APPENDIX H.16

242-A EVAPORATOR (CP-OP-10, CENTRAL PLATEAU) EVALUATION UNIT SUMMARY TEMPLATE

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PART I. EXECUTIVE SUMMARY

EU LOCATION

The 242-A Evaporator is located in the eastern side of 200 East Area, near the center of the Hanford Site on a relatively flat terrace known as the 200 Area Plateau.

RELATED EUS

CP-TF-5

PRIMARY CONTAMINANTS, CONTAMINATED MEDIA AND WASTES

Dilute tank waste to be concentrated is fed from the million-gallon double-shell evaporator feed tank, 241-AW-102 to the 242-A Evaporator through an underground-encased pipeline. The waste feed is concentrated to a specified concentration creating product slurry and water vapor where the product slurry is pumped to a tank farm valve pit and then to the specified double-shell tank (DST) through the tank farm waste transfer system (HNF-14755, Rev. 6). Process off gases and water vapor are passed through one primary and two secondary condensers, which generate process condensate and a gaseous effluent. The gaseous effluent is filtered and released to the environment from the vessel ventilation system. The 242-A Evaporator process and steam condensate and cooling water streams are transferred to other waste handling facilities (e.g., Liquid Effluent Retention Facility) for further treatment and storage.

The 242-A Evaporator manages mixed wastes from the Hanford DSTs (WA7890008967 Part III, Operating Unit Group 4; 242-A Evaporator). The liquid wastes in the DST tank systems (see Appendix E.9 and Appendix E.10) are radioactive aqueous solutions containing dissolved inorganic salts, including sodium, potassium, aluminum nitrates and nitrites, and hydroxides. The wastes in some Hanford tanks have detectable levels of heavy metals, including lead, chromium, and cadmium. Radionuclides include fission products (e.g., Sr-90 and Cs-137) and actinide series elements (e.g., uranium and plutonium). Small quantities of ammonia and organics (e.g., acetone, butanol, and tri-butyl phosphate) may be present in some tank waste. Furthermore, small incidental amounts of insoluble solids may be transferred to the 242-A Evaporator as the result of waste mixing during the transfer process (WA7890008967 Part III, Operating Unit Group 4; 242-A Evaporator).

BRIEF NARRATIVE DESCRIPTION

The current and future mission of the 242-A Evaporator (CP-OP-7 EU) is to support environmental restoration and remediation of the Hanford Site by optimizing the 200 East and West areas DST waste volumes in support of tank farm and vitrification operations (HNF-14755, Rev. 6). The evaporator began operations in 1977 with a 10-year design life; however, to support past, current, and future missions, the evaporator facility has undergone several life extension upgrades (HNF-14755, Rev. 6). Future upgrades are expected to support mission objectives. Thus operation of the 242-A Evaporator is required for the next several decades, and final cleanup and closure decisions have been deferred to future decision-making processes (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B).

The documented safety analysis (DSA) and the technical safety requirements (TSRs) establish an adequate safety basis for managing the risk from 242-A Evaporator operations (HNF-14755, Rev. 6). The

DSA included a comprehensive and systematic identification of hazardous conditions; an evaluation of frequencies and potential consequences for postulated accidents; and an identification of safety-significant structures, systems, and components (SSCs), TSRs, and defense-in-depth design and administrative features (HNF-14755, Rev. 6). The 242-A Evaporator is a Hazard Category 2 facility indicating the potential for significant onsite consequences. The estimated offsite radiological consequences for the bounding accidents were less than 5 rem and no safety-class SSCs are required. The identified controls were deemed protective of the health and safety of the public, workers, and the environment (HNF-14755, Rev. 6, p. ES-5).

In June 2014 the Defense Nuclear Safety Board (DNFSB) issued a Staff Issue Report entitled "Safety Basis Review of 242-A Evaporator at Hanford" stating that the approved Safety Basis for the 242-A Evaporator facility (predating the current revision of the DSA (HNF-14755, Rev. 6)) was "not compliant with Title 10, Code of Federal Regulations (CFR) Part 830, Nuclear Safety Management, and other Department of Energy (DOE) requirements".[1] In August 2014, the US DOE responded with 1) compensatory measures (related to Technical safety Requirements) for the steam isolation valve, 2) changes to Specific Administrative Controls and amendments to the Safety Basis, and 3) that treatment of "beyond extremely unlikely" events in the DSA and hazard evaluation database reports is compliant with CFR Part 830.[2] Two of the changes were subsequently delayed due "to budgetary and operational impacts associated with the work required to complete the C-Farm single shell tank waste retrieval effort and the need to empty the AY-102 double shell tank due to a leak into the tank annulus".[3]

SUMMARY TABLES OF RISKS AND POTENTIAL IMPACTS TO RECEPTORS

Table H.16-1 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 242-A Evaporator area; a Co-located Person (CP) is an individual located 100 meters from the physical boundaries of the 242-A Evaporator 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 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*.

[1] https://www.dnfsb.gov/documents/reports/staff-issue-reports/safety-basis-review-242-evaporator-hanford

[2] https://www.dnfsb.gov/documents/letters/doe-response-board-june-18-2014-letter-transmitting-boards-staff-issue-report

[3] https://ehss.energy.gov/deprep/2016/TB16O13A.PDF

Ecological Resources

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

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.

Table H.16-1. 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: Tank waste treatment	**From Cleanup Actions:** Operations and Closure / D&D
Human Health	Facility Worker	***High*** *(Low)*	***Operations***: *High* (*Low*) ***Closure /D&D***: *IS*[d] (*IS*)
	Co-located Person	***Medium-High*** *(Low)*	***Operations***: *Medium-High* (*Low*) ***Closure /D&D***: *IS* (*IS*)
	Public	***Not Discernible (ND)-Low*** *(ND-Low)*	***Operations***: *ND-Low* (*ND-Low*) ***Closure /D&D***: *IS* (*IS*)
Environmental	Groundwater (A&B) from vadose zone[a]	*ND* – all Group A&B PCs	*ND* – all Group A&B PCs[c]
	Columbia River from vadose zone[a]	Benthic and Riparian: *ND* Free-flowing: *ND* **Overall**: *ND*	Benthic and Riparian: *ND*[c] Free-flowing: *ND*[c] **Overall**: *ND*
	Ecological Resources[b]	ND	Estimated to be Low[c]
Social	Cultural Resources[b]	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: None **Manhattan/Cold War** Direct: None Indirect: Known	Estimated to be:[c] **Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: None **Manhattan/Cold War** Direct: None Indirect: Known

a. Threat to protected resources (i.e., groundwater and Columbia River) from Group A and B primary contaminants (PCs) (Table 6-1, CRESP 2015a) remaining in the vadose zone. Note there are also no Group C or D primary contaminants in the vadose zone. Because no waste associated with this EU is in the vadose zone (or is expected to be), there is no current or foreseeable threats to protected resources during the Active Cleanup period.

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. No final cleanup and closure have been made for this EU; however, it is assumed that (as in the past) waste is contained in the facility until final disposition.

d. Insufficient information.

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

Current

Both a Hazard Analysis (HNF-13117, Rev. 0) and Documented Safety Analysis (DSA) (HNF-14755, Rev. 6) have been performed on the 242-A Evaporator facility. The focus in this evaluation will be on the DSA although no information found in the Hazard Analysis would necessarily change any of the conclusions made. The hazardous conditions identified using a qualitative hazard analysis were grouped into representative accidents based on similarities in accident phenomenology (HNF-14755, Rev. 6, p. ES-4). The resulting representative accidents (including flammable gas accidents, nuclear criticality, waste leaks and misroutes, and external and natural events) were qualitatively evaluated for radiological and toxicological exposures, frequencies, and consequences to the offsite public, onsite workers, and facility workers (including whether the accident poses a significant hazard); offsite radiological exposures were quantitatively evaluated. Two bounding accidents (design basis) were primarily based on the onsite radiological consequences; these accidents were the flammable gas accident (detonation in the C-A-1 vessel) and the waste leak and misroute accident (fine spray leak during a transfer using slurry pump P-B-2) (HNF-14755, Rev. 6, p. 3.3.2.3.1-2). The qualitative analysis in the DSA indicated that without mitigation there was significant potential impact to the facility worker (i.e., could result in prompt death, serious injury, or significant radiological or chemical exposure) (HNF-14755, Rev. 6, Table ES-1, p. ES-9) and thus a *High* rating is assessed.

The selected bounding accidents were also analyzed for on-site radiological consequences. For flammable gas accidents, a TED of 16.6 rem was calculated (RPP-48050, Rev. 1, p. 2) that would translate to a *Medium* rating (CRESP 2015a, Table 2-4). An analysis of the waste leak and misroute accident, the TED of less than 100 rem was calculated[4] (HNF-14755, Rev. 6, p. ES-9), which if the TED exceeded 25 rem would translate to a *High* rating. Thus the rating for the co-located person would be *Medium-High* (without additional information).

The selected bounding accidents were also analyzed for off-site radiological consequences. The off-site doses for the flammable gas accident and waste leak and misroute accident were 0.15 and 0.031 rem, respectively (HNF-14755, Rev. 6, pp. 3.4.2.1-3 and 3.4.2.2-3), which translate to *Not Discernible* (*ND*)-*Low* ratings (CRESP 2015a, Table 2-4). Note that no safety-class SSCs are required for the 242-A Evaporator (HNF-14755, Rev. 6, p. 3.4.2-2)[5].

Unmitigated Consequences: Facility Worker – *High*, CP – *Medium-High*; Public – *ND-Low*

Mitigation: The Department of Energy (DOE) 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. Further, the safety and health program must effectively ensure that ongoing task-specific hazard analyses are conducted so that the selection of

[4] The actual calculation is found in in RPP-13750, *Waste Transfer Leaks Technical Basis Document*. If the driving pressure is hydrostatic head (e.g., waste in the C-A-1 vessel, waste recirculated by recirculation pump P-B-1), the consequences are based on analyses in RPP-CALC-47411, *Technical Basis for Release Events due to Vessel Failure for the 242-A Evaporator Facility*. These reports were not available at the time of the evaluation.

[5] The accident analysis of the DBAs was compared with DOE/EIS-0189, Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement, and no significant discrepancies were identified.

appropriate PPE can be made and modified as conditions warrant. Task-specific hazard analyses must lead to the development of written work planning documents and standard operating procedures (SOPs) that specify the controls necessary to safely perform each task, to include continuous employee exposure monitoring. The following information is paraphrased from the 242-A DSA (HNF-14755, Rev. 6, pp 3.3.1-6 to 3.3.1-9):

Control selection and classification for radiological protection of the offsite public – Safety-class SSCs and TSRs are selected and classified based on the quantitative radiological consequence analysis for the bounding (design basis) accidents. If offsite radiological consequences are ≥ 25 rem (TED Evaluation Guideline from DOE-STD-3009-94, Appendix A), then safety-class SSCs or TSRs are required for protection of offsite public. Furthermore, an accident is considered to challenge the Guideline if the offsite dose (TED) is ≥ 5 and < 25 rem; this dictates that safety-class designation must be considered and any rationale for the decision should be explained and justified. Those accidents with offsite radiological consequences (TED) ≥ 1 rem and < 5 rem with a frequency > 1E-04/yr must be considered for safety-significant SSCs or TSRs.

Control selection and classification for protection of the onsite worker and offsite public (toxicological exposure only) – Safety-significant SSCs and TSRs are selected based on the qualitative hazard evaluation of representative accidents. The offsite toxicological and onsite radiological and toxicological consequences are then used for identifying safety-significant SSCs and TSRs where accidents with consequences that are ≥ 100 rem or > protective action criteria[6] (PAC)-3 to the onsite worker, or > PAC-2 to the offsite public, require safety-significant SSCs or TSRs.

Control selection and classification for protection of the facility worker – Safety-significant SSCs and TSRs are also considered for significant facility worker hazards (i.e., a prompt worker fatality, serious injuries to workers, significant radiological or chemical exposures to workers). Conditions that present a significant consequence to the facility worker include:

- Energetic releases of high concentrations of radiological or toxic chemical materials where the facility worker would normally be immediately present and thus unable to take self-protective actions.
- Deflagrations or explosions within process equipment or confinement/containment structures or vessels where grievous injury or death to a facility worker may result from the fragmentation of failed process equipment or the confinement (or containment) with the facility worker proximate.
- Chemical hazards to a facility worker not screened out (DOE-STD-1189-2008, Appendix B), or thermal burns to a facility worker that could reasonably cover a significant portion of the facility worker's body, where self-protective actions are not reasonably available due to the speed of the event or where there may be no reasonable warning to the facility worker of the hazardous condition and when only one barrier exists between the hazard and the facility worker.
- Exposures to radiological or toxic materials of sufficient magnitude (> 100 rem TED or > PAC-3) that death or ongoing large-scale medical intervention may reasonably be expected to result.
- Leaks from process systems where asphyxiation of a facility worker normally present may result.

[6] Protective Action Criteria (PAC) are toxicological risk guidelines (i.e., allowable human exposure limits) that are identified for chemical compounds (HNF-14755, Rev. 6, p. 5-19).

- Other conditions, with a significant facility worker consequence, which are unique to a specific process.

Classification of Administrative Controls (ACs) as Specific Administrative Controls – ACs may be implemented as SACs or as Key Elements. An AC is implemented as an SAC when it:

- is credited in the hazard or accident analysis in preventing or mitigating an event with consequences that are ≥ 5 rem TED or > PAC-2 to the offsite public[7]
- is credited in the hazard or accident analysis in preventing or mitigating an event with consequences that are ≥ 100 rem TED or > PAC-3 to the onsite worker[7]
- is credited in the hazard analysis in protecting the facility worker from a significant facility worker hazard[7]
- protects an important initial condition assumed in the hazard analysis

Those ACs selected as important contributors to defense-in-depth and ACs that provide a support function to SACs or LCOs are implemented as Key Elements.

Defense-in-Depth Features – In addition to the safety SSCs and TSRs selected to prevent or mitigate potential hazardous conditions and postulated accidents at the 242-A Evaporator, other non-safety SSCs and non-TSR administrative features may be identified for defense-in-depth. In general, more layers of defense-in-depth (i.e., non-safety SSCs, non-TSR administrative features) are selected for higher consequence accidents. There is no requirement to demonstrate any generic, minimum number of layers of defense.

The identified controls were deemed protective of the health and safety of the public, workers, and the environment (HNF-14755, Rev. 6, p. ES-5). Thus the resulting mitigated risks and potential impacts to workers are *Low* and to the public are rated *ND-Low* due to the distance from the 242-A Evaporator facility to the site boundary.

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

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

Final cleanup and closure decisions have been deferred to future decision-making processes (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B); therefore, these risks and future impacts cannot be evaluated.

Groundwater, Vadose Zone, and Columbia River

Current

As described in **Part VI** and illustrated in Table H.16-5, the vadose zone (VZ) GTM values for the IDF Group A and B primary contaminants (PCs) remaining in the vadose are all *Not Discernible* (*ND*) because no wastes from the 242-A Evaporator are in the vadose zone. Thus the overall rating for the CP-OP-10 EU is *ND* for both groundwater and the Columbia River.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

Operation of the 242-A Evaporator is required for the next several decades, and final cleanup and closure decisions have been deferred to future decision-making processes (DOE/RL-2015-10, Rev. 0, p.

[7] Another requirement for SAC designation is that the AC was selected when an SSC was available or could have been designed and installed to perform the credited safety function (without consideration of cost or schedule).

B-17; Appendix B). However, it is assumed that, in the future, waste will be maintained in the facility until it is properly dispositioned (as has been the case in the past). Thus the overall rating for the CP-OP-10 EU is *ND* for both groundwater and the Columbia River.

Ecological Resources

Current

0% of EU (1 acre) and 0% of the buffer area (6 acres) are level 3 or higher resource. Currently, the area is all disturbed with buildings, and cleared areas. There are be migratory birds nesting on buildings. Work would be done when birds are not nesting, or other mitigation activities.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

No cleanup decisions have been made, and as a result, the potential effects of cleanup on ecological resources is uncertain for the active cleanup evaluation period. Removal of facility and retrieval of subsurface contamination would include a lot of truck disturbance. Removal of facility will decrease potential nesting sites and roost sites. No information regarding final D&D of the facility, so no information available to evaluate those effects.

Cultural Resources

Current

Much of the land within the EU is extensively disturbed. None of the EU has been inventoried for cultural resources. Geomorphology indicates a low potential to contain intact archaeological resources on the surface and/or subsurface. Traditional cultural places are visible from EU.

National Register eligible Manhattan Project/Cold War Era significant resources located within 500 meters of the EU will be demolished, but they have already been mitigated.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

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

National Register eligible Manhattan Project/Cold War Era significant resources located within 500 meters of the EU will be demolished, but they have already been mitigated.

Considerations for Timing of the Cleanup Actions

Operation of the 242-A Evaporator is required for the next several decades, and final cleanup and closure decisions have been deferred to future decision-making processes (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B).

Near-Term, Post-Cleanup Risks and Potential Impacts

Final cleanup and closure decisions have been deferred to future decision-making processes (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B); therefore, these risks and future impacts cannot be evaluated (i.e., there is insufficient (*IS*) information to evaluate).

PART II. ADMINISTRATIVE INFORMATION

OU AND/OR TSDF DESIGNATION(S)

CP-OP-10. EU. The *Operable Unit Cross-Walk* in Attachment 1 indicates that there are no related operable units (OUs).

COMMON NAME(S) FOR EU

242-A Evaporator

KEY WORDS

242-A Evaporator

REGULATORY STATUS:

Regulatory basis

The final hazard categorization of the 242-A Evaporator was determined based on the requirements of 10 CFR 830 and the methodology of DOE-STD-1027-92; the final categorization of the 242-A Evaporator is Hazard Category 2 (HNF-14755, Rev. 6, p. ES-2). A Hazard Category 2 facility shows the potential for significant onsite consequences (HNF-14755, Rev. 6, p. 3.3.2.2-1).

General radiological hazards are subject to 10 CFR 835, which is used to screen hazards during the Hazard Analysis (HNF-13117, Rev. 0, p. 13).

The DSA and associated TSRs were prepared in accordance with 10 CFR 830, Subpart B, "Safety Basis Requirements;" DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*; and DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*.

Cooling water from the condensers and steam condensate streams is discharged from the 242-A Building to the TEDF (HNF-14755, Rev. 6, p. 2-23). Sampling and monitoring of the cooling water effluent streams are performed in accordance with requirements in HNF-SD-W049H-ICD-001. The process condensate is discharged to the LERF where sampling and monitoring is performed in accordance with the requirements given in HNF-3395 (Interface Control Document).

Hanford Facility Dangerous Waste Permit Application, 242-A Evaporator, (Part B) (DOE/RL-90-42) was submitted to the state of Washington in 1991 and a revised Part B was submitted in 1997 and incorporated into the Hanford Site Permit in 1998 (HNF-14755, Rev. 6, p. 2-14). Evaporator restart was covered under an Interim Status Permit Application (Part A). The following integrity assessments were performed (HNF-14755, Rev. 6, p. 2-14):

- An integrity assessment was performed in 1992-93 (WHC-SD-WM-ER-124) to confirm integrity of vessels, piping, and secondary containment concrete as part of the Dangerous Waste Permit Application and concluded that all tank and containment systems were fit for use.
- A second integrity assessment (HNF-2905) reconfirmed that all systems were fit for use.
- A third integrity assessment performed in 2007 (RPP-RPT-33306) again confirmed that all systems were fit for use.

Applicable regulatory documentation

- HNF-13117, Rev. 0, *Hazard Analysis For The 242-A Evaporator*, Washington River Protection Solutions, Richland, Washington.
- HNF-SD-WM-FHA-024, *Fire Hazards Analysis for the Evaporator Facility (242-A)*, Rev. 8B, Washington River Protection Solutions LLC, Richland, Washington.
- HNF-3327, 1998, *242-A Evaporator Life Extension Study*, Rev. 0, Waste Management Federal Services, Inc., Richland, Washington.
- HNF-3327, 2001, *Engineering Study for the 242-A Life Extension Upgrades for Fiscal Years 2002 Thru 2005*, Rev. 1, Waste Management Hanford, Richland, Washington.
- HNF-3327, 2009, *Engineering Study for the 242-A Life Extension Upgrades for Fiscal Years 2002 Thru 2005*, Rev. 2, Waste Management Hanford, Richland, Washington.
- HNF-3395, 2010, *Interface Control Document Between the 242-A Evaporator Facility and the Liquid Effluent Retention Facility*, Rev. 6, Washington River Protection Solutions LLC, Richland, Washington.
- HNF-14755, Rev. 6, *242-A Evaporator Documented Safety Analysis*, Washington River Protection Solutions, Richland, Washington.
- HNF-2905, 1998, *1998 242-A Interim Evaporator Tank System Integrity Assessment Report*, Rev. 0, Lockheed Martin Hanford Company, Richland, Washington.
- RPP-13033, *Tank Farms Documented Safety Analysis, as amended*, Washington River Protection Solutions LLC, Richland, Washington.

Applicable Consent Decree or TPA milestones

As suggested in the 242-A Evaporator DSA (HNF-14755, Rev. 6, p. 2-2), the 242-A Evaporator operation and treating / disposing of process condensate are key activities in supporting the goals and milestones defined in the Hanford Federal Facility Agreement and Consent Order (Ecology, EPA, and DOE 1996).

- Milestone M-026-07D -- Submit to EPA and Ecology an evaluation of development status of tritium treatment technology that would be pertinent to the cleanup and management of Tritiated Waste Water (e.g., the 242-A Evaporator Process Condensate Liquid Effluent) and tritium contaminated groundwater at the Hanford site. Due date is 03/31/2019 (And Every Five Years Thereafter).

RISK REVIEW EVALUATION INFORMATION

Completed

February 12, 2017

Evaluated by

Kevin G. Brown

Ratings/Impacts Reviewed by

James H. Clarke

PART III. SUMMARY DESCRIPTION

CURRENT LAND USE

DOE Hanford Site for industrial use. All current land-use activities in the 200-East 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-East 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

Not applicable

High-Level Waste Tanks and Ancillary Equipment

Not applicable. The source of the waste / feed that for the 242-A Evaporator facility is the million-gallon double-shell evaporator feed tank, 241-AW-102. The waste feed is concentrated to a specified concentration creating product slurry and water vapor where the product slurry is pumped to a tank farm valve pit than then to the specified double-shell tank (DST) through the tank farm waste transfer system (HNF-14755, Rev. 6).

Groundwater Plumes

Not applicable

Operating Facilities[8]

The 242-A Evaporator is located in the 200 East Area. Construction began in 1974 and was completed in 1977. The 242-A Evaporator began operations in 1977 and its missions between 1977 and 1980 included:

- Supporting defense-related production of nuclear weapons material;
- Concentrating and transferring liquid waste from single-shell tanks (SST) into double-shell tanks (DST); and
- Managing DST waste by reducing the volume and the number of DSTs required for storage of liquid waste.

Portions of the 242-A Evaporator facility were expanded and upgraded in 1983, including changes to the control room, change rooms, and adding buildings.

The original design life of the 242-A Evaporator was 10 years; however, subsequent study determined that the 242-A Evaporator would be required through the year 2000. Engineering studies and design

[8] The information in this section is taken from the 242-A DSA (from HNF-14755, Rev. 6).

efforts were initiated in 1987 to upgrade the facility to extend the operating life by an additional 10 years. The 242-A Evaporator was placed in temporary shutdown in 1989, pending determination if process condensate would be a mixed waste due to mixed waste being introduced into the DSTs and, consequently, into the 242-A Evaporator. Subsequent meetings with Ecology concluded that the process condensate stream was a mixed waste stream regulated by Ecology, which led to a 5-year shutdown of the Evaporator until the Liquid Effluent Retention Facility (LERF) basins were constructed for storing process condensate. The LERF basins temporarily store process condensate before treatment in support of 242-A Evaporator operation.

The current and future mission of the 242-A Evaporator is to support environmental restoration and remediation of the Hanford Site by optimizing the 200 East and West DST waste volumes in support of the tank farm waste treatment. An additional life extension study (HNF-3327, 1998) was prepared to identify the scope needed to extend facility life through 2016 and was revisited due to a need for the facility through 2019 (HNF-3327, 2001). A Project Execution Plan (RPP-8949) was issued in May 2002 to provide guidance in execution of the life extension projects.

The 242-A Evaporator manages mixed wastes from the Hanford DSTs (WA7890008967 Part III, Operating Unit Group 4; 242-A Evaporator). The liquid wastes in the DST tank systems (see Appendix E.9 and Appendix E.10) are radioactive aqueous solutions containing dissolved inorganic salts, including sodium, potassium, aluminum nitrates and nitrites, and hydroxides. The wastes in some Hanford tanks have detectable levels of heavy metals, including lead, chromium, and cadmium. Radionuclides in the tank wastes that will be concentrated include fission products (e.g., Sr-90 and Cs-137) and actinide series elements (e.g., uranium and plutonium). Small quantities of ammonia and organics (e.g., acetone, butanol, and tri-butyl phosphate) may also be present in some tank waste. Furthermore, small incidental amounts of insoluble solids may be transferred to the 242-A Evaporator as the result of waste mixing during the transfer process (WA7890008967 Part III, Operating Unit Group 4; 242-A Evaporator).

D&D of Inactive Facilities

Not applicable

LOCATION AND LAYOUT MAPS

The 242-A Evaporator facility (Figure H.16-1 from Attachment A) is located in the Hanford 200-East Area near the southern part of the 241-A Tank Farm (described as part of the CP-TF-5 EU in Appendix E.6) as illustrated in Figure H.16-2 (http://phoenix.pnnl.gov/apps/gw/phoenix.html). The 242-A Evaporator receives mixed waste from the DST System (via tank 241-AW-102) that contains inorganic and organic constituents and radionuclides (WA7890008967 Part III, Operating Unit Group 4; 242-A Evaporator). The 242-A Evaporator separates the mixed waste from the DST System into 1) a concentrated slurry containing most of the radionuclides, inorganic constituents, and nonvolatile organics components and 2) a dilute process condensate containing volatile components. The slurry is routed back to the DST System for storage pending further treatment and the process condensate is transferred to the LERF and 200 Area ETF for treatment and final disposal at the State Authorized Land Disposal Site (SALDS).

The 242-A facility has three sections: a multilevel Process Area and single-level Support Area (Building 242-A) and a single-story Control Room (Building 242-AB) (Figure H.16-3). Figure H.16-4 provides a diagram of the 242- Evaporator process.

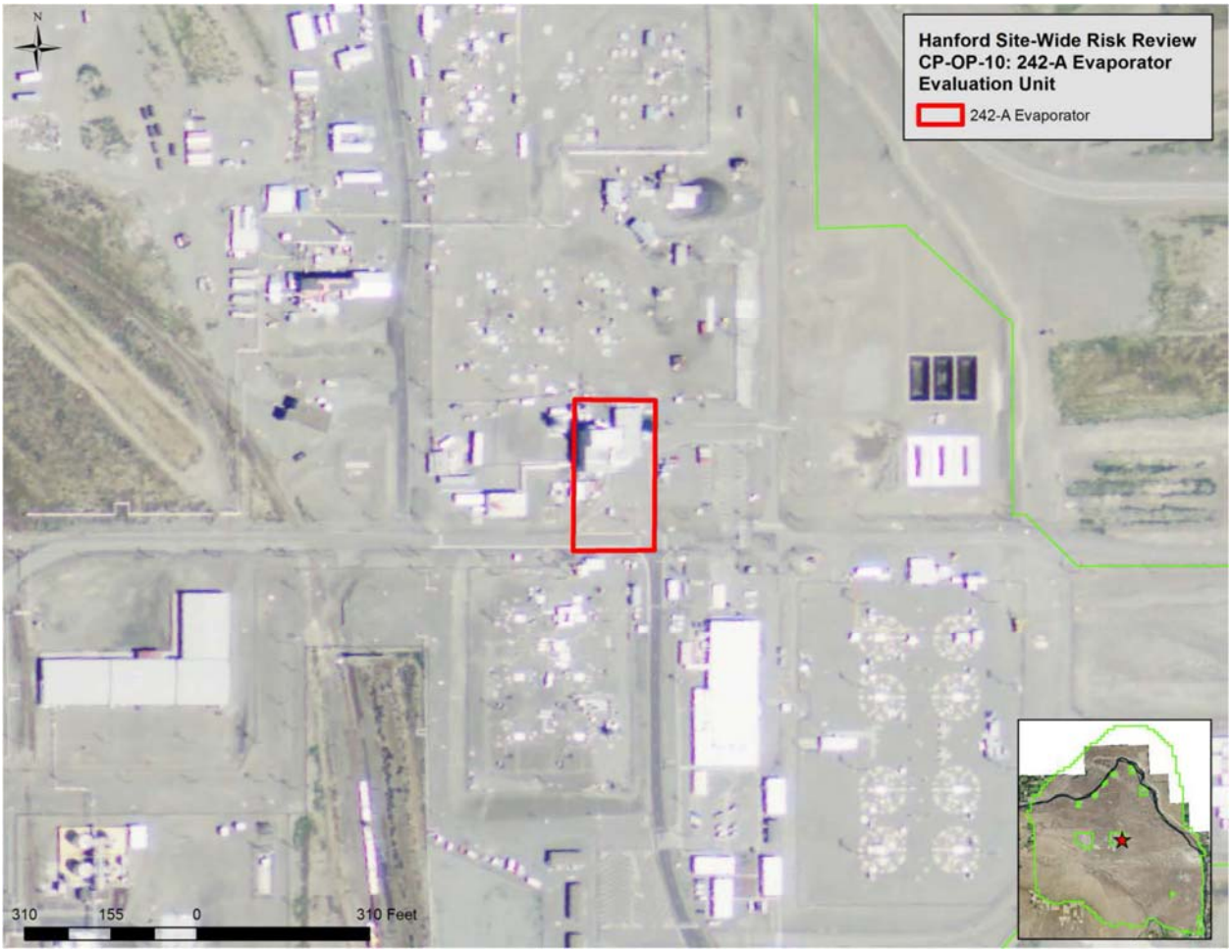

Figure H.16-1. CP-OP-7 (Integrated Disposal Facility) Site Location Map and Waste Site Locations

Figure H.16-2. The 242-A Evaporator in relation to the 241-A Tank Farm (http://phoenix.pnnl.gov/apps/gw/phoenix.html).

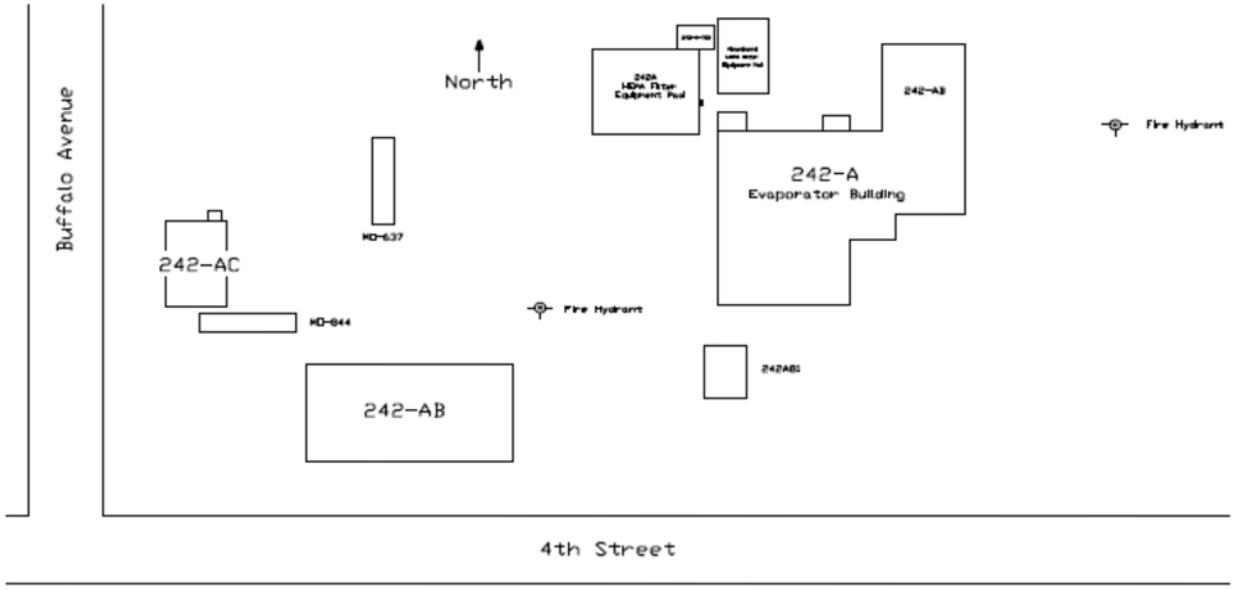

Figure H.16-3. Site Plan for the 242-A Facility (from HNF-SD-WM-FHA-024, Revision 8B)

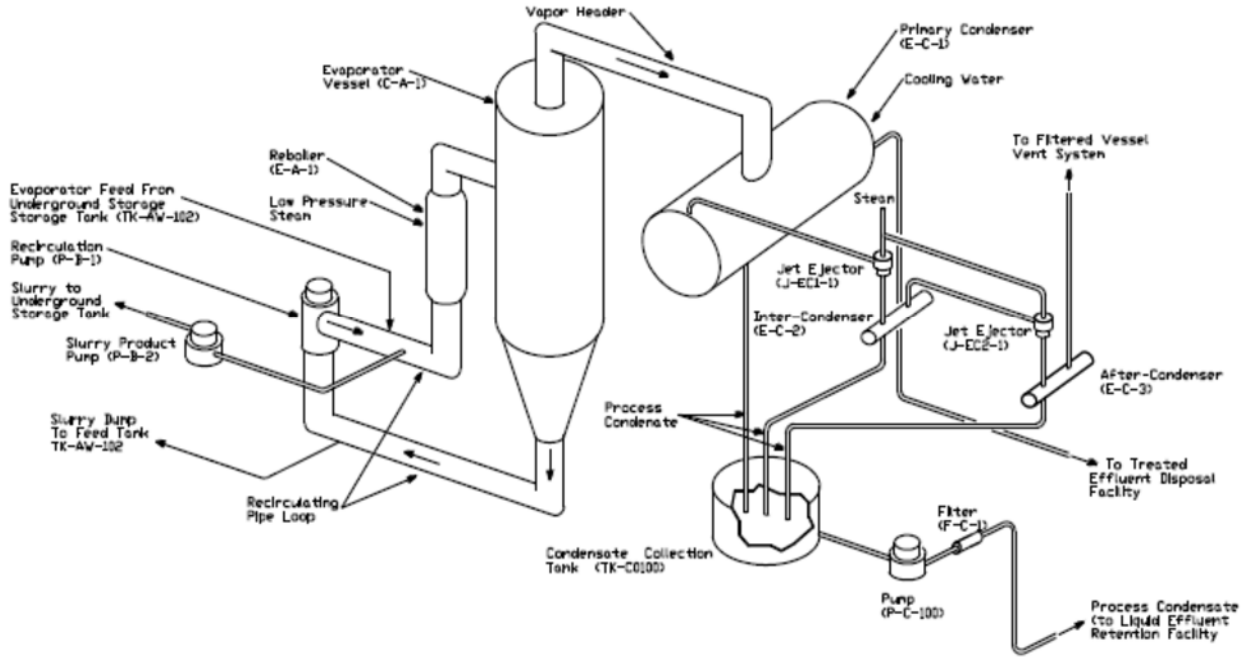

Figure H.16-4. Diagram of the 242-A Evaporator process (from HNF-SD-WM-FHA-024, Revision 8B)

PART IV. UNIT DESCRIPTION AND HISTORY

EU FORMER/CURRENT USE(S)

The 242-A Evaporator is a Hazard Category 2 non-reactor nuclear facility based on based on the requirements of 10 CFR 830 and DOE-STD-1027-92 (HNF-14755, Rev. 6, p. ES-2). The 242-2 Evaporator facility manages mixed wastes from the Hanford DSTs by optimizing the 200 East and West areas waste volumes in support of tank farm and vitrification operations. Dilute tank waste to be concentrated is fed from the million-gallon double-shell evaporator feed tank, 241-AW-102 to the 242-A Evaporator where the waste feed is concentrated to a specified concentration creating product slurry and water vapor. The current and future mission of the 242-A Evaporator is to support environmental restoration and remediation of the Hanford Site.

The 242-A Evaporator was constructed from 1974 through 1977 and began operations in 1977 (HNF-14755, Rev. 6, p. 13-1). The facility is located in the 200 East area near the southern part of the 241-A Single-shell Tank (SST) Farm. The 242-A Evaporator originally had a 10-year design life but has gone through several life extension upgrades (HNF-14755, Rev. 6, p. ES-1). The original missions (1977 to 1980) included supporting defense-related production of nuclear weapons material, concentrating and transferring liquid waste from SSTs to DSTs, and managing DST waste by reducing the volume. Portions of the facility were expanded and upgraded in 1983, including changes to the control room, change rooms, and adding buildings. Subsequent studies determined that the 242-A Evaporator would be required through the year 2000 (after its original design life). Engineering studies and design efforts were initiated in 1987 to upgrade the facility to extend the operating life by an additional 10 years. The 242-A Evaporator was placed in temporary shutdown in 1989, pending determination if process condensate would be a mixed waste due to mixed waste being introduced into the DSTs and,

consequently, into the 242-A Evaporator. Subsequent meetings with Ecology concluded that the process condensate stream was a mixed waste stream regulated by Ecology, which led to a 5-year shutdown of the Evaporator until the LERF basins were constructed for storing process condensate before treatment in support of 242-A Evaporator operation. The current and future mission of the 242-A Evaporator is to support environmental restoration and remediation of the Hanford Site by optimizing the 200 East and West DST waste volumes in support of the tank farm waste treatment. An additional life extension study (HNF-3327, 1998) was prepared to identify the scope needed to extend facility life through 2016 and was revisited due to a need for the facility through 2019 (HNF-3327 2001). A Project Execution Plan (RPP-8949) was issued in May 2002 to provide guidance in execution of the life extension projects.

LEGACY SOURCE SITES

Not applicable

GROUNDWATER PLUMES

Not applicable

D&D OF INACTIVE FACILITIES

Not applicable

OPERATING FACILITIES

Operation of the 242-A Evaporator is required for the next several decades to support operation of the Waste Treatment and Immobilization Plant (WTP). More detailed information on the planned operations can be found above.

ECOLOGICAL RESOURCES SETTING

Landscape Evaluation and Resource Classification

Both the 242-A Evaporator EU and its surrounding buffer area are classified as resource level 0 (Appendix J, Figure J.117, Table J.103). Together, the EU and surrounding buffer area cover 6.8 acres.

Field Survey

Survey performed on June 6, 2015 found no vegetation within the EU other than a small shade tree. Cliff swallows (*Hirundo pyrrhonota*) were observed nesting on the north side of the building and a western kingbird (*Tyrannus verticalis*) was heard in the vicinity (see the field data records at the end of this EU description in Appendix J).

CULTURAL RESOURCES SETTING

No cultural resources have been documented within the CP-OP-10, 242-A Evaporator EU. The 242-A Evaporator EU does not appear to have been inventoried for archaeological resources and it is unknown if an NHPA Section 106 review has been completed specifically for remediation of the CP-OP-10, 242-A Evaporator EU. It is unlikely that intact archaeological material is present in the EU, which has been extensively disturbed by building and utilities construction.

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 have been

recorded within 500 meters of the EU. Additionally, 12 National Register-eligible buildings that are contributing properties within the Manhattan Project and Cold War Era Historic District have been recorded within 500 meters of the EU (all 12 are contributing within the Manhattan Project and Cold War Era Historic District, 6 with documentation required, and 6 with no additional documentation required). All National-Register-eligible Manhattan Project and Cold War Era buildings have been documented as described in the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE-RL 1998).

Historic maps indicate a low potential for the presence of archaeological resources associated with the Pre-Hanford Early Settlers/Farming Landscape within the EU. Geomorphology indicates a very low potential for the presence of Native American Precontact and Ethnographic cultural resources to be present within the CP-OP-10, 242-A Evaporator EU. Further, extensive ground disturbance within the EU suggests little to no potential for intact cultural resources at or below ground surface.

Because the CP-OP-10 has not been formally inventoried for cultural resources, it may be appropriate to conduct archaeological surface inventories prior to the initiation of any remediation activities. Indirect effects are always possible when TCPs are known to be located in the general vicinity. Consultation with Hanford Tribes (Confederated Bands of the Yakama Nation, Wanapum, Confederated Tribes of the Umatilla Indian Reservation, and the Nez Perce) and other groups associated with these landscapes (e.g. East Benton Historical Society, the Franklin County Historical Society and the Prosser Cemetery Association, the Reach, and the B-Reactor Museum Association) may be necessary to provide input on indirect effects to both recorded and potential unrecorded TCPs in the area and other cultural resource issues of concern.

PART V. WASTE AND CONTAMINATION INVENTORY

CONTAMINATION WITHIN PRIMARY EU SOURCE COMPONENTS

Operating Facilities

The original radiological and chemical inventory (Table H.16-2 through Table H.16-4) associated with the 242-A Evaporator was taken from the Tank Farm Closure & Waste Management Environmental Impact Statement (TC&WM EIS) (DOE/EIS-0391 2012, Appendix S)[9]. The 242-A Evaporator is a Hazard Category 2 facility based on the requirements of 10 CFR 830 and the methodology of DOE-STD-1027-92 indicating the potential for significant onsite consequences (HNF-14755, Rev. 6, pp. ES-2 and 3.3.2.2-1). To keep 242-A Evaporator below the Category 1 Hazard thresholds, the radioactive inventory within the 242-A Evaporator at any one time must remain below the threshold quantities (TQs) shown in Table H.16-2 and Table H.16-3 (DOE-STD-1027-92, Attachment 1, p. A-4 and Table A.1).

[9] The basis for how these inventories were derived is provided in: SAIC (Science Applications International Corporation), 2011, Cumulative Impacts Analysis, Inventory Development, Rev. 6, Germantown, Maryland, June 27. This report was not made available for this review. The TC&WM EIS does not explain how the inventory information was derived for the 242-A Evaporator.

Table H.16-2. Inventory of Primary Contaminants [(a)]

				Inventory (Curies)								
WIDS	Description[(b)]	Decay Date	Ref[(c)]	Am-241	C-14	Cl-36	Co-60	Cs-137	Eu-152	Eu-154	H-3	I-129
242-A	Evaporator	1998	EIS-S	9.90E+01	NR	NR	NR	1.49E+05	NR	NR	NR	NR
N/A	Category 2 TQs	N/A	DOE-STD-1027-92	5.50E+01	1.40E+06	1.40E+03	1.90E+05	8.90E+04	1.30E+05	1.10E+05	3.00E+05	NR
N/A	Category 3 TQs	N/A	DOE-STD-1027-92	5.20E-01	4.20E+02	3.40E+02	2.80E+02	6.00E+01	2.00E+02	2.00E+02	1.6E+04	NR

a. NR = Not reported for indicated EU

b. Threshold quantities (TQs) for radioactive materials that define a Category 2 facility (DOE-STD-1027-92, p. A-4) taken from Table A-1 (DOE-STD-1027-92).

c. EIS-S = DOE/EIS-0391 2012

Table H.16-3. Inventory of Primary Contaminants (cont)[(a)]

				Inventory (Curies)					
WIDS	Description	Decay Date	Ref[(c)]	Ni-59	Ni-63	Pu (total)	Sr-90	Tc-99	U (total)
242-A	Evaporator	1998	EIS-S	NR	NR	1.58E+01	2.18E+04	NR	NR
N/A	Category 2	N/A	DOE-STD-1027-92	NR	4.50E+06	3.02E+03	2.20E+04	3.80E+06	9.20E+02
N/A	Category 3	N/A	DOE-STD-1027-92	NR	5.40E+03	3.31E+01	1.60E+01	1.70E+03	1.68E+01

a. NR = Not reported for indicated EU

b. Threshold quantities (TQs) for radioactive materials that define a Category 2 facility (DOE-STD-1027-92, p. A-4) taken from Table A-1 (DOE-STD-1027-92).

c. EIS-S = DOE/EIS-0391 2012

Table H.16-4. Inventory of Primary Contaminants (cont)[(a,b)]

WIDS	Description	Ref[(c)]	CCl4 (kg)	CN (kg)	Cr (kg)	Cr-VI (kg)	Hg (kg)	NO3 (kg)	Pb (kg)	TBP (kg)	TCE (kg)	U (total) (kg)
242-A	Evaporator	1998	EIS-S	NR	NR	NR	NR	NR	NR	NR	NR	NR

a. NR = Not reported for indicated EU

b. Only radioactive threshold quantities given to define Hazard Category (DOE-STD-1027-92).

c. EIS-S = DOE/EIS-0391 2012

Table H.16-5. 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	0.25	0	1.82	---	---	---	---	---	*ND*
I-129	A	1 pCi/L	0.25	0.2	1.82	---	---	---	---	---	*ND*
Sr-90	B	8 pCi/L	0.25	22	1.82	---	---	---	---	---	*ND*
Tc-99	A	900 pCi/L	0.25	0	1.82	---	---	---	---	---	*ND*
CCl4	A	5 µg/L	0.25	0	1.82	---	---	---	---	---	*ND*
Cr	B	100 µg/L	0.25	0	1.82	---	---	---	---	---	*ND*
Cr-VI	A	48 µg/L[b]	0.25	0	1.82	---	---	---	---	---	*ND*
TCE	B	5 µg/L	0.25	2	1.82	---	---	---	---	---	*ND*
U(tot)	B	30 µg/L	0.25	0.8	1.82	---	---	---	---	---	*ND*

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).

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?

A Hazard Analysis (HA) was performed (HNF-13117, Rev. 0) to support the DSA[10] that provides the Safety Basis for the 242-A Evaporator. A wide range of potential hazards that could contribute to the uncontrolled release of radioactive or hazardous materials (denoted "hazardous conditions") are systematically and comprehensively identified through the HA. A set of 71 hazardous conditions were identified where no conditions were identified for the receptor at the site boundary (maximum offsite individual), one condition was identified for the receptor at the facility boundary, and 16 conditions were identified for the facility worker. The results of the HA (RPP-48900, Rev. 0) is a part of the Safety Basis for the DSA. The following representative accidents were selected to represent groups of similar hazardous conditions and are intended to bound onsite consequences for the group (taken from HNF-14755, Rev. 6, p. 3.3.2.3.1-1):

- **Flammable Gas Accidents**. This accident involves flammable gas deflagrations/detonations in the C-A-1 vessel and also in waste feed transfer piping, waste slurry transfer piping, and C-A-1 drain piping. In addition, flammable gas deflagrations/detonations in the process condensate, steam condensate, and raw water systems due to waste contamination as a result of misroutes are evaluated. *The bounding event is a flammable gas detonation in the C-A-1 vessel*.
- **Nuclear Criticality**. This accident involves a nuclear criticality in the C-A-1 vessel.
- **Waste Leaks and Misroutes**. This accident involves a broad spectrum of waste leaks including (pumped) pressurized leaks, gravity head (C-A-1 vessel) leaks, and leaks involving contaminated process condensate, steam condensate, and raw water due to misroutes. Misroutes also consider direct radiation hazards to the facility worker. *The bounding event is a fine spray leak during a waste transfer using slurry pump P-B-2*.
- **External Events**. This accident involves external initiators (i.e., aircraft crash, vehicle accident, range fire, or rail accident) of 242-A Evaporator accidents.
- **Natural Events**. Natural events, which are not unique accidents (and hence not truly a representative accident), encompass natural phenomena events (e.g., seismic events, lightning, high winds) that serve as initiators of other representative accidents. For example, a seismic event could initiate a flammable gas accident or a waste leak. A seismically-induced leak is included with the waste leak and misroute hazardous conditions.

[10] "Hazard categorization is selected on the basis of the definitions of hazard categories in 10 CFR 830 and the methodology for hazard categorization in DOE-STD-1027-92…." (HNF-14755, Rev. 6, p. 3.3.1-9).

The following representative accidents have consequences that are less than the guidelines for the onsite worker and do not pose significant facility worker hazards (taken from HNF-14755, Rev. 6, p. 3.3.2.3.1-2):

- **Ammonia releases**. This accident involves off-normal releases of ammonia gas from the vessel ventilation system due to high ammonia feed in C-A-1 vessel or over-temperature events (e.g., fires) involving process condensate. *The bounding event is a release of ammonia out of the C-A-1 vessel vent stack due to a fire in the condenser room*.
- **Fires**. This accident involves building fires. *The bounding event is a fire occurring in the evaporator room or pump room*. Fire protection requirements on transient combustible loading limits are selected as a defense-in-depth feature to protect against large fires occurring within the evaporator and pump rooms.
- **Filtration Failures Leading to Unfiltered Releases**. This accident involves releases caused by a failure of the vessel ventilation system or the K1 ventilation system due to a fire, overpressure transient, or filter crushing event involving the vessel ventilation system high-efficiency particulate air (HEPA) filters or the K1 ventilation system HEPA filters, as well as a subsequent unfiltered release.
- **Pump Room Sump Steam Jet Events**. This accident involves an event where the steam/waste discharge for the pump room sump steam jet pump J-B-1 is blocked and the steam supply flows down the inlet side of the 37 sump jet eductor and is injected into a waste pool in the sump, causing the generation of waste aerosols due to entrainment or bubble burst.

The selection of bounding accidents for quantitative analysis of radiological consequences was primarily based on the onsite radiological consequences for the representative accidents. The two accidents with the highest onsite radiological consequences were the flammable gas accident (detonation in the C-A-1 vessel) (HNF-14755, Rev. 6, p. 3.4.2.1-1; RPP-48050) and the waste leak and misroute accident (i.e., fine spray leak during a transfer using slurry pump P-B-2) (HNF-14755, Rev. 6, p. 3.4.2.2-1; RPP-13750).

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

The overall hierarchy of control decision preference is defined in DOE-STD-1189-2008 as follows (HNF-14755, Rev. 6, pp. 3.3.1-5 and 3.3.1-6):

- Minimization of hazardous materials is the first priority
- Safety SSCs are preferred over ACs
- Passive SSCs are preferred over active SSCs
- Preventive controls are preferred over mitigative controls
- Facility safety SSCs are preferred over personal protective equipment
- Controls closest to the hazard may provide protection to the largest population of potential receptors, including workers and the public
- Controls that are effective for multiple hazards can be resource effective

For the 242-A Evaporator, no safety-class SSCs were identified (HNF-14755, Rev. 6, p. 3.3.2.3.2-1) although the following safety-significant SSCs and Administrative Controls were identified (HNF-14755, Rev. 6, Table 3.3.2.3.2-1):

- **Flammable Gas Accidents**. Preventive SSCs include the C-A-1 Vessel Flammable Gas Control System and the C-A-1 Vessel Waste High Level Control System. Facility Worker Protection SSCs include E-A-1 Reboiler (tube/tube sheet integrity) and Backflow Prevention Devices (PSV-RW-3 and BFP-RW-11) (passive). Flammable Gas Controls for Waste Feed Transfer Piping, Waste Slurry

Transfer Piping, and C-A-1 Vessel Drain (Dump) Piping were identified as a Specific Administrative Control (SAC) for Facility Worker Protection. For Supporting TSRs, Evaporator and Pump Room Transient Combustible Material Controls was identified as a SAC and C-A-1 Vessel Time to Lower Flammability Limit and Ignition Controls were identified as ACs. Other ACs include E-A-1 Reboiler Steam Isolation Verification and Emergency Response Actions Following Facility Fires (passive).

- **Waste Leaks and Misroutes**. Mitigative SSC is the Pressure Relief Valve (PSV-PB2-1) (passive). Facility Worker Protection SSCs are the C-A-1 Vessel Waste High Level Control System, E-A-1 Reboiler (tube/tube sheet integrity), and Backflow Prevention Devices (PSV-RW-3 and BFP-RW-11). For Facility Worker Protection, C-A-1 Vessel Waste High Level Control System and Evaporator and Pump Room Access and Pump Room Cover Block Control. For Supporting TSR, Evaporator and Pump Room Transient Combustible Material Controls. The Other AC included the Emergency Response Actions Following Facility Fires.
- **External Events**. No SSCs or ACs are required.
- **Natural Events**. Preventive SSCs include C-A-1 Vessel Seismic Dump System and 242-A Building (passive). The Preventive TSR was C-A-1 Vessel Seismic Dump System. Supporting TSR included the Evaporator and Pump Room Transient Combustible Material Controls as a SAC and Emergency Preparedness was identified as an AC.

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

See previous answer (where passive controls are indicated).

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 Hazard Analysis process considers potential hazardous conditions that could result in the uncontrolled release of radioactive and/or hazardous material. The SSCs, TSRs, and ACs indicated above are intended to address the hazardous conditions. Furthermore, defense-in-depth is a safety philosophy for hazard control based on building layers of defense against the uncontrolled release of radioactive and other hazardous material so that no one layer by itself is completely relied upon for protection of the public, workers, and the environment. There is no requirement to demonstrate any generic, minimum number of layers of defense although typically more layers of defense are identified for higher risk accidents. Defense-in-depth features include safety SSCs, TSRs, and other design and administrative features that provide multiple layers of defense to prevent or mitigate potential hazardous conditions and postulated accidents.

The primary barrier to release is the 242-A building itself, the construction of which is substantial (massive reinforced concrete) and could be considered to also be fire rated due to the thickness of the walls. Inside the building, the pump room is provided with removable cover blocks that with the building ventilation system form a confinement barrier between the pump room and the rest of the canyon area (HNF-14755, Rev. 6, pp. 2-16 -- 2-17). The wall separating the control room from the support area is the single fire rated barrier in the 242-A Evaporator (HNF-14755, Rev. 6, p. 2-90).

The 242-A facility and associated barriers are structurally sound and there are no completed pathways to receptors. Because of the upgrades that have been made (and will likely be made), completed pathways are unlikely during the evaluation period.

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

Safety-significant SSCs and TSRs were identified for the 242-A Evaporator (HNF-14755, Rev. 6, Table 3.3.2.3.2-1). Use of these SSCs and adherence to the TSRs ensure that the 242-A Evaporator will be operated within established risk guidelines.

Based on design life and operating conditions (HNF-14755, Rev. 6):

- The ability of the C-A-1 vessel flammable gas control system and C-A-1 vessel waste high level control system to perform their safety functions can degrade, and thus periodic calibrations, calibration checks, and functional tests are required (pp. 4-12 and 4-21).
- The ability of the C-A-1 vessel seismic dump system, E-A-1 reboiler, PSV-RW-3, and BFP-RW-11 to perform their safety functions can degrade and periodic testing is required (pp. 4-30, 4-33, 4-34, and 4-38).
- The ability of pressure relief valve PSV-PB2-1 to perform its safety function can degrade and periodic replacement is required (p. 4-41).

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

The radiological consequence calculations in the 242-A DSA use the exposure pathways recommended in DOE-STD-3009-94, Appendix A where two potential radiological exposure pathways (i.e., internal and external) are associated with releases of radioactive materials (HNF-14755 Rev. 6, p. 3.4.1-4). The internal exposure pathway used is inhalation where exposure occurs (1) when an accident would result in a release of airborne radioactive material that would be transported downwind and inhaled by the *maximum onsite* (nominally at 100 m) and *offsite* (at Hanford boundary) *individuals* or (2) when radioactive materials that have been deposited on the ground would become (re)suspended and are subsequently inhaled[11]. The external exposure pathways include ground shine[12] and direct shine[13] from a concentrated radioactive source (e.g., a spill of liquid radioactive material).

For toxicological impacts from liquid and solid particulates (dispersed as aerosols) and gases, exposures are assumed to primarily occur via the inhalation pathway where exposure limits are based on PAC values (HNF-14755 Rev. 6, p. 3.4.1-8). Exposure to skin and eyes is also considered in development of the PAC values used.

For facility workers, the 242-A Evaporator DSA qualitatively judged there were risks of a prompt fatality, serious injuries, or significant radiological or chemical exposures resulting from energetic releases of high concentrations of radiological or toxic materials in areas where facility workers are present, deflagrations or explosions within process equipment or structures resulting in fragmentation and

[11] The resuspension dose is not included in the consequence calculations in the 242-A DSA because inhalation of resuspended material is generally orders of magnitude less than that from inhalation of the material in the original plume (HNF-14755 Rev. 6, p. 3.4.1-4).

[12] Ground shine is not included in the 242-A DSA consequence calculations because it is a slow-to-develop pathway that produces relatively low dose rates making it not an immediate threat to personnel (HNF-14755 Rev. 6, p. 3.4.1-4).

[13] Direct shine from liquid leaks may be included in accident evaluations, but it is not included in ULDs because the dose would vary depending on the accident scenario. The calculation documents specific to leak or spill scenarios can be consulted for details of the pool shine calculations (HNF-14755 Rev. 6, p. 3.4.1-4).

injury, chemical hazards or thermal burns, leaks resulting in asphyxiation (HNF-14755 Rev. 6, p. 3.3.1-6 and 3.3.1-7).

There are no plumes currently associated with the 242-A Evaporator (nor likely will be in the evaluation period considered in this Review); therefore, there is likely so no impact to protected resources (i.e., groundwater or the Columbia River).

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

The initiating events considered in the 242-A Evaporator DSA are typically in the immediate to perhaps hours in duration (e.g., 2 to 8 hours for the hypothetical *maximally-exposed offsite individual* at the Hanford Site boundary (HNF-14755, Rev. 6, p. 3.4.2-1)). For example, as described above, ground shine is not considered because it is slow to develop (HNF-14755, Rev. 6, p. 3.4.1-4).

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

All current releases from the 242-A Evaporator to the environment or to potential receptors are controlled and managed. The 242-A Evaporator process condensate is currently sent to the LERF (CP-OP-16 EU in Appendix H.12), where it is stored temporarily prior to treatment at the 200 Area ETF. The steam condensate (and raw water) is discharged directly to the TEDF (CP-OP-12 in Appendix H.13). These basins contain low levels of fixed residual radioactive contamination.

POPULATIONS AND RESOURCES CURRENTLY AT RISK OR POTENTIALLY IMPACTED

As mentioned in **Part I**, a Hazard Analysis (HNF-13117, Rev. 0) and Documented Safety Analysis (HNF-14755, Rev. 6) were completed for the 242-A Evaporator.

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—has proven to be effective in reducing industrial accidents at the Hanford Site to well below that in private industry. Further, the safety and health program must effectively ensure that ongoing task-specific hazard analyses are conducted so that the selection of appropriate PPE can be made and modified as conditions warrant. Task-specific hazard analyses must lead to the development of written work planning documents and standard operating procedures (SOPs) [DOE uses the term work planning documents in addition to procedures] that specify the controls necessary to safely perform each task, to include continuous employee exposure monitoring. Furthermore, safety-significant SSCs, TSRs, and defense-in-depth strategies were defined in the DSA to control risks and potential impacts to acceptable levels. As such, mitigation actions will generally lead to reduced risks.

Facility Worker

Based on the 242-A Evaporator DSA, both *flammable gas accidents* (with anticipated, unmitigated frequency) and *waste leaks and misroutes* (with unlikely, unmitigated frequency) were qualitatively judged to result in prompt death, serious injury, or significant radiological or chemical exposure to the facility worker. Thus the human health rating is *High* for a facility worker. (See **Part I** for additional information.)

Facility Worker: Unmitigated risks are rated as *High* because accidents have been postulated in the DSA that have been judged as potentially resulting in prompt death, serious injury, or significant exposure. As described in **Part I**, mitigated risks are *Low* due to safety measures employed by the DOE.

Co-Located Person (CP)

Based on the 242-A Evaporator DSA (HNF-14755, Rev. 6), selected bounding accidents were analyzed for on-site radiological consequences. For flammable gas accidents, a TED of 16.6 rem was calculated (RPP-48050, Rev. 1, p. 2) that would translate to a *Medium* rating (CRESP 2015a, Table 2-4). An analysis of the waste leak and misroute accident, the TED of less than 100 rem was calculated (HNF-14755, Rev. 6, p. ES-9), which if the TED exceeded 25 rem would translate to a *High* rating. Thus the rating for the co-located person would be *Medium-High* (without additional information).

Co-Located Person: Unmitigated risks are thus rated as *Medium-High* where, as described in **Part I**, mitigated risks are *Low* due to SSCs and TSRs as well as other safety measures employed by the DOE.

Public

Based on the 242-A Evaporator DSA (HNF-14755, Rev. 6), selected bounding accidents were analyzed for off-site radiological consequences. The off-site doses for the flammable gas accident and waste leak and misroute accident were 0.15 and 0.031 rem, respectively (HNF-14755, Rev. 6), which translates to *Not Discernible* (*ND*)-*Low* ratings (CRESP 2015a, Table 2-4).

Public: Unmitigated risks are rated as *ND-Low* with mitigated risk rated also as *ND-Low* as described in **Part I**.

Groundwater and Columbia River

As illustrated in Table H.16-5, the vadose zone (VZ) GTM values for the IDF Group A and B primary contaminants (PCs) remaining in the vadose are all *Not Discernible* (*ND*) (for protected resources including groundwater and the Columbia River) because no wastes from the 242-A Evaporator are in the vadose zone. Thus the overall rating for the CP-OP-10 EU is also *ND* for the protected resources.

Ecological Resources

Summary of Ecological Review:

- 100% of the EU and adjacent landscape buffer area are classified as level 0; consequently, there will no loss of habitat during cleanup activities.

Cultural Resources

The 242-A Evaporator EU is located within the 200-East 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.

The CP-OP-10, 242-A Evaporator EU has not been inventoried for archaeological resources and it is unknown if an NHPA Section 106 review has been completed specifically for remediation of the 242-A Evaporator EU. It is unlikely that intact archaeological material is present within the EU (both on the surface and in the subsurface), particularly because the soils in the 242-A Evaporator EU appear to be heavily disturbed by the 242-A Evaporator itself.

Archaeological sites, buildings and Traditional Cultural Properties (TCPs) located within the EU[14]

- There are no known archaeological sites, inventoried historic buildings, or TCPs located within the CP-OP-10, 242-A Evaporator EU.

Archaeological sites, buildings and TCPs located within 500 meters of 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 500-meters of the CP-OP-10, 242-A Evaporator EU. In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan (*DOE/RL-97-56) (DOE-RL 1998), all documentation requirements have been completed for this property.
- There are 12 National Register-eligible buildings that are contributing properties within the Manhattan Project and Cold War Era Historic District located within 500-meters of the 242-A Evaporator EU (all 12 are contributing within the Manhattan Project and Cold War Era Historic District, 6 with individual documentation required, and 6 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.65 (Appendix K) has more details about the 12 buildings that are National Register-eligible Manhattan Project and Cold War Era buildings located within 500-meters of the 242-A Evaporator EU.

Closest Recorded TCP

There are two recorded TCPs associated with the Native American Precontact and Ethnographic Landscape that are visible from the CP-OP-10, 242-A Evaporator EU.

CLEANUP APPROACHES AND END-STATE CONCEPTUAL MODEL

Selected or Potential Cleanup Approaches

Operation of the 242-A Evaporator is required for the next several decades, and final cleanup and closure decisions have been deferred to future decision-making processes (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B).

Contaminant Inventory Remaining at the Conclusion of Planned Active Cleanup Period

Final cleanup and closure decisions for the 242-A Evaporator have been deferred (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B); therefore, final contaminant inventories cannot be determined. However, selected inventories (Table H.16-2 through Table H.16-4) are provided for the 242-A Evaporator in the TC&WM EIS (DOE/EIS-0391 2012, Appendix S) that are considered final inventories for the purpose of this Review.

Risks and Potential Impacts Associated with Cleanup

As described earlier in **Part I** and **Part VI**, a Hazard Analysis (HNF-13117, Rev. 0) and Documented Safety Analysis (HNF-14755, Rev. 6) were completed for the 242-A Evaporator. These evaluations identified

[14] 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).

causes and consequences of potential off-normal conditions associated with 242-A Evaporator operations. The results of these evaluations indicated that there appear to be no offsite public hazardous conditions that would dictate evaluation of safety class SSCs and/or TSR controls. There are on-site receptor risks that dictated both safety-significant SSCs and TSRs. Furthermore, there are hazardous conditions with potentially significant facility worker consequences; however, it is expected that the existing DOE safety management programs will adequately address these issues. However, because no final cleanup or D4 decisions have been made for the IDF (DOE/RL-2015-10, Rev. 0, p. B-13), there is *insufficient information* (*IS*) to assess final closure risks and potential impacts.

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

Facility Worker

During tank waste treatment (evaporation) operations, the DSA suggested that activities would present hazard conditions that (unmitigated) would pose significant risks or potential impacts that are rated *High* (where more details on the analysis are provided earlier in **Part VI**). Final cleanup and closure decisions for the 242-A Evaporator have been deferred (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B). Thus there is *insufficient information* (*IS*) to assess risks or potential impacts to facility workers.

Unmitigated Consequences: Facility Worker – *High* (Operations) and *IS* (Closure and D&D)

Mitigation: There are hazardous conditions associated with 242-A operations with potentially significant facility worker consequences; however, it is expected that the existing DOE safety management programs would adequately address these issues as described in more detail **Part I** and **Part VI**. Thus the risk ratings are not impacted by the mitigation actions (because the mitigated risk ratings are already adjudged as *Low*). Furthermore, because no final cleanup or D4 decisions have been made for the IDF (DOE/RL-2015-13, Rev. 0, p. B-13; Appendix B), there is *insufficient information* (*IS*) to assess the impacts of mitigation efforts in final closure risks and potential impacts.

Mitigated Consequences: Facility Worker – *Low* (Operations) and *IS* (Closure and D&D)

Co-located Person

During tank waste treatment (evaporation) operations, the DSA suggested that activities would present hazard conditions that (unmitigated) would pose risks or potential impacts to co-located persons that are rated *Medium-High* and require safety-significant SSCs and TSRs to address (where more details on the analysis are provided earlier in **Part I** and **Part VI**). Final cleanup and closure decisions for the 242-A Evaporator have been deferred (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B). Thus there is *insufficient information* (*IS*) to assess risks or potential impacts to co-located persons.

Unmitigated Consequences: Co-located Person – *Medium-High* (Operations) and *IS* (Closure and D&D)

Mitigation: There are hazardous conditions associated with 242-A operations with potentially significant consequences to on-site personnel (denoted here the co-located here) that require safety-significant SSCs and TSRs as well as existing DOE safety management programs would adequately address these issues as described in more detail **Part I** and **Part VI**. Thus the risk ratings are not impacted by the mitigation actions (because the mitigated risk ratings were previously adjudged as *Low*). Furthermore, because no final cleanup or D&D decisions have been made for the IDF (DOE/RL-2015-10, Rev. 0, p. B-13; Appendix B), there is *insufficient information* (*IS*) to assess the impacts of mitigation efforts in final closure risks and potential impacts.

Mitigated Consequences: Facility Worker – *Low* (Operations) and *IS* (Closure and D&D)

Public

During tank waste treatment (evaporation) operations, the DSA suggested that activities would present hazard conditions that (unmitigated) would pose risks or potential impacts to off-site receptors (denoted here as public) that are rated *ND-Low* ratings that do not require safety-class SSCs (where more details on the analysis are provided earlier in **Part I** and **Part VI**). Final cleanup and closure decisions for the 242-A Evaporator have been deferred (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B). Thus there is *insufficient information* (*IS*) to assess risks or potential impacts to the public.

Unmitigated Consequences: Co-located Person – *ND-Low* (Operations) and *IS* (Closure and D&D)

Mitigation: There are hazardous conditions associated with 242-A operations with potentially significant consequences to on-site personnel (denoted here the co-located here); however, consequences to off-site personnel are such that ratings to off-site personnel would not be impacted by the mitigation actions (because the mitigated risk ratings were previously adjudged as *ND-Low*). Furthermore, because final cleanup and closure decisions for the 242-A Evaporator have been deferred (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B), there is *insufficient information* (*IS*) to assess the impacts of mitigation efforts in final closure risks and potential impacts.

Mitigated Consequences: Facility Worker – *ND-Low* (Operations) and *IS* (Closure and D&D)

Groundwater and Columbia River

Operation of the 242-A Evaporator is required for the next several decades to support WTP operations. Final cleanup and closure decisions have been deferred to future decision-making processes (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B). However, it is assumed that future operations will continue to maintain waste in the facility until proper disposition (as in the past). Thus the overall rating for the CP-OP-10 EU is *ND* for both groundwater and the Columbia River.

Ecological Resources

No cleanup decisions have been made for this EU. As a result, the potential effects of cleanup on ecological resources are uncertain.

Cultural Resources

No information regarding final D&D of the facility is available, and as a result, the potential effects of cleanup on cultural resources are uncertain.

Additional Risks and Potential Impacts if Cleanup is Delayed

The radiological inventory is to be maintained to limits according the requirements of a Hazard Category 2 facility; therefore, the 242-A Evaporator may be of higher priority when compared to other facilities if the basis were solely on the radiological inventory within the facility.

Near-Term, Post-Cleanup Status, Risks and Potential Impacts

Final cleanup and closure decisions for the 242-A Evaporator have been deferred (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B); therefore, no assessments of these risks or potential impacts can be made.

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

Table H.16-6. Summary of Populations and Resources at Risk or Potentially Impacted after Cleanup.

Population or Resource		Risk/Impact Rating	Comments
Human	Facility Worker	*Insufficient Information (IS)*	Final cleanup and closure decisions have been deferred.
	Co-located Person	*IS*	Final cleanup and closure decisions have been deferred.
	Public	*IS*	Final cleanup and closure decisions have been deferred.
Environmental	Groundwater from vadose zone[a]	*Not Discernible (ND)*	Final cleanup and closure decisions have been deferred to future decision-making processes; however, assume that operations will be maintained as in the past (proper waste disposition).
	Columbia River from vadose zone[a]	*ND*	
	Ecological Resources[b]	No cleanup decisions have been made for this EU. Estimated to be Not Discernible (ND) to Low	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. Post-cleanup monitoring might pose a risk to level 3 and above resources in the buffer area. Possible disruption of migratory birds. No information regarding final D4 of the facility, so no information available to evaluate those effects.
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: Unknown Indirect: None **Manhattan/Cold War** Direct: None Indirect: None	No information regarding final D&D of the facility is available. 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.

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.

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

As described above, final cleanup and closure decisions for the 242-A Evaporator have been deferred (DOE/RL-2015-10, Rev. 0, p. B-17; Appendix B); therefore, final contaminant inventories and corresponding long-term risks and potential impacts cannot be determined. However, selected inventories (Table H.16-2 through Table H.16-4) are provided for the 242-A Evaporator in the TC&WM EIS (DOE/EIS-0391 2012, Appendix S) that are considered final inventories for the purpose of this Review.

PART VII. SUPPLEMENTAL INFORMATION AND CONSIDERATIONS

None

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ATTACHMENT A

Hanford Site-Wide Risk Review

Evaluation Unit:	242-A Evaporator
ID:	CP-OP-10
Group:	Operations
Operable Unit Cross-Walk:	NA
Related EU:	CP-TF-5
Sites & Facilities:	Operations and D&D of the 242-A evaporator.
Key Data Sources Docs:	242-A Hazards Analysis (HNF-13117, Rev 0) 242-A Evaporator Documented Safety Analysis (HNF-14755, Rev 4B) 242-A Evaporator Documented Safety Analysis (HNF-14755, Rev 4C) Fire Hazards Analysis for the 242-A Evaporator (HNF-SD-WM-FHA-024, Rev 08B) Technical Basis for Releases from Deflagration or Detonation in the 242-A Evaporator (RPP-48050, Rev 1) 242-A Evaporator Hazard Evaluation Database Report (RPP-48900, Rev 0A) Flammability Analysis and Time to Reach Lower Flammability Limit Calculations on the Waste Evaporation at 242-A Evaporator (RPP-CALC-29700, Rev 3) Radiological Monitoring Plan for Transfer of Waste from 241-AW-102 to 241-AP-107 via the 242-A Evaporator (RPP-PLAN-56816, Rev 4) Waste Leak Path Evaluation for Transfers and Flushes to/from AP-Farm and AW Tanks (RPP-TE-57395, Rev 0 and Rev 1)

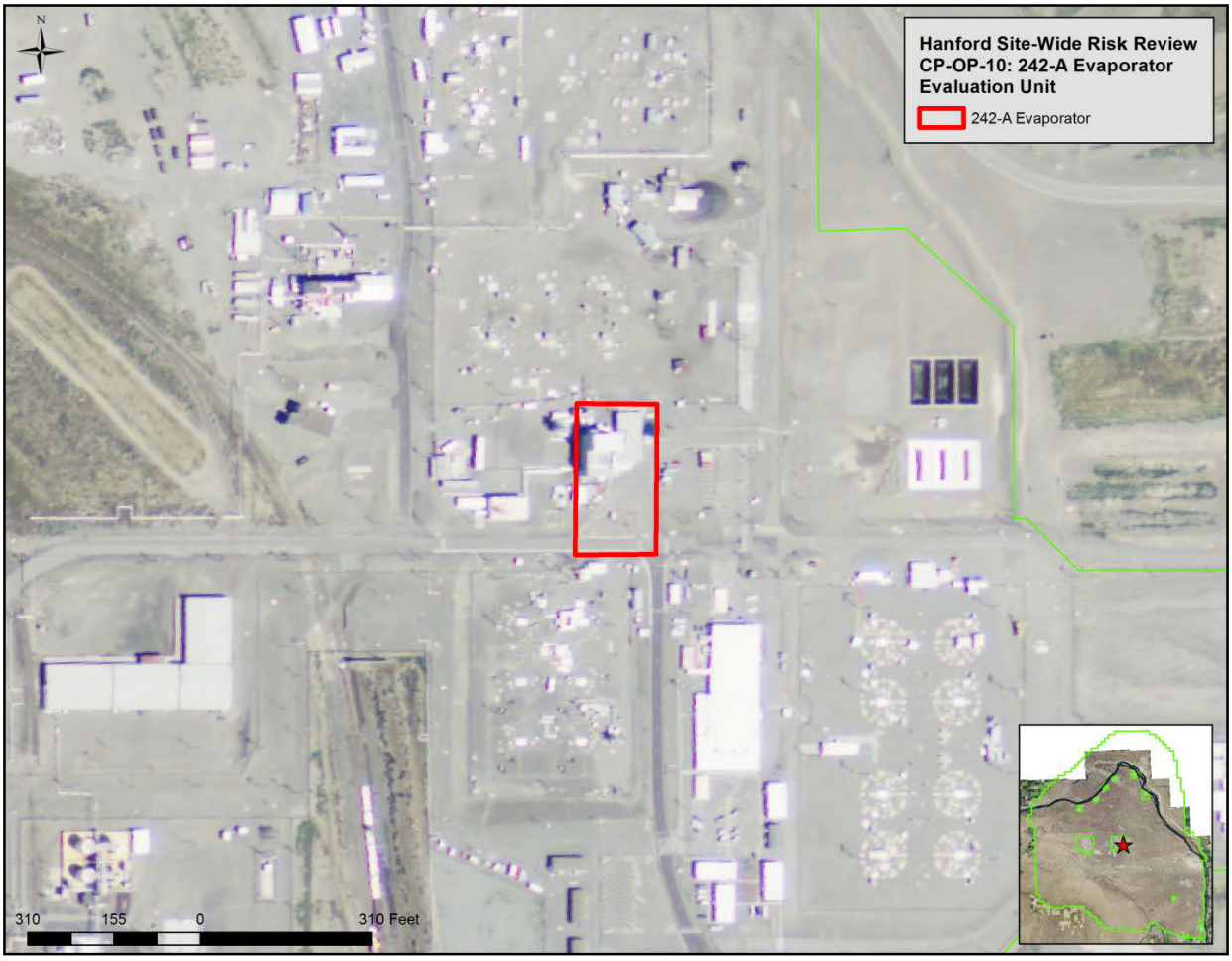

Figure 1. CP-OP-10 (242-A Evaporator) Site Location Map

Hanford Site-Wide Risk Review
CP-OP-10 (242-A Evaporator)
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
242-A	242-A; 242-A Evaporator	Waste Site	Active	Accepted	None	Evaporator	Process Building	Not Applic		
200-E-187-P-	200 E 187 PL; Chemical Sewer from 202 A to 216 A 29 Ditch; Lines 8819, 5802 and 5701; PUREX Chemical Sewer (CSL)	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD	X	Included in A-AX Tank Farm Eval.
200-E-229-P-	200-E-229-PL ; Line SN-650; Transfer line Between tank 241-A-7-107 and 241-A-B Valve Pit	Waste Site	Inactive	Accepted	None	Direct Buried Tank Farm Pipeline	Pipeline and associated valves, etc.	TBD	X	Included in A-AX Tank Farm Eval.
200-E-234-P-	200-E-234-PL; Lines 300, 501, 505, and 557; Pipelines from 242-A Evaporator Building to the 207-A Basins	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD	X	Included in A-AX Tank Farm Eval.
200 E 283 P-	200 E 283 PL; Line 395; "Pipeline from 242 A Bldg to 600 291 PL (TEDF Line)	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD	X	Included in A AX Tank Farm Eval.
200 E 288 P-	200-E-288-PL ; PC-5000; Pipeline from 242-A Evaporator to Liquid Effluent Retention Facility	Waste Site	Active	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD	X	Included in A AX Tank Farm Eval.
600-291-PL	600-291-PL; TEDF Line; 200 Area Treated Effluent Disposal Facility Pipeline	Waste Site	Active	Accepted	None	Process Sewer	Pipeline and associated valves, etc.	Not Applic	X	Included in TEDF Eval.
200 E 211 P-	200-E-211-PL; Lines DR334, DR335 and DR343; Transfer Lines from 241-AW to 242-A Evaporator Building	Waste Site	Active	Accepted	None	Direct Buried Tank Farm Pipeline	Pipeline and associated valves, etc.	Not Applic	X	Included in A AX Tank Farm Eval.
200-E-210-P-	200-E-210-PL ; Encased Lines Between 241-AW Tank Farm and 242-A Evaporator Building; Lines SL-167, SL-168, SN-219, SN-220, SN-269 and SN-270	Waste Site	Active	Accepted	None	Encased Tank Farm Pipeline	Pipeline and associated valves, etc.	Not Applic	X	Included in A-AX Tank Farm Eval.
200-E-286	200-E-286; A Swamp; A-Swamp and Ditch; Original 200 East Area Powerhouse Effluent Pond; Powerhouse Swamp	Waste Site	Inactive	Accepted	Rejected	Pond	Pond/Ditch – Surface Liquid Disposal Site	Not Applic	X	Rejected
200-E-131	200-E-131; Contaminated Soil Associated with 241-A Tank Farm Complex	Waste Site	Inactive	Accepted	None	Contamination Migration	Unplanned Release Surface/Near Surface	WMA A/AX	X	Included in A-AX Tank Farm Eval.
242AB	242A CONTROL ROOM ADDITION	Facility	ACTIVE			BUILDING	Infrastructure Building			
242AB1	WATER SERVICE BUILDING	Facility	ACTIVE			BUILDING	Infrastructure Building			
242A702	TURBINE BUILDING	Facility	ACTIVE			BUILDING	Infrastructure Building			
242A	EVAPORATOR	Facility	ACTIVE			BUILDING	Process Building		X	Duplicative
241A	WASTE DISPOSAL TANK FARM	Facility	ACTIVE			OTHER	Underground Storage Tank		X	Duplicate - refers to the entire 241-A Tank Farm

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).