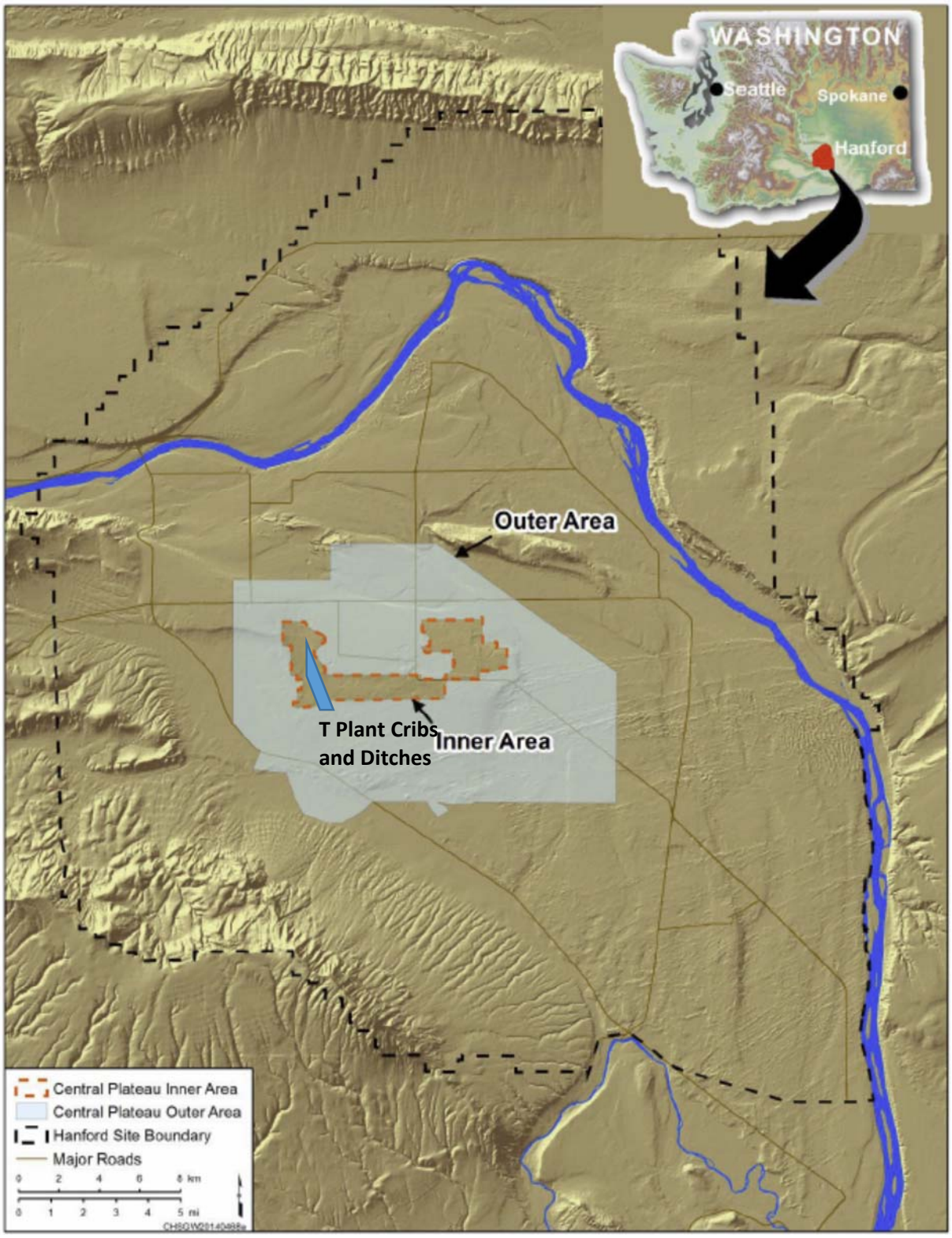

Figure G.5.5-1. The Hanford Site showing the Central Plateau Inner and Outer Areas (reproduced from (DOE/RL-2010-49, Draft B, p. 1-2))

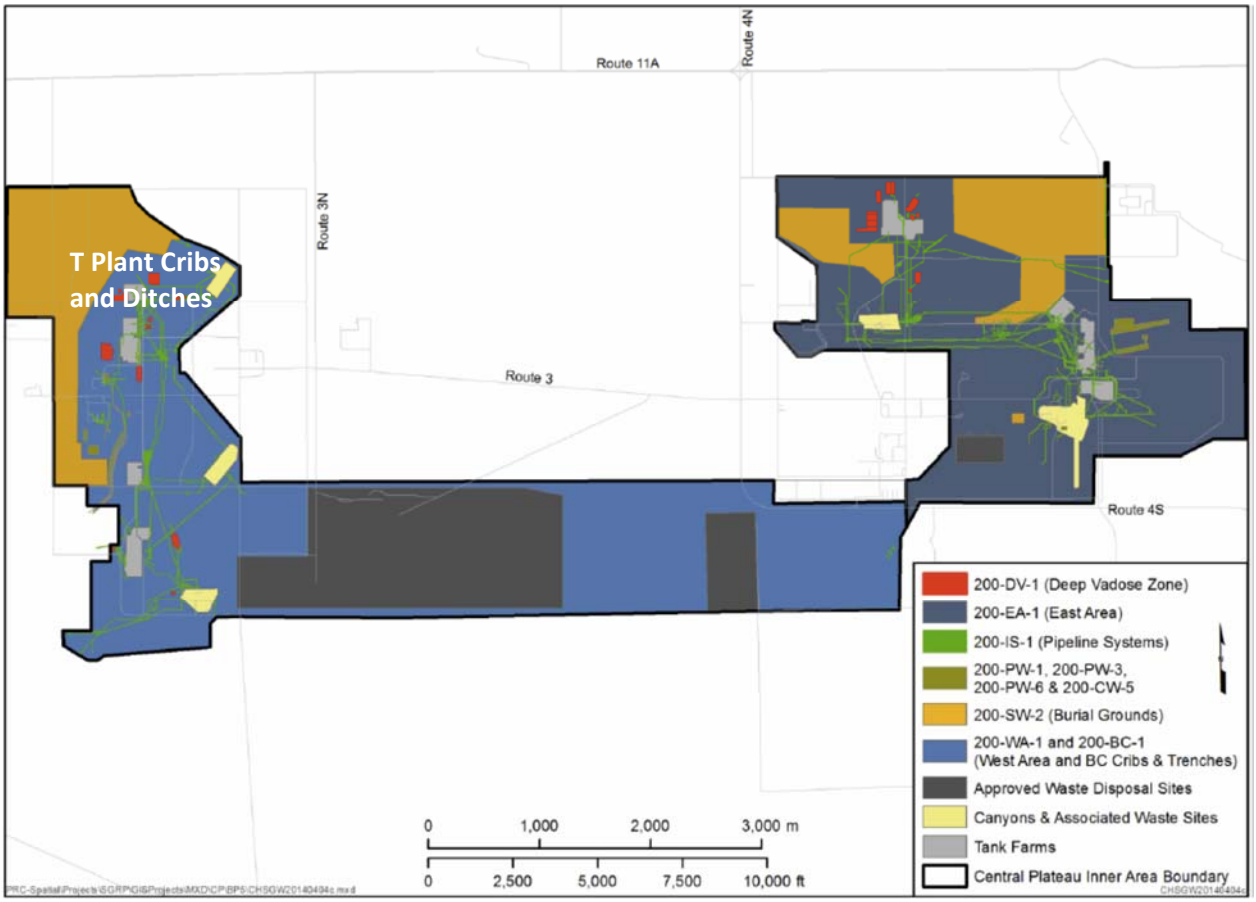

Figure G.5.5-2. Operable Units in the Hanford Central Plateau Inner Area (reproduced from (DOE/RL-2010-49, Draft B, p. 1-10))

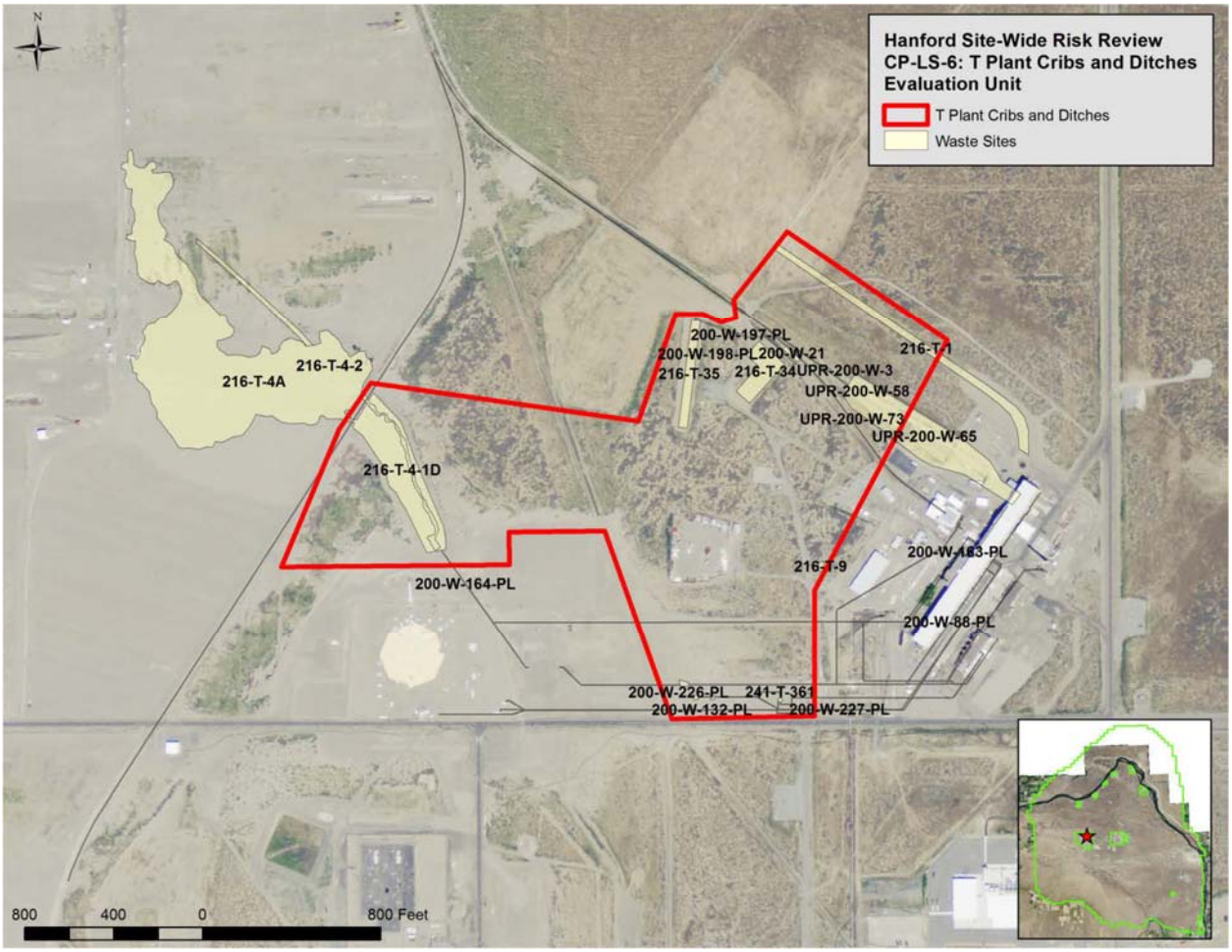

Figure G.5.5-3. CP-LS-6 (T Plant Cribs and Ditches) Site Location Map and WIDS Locations

PART IV. UNIT DESCRIPTION AND HISTORY

EU FORMER/CURRENT USE(S)

The CP-LS-6 waste sites primarily consist of *liquid waste disposal* sites associated with 221-T Facility operations (see the CP-OP-2 EU described in Appendix H.4). T Plant was the first chemical separation facility completed (1944) at the Hanford Site to produce purified plutonium for use in nuclear weapons using a bismuth phosphate chemical separation process (DOE/RL-91-61, Rev. 0). Currently 221-T is the oldest remaining nuclear facility in the country that is still operating with a current mission.

LEGACY SOURCE SITES

The T Plant (221-T) process generated significant amounts of liquid waste that were discharged to various legacy waste sites (i.e., cribs, ditches, wells, and trenches) (Attachment 1). Cribs and drains were designed to percolate low-level liquid wastes into the soil without exposing it to air (DOE/RL-91-61, Rev. 0). Most cribs, drains, and trenches were designed to receive liquid until the unit's specific retention or radionuclide capacity was met. Cribs are shallow excavations that are either backfilled or held open by wood structures that are then covered with an impermeable layer. Occasionally, surface contamination

at a crib or other waste management unit requires stabilization activities, which generally consist of removal of the contaminated soil followed by covering the excavated site with clean fill, gravel, or asphalt.

GROUNDWATER PLUMES

The saturated zone beneath the CP-LS-6 area (T Plant Cribs and Ditches) currently has elevated levels of total and hexavalent chromium (Cr-VI), I-129, nitrates, carbon tetrachloride (CCl_4), and trichloroethene (TCE) (http://phoenix.pnnl.gov/apps/gw/phoenix.html). Associated plumes are described as part of the 200-ZP GWIA described in CP-GW-2 EU (Appendix D.6). Sites within the CP-LS-6 EU, including 216-T-3, 216-T-6, 216-T-34, and 216-T-35 are suspected of being able to contribute mobile contaminants to the saturated zone (i.e., representing migration of contaminants from the waste site to the uppermost aquifer) (DOE/RL-92-16, Rev. 0, Table 2-2). However, CCl_4 and TCE are not reported for the CP-LS-6 wastes sites (Table G.5.5-4) and there is no link between the CP-LS-6 EU waste sites and the Tc-99 plume in 200-ZP[7]. Monitoring and treatment of groundwater is being conducted within the 200-ZP GWIA using the 200 West Area Pump and Treat Facility.

D&D OF INACTIVE FACILITIES

Not applicable

ECOLOGICAL RESOURCES SETTING

Landscape Evaluation and Resource Classification

A patchwork of vegetated and non-vegetated habitat occurs within the T Plant Cribs and Ditches EU Approximately 72% of the EU is classified as resource level 2 or below, the remaining 28% is classified as level 3 habitat (Appendix J, Figure J.20, Table J.18). The level 3 and level 2 habitats extending from the center of the EU toward the northeast provide a corridor to the level 3 habitat within the buffer area and higher quality shrub-steppe habitats to the northwest.

The amount and proximity of biological resources surrounding the EU were examined within the adjacent landscape buffer area, which extends 3162 ft (964 m) from the geometric center of the EU (Appendix J, Figure J.20). Over 83% of the combined EU and buffer area is classified as resource level 2 or below (Appendix J, Table J.18). Nearly 17% is classified as a level 3 resource. High-quality habitat in the northwest portion of the buffer area includes several different shrub-steppe and steppe plant communities.

Field Survey

The T Plant Cribs and Ditches EU encompasses a patchwork of different habitats including waste sites and roads kept free of vegetation and remnants patches of shrub-steppe. A crib in the northern part of the EU has been revegetated with crested wheatgrass (*Agropyron cristatum*). Level 2 habitat (Appendix J, Figure J.20) in the EU typically contains 25% successional shrub cover and up to 5% climax shrub cover in the overstory with a mixture of native and introduced grasses and forbs in the understory (Appendix J, Table J.17).

[7] The focus here is on Group A and B primary contaminants, which are persistent and likely mobile in the Hanford subsurface (CRESP 2015a).

Some of the level 3 habitat surrounding the laydown/storage yard in the center of the EU consists of big sagebrush (*Artemisia tridentata*) (Appendix J, Table J.17) with only very sparse Sandberg's bluegrass (*Poa secunda*) or no herbs in the understory. In these areas, the understory may have been denuded by rabbits; black-tailed jackrabbits (*Lepus californicus*), a state candidate species, were observed in the area. Another state candidate species, sage sparrows (*Amphispiza belli*) were observed perched and singing in the EU. Field data records at the end of this EU section in Appendix J provides lists of the animals and plants observed during the May 2015 survey.

CULTURAL RESOURCES SETTING

Very small portions of the CP-LS-6, T Plant Cribs and Ditches EU were inventoried for cultural resource under two archaeological surveys: HCRC#87-200-016 (Cadoret and Chatters 1988) and HCRC#88-200-038 (Chatters and Cadoret 1990). It is unknown if an NHPA Section 106 review has been completed for remediation of CP-LS-6, T Plant Cribs and Ditches EU. It is possible, but not likely, that intact archaeological material is present in the EU, both on the surface and in the subsurface, because the soils in the EU have been disturbed by Hanford Site activities.

One archaeological resource, a non-contributing segment of a National Register eligible historic/ethnohistoric trail/road has been documented within the CP-LS-6, T Plant Cribs and Ditches EU which runs through the EU. Additionally, a segment 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 has also been documented with the EU. In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE-RL 1998), all documentation requirements have been completed for this latter property.

One archaeological isolate associated with the Native American Precontact and Ethnographic Landscape has been recorded within 500 meters of the CP-LS-6, T Plant Cribs and Ditches EU. This isolate has not been formally evaluated for listing in the National Register of Historic Places, however, it should be noted that isolates are typically considered not eligible. In addition 13 National Register-eligible buildings that are contributing properties within the Manhattan Project and Cold War Era Historic District are located within 500 meters of the CP-LS-6, T Plant Cribs and Ditches EU (all 13 are contributing within the Manhattan Project and Cold War Era Historic District, 10 with individual documentation required, and 3 with no additional documentation required). In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE-RL 1998), all documentation requirements have been completed for these contributing properties. T Plant (221-T) is located within 500 meters of the CP-LS-6, T Plant Cribs and Ditches EU. This building has been selected for preservation, and HAER level documentation has been completed. Additionally, T Plant (221-T) has been identified as part of the Manhattan Project National Historic Park by the National Park Service.

Historic maps and aerial imagery of this area show a historic/ethnohistoric trail/road running through the EU suggesting a moderate 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-LS-6, T Plant Cribs and Ditches EU. However, extensive ground disturbance throughout the entire EU suggests a lower potential for intact cultural resources at or below ground surface. It is possible that pockets of undisturbed soils exist within the EU. Resources, if present, would likely be limited to these areas of intact or undisturbed soils.

Because only small portions of the CP-LS-6 have been inventoried for cultural resources, and because of the potential for intact archaeological deposits within portions of the EU, it may be appropriate to

conduct surface and subsurface archaeological investigations in these areas prior to initiating 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

As indicated in Attachment 1, there are six waste sites in the CP-LS-6 EU that have reported inventory information in the SIM, Rev. 1 (Corbin, et al., 2005) (i.e., Table G.5.5-2 through Table G.5.5-4) and are considered representative of the major inventory sources and risks from this EU. These waste sites consist of one MUST, three cribs, one well, and one ditch (DOE/RL-91-61, Rev. 0; DOE/RL-92-16, Rev. 0):

- The 216-T-1 ditch is 556 x 0.9 m (1,825 x 3 ft) with a depth of 3.3 m (10 ft). From 1944 to 1956, the waste site received waste from pilot plant experimental work, intermittent decontamination waste, and waste from the head end of the 221-T Building. In 1964 it started receiving cooling water from the blowdown vessel in the 221-T Building and miscellaneous waste from PNL head end operations in the 221-T Building. Since 1970 the ditch has been receiving condensate from radiators at the head end of the 221-T Building.
- The 216-T-3 reverse well operated from 1945-1946 and received 11,300 m^3 of cell drainage from Tank 5-6 in the 221-T Building and overflow waste from the 214-T-361 Settling Tank.
- The 216-T-6 crib operated from 1946 to 1952 and received 45,000 m^3 of cell drainage from tanks in 221-T building. The waste is low salt and neutral/basic.
- The 216-T-34 crib operated from 1966 to 1967 and received 17,300 m^3 of 300 area laboratory waste from the 340 facility.
- The 216-T-35 crib operated from 1967 to 1968 and received 5,720 m^3 of 300 area laboratory waste from the 340 facility.
- The 241-T-361 settling tank is a concrete, in-ground settling tank that received 106 m^3 of T Plant drainage and was used to collect solids (including 75,700 L of sludge) from the bismuth phosphate separation process in the 221-T Building. The tank stopped operating in 1976. The solids were high in uranium with an alkaline pH.

CONTAMINATION WITHIN PRIMARY EU SOURCE COMPONENTS

Legacy Source Sites

The CP-LS-6 EU waste sites with reported inventories are primarily legacy sites (with the exception of the 241-T-361 MUST); inventory information is provided in Table G.5.5-2 through Table G.5.5-4.

Vadose Zone Contamination

Because the CP-LS-6 EU waste sites are primarily legacy sites that represent soil and other vadose zone contamination (including discharges to the soil), the reported inventory information is provided in Table

G.5.5-2 through Table G.5.5-4. However, because the 241-T-361 MUST, which is a reinforced concrete settling tank, is considered sufficiently isolated from the vadose zone[8], this inventory is considered not part of the vadose zone inventory for the purpose of this Review.

The inventories provided in Table G.5.5-2 through Table G.5.5-4 (minus those for 241-T-361) represent the reported contamination originally discharged (without decay correction[9]) to the vadose zone from the CP-LS-6 EU waste sites. These values are used to estimate the inventory remaining in the vadose zone using the process described in the Methodology Report (CRESP 2015a) for the 2013 groundwater plume information as revised for the 2015 Groundwater Monitoring Data (DOE/RL-2016-09, Rev. 0) described in Appendix D.1. The focus in this section will be on the Group A and B contaminants (CRESP 2015a) in the vadose zone due to their mobility and persistence and potential threats to groundwater (a protected resource). To summarize (where current 200-ZP GWIA plumes for total and hexavalent chromium, I-129, Tc-99, CCl_4, and TCE are not associated with the T Plant Cribs and Ditches EU waste sites as described below)[10]:

- *Chromium* – There are reported inventories for chromium in the CP-LS-6 waste sites (Table G.5.5-4) and current plumes in the 200-ZP GWIA in the vicinity. The vadose inventory is dominated by a crib (216-T-34) and a reverse well (216-T-3). Sources include past leaks from SSTs and from REDOX and PUREX (200 East Area) plant operations; however, none of these sources could be linked back to the CP-LS-6 EU waste sites by the author. Using information from Section 2.5 (Appendix E.2) for chromium in the WMA T (200 West), a continuation of chromium plumes in the 200-ZP GWIA is expected during the next 150 years; it is possible that a portion these plumes would have CP-LS-6 waste sites as contributors. However, there is no information available to partition the future plumes and it is assumed that any future contributions would be localized and small relative to those already from WMA T and WMA TX-TY. Furthermore, the 200-ZP groundwater is being treated using the 200 West P&T Facility, which is reducing the amount of chromium in the local groundwater (Table 12-1 in DOE/RL-2016-09, Rev. 0).
- *Carbon tetrachloride (CCl_4) and trichloroethene (TCE)* – There are no reported vadose zone inventories for these contaminants for the CP-LS-6 waste sites (Table G.5.5-4).
- *I-129* – There are reported inventories for I-129 (Table G.5.5-2) and multiple plumes in the vicinity. The vadose zone inventory is dominated by the 216-T-34 Crib. Sources include past leaks from SSTs containing metal and liquid waste and chemical processing at T Plant; however, based on the plume history, none of these sources could be definitively linked to CP-LS-6 EU waste sites[11]. Using information from Section 2.5 (Appendix E.2) for I-129 in the WMA T (200

[8] There has been no indication of leaking from the 241-T-361 MUST (DOE/RL-88-30, Rev. 23, pp. 1249-1250).

[9] As described in the Methodology Report (CRESP 2015a) values are typically not decay corrected because of the large uncertainties in many of the values used in the CRESP evaluations and the rough-order-of-magnitude evaluations presented in the Review. One exception, for example, is when evaluating long-term impacts to groundwater for Group A and B radionuclides (e.g., Sr-90) with half-lives that are relatively short relative to the evaluation period (CRESP 2015a).

[10] The plume information is primarily taken from PHOENIX (http://phoenix.pnnl.gov/apps/gw/phoenix.html) that show the 2014 groundwater plumes. These plumes were assumed representative of 2015 groundwater plumes.

[11] The I-129 plume areas (including any possible and likely small contributions from the CP-LS-6 EU waste sites based on the reported inventory in Table G.5.5-2) are evaluated as part of the TX-TY Tank and Waste Farm EU (Appendix E.4). Note that the total reported I-129 inventory (0.0082 Ci) for the CP-LS-6 EU waste sites is almost 30

West), a continuation of 200-ZP I-129 plumes is expected over the next 150 years, where it is possible that a portion these plumes would have CP-LS-6 waste sites as contributors. However, there is no information available to partition these future plumes and it is assumed that any future contributions would be small relative to those already from WMA TX-TY[11]. Furthermore, the 200-ZP groundwater is being treated using the 200 West P&T Facility, which is reducing the amount of I-129 in the local groundwater (Table 12-1 in DOE/RL-2016-09, Rev. 0).

- *Tc-99* – There are reported inventories for Tc-99 (Table G.5.5-3) and small plumes in the vicinity. The vadose zone inventory is dominated by the 216-T-6 Crib; however, the sources for the 200-ZP plume were releases from leaks in single-shell tanks (SSTs) and pipelines in WMA T and WMA TX-TY and from liquid waste disposal from plutonium-processing operations to cribs and trenches adjacent to the WMAs (i.e., not part of CP-LS-6). Using information from Section 2.5 (Appendix E.2) for Tc-99 in the WMA T (200 West), a continuation of the 200-ZP Tc-99 plumes is expected over the next 150 years, where it is possible that a portion these plumes would have CP-LS-6 waste sites as contributors. However, there is no information available to partition these future plumes and it is assumed that any future contributions would be small relative to those already from WMA T and WMA TX-TY. Furthermore, the 200-ZP groundwater is being treated using the 200 West P&T Facility, which is reducing the amount of Tc-99 in the local groundwater (Table 12-1 in DOE/RL-2016-09, Rev. 0).
- *Sr-90, Uranium, and other Group A&B Primary Contaminants (PCs)* – There are no current plumes for total uranium, Sr-90, or other Group A&B PCs not mentioned above (i.e., C-14, Cl-36, or CN) in the vicinity of CP-LS-6; however, there are reported vadose zone inventories for Sr-90 (Table G.5.5-3), C-14 (Table G.5.5-2), and uranium (Table G.5.5-3 and Table G.5.5-4) but none for Cl-36 (Table G.5.5-2) or CN (Table G.5.5-4). The reported Sr-90 vadose zone inventory (i.e., outside of 241-T-361) is dominated by a crib (216-T-6), a ditch (216-T-1), and a reverse well (216-T-3). The total uranium vadose zone inventory (outside of 241-T-361) is dominated by three cribs (216-T-34, 216-T-35, and 216-T-6). The reported C-14 inventory is dominated by the 216-T-35 and 216-T-34 Cribs. The majority of the Sr-90 and uranium originally discharged into the vadose zone (via cribs and a ditch) would have had to travel through much of the vadose zone to impact groundwater[12]. Using an analysis similar to that in Section 2.5 (Appendix E.2) in the WMA T (200 West), a Sr-90 or uranium plume is not expected in the next 150 years due to retardation in the vadose zone or afterwards due to radioactive decay of Sr-90 (+99.9% further reduction in inventory). Thus Sr-90 and total uranium (and the remaining Group A and B PCs for the reasons mentioned above) are not considered significant threats to the Hanford groundwater during the first 150 years.

Using the process outlined in Chapter 6 of the Methodology Report (CRESP 2015a) for the 2013 groundwater results as revised for the 2015 Groundwater Monitoring Data (DOE/RL-2016-09, Rev. 0) described in Appendix D.1, the remaining vadose zone inventories in Table G.5.5-5 are estimated by difference and used to calculate Groundwater Threat Metric (GTM) values for the Group A and B contaminants remaining in the vadose zone as illustrated in Table G.5.5-5. Note that the remaining

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times lower than the I-129 inventory associated with leaks, cribs, trenches, and UPRs from the TX-TY Tank and Waste Farm EU (Appendix E.4). Furthermore, the history of the plume indicates that the plume appeared to originate from TX-TY sources.

[12] Sr-90 was injected into the groundwater in the 1940s using the 216-T-3 reverse/injection well; however, this contamination has both dispersed and decayed.

vadose zone (VZ) ratings range from *Low* (C-14, I-129, and Tc-99) to *Medium* (total chromium) to *High*. Because there is no current Sr-90 or uranium plume nor one expected for the next 150 years as described above, the current ratings for Sr-90 and total uranium are *Not Discernible* (*ND*). The overall current rating is defined as the highest over all the ratings and thus *High*.

Groundwater Plumes

Waste sites within the CP-LS-6 EU are suspected of be able to contribute contamination to the saturated zone (DOE/RL-92-16, Rev. 0), and (of the Group A and B primary contaminants) chromium, C-14, Tc-99, I-129, Sr-90, and uranium have reported inventories for the CP-LS-6 sites (Table G.5.5-2 through Table G.5.5-4). Monitoring and treatment of groundwater the 200-ZP GWIA using the 200 West P&T facility is being conducted within the 200-ZP GWIA, which is described as part of the CP-GW-2 EU (Appendix D.6). The saturated zone inventories related to the CP-LS-6 EU are provided in Table G.5.5-5; the process for deriving these inventories is described in CRESP Methodology Report (CRESP 2015a) originally for the 2013 groundwater plume information as revised for the 2015 Groundwater Monitoring Data (DOE/RL-2016-09, Rev. 0) described in Appendix D.1.

In general the 2015 groundwater plumes are evaluated in separate EUs (see Appendix D.1 through Appendix D.6); however, portions of the groundwater plumes can be associated with the T Plant Cribs and Ditches EU based on source information in the Groundwater Monitoring Report (DOE/RL-2016-09, Rev. 0), and these partial plume areas will be evaluated to provide a better idea of the saturated zone versus remaining vadose zone threats to groundwater. The estimated inventory for the saturated zone contamination is provided in Table G.5.5-5 where Photoshop was used to estimate the fraction of plumes considered associated with the T Plant Cribs and Ditches EU (Attachment 6-4 in the Methodology Report (CRESP 2015a) as revised for the 2015 Groundwater Monitoring Data (DOE/RL-2016-09, Rev. 0) described in Appendix D.1). This information is also used to estimate amounts treated and remaining in the vadose zone. For the groundwater plumes described in the 200-ZP GWIA, apportionment of plumes and ratings to the T Plant Cribs and Ditches EU would be as follows (DOE/RL-2016-09, Rev. 0):

- *Chromium* – There are current total and hexavalent plumes in the 200-ZP GWIA. Sources include past leaks from SSTs and from REDOX and PUREX (200 East Area) plant operations and involve the WMA T (Appendix E.2) and WMA TX-TY (Appendix E.4); none of these sources could be linked back to the CP-LS-6 EU waste sites. Thus no portion of these total or hexavalent chromium plumes are associated with the CP-LS-6 EU.
- *Carbon tetrachloride (CCl_4) and trichloroethene (TCE)* – The CCl_4 and TCE plumes "straddle" the 200-UP and 200-ZP GWIAs; these plumes are "managed" in the 200-ZP GWIA (Appendix G.6). Furthermore, there are no inventories for CCl_4 or TCE reported for the CP-LS-3 EUs and thus no portions of the corresponding plumes are associated with the CP-LS-3 EU.
- *I-129* – There are plumes in the vicinity of the CP-LS-6 EU waste sites and vadose zone inventories (Table G.5.5-2). The 200-ZP sources for plumes include past leaks from single-shell tanks (SSTs) containing metal and liquid waste and chemical processing at T Plant; however, none of the plume areas can be definitively linked to CP-LS-6 waste sites as described in the previous section. Thus no portion of the 200-ZP plume area is associated with the CP-LS-6 EU.
- *Tc-99* – There are plumes in the vicinity of the CP-LS-3 EU waste sites and reported vadose zone inventories (Table G.5.5-3). For 200-ZP, sources include releases from SST and pipeline leaks in WMA T and WMA TX-TY and liquid waste disposal from plutonium-processing operations to cribs and trenches adjacent to these WMAs; however, none of the plume areas can be

definitively linked to CP-LS-6 waste sites as described in the previous section. Thus no portion of the 200-ZP plume area is associated with the CP-LS-6 EU.

- *Group C&D Contaminants* – There are plumes and reported inventories for nitrates and tritium; however, these are not the focus of this discussion.

Thus no portions of the 200-ZP GWIA plumes are associated with the CP-LS-6 EU waste sites. Treatment actions in the 200-ZP GWIA would impact CP-LS-6 EU contaminants.

No groundwater plumes were associated with the Group A and B PCs from the T Plant Cribs and Ditches EU, where the 200-ZP plumes are described in detail in the Appendix G.6 for the CP-GW-2 EU. Note that nitrate, hexavalent chromium, tritium (H-3), and I-129 are risk drivers (*Medium* ratings) for the 200-UP GWIA, and carbon tetrachloride (*Very High*) is the primary risk driver for the 200-ZP GWIA; however, there are no T Plant Cribs and Ditches EU sources associated with these plumes, and the remaining vadose zone sources from other EUs would drive future risks to groundwater from this EU.

Impact of Recharge Rate and Radioactive Decay on Groundwater Ratings

As described in Appendix E.2 for the CP-TF-1 (T Tank and Waste Farms) EU, the TC&WM EIS screening groundwater transport analysis (Appendix O, DOE/EIS-0391 2012) indicates that there is little impact of emplacing an engineered surface barrier (and resulting reduction of infiltrating water) on the predicted peak groundwater concentrations (relative to thresholds) at the T Barrier[13]. This result is likely due to the significant amounts of contaminants already in the groundwater and not due to an ineffective surface barrier. To summarize, the screening groundwater results at the T Barrier (Appendix O, DOE/EIS-0391 2012) include:

- Tc-99 peak concentration is 6,480 pCi/L (CY 2050) for the No Action Alternative versus 6,600 pCi/L (CY 2051) for Landfill Closure where the threshold value is 900 pCi/L.
- I-129 peak concentration is 26.1 pCi/L (CY 4560) for the No Action Alternative versus 12.6 pCi/L (CY 2050) for Landfill Closure where the threshold value of 1 pCi/L.
- Chromium peak concentration is 336 µg/L (CY 2036) for the No Action Alternative versus 353 µg/L (CY 2045) for Landfill Closure where the threshold value is 100 µg/L (total) or 48 µg/L (hexavalent).
- Uranium peak concentration is 9 µg/L (CY 11,840) for the No Action Alternative versus 1 µg/L (CY 11,843) for Landfill Closure where the threshold value is 30 µg/L (total uranium).
- No values are reported at the T Barrier for Sr-90 for either scenario, which indicates that predicted peak fluxes that were less than 1×10^{-8} Ci/yr (Appendix O, DOE/EIS-0391 2012, p. O-2).

Since the predicted peak concentrations remain above thresholds for Tc-99, I-129, and chromium even after surface barrier emplacement, it is decided to not alter the CP-LS-6 EU ratings related to groundwater based on different recharge rate scenarios. This effect is likely not due to an ineffective

[13] The barrier represents the edge of the infiltration barrier to be constructed over disposal areas that are within 100 meters [110 yards] of facility fence lines (DOE/EIS-0391 2012). The T Barrier is the closest to the CP-LS-6 EU. Despite including sources other than those for the CP-LS-6 EU, the analysis in the TC&WM EIS was considered a reasonable source of information to assess the potential impact of the engineered surface barrier emplacement.

surface barrier but instead the amount of these contaminants already in the groundwater and possible contributions of sources outside the CP-LS-6 EU (used in the TC&WM EIS analysis[14]).

Columbia River

Threats to the Columbia River similar to those presented by the T Plant Cribs and Ditches EU were evaluated in Section 2.5 of Appendix E.2 for CP-TF-1 (T Single-shell Tank and Waste Farm in 200 West) where all risks and potential impacts were rated *Not Discernible* (*ND*).

[14] Analyses specific to each Tank Farm or Central Plateau EU are not available; thus the aggregate screening analysis provided in the TC&WM EIS was used as an indication.

Table G.5.5-2. Inventory of Primary Contaminants [a]

WIDS	Description	Decay Date	Ref[b, c]	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[d]			1600	0.26	NR	0.11	4900	0.003	0.29	0.043	8.20E-03
241-T-361	MUST		EIS-S	1600	NR	NR	NR	4900	NR	NR	NR	NR
216-T-34	Cribs	2001	SIM	1.8	0.087	NR	0.038	0.31	3.60E-06	0.00026	0.00037	8.20E-03
216-T-35	Cribs	2001	SIM	3.1	0.15	NR	0.066	0.077	NR	NR	NR	NR
216-T-6	Cribs	2001	SIM	0.072	0.015	NR	0.007	16	0.0018	0.17	0.00021	3.50E-06
216-T-1	Ditch	2001	SIM	0.00036	6.30E-04	NR	5.20E-05	2.4	3.50E-06	0.00027	0.042	9.60E-07
216-T-3	Reverse well	2001	SIM	0.073	4.10E-03	NR	0.002	2	0.0012	0.12	2.00E-05	4.20E-07

a. NR = Not reported for indicated EU
b. EIS-S = DOE/EIS-0391 2012
c. SIM = RPP-26744, Rev. 0 (Corbin, et al. 2005)
d. Radionuclides are summed without decay correction since the uncertainties in inventories are large.

Table G.5.5-3. Inventory of Primary Contaminants (cont)[a]

WIDS	Description	Decay Date	Ref[b, c]	Ni-59 (Ci)	Ni-63 (Ci)	Pu (total) (Ci)	Sr-90 (Ci)	Tc-99 (Ci)	U (total) (Ci)
All	Sum[d]			0.005	0.43	14000	890	0.0099	0.42
241-T-361	MUST		EIS-S	NR	NR	14000	870	NR	NR
216-T-34	Cribs	2001	SIM	3.20E-05	0.0031	42	0.17	7.40E-05	0.38
216-T-35	Cribs	2001	SIM	NR	NR	7.1	0.0071	NR	0.025
216-T-6	Cribs	2001	SIM	0.0039	0.33	17	14	0.0079	0.014
216-T-1	Ditch	2001	SIM	1.30E-05	0.0013	0.041	2.7	0.00097	0.00016
216-T-3	Reverse well	2001	SIM	1.10E-03	0.092	19	1.7	0.00096	1.40E-03

a. NR = Not reported for indicated EU
b. EIS-S = DOE/EIS-0391 2012
c. SIM = RPP-26744, Rev. 0 (Corbin, et al. 2005)
d. Radionuclides are summed without decay correction since the uncertainties in inventories are large.

Table G.5.5-4. Inventory of Primary Contaminants (cont)[a]

WIDS	Description	Ref[b, c]	CCl4 (kg)	CN (kg)	Cr (kg)	Cr-VI (kg)	Hg (kg)	NO3 (kg)	Pb (kg)	TBP (kg)	TCE (kg)	U (total) (kg)
All	Sum		NR	NR	10000	NR	1	1.00E+06	7.1	NR	NR	120
241-T-361	MUST	EIS-S	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
216-T-34	Cribs	SIM	NR	NR	5800	NR	0.073	1.40E+05	1.7	NR	NR	64
216-T-35	Cribs	SIM	NR	NR	3	NR	0.13	3.00E+00	3	NR	NR	30
216-T-6	Cribs	SIM	NR	NR	680	NR	NR	2.30E+05	NR	NR	NR	21
216-T-1	Ditch	SIM	NR	NR	820	NR	0.84	19000	2.4	NR	NR	0.21
216-T-3	Reverse well	SIM	NR	NR	2600	NR	NR	650000	NR	NR	NR	2

a. NR = Not reported for indicated EU
b. EIS-S = DOE/EIS-0391 2012
c. SIM = RPP-26744, Rev. 0 (Corbin, et al. 2005)

Table G.5.5-5. 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	2.56E-01 Ci	---	---	2.56E-01 Ci	1.28E-01	*Low*
I-129	A	1 pCi/L	0.23	0.2	1.84	8.21E-03 Ci	---	---	8.21E-03 Ci	3.16E+00	*Low*
Sr-90	B	8 pCi/L	0.23	22	1.84	1.86E+01 Ci	---	---	1.86E+01 Ci	1.31E+01	*ND*[e]
Tc-99	A	900 pCi/L	0.23	0	1.84	9.87E-03 Ci	---	---	9.87E-03 Ci	1.10E-02	*Low*
CCl_4	A	5 µg/L	0.23	0	1.84	---	---	---	---	---	*ND*
Cr	B	100 µg/L	0.23	0	1.84	9.99E+03 kg	---	---	9.99E+03 kg	9.99E+01	*Medium*
Cr-VI	A	48 µg/L[b]	0.23	0	1.84	9.99E+03 kg	---	---	9.99E+03 kg	2.08E+02	*High*
TCE	B	5 µg/L	0.23	2	1.84	---	---	---	---	---	*ND*
U(tot)	B	30 µg/L	0.23	0.8	1.84	1.17E+02 kg	---	---	1.17E+02 kg	5.26E-01	*ND*[e]

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

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 2015a).

e. As discussed in **Part V**, no appreciable Sr-90 or total uranium plume would be expected in the next 150 years related to the CP-LS-6 EU waste site due to transport and decay considerations. The *Low* rating would apply after the Active Cleanup period to account for uncertainties.

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 waste sites were covered in clean soil, and soil cover is maintained as needed to prevent release to the air or intrusion by biological receptors or humans. The primary accident scenarios are direct human and ecological contact as well as continued groundwater impact (DOE/RL-2003-24, Rev. 0).

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

Active controls include monitoring and treatment of groundwater is being conducted within the 200-ZP GWIA using the 200 West Pump and Treat Facility. There are no active safety class or safety significant systems and controls.

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

Passive controls include the clean soil cover placed over the waste sites to prevent human and biological intrusion. There are no passive safety class or safety significant systems and controls.

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 primary barriers to release and transport from the waste sites, include sorption to vadose zone and saturated zone media and temporary soil and gravel cover. The soil and gravel covers are still in place although waste sites within the CP-LS-6 EU are still contaminating the surrounding vadose zone media and may be leading to additional saturated zone contamination. The saturated zone in the area is currently being treated using the 200 West Pump and Treat Facility (DOE/RL-2016-09, Rev. 0), which acts as an additional barrier. There are currently no complete pathways to human or ecological receptors; however, there is a complete path to the saturated zone (via the vadose zone), which is treated as a protected resource.

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

Those events (e.g., significant water line break or increased infiltration including temporary cover degradation) that could provide sufficient water to the CP-LS-6 waste sites to cause release and migration of the relatively more mobile species (e.g., Cr, Tc-99, and I-129) in the Hanford subsurface environment.

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

The primary pathway from the CP-LS-6 EU waste sites is release to the vadose zone (primarily from contact with infiltrating water) that then migrates to the saturated zone (groundwater), which is considered a protected resource (and thus receptor) and ultimately the Columbia River (which is also considered a protected resource and thus a receptor for the purpose of this study). Either contaminated groundwater or surface water (Columbia River) may be used by human or ecological receptors.

There are complete pathways for the exposure of ecological receptors to vadose zone contaminants in the legacy source areas. There will also be other possible pathways (ingestion, external radiation and dermal, inhalation) from residual wastes to human and ecological receptors after institutional controls are lifted.

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

As described in the CP-GW-2 (Appendix D.6), the relatively long residence times in Hanford groundwater are consistent with recharge conditions for a semi-arid site; however, there is variation in expected residence times (PNNL-6415 Rev. 18, p. 4-72). Groundwater travel time from 200 West to 200 East (50+ years) and then from 200 East to the Columbia River is (~10-30 years) limits impacts to the Columbia River to very mobile contaminants over very long time frames. Travel times from the 200 Areas to the Columbia River are expected to decrease because of the reduced hydraulic gradient from the discontinued wastewater recharge in the 200 Areas.

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

Waste sites in the CP-LS-6 EU pose a current risk (where constituents have already migrated to the saturated zone) and continuing risk to protected natural resources in the area including groundwater and perhaps the Columbia River in the very long-term, which is outside the scope of this evaluation. However, since there is prohibition on the use of groundwater through the Active and Near-term, Post-Cleanup periods, there is no risk to humans. Contaminated groundwater in the area is also being treated using the 200 West Pump and Treat Facility (DOE/RL-2016-09, Rev. 0), which decreases the risks to both the groundwater and the Columbia River. Furthermore, the risks to benthic, riparian zone, and free-flowing ecology are minimal as described in **Part V** of Appendix D.6 (CP-GW-2 EU).

POPULATIONS AND RESOURCES CURRENTLY AT RISK OR POTENTIALLY IMPACTED

As mentioned in **Part I**, there is no Documented Safety Analysis (DSA) or hazard analysis (HA) for the CP-LS-6 waste sites because they do not currently satisfy the requirements for performing these types of analyses. Thus evaluations of risk for this type of site (i.e., a legacy site) are often more qualitative in nature than those with a formal safety analysis.

The Department of Energy and contractor site-specific safety and health planning that includes work control, fire protection, training, occupational safety and industrial hygiene, emergency preparedness and response, and management and organization—which are fully integrated with nuclear safety and radiological protection—have proven to be effective in reducing industrial accidents at the Hanford Site to well below that in private industry. Because of similarities among waste sites within CP-LS-6 and CP-LS-3, **Part VI** in Appendix G.5.3 (CP-LS-3) has additional information. The evaluations and ratings in the section below are summaries of those developed for the CP-LS-3 EU (**Part VI** in Appendix G.5.3).

Facility Worker

Facility workers are at risk when working in or around areas with contaminated soils, where exposure to such contaminants is limited because waste sites and contaminated soils are located below grade. However, during monitoring and maintenance operations near the CP-LS-6 waste sites (e.g., drilling and sampling), there may be the potential for limited exposure to hazardous and radioactive contaminants; however, risks would be minimal and short-term resulting from activities conducted by experienced workers and appropriate safety precautions.

Facility Worker: Risks are thus rated as *Not Discernible (ND*) to *Low* because of the soil cover over most sites, with mitigated risk of *ND* to *Low* due to both soil cover and safety measures.

Co-Located Person (CP)

Co-located persons would be expected to have similar reduced exposures as for facility workers.

Co-Located Person: Risks are thus rated as *ND* to *Low*, with mitigated risk of *ND*.

Public

The public would be expected to have significantly reduced exposure, even lower than that for facility workers and co-located persons, due to the remote distance to the site, depth from ground surface to soil contamination, and depth to groundwater contamination (and lack of use).

Public: Risks are rated as *ND*; mitigated risk is rated as *ND*.

Groundwater

Table G.5.5-5 represents the current risks and associated ratings for the saturated zone (groundwater) from vadose zone contamination associated with the CP-LS-6 waste sites. Sites within the CP-LS-6 EU have contaminated both the shallow and deep vadose zone and are suspected of being able to contribute mobile contaminants to the saturated zone (DOE/RL-92-16, Rev. 0, Table 2-2) although no current plumes have been linked to CP-LS-6 sources (DOE/RL-2016-09, Rev. 0). Monitoring and treatment of groundwater is being conducted within the 200-ZP GWIA using 200 West Pump and Treat Facility, which is described as part of the CP-GW-2 EU (Appendix D.6). No 200-ZP plumes have been associated with CP-LS-6 EU waste sites.

Columbia River

As described in Appendix D.6 (CP-GW-2 EU, **Part V**), no plumes from the 200 West Area (that includes the CP-LS-6 waste sites) currently intersect the Columbia River, thus current ratings for all contaminants for the benthic, riparian, and free-flowing ecology are *ND*.

Ecological Resources

Summary of Ecological Review:

- 72% of the EU is characterized as a level 2, level 1 or level 0 resource.
- Level 3 resources within the EU provide habitat for black-tailed jackrabbits and sage sparrows, both Washington state candidate species. Because this is a relatively small acreage compared to the available level 3 resources around the EU, it is unlikely that removal of this habitat would significantly impact these species; however, it would represent a reduction of available habitat for sagebrush obligate species.
- Over 83% of the combined EU and adjacent landscape buffer area is considered resource level 2 or below.
- Level 3 sources near the center of the buffer area are isolated from other high-quality habitat, but similar habitat inside the buffer on the east and northeast are a part of larger expanses of level 3 resources.

Cultural Resources

The CP-LS-6, T Plant Cribs and Ditches 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.

Very small portions of the CP-LS-6, T Plant Cribs and Ditches EU were inventoried for cultural resource under two archaeological surveys: HCRC#87-200-016 (Cadoret and Chatters 1988) and HCRC#88-200-038 (Chatters and Cadoret 1990). Neither review resulted in the identification of cultural resources within the EU. It is unknown if an NHPA Section 106 review has been completed specifically for remediation of CP-LS-6, T Plant Cribs and Ditches 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-LS-6, T Plant Cribs and Ditches EU appear to have been heavily disturbed by Hanford Site activities.

Archaeological sites, buildings and Traditional Cultural Properties (TCPs) located within the EU[15]

- A non-contributing segment of a National Register eligible, historic/ethnohistoric trail/road is located within the EU.
- 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 the CP-LS-6 T Plant Cribs and Ditches EU. In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE-RL 1998), all documentation requirements have been completed for this property.

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

- One archaeological isolate associated with the Native American Precontact and Ethnographic Landscape has been documented within 500 meters of the EU. This isolate has not been formally evaluated for listing in the National Register, however, it should be noted that isolates are typically considered not eligible.
- There are 13 National Register-eligible buildings that are contributing properties within the Manhattan Project and Cold War Era Historic District are located within 500 meters of the CP-LS-6, T Plant Cribs and Ditches EU (all 14 are contributing within the Manhattan Project and Cold War Era Historic District, 10 with individual documentation required, and 3 with no additional documentation required). In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE-RL 1998), all documentation requirements have been completed for these properties.
- Table K.7 (Appendix K) has more information about the 13 buildings that are National Register-eligible Manhattan Project and Cold War Era buildings located within 500 meters of the CP-LS-6, T Plant Cribs and Ditches EU. T Plant (221-T) is located within 500 meters of the CP-LS-6, T Plant Cribs and Ditches EU. This building has been selected for preservation, and HAER level documentation has

[15] 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 & King 1998).

been completed. Additionally, T Plant (221-T) has been identified as part of the Manhattan Project National Historic Park by the National Park Service.

Closest Recorded TCP

There are two recorded TCPs associated with the Native American Precontact and Ethnographic Landscape that are visible from the CP-LS-6, T Plant Cribs and Ditches EU.

CLEANUP APPROACHES AND END-STATE CONCEPTUAL MODEL

Selected or Potential Cleanup Approaches

There is no documented safety analysis, hazards analysis, or feasibility study that includes the CP-LS-6 waste sites. It was decided by the author to use the evaluation provided in the *Focused Feasibility Study for the 200-UW-1 Operable Unit* (FFS) (DOE/RL-2003-23, Rev. 0) for the CP-LS-6 remedial alternatives because the hazards (associated with buried liquid waste legacy sites) are considered similar enough for the rough order of magnitude analysis provided in this Risk Review. Thus the four alternatives (and the analysis) provided in the 200-UW-1 FFS are used instead of those provided in the Evaluation Unit Disposition Table (Appendix B) for this EU. Note that the basic remedial component activities (No Action, capping, and RTD) are captured in both sets of remedial alternatives.

As described in the *200-UW-1 FFS*, remedial action alternatives were developed, including:[16] No Action (Alternative 1), Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation (Alternative 2), Removal, Treatment, and Disposal (Alternative 3), and Engineered Barrier (Alternative 4). The alternatives were considered as standalone alternatives; however, impacts from remedial activities at adjacent sites should also be considered during implementation. These alternatives provide a range of remedial responses deemed appropriate to address site-specific conditions. The alternatives were evaluated and compared to the nine CERCLA criteria (DOE/RL-2003-23, Rev. 0).

More detailed descriptions of the four alternatives provided in the 200-UW-1 FFS (DOE/RL-2003-23, Rev. 0) are provided in Part VI of Appendix G.5.3 (CP-LS-3).

Contaminant Inventory Remaining at the Conclusion of Planned Active Cleanup Period

The remedial actions that have either been identified (i.e., non-time-critical actions for the CP-LS-6 waste sites also in the 200-MG-2 OU (DOE/RL-2009-37, Rev. 0)) or are being evaluated using the 200-UW-1 FFS (DOE/RL-2003-23, Rev. 0)) would leave existing contamination in CP-LS-6 waste sites as well as that contamination that has been released from CP-LS-6 waste sites into the shallow and deep vadose zones. Waste sites within the CP-LS-6 EU have likely contributed to groundwater contamination in the 200-ZP GWIA (DOE/RL-92-16, Rev. 0), which is currently being treated using the 200 West Pump and Treat Facility. However, remedial actions will be taken until resulting residual contamination levels satisfy remedial objectives and monitoring of both vadose and saturated zone contamination will continue to assess remedial action performance. These residual concentrations cannot be determined at this time.

Risks and Potential Impacts Associated with Cleanup

These risks and potential impacts are assumed to be the same as those described for the CP-LS-3 EU (Appendix G.5.3, **Part VI**). As for the CP-LS-3 impacts, the 200-UW-1 FFS results are used to evaluate

[16] Non-time-critical actions have also been defined for selected 200-MG-2 OU waste sites that are also within the CP-LS-6 EU (DOE/RL-2009-37, Rev. 0).

possible radiological impacts to workers during selected remedial alternatives. However, because the FFS evaluation is not done according to the same standard as for a DSA (DOE-STD-3009-2014), results should not be considered of the same quality of those for a DSA and should not be represented as such (i.e., FFS dose estimates should only be tabulated with appropriate caveats and should not be plotted on the same graphs as DSA results to avoid confusion).

POPULATIONS AND RESOURCES AT RISK OR POTENTIALLY IMPACTED DURING OR AS A CONSEQUENCE OF CLEANUP ACTIONS

Facility Worker

As described above, the decision was made to use the 200-UW-1 FFS to describe potential risks and potential impacts to workers for this EU. For example, the estimated dose for *maximally exposed* workers range from approximately 2 to 800 person-rem for a single receptor performing the work (DOE/RL-2003-23, Rev. 0, p. G-13) that would correspond to *Low* and *High* ratings, respectively as described in Appendix G.5.3 (CP-LS-3, **Part VI**). Estimated doses for other active remedial actions would be lower. *As described above, these dose estimates are not computed to the same standard as for a DSA and should be treated accordingly.* When compared to CP-LS-3 inventories for Cs-137 and Sr-90 (that tend to drive the worker risks presented in the 200-UW-1 FFS), inventories (Table G.5.5-2 to Table G.5.5-4) are larger for some CP-LS-6 waste sites; however, radiological concentrations and not inventories tend to drive risk. Despite this fact, 99% of reported Cs-137 and Sr-90 inventories for CP-LS-6 are contained in a single waste site (241-T-361 MUST), which is a storage tank (i.e., not released into soil). However, the inventories of Cs-137 and Sr-90 in the 216-T-6 Crib (CP-LS-6), for example, are significantly higher than those for the 216-U-1/2 Cribs, which represented the highest calculated worker dose for CP-LS-3. The Cs-137 and Sr-90 concentrations for the 216-U-1/2 Cribs (which pose the highest doses) are $1.1x10^5$ (95% UCL) / $1.4x10^6$ (maximum) pCi/g and $1.4x10^5$ (95% UCL) / $2.4x10^6$ (maximum) pCi/g, respectively (DOE/RL-2003-23 Rev. 0, p. C-T24). However, no documentation that was found indicated measured concentrations for Cs-137 or Sr-90 associated with the CP-LS-6 waste sites (Table G.5.5-2 to Table G.5.5-4) approached those for the CP-LS-3 216-U-1/2 Cribs. For example, the 216-T-3, 216-T-6, and 216-T-34 had maximum measured soil concentrations for Cs-137 of 54,100 pCi/g (at 19 ft); 9,600 pCi/g (1t 34 ft); and near background, respectively (DOE/RL-2007-02-VOL II-ADD 4, Rev. 0., pp. 4-5 & 6-5; DOE/RL-2007-02-VOL II-ADD 2, Rev. 0). Values for the other CP-LS-6 waste sites were not found in literature. In comparison, the 216-T-3 reverse well (in CP-LS-6) had a measured Cs-137 concentration within a factor of two of that in the 216-U-1/2 Cribs. Thus it would appear reasonable that the doses from the CP-LS-6 waste sites might pose comparable doses to those from CP-LS-3 and thus the same ratings are used. For the *No Action* alternative, the monitoring and maintenance actions are also assumed to be conducted (as described above for *Current* conditions) with an *ND-Low* risk rating. The unmitigated risk ratings for facility workers range from *Low* to *High* based on the action that would be taken (or not taken) (i.e., *ND-Low* for *No Action*, which is the same as for current conditions, to *Low-High* for RTD).

Unmitigated Consequences: Facility Worker – *ND-Low* (No Action) to *Low-High* (RTD)

Mitigation: Although calculated doses to all receptors are "high" for the RTD scenario (DOE/RL-2003-23, Rev. 0, p. G-6), the analysis assumed a single receptor for each task, when in reality, multiple personnel would be performing the tasks. Additional radiological controls (e.g., a water cannon to prevent laborers from entering the active exhumation area or additional shielding) could also be implemented to maintain ALARA exposure goals, which would result in *Low* rating. Risk ratings for other scenarios would be *ND-Low*.

Mitigated Consequences: Facility Worker – *ND-Low* to *Low* (RTD)

Co-located Person

The only workers at increased risks (over those for *Current* conditions as described above) are the facility workers. Thus the ratings for co-located persons are the same as those for *Current* conditions.

Unmitigated Consequences: Co-located Person – *ND-Low*

Mitigation: No *additional* mitigation actions (to those described above for *Current* conditions) are required.

Mitigated Consequences: Co-located Person – *ND-Low*

Public

Only workers would be at risk due to distance and soil cover.

Unmitigated Consequences: Public – *ND*

Mitigation: No *additional* mitigation actions (to those described above for *Current* conditions) are required.

Mitigated Consequences: Public – *ND*

Groundwater

As described in **Part V**, there will be a continuing threat during this period to groundwater (as a protected resource) from mobile primary contaminants in the T Plant Cribs and Ditches legacy sites. These and additional threats and impacts to groundwater are described in more detail in Appendix G.6 for the CP-GW-2 EU. Furthermore, there are contaminant sources (legacy source sites) in the vadose zone that pose continuing risk to groundwater (via the vadose zone). For the Active Cleanup period, there would be no change to the current ratings (Table G.5.5-5). For the Near-term, Post-Cleanup period, the vadose zone (VZ) GTM ratings for the Group A and B primary contaminants (PCs) for the T Plant Cribs and Ditches EU would not change (except for Sr-90 and total uranium to address uncertainties in the evaluation). As indicated in **Part V**, Sr-90 and total uranium are unlikely to impact the groundwater in sufficient quantities to exceed the drinking water standard and thus are not considered a significant future threat. Treatment of groundwater in the area would not impact the threats or ratings associated with remaining vadose zone contamination. Non-time-critical actions are being taken for the CP-LS-6 waste sites in the 200-MG-2 OU (DOE/RL-2009-37, Rev. 0) and are being evaluated in the 200-UW-1 FFS (DOE/RL-2003-23, Rev. 0); selected future remedial actions involving vadose zone sources would likely result in lower ratings. The ratings correspond to an overall rating of *High* for both the Active and Near-term, Post-Cleanup periods. The 200 West Area P&T system in the 200-ZP GWIA is assumed to be operational during this evaluation period, which will be treating groundwater contamination in the 200 West area.

It is considered unlikely that additional groundwater resources would be impacted as a result of either interim remedial actions (e.g., pump and treat) or final closure activities (that are not covered in the Ecological or Cultural Resources results).

Columbia River

As described in **Part V**, impacts to the Columbia River benthic, riparian, and free-flowing ecology for the Active Cleanup and Near-term, Post Cleanup periods are rated as *Not Discernible* (*ND*). Additional information on groundwater plumes and potential threats associated with sources including those from

the T Plant Cribs and Ditches waste sites are described in Appendix G.6 for the CP-GW-2 EU (200-ZP GWIA).

It is considered unlikely that additional benthic or riparian resources would be impacted as a result of either interim remedial actions (e.g., pump and treat) or final closure activities (that are not covered in the Ecological or Cultural Resources results).

Ecological Resources

No cleanup decisions have been made for this EU. As a result, the potential effects of cleanup on ecological resources cannot be made for the active cleanup evaluation period.

Cultural Resources

No cleanup decision for the remediation of the Deep Vadose Zone (between groundwater and 15 feet below the surface).

ADDITIONAL RISKS AND POTENTIAL IMPACTS IF CLEANUP IS DELAYED

Sites within the CP-LS-6 EU have contaminated the vadose zone and are suspected of contributing contaminants to the saturated zone (DOE/RL-92-16, Rev. 0). Despite on-going treatment (200 West Pump and Treat Facility), vadose zone contamination may continue (depending on the control of infiltrating water to the waste sites) and some contaminant plumes in the 200 West Area may continue to increase in size and impact additional groundwater.

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

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

Table G.5.5-6. Summary of Populations and Resources at Risk or Potentially Impacted after Cleanup.

Population or Resource		Risk/Impact Rating	Comments
Human	Facility Worker	*Not Discernible* (*ND*)-*Low*	Only risks during monitoring and maintenance activities (assumed similar to current risks)
	Co-located Person	*ND*	*De minimus* risks related to residual contamination (after capping or retrieval), which will be remedied to acceptable levels.
	Public	*ND*	*De minimus* risks related to residual contamination (after capping or retrieval), which will be remedied to acceptable levels. Access restrictions and ICs in place, when required.
Environmental	Groundwater (A&B) from vadose zone[(a)]	*High* (Cr-VI) *Medium* (Cr(tot)) *Low* (other PCs[(c)]) **Overall**: *Low*	Current GTM values for Group A&B primary contaminants (Table G.5.5-5): *High* (Cr-VI), *Medium* (Cr(tot)), *ND* (Sr-90, U(tot)) and *Low* (other PCs with reported inventories). Sr-90 and U(tot) not likely to impact groundwater and are given *Low* ratings here to address uncertainties (**Part V**).
	Columbia River from vadose zone[(a)]	Benthic: *ND* Riparian: *ND* Free-flowing: *ND* Overall: *ND*	TC&WM EIS screening results indicate that exposure to radioactive and chemical contaminants from peak groundwater discharge below benchmarks for both benthic and riparian receptors (Part V). Dilution factor of greater than 100 million between Columbia River and upwellings.
	Ecological Resources[(b)]	No cleanup decisions have been made for this EU. Estimated to be Low to Medium	No cleanup decisions have been made for this EU, and as a result, the potential effects of cleanup on ecological resources is uncertain for the near-term post-cleanup evaluation period. Cleanup decision for surface may change based on cleanup for deep vadose zone. Post-cleanup monitoring might pose a risk to level 3 resources in the EU and buffer area.

Social	Cultural Resources[(b)]	No cleanup decisions have been made for this EU. Estimated to be: **Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Known Indirect: Unknown **Manhattan/Cold War** Direct: None Indirect: Known	Potential direct impacts are unknown and difficult to estimate without further information on the remediation. Any remediation activity has potential for indirect impacts.

a. Threat to groundwater or Columbia River for Group A and B contaminants remaining in the vadose zone. Threats from existing plumes associated with the T Plant Cribs and Ditches EU are described in **Part V** with more detailed evaluation in Appendix G.6 (CP-GW-2). No current plumes have been definitively associated with CP-LS-6 EU waste sites.

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. There is a nitrate plume in the area that has sources unrelated to CP-LS-6 EU waste sites. Thus risks are driven by Group A and B primary contaminants.

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

The long-term, post-cleanup status is dependent on the selected remedial alternative. Regardless of that alternative selected, long-term site use restriction, vadose zone and groundwater monitoring, and maintenance must remain due to the presence of persistent contaminants in the deep vadose zone that are not amendable to excavation and the likely continued release and migration of contaminants through the vadose zone to the groundwater. DOE is expected to continue industrial exclusive activities for at least 50 years (DOE/EIS-0222-F).

PART VII. SUPPLEMENTAL INFORMATION AND CONSIDERATIONS

The T Plant Cribs and Ditches area needs to remain under DOE control to maintain a safety buffer for all remedial alternatives, including RTD, because of the deep vadose zone contamination in the area.

BIBLIOGRAPHY[17]

BHI-00177, Rev. 00, T *Plant Aggregate Area Management Study Technical Baseline Report*, Bechtel Hanford, Inc., Richland, Washington.

[17] **References available to qualified individuals at the Washington State Department of Archaeology and Historic Preservation.

Cadoret, NA and JC Chatters. 1988. *Cultural Resources Survey of the Proposed 200-West 218-W-3A, 218-W-3AE, and 218-W-5 Waste Trenches HCRC#87-200-016.* Pacific Northwest Laboratory, Richland, Washington.**

Chatters, JC and NA Cadoret. 1990. *Archaeological Survey of the 200 East and 200 West Areas, Hanford Site HCRC#88-200-038.* Pacific Northwest Laboratory, Richland, Washington.**

Corbin RA, BC Simpson, MJ Anderson, WF Danielson, JG Field, TE Jones, and CT Kincaid. 2005. *Hanford Soil Inventory Model*, RPP-26744, Rev. 0, CH2M Hill Hanford Group, Inc., Richland, Washington.

CRESP 2015a. Methodology for the Hanford Site-Wide Risk Review Project, Consortium for Risk Evaluation with Stakeholder Participation (CRESP), Nashville, Tennessee. Available at: http://www.cresp.org/hanford/.

CRESP 2015b. Hanford Site-Wide Risk Review Project: Interim Progress Report, Consortium for Risk Evaluation with Stakeholder Participation (CRESP), Nashville, Tennessee. Available at: http://www.cresp.org/hanford/.

DOE/EIS-0222-F 1999, 'Final Hanford Comprehensive Land-Use Plan - Environmental Impact Statement,' DOE/EIS-0222-F, U.S. Department of Energy, Washington, D.C.

DOE/EIS-0391 2012, *Tank Farm Closure & Waste Management (TC&WM) Environmental Impact Statement*. U.S. Department of Energy, Richland, WA. Available at: http://www.hanford.gov/page.cfm/FinalTCWMEIS.

DOE/RL-91-61, Rev. 0, *T Plant Source Aggregate Area Management Study Report*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-92-16, Rev. 0, *200 West Groundwater Aggregate Area Management Study Report*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE-RL (Department of Energy, Richland Operations Office). 1998. *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE/RL-97-56). Richland, Washington.

DOE/RL-2003-23, Rev. 0. 2005. *Focused Feasibility Study for the 200-UW-1 Operable Unit*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at: http://pdw.hanford.gov/arpir/index.cfm/docDetail?accession=D7944638 (Part 1 of 3).

DOE/RL-2003-24, Rev. 0. 2005. *Proposed Plan for the 200-UW-1 Operable Unit*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://pdw.hanford.gov/arpir/index.cfm/docDetail?accession=DA007725.

DOE/RL-2007-02-VOL II-ADD 2, Rev. 0, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-81 216-B-10A&B, and 216-Z-16 Cribs (Addendum 2)*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2007-02-VOL II-ADD 4, Rev. 0, *Site-Specific Field-Sampling Plans for the 216-B-7A&B Crib, 216-B3-B Crib and Tile Field, 216-T-3 Injection/Reverse Well, 216-T-5 Trench, 216-T-6 Cribs, 216-T-7 Crib and Tile Field, 216-T-15 Trench, and 216-T-32 Crib in the 200-TW-2 Operable Unit*, Addendum 4, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2007-28, Rev. 0, Feasibility Study for the 200-ZP-1 Groundwater Operable Unit, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2008-45 Rev. 0, *Engineering Evaluation/Cost Analysis for the 200-MG-2 Operable Unit Waste Sites*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2008-44, Rev. 0, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2008-45 Rev. 0, *Engineering Evaluation/Cost Analysis for the 200-MG-2 Operable Unit Waste Sites*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2009-37, Rev. 0, *Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2009-48, Rev. 0, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2009-86, Rev. 0, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2010-49, Draft B, 2015. *Remedial Investigation/Feasibility Study Work Plan 200-WA-1 and 200-BC-1 Operable Units*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://pdw.hanford.gov/arpir/pdf.cfm?accession=0079991H.

DOE/RL-2010-114, Draft A, *200-IS-1 Operable Unit Pipeline System Waste Sites RFI/CMS/RI/FS Work Plan*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2011-56, Rev. 1, *HANFORD SITE: Third CERCLA Five-Year Review Report*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington

DOE/RL-2011-102, Draft A, *Remedial Investigation/Feasibility Study and RCRA Facility Investigation/Corrective Measures Study Work Plan for the 200-DV-1 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2011-104, Rev. 0, *Characterization Sampling and Analysis Plan for the 200-DV-1 Operable Unit*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2014-11, Rev. 0, *2015 Hanford Lifecycle Scope, Schedule and Cost Report*, U.S. Department of Energy, Richlands Operations Office, Richland, Washington.

DOE/RL-2016-09, Rev. 0. Hanford Site Groundwater Monitoring Report for 2015, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE 1996, 'Hanford Federal Facility Agreement and Consent Order, as amended,' Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA 2008, 'Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington,' U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://yosemite.epa.gov/r10/CLEANUP.NSF/sites/hanford2/$FILE/Hanford-200-ZP-1-ROD.pdf

EPA 2012, 'Record of Decision For Interim Remedial Action -- Hanford 200 Area Superfund Site 200-UP-1 Operable Unit,' U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.epa.gov/region10/pdf/sites/hanford/200/Hanford_200_Area_Interim_ROD_Remedial_Action_0912.pdf.

Parker, P and T King. 1998. *National Register Bulletin: Guidelines for Evaluating and Documenting Traditional Cultural Properties.* U.S. Department of the Interior, National Park Service. Washington, D. C.

PNNL-6415, Rev. 18, Hanford Site National Environmental Policy Act (NEPA) Characterization, Pacific Northwest National Laboratory, Richland, Washington.

ATTACHMENT 1

Hanford Site-Wide Risk Review

Evaluation Unit:	T Plant Cribs and Ditches
ID:	CP-LS-6
Group:	Legacy Source
Operable Unit Cross-Walk:	200-WA-1, 200-DV-1
Related EU:	CP-GW-2
Sites & Facilities:	Liquid waste sites on the northern end of 200-W area (associated with T Plant operations).
Key Data Sources Docs:	Groundwater Impact Assessment Report for the 216-T-4-2 Ditch (WHC-EP-0815) Groundwater Impact Assessment Report for the 216-T-1 Ditch (WHC-EP-0814) Conceptual Site Models for the 200-DV-1 Operable Unit Waste Sites in the T Complex Area, Central Plateau, Hanford, Washington (SGW-49924) Geophysical Logging Report for 200-DV-1 Operable Unit Waste Sites in the T Complex Area (SGW-49498) Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units (DOE-RL-2007-02-Rev0-Vol2-ADD4) Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units (DOE-RL-2007-02-Rev0-Vol2-ADD3) Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units (DOE-RL-2007-02-Rev0-Vol2-ADD2) Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Area Central Plateau Operable Units (DOE-RL-2007-02-DFT-A) Geologic Cross Section Development in the Vicinity of S-Complex and T-Complex to Support the 200-DV-1 Operable Unit Conceptual Models (SGW-50900) Remedial Investigation/Feasibility Study and RCRA Facility Investigation/Corrective Measures Study Work Plan for the 200-DV-1 Operable Unit (DOE-RL-2011-102_DFT-A) 200 West Groundwater Aggregate Area Management Study Report (DOE-RL-92-16) Remedial Investigation/Feasibility Study Work Plan 200-WA-1 and 200-BC-1 Operable Units (DOE_RL-2010-49, Draft A) Characterization Sampling and Analysis Plan for the 200-DV-1 Operable Unit (DOE_RL-2011-104, Rev 0)

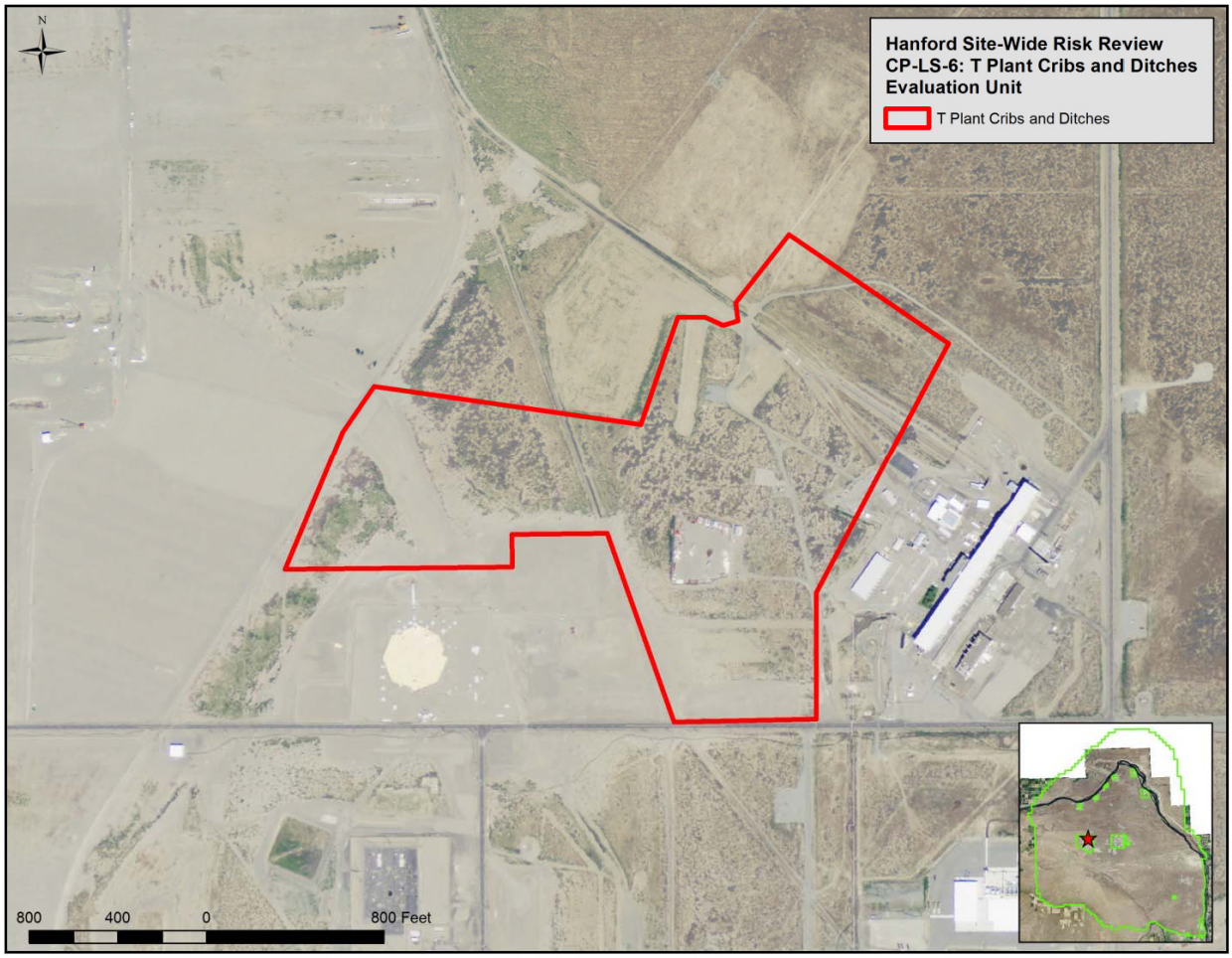

Figure 1. CP-LS-6 (T Plant Cribs and Ditches) Site Location Map

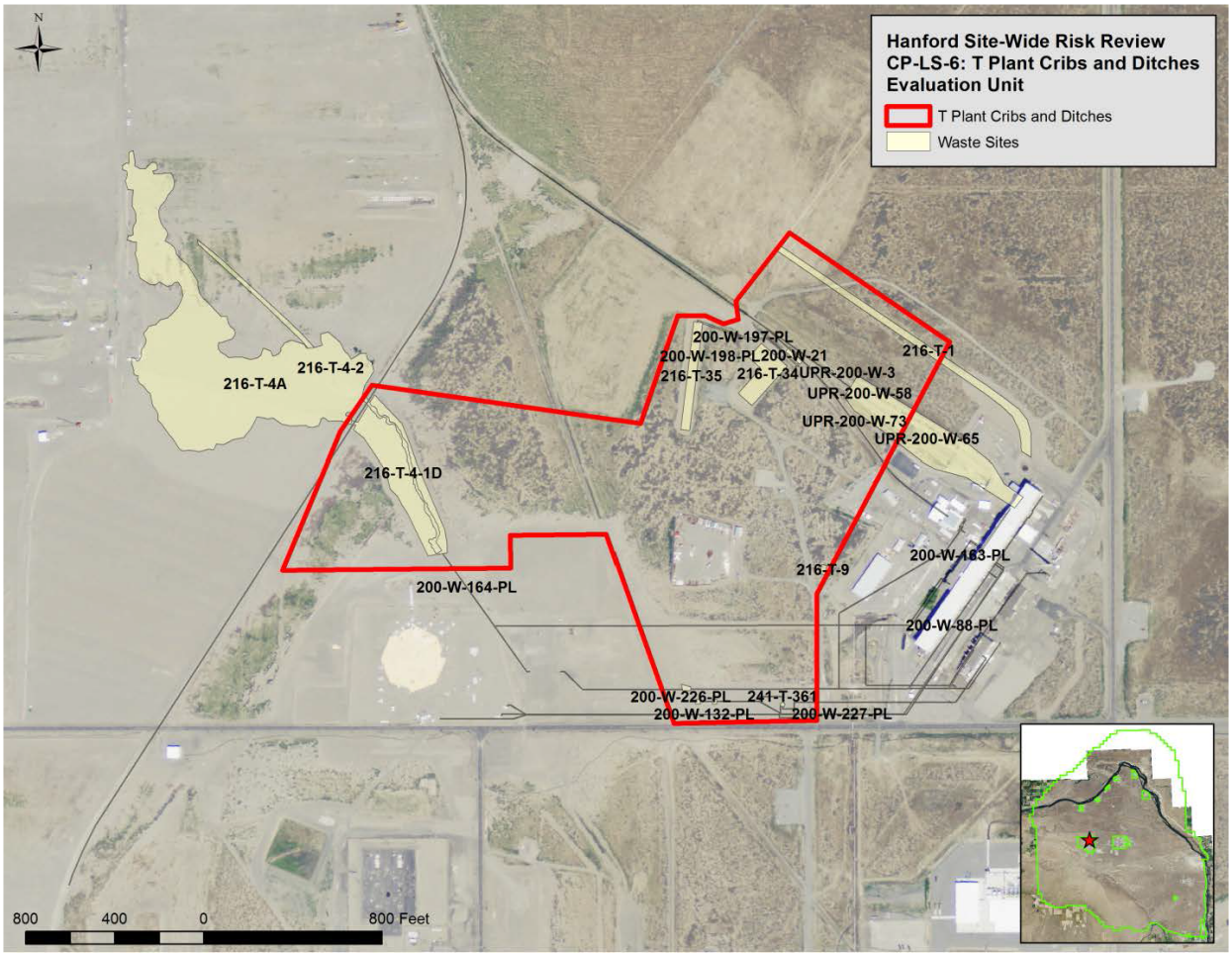

Figure 2. CP-LS-6 (T Plant Cribs and Ditches) Site Location Map and WIDS Locations

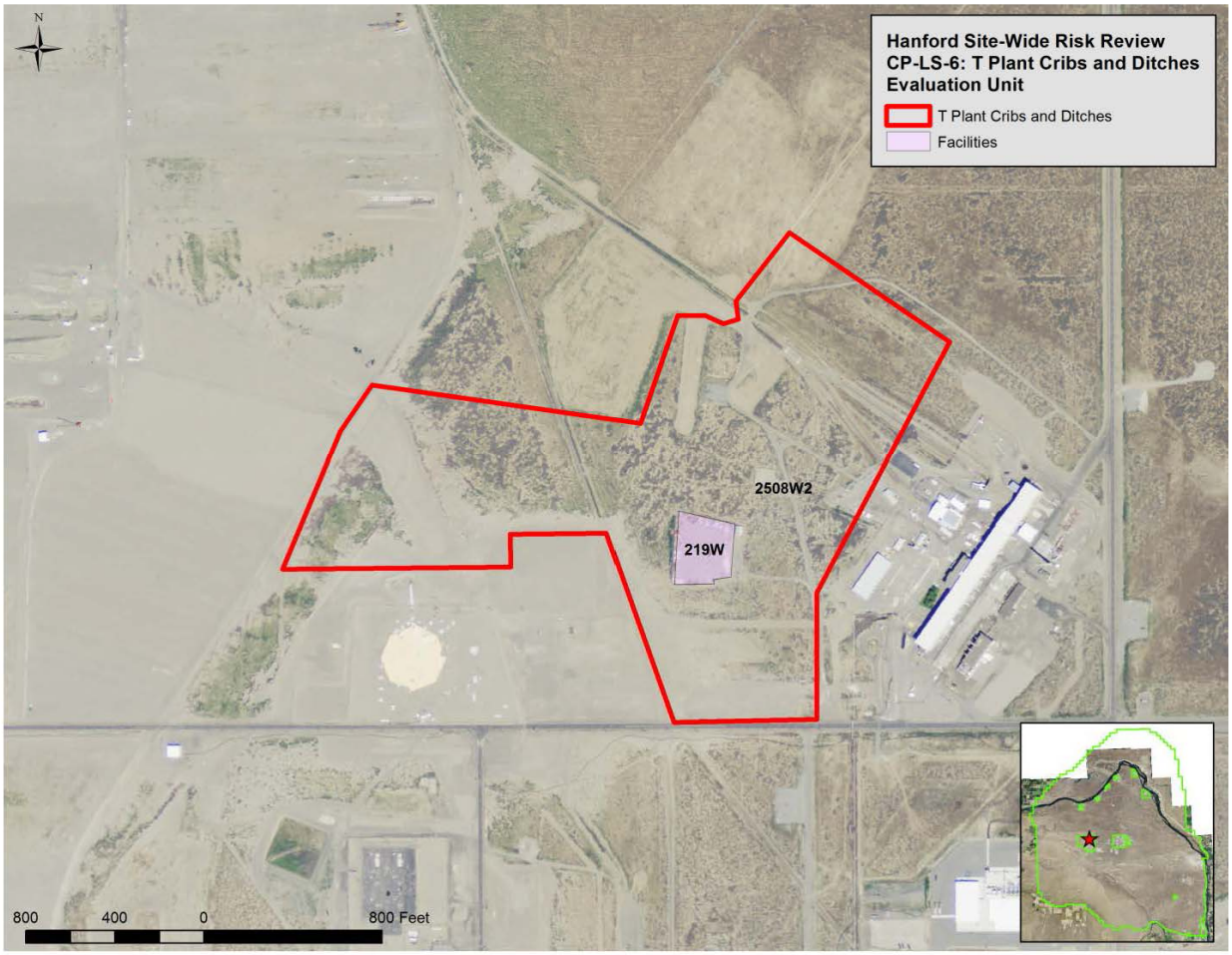

Figure 3. CP-LS-6 (T Plant Cribs and Ditches) Site Location Map and Facility Locations

Hanford Site-Wide Risk Review
CP-LS-6 (T Plant Cribs and Ditches)
Waste Site and Facility List

Site Code	Name, Aliases, Description	Feature Type	Site Status	ERS Classification	ERS Reclassification	Site Type	Site Type Category	Operable Unit	Exclude from Evaluation	Comments
218-W-2A	218-W-2A; Equipment Burial Ground #2; Industrial Waste No. 02A	Waste Site	Inactive	Accepted	None	Burial Ground	Burial Ground	200-SW-2		
216-T-34	216-T-34; 216-T-34 Crib	Waste Site	Inactive	Accepted	None	Crib	Crib - Subsurface Liquid Disposal Site	200-WA-1		
216-T-35	216-T-35; 216-T-35 Crib	Waste Site	Inactive	Accepted	None	Crib	Crib - Subsurface Liquid Disposal Site	200-WA-1		
216-T-5	216-T-5; 241-T-361 (1&2 Cribs); 361-T-1&2 Cribs; 216-T-5	Waste Site	Inactive	Accepted	None	Crib	Crib - Subsurface Liquid Disposal Site	200-DV-1		
200 W 132 PL	200-W-132-PI; Pipelines from 221-T to 241-T-151 and 241-T-152; V653, V554, V667, V568, V663, V706, and V707	Waste Site	Inactive	Accepted	None	Direct Buried Tank Farm Pipeline	Pipeline and associated valves, etc.	TBD_200- S-1		
216-T-1	216-T-1; 216-T-1 Trench; 221-T Ditch; 221-T Trench	Waste Site	Inactive	Accepted	None	Ditch	Pond/Ditch – Surface Liquid Disposal Site	200-OA-1		
216-T-4-1D	216-T-4-1D; 216-T-4 Ditch; 216-T-4 Swamp	Waste Site	Inactive	Accepted	None	Ditch	Pond/Ditch – Surface Liquid Disposal Site	200-WA-1		
216 T 4 2	216 T 4 2; 216 T 4 2 Ditch	Waste Site	Inactive	Accepted	None	Ditch	Pond/Ditch – Surface Liquid Disposal Site	200 SW 2		
216-T-3	216-T-3; 241-T-361-A Reverse Well; 361-T Reverse Well	Waste Site	Inactive	Accepted	None	Injection/Reverse Well	Crib - Subsurface Liquid Disposal Site	200-DV-1		
216-T-4A	216-T-4A; 216-T-4 Swamp; 216-T-4-1 (P); 216-T-4-1 Pond	Waste Site	Inactive	Accepted	None	Pond	Pond/Ditch – Surface Liquid Disposal Site	200-SW-2		
200-W-21	200-W-21; 204-T Unloading Station; T-Plant Waste Railcar Unloading Facility; Unloading Station 1 and Unloading Station 2	Waste Site	Inactive	Accepted	None	Pump Station	Infrastructure Building	200-WA-1		
200-W-163-PL	200-W-163-PL; T Plant Process Sewer; 18-inch 221-T Process Sewer Pipeline	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200- S-1		
200-W-164-PL	200-W-164-PL; Pipeline from 207-T Retention Basin to the 216-T-4 Ditch	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD 200- S-1		
200 W 196 PL	200 W 196 PL; Pipelines from Railcar Unloading Stations to 216 T 34 Crib	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200 S 1		
200-W-197-PI	200-W-197-PI; Pipelines from Railcar Unloading Stations to 216-T-35 Crib	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200- S-1		
200-W-198-PI	200-W-198-PL; Pipelines from Truck Unloading Station to 216-T-34 and 216-T-35 Cribs	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200- S-1		
200-W-226-PL	200-W-226-PL; Lines V326, V671 and V706; Pipeline from 224-T (Plutonium Concentration Facility) to 241-T-351 Settling Tank and 216-T-3 Reverse Well	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200- S-1		
200 W 227 PL	200 W 227 PL; Pipeline from 221 T Separations Facility to 216 T 6 Crib	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD 200 S 1		
200 W 88 P.	200-W-88-PI; 221-T Process Sewer; 24 inch Process Sewer; T Plant Process Sewer Pipeline; 200 W 88	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200 S 1		
241-T-361	241-T-361; 241-T-361 Settling Tank; 361-T-TANK; MUST; Inactive Miscellaneous Underground Storage Tank	Waste Site	Inactive	Accepted	None	Settling Tank	Underground Storage Tank	200-WA-1		
216-T-10	216-T-10; Decontamination Trenches; Equipment Decontamination Area	Waste Site	Inactive	Accepted	None	Trench	Crib - Subsurface Liquid Disposal Site	200-WA-1		
216-T-9	216-T-9; Decontamination Trenches; Equipment Decontamination Area	Waste Site	Inactive	Accepted	None	Trench	Crib - Subsurface Liquid Disposal Site	200-WA-1		
UPR-200-W-3	UPR-200-W-3; Railroad Contamination; UN-200-W-3	Waste Site	Inactive	Accepted	None	Unplanned Release	Unplanned Release - Surface/Near Surface	200-WA-1		
UPR 200 W 4	UPR 200 W 4; Railroad Contamination; UN 200 W 4	Waste Site	Inactive	Accepted	None	Unplanned Release	Unplanned Release - Surface/Near Surface	200 WA 1		
UPR 200 W 58	UPR 200 W 58; Railroad Track Contamination; UN 200 W 58	Waste Site	Inactive	Accepted	None	Unplanned Release	Unplanned Release - Surface/Near Surface	200 OA 1		
UPR-200-W-65	UPR-200-W-65; Contamination in the T-Plant Railroad Car; UN-200-W-65	Waste Site	Inactive	Accepted	None	Unplanned Release	Unplanned Release - Surface/Near Surface	200-WA-1		
UPR-200-W-73	UPR-200-W-73; Contaminated Railroad Track at 221-T; UN-200-W-73	Waste Site	Inactive	Accepted	None	Unplanned Release	Unplanned Release - Surface/Near Surface	200-WA-1		
200 W 20	200 W 20; T Plant Complex	Waste Site	Active	Accepted	None	Process Unit./Plant	Process Building	No. Applicable	X	Included in T Plant Eval.
2607-W3	2607-W3	Waste Site	Inactive	Accepted	None	Septic Tank	Septic System	200-WA-1	X	Septic System
219W	GROUND WATER LAYDOWN YARD	Facility	ACTIVE			STRUCTURE	Storage Pad			
2508W2	SIREN NORTH OF T PLANT	Facility	ACTIVE			STRUCTURE	Infrastructure Building			
MO180	MOBILE OFFICE EAST OF 219W	Facility	ACTIVE			BUILDING	Infrastructure Building		X	Mobile Office

Note that only those waste sites with a WIDS (Waste Information Data System) Classification of "Accepted" are included in the evaluation, along with non-duplicate facilities, identified via the Hanford Geographic Information System (HGIS).