APPENDIX F.5

FFTF (RC-DD-4, RIVER CORRIDOR)
EVALUATION UNIT SUMMARY TEMPLATE

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PART I. EXECUTIVE SUMMARY

EU Location

The Fast Flux Test Facility (FFTF) is located in the 400 Area of the Hanford Site and is about 4-1/2 miles from the nearest point on the reservation boundary on the west bank of the Columbia River.

Related EUs

Not applicable

Primary Contaminants, Contaminated Media and Wastes

To the extent practical, inventories of readily dispersible hazardous substances, radiological material and hazardous chemicals and toxic materials, were removed from FFTF as part of the deactivation efforts. The remaining materials primarily consist of:

- Residual sodium remaining following the "bulk draining" of sodium systems. Residual sodium also includes the sodium in some components that are filled with sodium and were not drained.
- Cesium (Cs-137), a radioactive contaminant remaining in sodium, gas and refueling components.
- Radioactive components that were activated in the reactor during operation. The radioactive isotopes in these components, primarily Fe-55, Co-60, and Ni-63 are not readily dispersible.
- Clad, depleted uranium (U-234, -235 & -238) shielding above the reactor.

Although cesium exists throughout the plant, no other fission products or fissile fuel material are present in significant quantities.

Approximately 243,000 gallons of sodium were transferred from FFTF to the Sodium Storage Facility (SSF), Building 402, during the bulk sodium drains. The frozen sodium is stored in four storage tanks with an inert argon cover gas. Elemental sodium is a silver, soft, and ductile alkali metal at room temperature and has a density slightly less than that of water. Sodium reacts vigorously with water and steam and is extremely reactive, oxidizing rapidly when exposed to air. It melts at about 190 °C (208 °F) to form a silvery liquid. The normal boiling point of sodium is 1,600 °C (1,618 °F). The basic chemical reaction is an exothermic reaction with water that, for excess water, produces a caustic sodium hydroxide solution and the evolution of hydrogen gas.

This EU also contains four waste sites consisting of two underground fuel tanks, an active storage pad and a burial site associated with a demolished 4722-A Building Slab. No inventory data is available for any of these sites.[1]

Brief Narrative Description

Construction of FFTF was completed in 1978, and initial criticality was achieved on February 9, 1980, with full power initiated on December 21, 1980. It operated as a 400-MW sodium-cooled, low-pressure, high temperature, fast-neutron flux, nuclear fission reactor plant from 1982 to 1992. It was originally designed and constructed to develop and test advanced fuels and materials for the Liquid Fast-Breeder

[1] Hanford Site Waste Management Units Report, DOE/RL-88-30, Revision 24, U.S. Department of Energy, Richland Operations Office, February 2015

Reactor Program, though several additional irradiation-related missions were later added. In 1993, the DOE concluded that there was no longer a need for the FFTF and thus ordered that it be shut down. Following eight years of additional study of potential new missions, the final decision to shut down the facility was made in 2001. During this eight-year period, the plant was maintained in a condition to allow safe and efficient shutdown or restart.

The FFTF is a 3-loop reactor with the reactor vessel and primary Heat Transport System (HTS) loops within the containment building. Heat was transferred to three secondary heat transport loops in the intermediate heat exchangers. These secondary system loops extended outside the containment building where the heat was removed by air-cooled tubes in the dump heat exchangers (DHX).

Deactivation was completed in 2009, including removal of all nuclear fuel, bulk drain of all sodium and sodium-potassium alloy (NaK) systems, and removal of all polychlorinated biphenyl (PCB) cooled transformers. An inert gas (argon) blanket will be maintained over the primary and secondary Main Heat Transport System (MHTS) and most auxiliary sodium and cover gas systems. From a safety standpoint, nitrogen gas would have also been acceptable for a blanket gas over the systems and components with residual sodium, but argon was chosen to provide for potential reuse of systems for reactor operation. Without the inert gas blanket, the residual sodium in the piping and components would slowly react as air enters the systems.

The facility is categorized as a Hazard Category (HC) 3 Nuclear Facility. There are currently no operational processes or deactivation activities ongoing at the FFTF facility, and the plant will be maintained in an S&M configuration until DOE makes the decision to begin decontamination and demolition (D&D).

Approximately 243,000 gallons of sodium were transferred from FFTF to the Sodium Storage Facility (SSF), Building 402, during the bulk sodium drains. The frozen sodium is stored in four storage tanks with an inert argon cover gas. After a period of holding the sodium in this condition, the facility will be reactivated to either transfer the sodium to another location or transfer it for chemical reaction to another product. As such, it is considered to be an operational facility rather than one being sequenced for near term D&D.

SUMMARY TABLES OF RISKS AND POTENTIAL IMPACTS TO RECEPTORS

Table F.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 FFTF facility (RC-DD-4) area; a Co-located Person (CP) is an individual located 100 meters from the physical boundaries of thee; and the Public is an individual located at the closest point on the Hanford Site boundary not subject to DOE access control. The maximum calculated dose distance for the onsite public was evaluated at the Energy North West Columbia Generating Station at a distance of 4.2 km (2.6 miles). The maximum calculated dose distance for the offsite public ("Public" used in risk ratings) was evaluated at the Columbia River at a distance of 7.24 km (4.5 miles). 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, which takes engineered and administrative controls and protections into consideration, is shown in Table F.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*.

Ecological Resources[2]

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[2]

No risk ratings are provided for Cultural Resources. Table F.5-1 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.

[2] 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 F.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:** Surveillance & Maintenance	**From Cleanup Actions:** Final D&D
Human Health	Facility Worker	***S&M***: High-Low (Low)	High-Low (Low)
	Co-located Person	***S&M***: Low-Not Discernible (ND) (Low-ND)	Low-ND (Low-ND)
	Public	***S&M***: ND (ND)	ND
Environmental	Groundwater[(a)]	*ND*	*ND*
	Columbia River[(a)]	*ND*	*ND*
	Ecological Resources[(b)]	Low	Low to Medium
Social	Cultural Resources[(b)]	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: Unknown **Manhattan/Cold War** Direct: Known Indirect: None	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: Unknown **Manhattan/Cold War** Direct: Known Indirect: None

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

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

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

Current

The FFTF facility is categorized as a Hazard Category (HC) 3 Nuclear Facility. There are currently no operational processes or deactivation activities ongoing at the FFTF facility, and the plant is being maintained in an S&M configuration.

Seismic Event: A seismic event is postulated in which the polar crane in the Reactor Containment Building (RCB) falls on the reactor vessel and results in a ground-level release of material. The inventory of the reactor vessel and the Test Assembly Conditioning Station (TACS) are affected. This inventory consists of the activated stainless-steel components of the vessel that are integrally part of the metallic structure. The inventory of the TACS is included since it is located between the Interim Examination and Maintenance (IEM) Cell and the Reactor Vessel. It was the engineering judgment that the impact effect of a seismic event would only affect the inventory represented by the exposed metal surfaces. The depleted uranium shielding is in the form of a metal alloy encased in steel structure. Although engineering studies indicate that no significant releases are associated with impact to metals, it was assumed that damage to the exposed metal surfaces may result in an airborne release. The event is a short duration event, so an acute ground release without plume meander is used to model the potential consequences. There is no response or mitigating action associated with this scenario. A conservative frequency of "unlikely" is assumed. The resulting FW and CP dose is estimated to be 2.30 rems and the dose to the Public is 0.0036 rems.

Unmitigated Risk: Facility Worker – Low; CP – Low; Public – ND

The major receptors at risk are the S&M facility worker and co-located person in close proximity to the facility. Since the event is NRH and the material at risk is limited to the residual materials, no mitigation was identified for this scenario. However, it was recognized that the RCB structure and the IEM Cell were originally seismically qualified and serve a generic confinement function which provides protection for the immediate facility worker. Also, the ex-containment buildings provide weather protection that reduces water intrusion and potential submersion of sodium piping and components. As a result, the RCB, IEM Cell, and ex-confinement building structures are identified as defense-in-depth equipment important to safety.

Mitigation: Facility Worker – Low; CP – Low; Public – ND

Release of Inert Atmosphere to Personnel Space: An oxygen-deficient atmosphere is considered an industrial hazard which has potentially significant consequences of worker fatality. It is appropriate to maintain a strong industrial safety control based on the potential consequences because:

- A small argon leak would probably not be detected based on argon supply surveillances.
- The deactivation of permanent monitoring equipment in S&M mode requires use of personal oxygen monitors.
- Normally there is no forced H&V to mix and exhaust the argon, but it is standard practice to activate the electrical and ventilation systems prior to planned S&M activities.

Unmitigated Risk: Facility Worker – High; CP – ND; Public – ND

Argon is denser than the normal atmosphere and would tend to pocket in the bottom of cells. Therefore there is no reason for special controls for personnel at or above the 550-foot level (ground level), but it is prudent to impose special industrial hygiene and industrial safety controls for lower levels of the facility. It is recognized that the argon supply piping within the facility does serve a generic function which minimizes argon gas leaks and provides protection of the immediate facility worker. As a result, the argon supply piping structure is identified as defense-in-depth equipment important to safety.

Mitigation: Facility Worker – Low; CP – ND; Public – ND

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

The several radiological event scenarios identified with current S&M activities at the FFTF facility would still likely be present during the early D&D phases, but the most serious consequences would diminish as contaminated areas and equipment are removed and/or grouted in place.

Groundwater, Vadose Zone, and Columbia River

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

Ecological Resources

Current

EU has 26% of level 3 or greater resources and the buffer has 69% of level 3 or greater resources, of which 45% are level 4 resources that are continuous with similar habitat beyond the buffer. Burrowing owls nest in the buffer and along the edge of the EU. Low impact based on low levels of pedestrian and vehicle traffic only in areas removed from the burrowing owl habitat.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

Impact level depends on the remediation activities and the ability to keep activities away from burrowing owl habitat. Revegetation of area after remediation needs to consider the potential for competition with other level 4 resources and minimize the introduction of exotic species along high value resource areas. 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.

Cultural Resources

Current

Two known TCPs lie within view from the EU. Area is heavily disturbed and even though the entire area has not been inventoried for archaeological resources, it has potential to contain intact archaeological resources on the surface or subsurface. Indirect effects (although unlikely) are unknown because it is uncertain if historic archaeological resources exist in the vicinity of the FFTF area.

Manhattan Project/Cold War Era significant resources have been mitigated. No Manhattan Project/Cold War Era buildings within 500 meters of the EU.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

Archaeological investigations and monitoring may need to occur prior to remediation. Although the area is heavily disturbed, based on geomorphological indicators, there is 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.

Manhattan Project/Cold War Era significant resources have been mitigated. No Manhattan Project/Cold War Era facilities within 500 meters of the EU.

Considerations for Timing of the Cleanup Actions

The large quantity of sodium currently stored in the Sodium Storage Facility will need to be removed and treated before D&D can begin on the other primary FFTF facilities.

Near-Term, Post-Cleanup Risks and Potential Impacts

The modified RCRA Subtitle C barrier that is proposed for covering the demolished RCB and other buildings would be designed to provide long-term containment and hydrologic protection for a performance period of 500 years, assuming no maintenance is performed after a 100-year institutional control period.

PART II. ADMINISTRATIVE INFORMATION

OU and/or TSDF Designation(s)

None Applicable

Common name(s) for EU

Fast Flux Test Facility or Reactor

Key Words

Fast Flux, Test Reactor

Regulatory Status:

Regulatory basis

Record of Decision: Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (78 FR 75913)[3]

Applicable regulatory documentation

Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington *(TC & WM EIS),* (EIS-0391-FEIS, 2012). DOE identified three decommissioning alternatives and chose to implement FFTF Alternative 2 Entombment.

Applicable Consent Decree or TPA milestones

M-092-09: Establish milestones and/or target dates if needed for acquisition of new facilities, modifications of existing facilities, and /or modification of planned facilities necessary for storage, treatment/processing, and disposal of Hanford site sodium. Due date September 30, 2018

Risk Review Evaluation Information

Completed

August 19, 2016, updated September 30, 2016, updated February 20, 2017

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[3] US Department of Energy*, Record of Decision, Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington*, Federal Register, Vol. 78, No. 240, p75913, December 13, 2013.

Evaluated by

Henry Mayer and K.G. Brown

Ratings/Impacts Reviewed by

David Kosson

PART III. SUMMARY DESCRIPTION

CURRENT LAND USE

Industrial

DESIGNATED FUTURE LAND USE

Industrial[4]

PRIMARY EU SOURCE COMPONENTS

Legacy Source Sites

Not applicable

High-Level Waste Tanks and Ancillary Equipment

Not applicable

Groundwater Plumes

Not applicable

Operating Facilities

Not Applicable

D&D of Inactive Facilities

The FFTF operated as a 400 MW sodium-cooled, low-pressure, high temperature, fast-neutron flux, nuclear fission reactor plant from 1982 to 1992. It was originally designed and constructed to develop and test advanced fuels and materials for the Liquid Fast-Breeder Reactor Program, though several additional irradiation-related missions were later added. In 1993, the DOE concluded that there was no longer a need for the FFTF but it was not until 2001 that a final decision to shut down the facility was made.

Deactivation was completed in 2009, including removal of all nuclear fuel, bulk drain of all sodium and sodium-potassium alloy (NaK) systems, and removal of all polychlorinated biphenyl (PCB) cooled transformers. An inert gas (argon) blanket will be maintained over the primary and secondary Main Heat Transport System (MHTS) and most auxiliary sodium and cover gas systems. From a safety standpoint, nitrogen gas would also be acceptable for a blanket gas over the systems and components

[4] *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (DOE/EIS-0222-F, September 1999) and *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)* (EIS-0391-FEIS, 2012).

with residual sodium, but Argon was chosen to provide for potential reuse of systems for reactor operation. Without the inert gas blanket, the residual sodium in the piping and components would slowly react as air enters the systems.

Approximately 243,000 gallons of sodium were transferred from FFTF to the Sodium Storage Facility (SSF), Building 402, during the bulk sodium drains. The frozen sodium is stored in four storage tanks with an inert argon cover gas. After a period of holding the sodium in this condition, the facility will be reactivated to either transfer the sodium to another location or transfer it for chemical reaction to another product.

LOCATION AND LAYOUT MAPS

The FFTF facility is located in the 400 Area of the Hanford Site and is about 4-1/2 miles from the nearest point on the reservation boundary on the west bank of the Columbia River.

Figure F.5-1. Fast Flux Test facility EU Location at Hanford

Figure F.5-2. Recent Aerial Photo of FFTF Complex.

PART IV. UNIT DESCRIPTION AND HISTORY

EU FORMER/CURRENT USE(S)

The FFTF operated as a 400 MW sodium-cooled, low-pressure, high temperature, fast-neutron flux, nuclear fission reactor plant from 1982 to 1992. It was originally designed and constructed to develop and test advanced fuels and materials for the Liquid Fast-Breeder Reactor Program, though several additional irradiation-related missions were later added. In 1993, the DOE concluded that there was no longer a need for the FFTF but it was not until 2001 that a final decision to shut down the facility was made.

The FFTF is a 3-loop reactor with the reactor vessel and primary Heat Transport System (HTS) loops within the containment building. Heat was transferred to three secondary heat transport loops in the intermediate heat exchangers. These secondary system loops extended outside the containment building where the heat was removed by air-cooled tubes in the dump heat exchangers (DHX).

Deactivation was completed in 2009, including removal of all nuclear fuel, bulk drain of all sodium and sodium-potassium alloy (NaK) systems, and removal of all polychlorinated biphenyl (PCB) cooled transformers. An inert gas (argon) blanket will be maintained over the primary and secondary Main Heat Transport System (MHTS) and most auxiliary sodium and cover gas systems. From a safety standpoint, nitrogen gas would also be acceptable for a blanket gas over the systems and components with residual sodium, but Argon was chosen to provide for potential reuse of systems for reactor operation. Without the inert gas blanket, the residual sodium in the piping and components would slowly react as air enters the systems.

Approximately 243,000 gallons of sodium were transferred from FFTF to the Sodium Storage Facility (SSF), Building 402, during the bulk sodium drains. The frozen sodium is stored in four storage tanks with an inert argon cover gas. After a period of holding the sodium in this condition, the facility will be reactivated to either transfer the sodium to another location or transfer it for chemical reaction to another product. As such, it is currently considered to be an operational facility rather than one being sequenced for near term D&D.

LEGACY SOURCE SITES

Not applicable

GROUNDWATER PLUMES

Not applicable

D&D OF INACTIVE FACILITIES

The D&D plan for the FFTF complex would be to decontaminate as necessary, dismantled, and remove all above-grade structures. The RCB structures below grade level, as well as the FFTF reactor vessel and radioactive and contaminated equipment, components, piping, and other materials that have become radioactive or otherwise contaminated, would remain in place. Sodium residuals would be either removed from the RCB and treated in existing 400 Area facilities or treated in place. In addition, the RCB below grade level would be filled with grout or other suitable fill material to immobilize remaining hazardous chemicals and radioactive materials to the maximum extent practicable and to prevent subsidence. A modified RCRA Subtitle C barrier would be constructed over the filled area. The barrier, together with the lower RCB and adjacent structures and the immobilized internal structures, would be within the entombed area.

<u>Reactor Containment Building</u>

The Reactor Containment Building (RCB), Building 405, is a vessel 186 feet, 8 inches high by 135 feet, 0 inch diameter with three airlocks and numerous penetrations for electrical and fluid systems. The containment vessel is a cylindrical welded carbon steel vessel with hemi-ellipsoidal top and bottom heads. The vertical walls are 1-3/8 inch thick; the upper dome is 1 inch thick. Reinforced-concrete cells occupy the lower portion of the containment vessel from grade level to approximately 24 meters (78 feet) below grade. Some areas near the sodium piping and vessels are steel-lined. Below-grade structures containing the greatest radionuclide inventories include the reactor vessel, the Interim Examination and Maintenance Cell, the Test Assembly and Conditioning Station, and the Interim Decay Storage Vessel.

The containment vessel is tornado hardened except for the airlocks and penetrations above grade level. In addition, the containment vessel, the internal structures and the vessel's foundation were designed as Seismic Category I structures and, as such, will withstand the DBE. It is an engineering judgment that within a reasonable time following beginning of S&M (e.g., <40 years), there would be negligible degradation of the containment building and it would still be able to withstand tornadoes and earthquakes and would also not be vulnerable to water intrusion.

The RCB contains the following major equipment/systems:[5]

- The reactor cavity, located in the center of the Containment Vessel, houses the reactor vessel, the guard vessel, the main reactor support structure and associated shielding, and reactor piping. The reactor vessel was defueled and drained of sodium, though some residual sodium remains in the vessel. Following defueling, the reactor vessel was used to store non-fuel components such as control rods and reflectors, which will remain in the vessel during S&M.
- Cells containing the three primary Main Heat Transport System (MHTS) loop piping and components are located to the east, south and west. These cells are lined with steel to prevent sodium concrete reactions if sodium leaks occurred during operation. The IEM Cell is located north and east of the Reactor Vessel. It was an inerted, shielded hot cell, a Seismic I qualified boundary, 55-feet deep, used for handling, washing and disassembling core components during the operational phase and also loading fuel and irradiated steel into containers for shipment during deactivation. During operation, the IEM Cell was maintained inerted with argon. In S&M it will remain closed at the bottom, but will have an air atmosphere and breathe through a filtered vent at the top. The lead glass windows remain as a boundary, but the oil has been drained such that they no longer provide good visibility of the cell interior.
- The IDS Vessel, located north and west of the Reactor Vessel, was designed to contain up to 112 core components 12-feet long and ten 40-feet test assemblies in a sodium pool. The 12-foot components were stored in Core Component Pots (CCP). All core components and CCPs have been removed from the IDS Vessel and it has been drained of sodium, although residual sodium remains.
- The Test Assembly Conditioning Station (TACS) is located between the IEM Cell and the Reactor Vessel. It was designed to store up to 27 40-foot or 28-foot long test assemblies. During S&M it will contain 23 non-fuel components, most of which are irradiated and/or contain sodium residue. In S&M, TACS will be isolated, and there will be no inert gas supply.
- The primary and Interim Decay Storage (Vessel)(IDS) cold traps, located in the northwest corner of the RCB, were intentionally left full of sodium and frozen. This is considered a safer storage condition than partially drained.
- Sodium and gas piping and miscellaneous components with residual sodium and radioactive contamination (primarily cesium [Cs]-137) are spread throughout the RCB. Most of the stainless steel piping and components are all welded. All are contained within cells. During S&M, an inert argon gas blanket will be maintained on these systems to minimize reaction of the sodium.

<u>Heat Transport System South</u>

The HTS Service Building – South (HTS-S or Building 491-S) contained equipment for primary sodium sampling, closed loop sampling (never utilized), primary cover gas monitoring and sampling and building inert gas cooling. The building is one-story with a basement. With the exception of a very small amount of residual sodium in the sodium sampling hot cell, all piping with residual sodium is well protected and below the 550-foot level. The main sodium system piping was drained and isolated. It is not connected to the low-pressure argon gas system.

The major single component is the Cesium trap, located in a closed cell below the 550-foot level, containing approximately 60 gallons of frozen sodium (full) and approximately 48 curies of cesium. The

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[5] CH3MHill Plateau Remediation Company, *Documented Safety Analysis for the Fast Flux Test Facility*, FFTF-36419, Revision 2, August 22, 2012

cesium trap was designed, fabricated and tested in accordance with ASME *Boiler and Pressure Vessel Code*, Section III and designed as Seismic Category I structure.

Reactor Service Building

The Reactor Service Building (RSB), Building 4717, is a structurally independent building to the north of the RCB. The 550-foot level is a large bay with a 100-ton bridge crane, rail access and rollup doors. It connects to the RCB with the Equipment Air Lock with an opening 11-foot wide by 16-feet, 10½ inches high that will permit vehicle entrance into the RCB. There may be some contaminated fuel handling components stored on the 550-foot level, but there are no systems on the 550-foot level that contain radioactive or hazardous materials other than a small amount of internally contaminated piping formerly used for radioactive waste loadout and a pipe containing residual sodium that was used for FSF sodium offload. There are two major levels below that contain systems that were used for reactor cover gas processing, sodium removal of IEM Cell components and radioactive liquid waste collection and offload. The radiation and contamination from these systems is primarily due to cesium and the source is relatively low (radiation dose rate in the mrem/hr range).

Fuel Storage Facility

The Fuel Storage Facility (FSF), Building 403, is connected to the RSB. The FSF is in a building of standard industrial above-grade construction and reinforced concrete below-grade construction. The FSF fuel storage vessel was capable of storing up to 466 fuel assemblies and fuel pin containers in sodium.

The FSF had piping systems for purification and sampling of the sodium. The FSF vessel and auxiliary systems have been drained, with the exception of the cold trap, which is full and frozen. As with the plant sodium and cover gas systems, these systems at FSF will be maintained with an argon gas blanket.

The 550-foot (ground) level of the FSF contains two large metal boxes for storage of 109 CCPs, each CCP containing up to 3.7 gallons of radiologically contaminated frozen sodium. One box contained 54 CCPs, the other 55 CCPs. Based on the approximate amount of sodium in each CCP, the total sodium inventory is approximately 400 gallons – about 200 gallons in each box.

Sodium Storage Facility

Approximately 243,000 gallons of sodium were transferred from FFTF to the Sodium Storage Facility (SSF), Building 402, during the bulk sodium drains. The frozen sodium is stored in four storage tanks (three 80,000 gallon tanks and one 52,000 gallon tank) with an inert argon cover gas. The SSF structure is a single rectangular shape, 90 feet by 93 feet, and approximately 41 feet high. The walls are monolithic, 18-inch thick cast-in-place concrete that function as shear walls and load bearing walls. They transfer all horizontal loads induced by wind or seismic forces to the foundation system. The structural elements of the roof are pre-cast concrete, twin tee members that span approximately 45 feet.

Source: ANL-W and Fluor Hanford 2002.

Figure F.5-3. Sodium Storage Facility.

ECOLOGICAL RESOURCES SETTING

Landscape Evaluation and Resource Classification

The majority (111 acres, 74.4%) of the area within the FFTF EU is classified as level 0 biological resources (Appendix J, Table J.69 and Figure J.82).

The remaining 38 acres (25.6%) are classified as level 3 resources (Appendix J, Table J.69 and Figure J.82). Included in the level 3 classification is the single area of natural habitat located in the southwest corner of the EU; however, the classification as level 3 comes not from vegetation type or condition, but from the nearby presence of burrowing owl (*Athene cunicularia*) burrows. Between 2006 and 2012 several burrowing owls nests were documented in road culverts located just outside the EU boundary at the southwest corner and the east side of the site (DOE/RL-96-32 2013). The burrowing owl is listed as a State Candidate species of concern by the Washington Department of Fish and Wildlife (WDFW 2014). Under the Hanford Site Biological Resources Management Plan burrowing owl nests are classified as level 3 resources and these established nest sites are given 250-m buffers surrounding them.

The amount and proximity of biological resources surrounding the FFTF EU were examined within the adjacent landscape buffer area, which extends 3,634 feet (1,108 m) from the geometric center of the EU (Appendix J, Figure J.82). The EU is bordered by substantial areas of natural shrub-steppe habitat. Lesser quality habitat (level 2) is located in the south and east portions of the landscape buffer; level 2 resources make up about 23.8% of the combined total area (EU plus adjacent landscape buffer). Higher quality habitats (levels 3 and 4), are located immediately around the EU as well as to the west and north; level 3 and level 4 resources make up approximately 24.2% and 37.8% of the combined total area, respectively (Appendix J, Table J.69 and Figure J.82). The proportion of level 3 or above resources lost from remediation actions in the EU would be approximately 4% at the landscape level (Appendix J, Table J. 69).

Field Survey

Most of the EU is an industrial-type area consisting of roads, parking lots, graveled areas, and buildings. The majority of the EU does not support vegetation except for sparse weeds and remnant ornamental shrubs adjacent to buildings or previous building sites (Appendix J, Figure J.82). There is a small patch of habitat located in the southwest corner which is characterized by sparse gray rabbitbrush (*Ericameria nauseosa*) in the overstory with a cheatgrass (*Bromus tectorum*) understory (Appendix J).

Several birds were observed perching or foraging near buildings, though no wildlife species of concern were observed during the survey. The Field Data Records section for this EU description in Appendix J had the full lists of plant and animal species recorded during the survey.

Cultural Resources Setting

Most of the RC-DD-4, FFTF EU has been inventoried for archaeological resources under 4 cultural resource surveys, all with negative findings within the EU. It is unknown if an NHPA Section 106 review has been completed specifically for the remediation of the RC-DD-4, FFTF EU. Most of the EU is heavily disturbed from ground disturbance associated with the installation of FFTF and associated infrastructure, suggesting a low potential for intact surface and subsurface archaeological resources.

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, is located within the RC-DD-4, FFTF EU. In addition, there are 33 National Register-eligible Manhattan Project and Cold War Era buildings located within the EU (all 33 are contributing within the Manhattan Project and Cold War Era Historic District, 6 recommended for individual documentation and 27 with no additional documentation required). Appendix K, Table 38, has more information about the 33 buildings that are National Register-eligible Manhattan Project and Cold War Era buildings located within the RC-DD-4, FFTF EU.

Mitigation and documentation for all of these contributing properties has been completed in accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan (*DOE/RL-97-56) (DOE-RL 1998).

There are no known or recorded archaeological sites/isolates, buildings and/or Traditional Cultural Properties within 500 meters of the EU.

Historic maps and aerial imagery indicate a low potential for archaeological resources associated with the Pre-Hanford Early Settlers/Farming Landscape. A review of recent aerial imagery of the EU suggests that most of the EU has been heavily disturbed. Geomorphology indicates a moderate potential for the presence of Native American Precontact and Ethnographic cultural resources to be present within the EU boundary. The EU is heavily disturbed from the installation of FFTF buildings and infrastructure; however areas of undisturbed sediments do appear to exist within the EU. Resources, if present, would likely be limited to areas of intact or undisturbed soils.

Because of the potential for intact archaeological deposits within portions of the RC-DD-4, FFTF EU, it may be appropriate to conduct surface and subsurface archaeological investigations in this area prior to initiating any remediation activities. 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 who may have an interest in the areas (e.g. East Benton Historical Society, Prosser Cemetery Association, Franklin County Historical Society, the Reach, and the B-Reactor Museum Association) may need to occur. Consultation with Hanford Tribes may also 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

Legacy Source Sites

Not applicable

Vadose Zone Contamination

The reported inventories for RC-DD-4 (Table F.5-3 through Table F.5-5) are contained in a process building; the inventories are considered isolated from the environment for the period of evaluation. Thus there is no reported vadose zone inventory to be evaluated.

Groundwater Plumes and Columbia River

Not applicable

Facilities for D&D

To the extent practical, inventories of readily dispersible hazardous substances, radiological material and hazardous chemicals and toxic materials, were removed from FFTF as part of the deactivation efforts. The remaining materials primarily consist of:

Residual sodium remaining following the "bulk draining" of sodium systems: Residual sodium also includes the sodium in some components that are filled with sodium and were not drained. It is estimated that only about 4,000 gallons of residual sodium remains in the drained systems and that it contains approximately 0.00143 curies of Cs-137, 2.29 curies of Tritium, and 7.44 curies of Sodium-22.[6]

Radionuclide inventory from activation[6]: The reactor hardware and core components have a total of more than 2.1 million curies of activation products (decayed to 2003). Table F.5-2 summarizes the location and primary radionuclides present.

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[6] *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS),* (EIS-0391-FEIS, 2012), Appendix D.

Table F.5-2. Reactor Component Radionuclide Inventories from Activation (curies)

Location	Fe-55	Co-60	Ni-63	Nb-94	Total
Reactor hardware	362,000	219,000	17,200	12	610,200
Core components	789,000	477,000	183,000	33.7	1,482,700
Nonfueled hardware	n/a	2,900	1,110	0.02	4,010
IEM Cell items	n/a	2,840	1,080	0.02	3,920
Total	1,151,000	701,740	202,390	45.74	2,100,830

These and other inventories reported in EIS-0391-FEIS, 2012), Appendix D, Table D-76, *Activated Reactor Hardware, Core Components, Nonfueled Hardware, and Interim Examination and Maintenance Cell Items Inventory, Decayed to September 2003 (curies)* for the FFTF facilities are reported in Table F.5-3, Table F.5-4, and Table F.5-5 under WIDS Code 405.

With respect to hazard categorization, Co-60 is clearly the dominant isotope. As of 2016, more than two additional half-lives (5.27 yrs) have passed, so the current curie content and fractions would be about one-fourth of the values stated above.

Sodium Storage Facility: Approximately 243,000 gallons of sodium were transferred from FFTF to the Sodium Storage Facility (SSF), Building 402, during the bulk sodium drains. The frozen sodium is stored in four storage tanks (three 80,000 gallon tanks and one 52,000 gallon tank) with an inert argon cover gas.

Table F.5-3. Inventory of Primary Contaminants [(a)]

WIDS	Description	Decay Date	Ref[(b)]	Am-241 (Ci)	C-14 (Ci)	Cl-36 (Ci)	Co-60 (Ci)	Cs-137 (Ci)	Eu-152 (Ci)	Eu-154 (Ci)	H-3 (Ci)	I-129 (Ci)
All	Sum			NR	52.3	NR	701,740	90	NR	NR	NR	NR
405	Process Building	2003	EIS-D	NR	52.3	NR	701,740	90	NR	NR	NR	NR

a. NR = Not reported
b. EIS-D = DOE/EIS-0391 2012, Appendix D

Table F.5-4. Inventory of Primary Contaminants (cont)[(a)]

WIDS	Description	Decay Date	Ref[(b)]	Ni-59 (Ci)	Ni-63 (Ci)	Pu (total) (Ci)	Sr-90 (Ci)	Tc-99 (Ci)	Nb-94 (Ci)	U (total) (Ci)
All	Sum			1,590	202,390	NR	NR	26.9	45.7	16.3
405	Process Building	2003	DSA/EIS-S	1,590	202,390	NR	NR	26.9	45.7	16.3

a. NR = Not reported
b. EIS-D = DOE/EIS-0391 2012, Appendix D

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

WIDS	Description	Ref[(b)])	CCl4 (kg)	CN (kg)	Cr (kg)	Cr-VI (kg)	Hg (kg)	NO3 (kg)	Pb (kg)	TBP (kg)	TCE (kg)	U (total) (kg)
All	Sum		NR	NR	NR	NR	NR	NR	47,900	NR	NR	37,694
405	Process Building	EIS-S	NR	NR	NR	NR	NR	NR	47,900	NR	NR	37,694

a. NR = Not reported

b. EIS-D = DOE/EIS-0391 2012, Appendix D

Table F.5-6. Summary of the Evaluation of 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	0.18	0	1.84	---	---	---	---	---	*ND*
I-129	A	1 pCi/L	0.18	0.2	1.84	---	---	---	---	---	*ND*
Sr-90	B	8 pCi/L	0.18	22	1.84	---	---	---	---	---	*ND*
Tc-99	A	900 pCi/L	0.18	0	1.84	---	---	---	---	---	*ND*
CCl4	A	5 µg/L	0.18	0	1.84	---	---	---	---	---	*ND*
Cr	B	100 µg/L	0.18	0	1.84	---	---	---	---	---	*ND*
Cr-VI	A	10 µg/L[(b)]	0.18	0	1.84	---	---	---	---	---	*ND*
TCE	B	5 µg/L	0.18	2	1.84	---	---	---	---	---	*ND*
U(tot)	B	30 µg/L	0.18	0.8	1.84	---	---	---	---	---	*ND*

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

b. Criteria for chronic exposure in fresh water, WAC 173-201A-240. “Water Quality Standards for Surface Waters of the State of Washington,” “Toxic Substances,” Table 240(3).

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

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

PART VI. POTENTIAL RISK/IMPACT PATHWAYS AND EVENTS

CURRENT CONCEPTUAL MODEL

Pathways and Barriers

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

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

The most serious potential risk to the Facility Worker is an oxygen-deficient atmosphere caused by a small argon leak. A design basis seismic event would have low radiological dose consequences to the facility Worker and Co-located person.

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

No safety class or safety significant SSCs are required for S&M activities at the FFTF.

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

The building structures and sodium piping and components do provide some ability to contain the inventory of radiological materials within the building and systems and a shielding barrier that promotes the safety of the collocated worker. As a result, the structures and sodium piping and components are identified as defense-in-depth equipment important to safety. Application of the site configuration management, maintenance management, and unreviewed safety question (USQ) programs ensure that the building structures (RCB, IEM Cell, and ex-containment buildings) and sodium and argon piping and components are adequately maintained during the S&M phase to minimize degradation of these SSCs. A Programmatic Administrative Control has been chosen to protect the worker from the inert atmosphere exposure risk. [7]

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 hazards at FFTF are inherently very well protected. The radioactive Fe, Co and Ni in the irradiated steel are well protected and not vulnerable to release mechanisms. The Cs and sodium are spread out and also encased in high quality stainless steel. Should a local release of a hazard occur within the RCB, the RCB provides a significant barrier against release to the environment.[1]

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

A design basis seismic event could cause partial damage or failure to the reactor vessel.

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

The primary pathway is the air and the Facility Worker or Co-located person breathing the contaminates which are released.

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[7] CH3MHill Plateau Remediation Company, *Documented Safety Analysis for the Fast Flux Test Facility*, FFTF-36419, Revision 2, August 22, 2012

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

Immediate

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

None

POPULATIONS AND RESOURCES CURRENTLY AT RISK OR POTENTIALLY IMPACTED

Facility Worker

Only during routine S&M work inside the FFTF building

Co-Located Person (CP)

Only when within the fenced area during routine S&M activities

Public

No risk or impact

Groundwater and Columbia River

Reported information for the RC-DD-4 waste sites are associated with a process building where contaminants are considered isolated from the environment for the period of this evaluation; thus there are no threats to groundwater or the Columbia River. The ratings for all Group A and B primary contaminants are *Not Discernible* (*ND*) (Table F.5-6).

Ecological Resources

Summary of Ecological Review:

- The majority of the EU (~74%) is classified as resource level 0.
- Remediation actions would result in only an approximate 4% loss of level 3 resources at the landscape scale; this loss is further assuaged by the fact that these level 3 resources are based on buffer designations, not current vegetation conditions.
- Due to the potential of disturbing nesting burrowing owls, remediation actions planned for the south and east portions of the EU will need further assessment prior to undertaking the work.

Cultural Resources

The RC-DD-4, FFTF EU is located in the 400 Area of the Hanford Site. Most of the EU has been inventoried for cultural resources under various survey efforts including, HCRL# 180 (Rice et al. 1978), HCRC# 90-400-001 (Gard 1990), HCRC# 90-600-028 (O'Neil and Crist 1993) and HCRC# 2011-400-003 (Mendez 2011). It is unknown if an NHPA Section 106 review has been completed specifically for the remediation of the RC-DD-4, FFTF EU. Most of the EU is heavily disturbed from ground disturbance associated with the installation of FFTF and associated infrastructure, suggesting a low potential for intact surface and subsurface archaeological resources.

Archaeological sites, buildings and Traditional Cultural Properties (TCPs) located within the EU[8]

- 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, is located within the FFTF 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 33 National Register-eligible Manhattan Project and Cold War Era buildings located within the RC-DD-4, FFTF EU (all 33 are contributing within the Manhattan Project and Cold War Era Historic District, 6 recommended for individual documentation and 27 with no additional documentation required). Mitigation for contributing buildings/structures has been completed in accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE/RL-97-56) (DOE-RL 1998) and buildings demolition is ongoing. Appendix J, Table 37 has more information about the 33 buildings that are National Register-eligible Manhattan Project and Cold War Era buildings located within the RC-DD-4, FFTF EU.

- No archaeological sites/isolates and/or Traditional Cultural Properties (TCPs) are currently known to exist within the EU.

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

- No archaeological sites/isolates and/or Traditional Cultural Properties (TCPs) are currently known to exist within 500 meters of the RC-DD-4, FFTF EU.

Closest Recorded TCP

There are 2 recorded TCPs associated with the Native American Precontact and Ethnographic Landscape that are visible from the RC-DD-4, FFTF EU.

Cleanup Approaches and End-State Conceptual Model

Selected or Potential Cleanup Approaches

As stated in the *Final TC&WM EIS*[9]*,* for FFTF Decommissioning, DOE's preference is for Alternative 2 Entombment, which would decontaminate and remove all above-grade structures. The RCB structures below grade level, as well as the FFTF reactor vessel and radioactive and contaminated equipment, components, piping, and other materials that have become radioactive or otherwise contaminated, would remain in place. Sodium residuals would be either removed from the RCB and treated in existing 400 Area facilities or treated in place. In addition, the RCB below grade level would be filled with grout or other suitable fill material to immobilize remaining hazardous chemicals and radioactive materials to the maximum extent practicable and to prevent subsidence. The RCB fill material may include other demolition debris containing hazardous or radioactive materials, as allowed by regulations. A modified RCRA Subtitle C barrier would be constructed over the filled area to provide long-term containment and hydrologic protection for a performance period of 500 years, assuming no maintenance is performed

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[8] 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 (a) rooted in the history of a community, and (b) are important to maintaining the continuity of that community's traditional beliefs and practices" (Parker & King 1998).

[9] *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)* (EIS-0391-FEIS, 2012).

after a 100-year institutional control period. The barrier also would extend over part or all of the immediately adjacent facility footprints. The barrier would be circular with a radius of about 39.2 meters (128.5 feet), not including the side slope used for drainage.

A preliminary, conceptual view of the Entombment Alternative is presented in Figure F.5-4. The area previously occupied by the facilities would then be backfilled with soil to eliminate void spaces and then compacted, contoured, and revegetated.

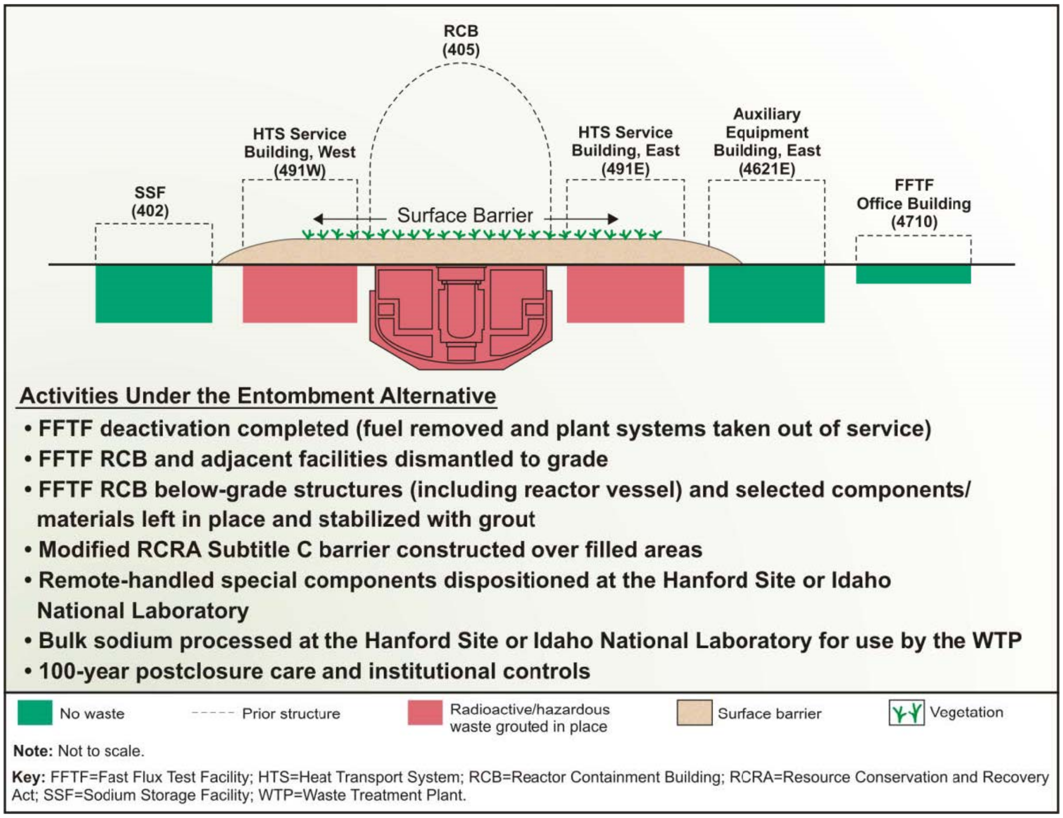

Figure F.5-4. FFTF Decommissioning Alternative 2: Entombment.

The main FFTF RCB and two adjacent support facilities (Buildings 491E and 491W) would have all above grade structures dismantled and the demolition waste would be disposed of in an IDF or consolidated in the below-grade spaces. All other ancillary buildings, including their internal equipment and components, would be demolished and the contaminated demolition debris would also be disposed of in an IDF or consolidated within available below-grade spaces within the RCB or Buildings 491E and 491W.

<u>Remote Handled Special Components Processing</u>

FFTF Remote Handled Special Components (RH-SCs) include the primary cold trap (N-5), the cesium trap (N-3), two sodium condenser vapor traps (U-527 and U-532), and the associated filter vapor traps (VT-61, VT-62, VT-63, and VT-64). Each of these components has a high-radiation-dose level due to the presence of high-energy, gamma-emitting fission products (primarily cesium-137). The primary cold trap and the cesium trap both contain sodium residuals (Fluor Hanford 2005c). Each of these components would require remote operations to disconnect and isolate the traps from process system piping, to cap or blind off inlets and outlets, and to remove them from the facility. Isolation and removal of these components is a major activity that must be completed before other D&D activities can occur.

The current plan is to leave the sodium residuals frozen in the traps until after removal and to transport the traps to an interim storage facility. Due to the inventory uncertainty, it was assumed for analysis purposes that the two vapor traps (U-527 and U-532) would also include their respective filter vapor traps. Two alternatives were analyzed for treatment of these RH-SCs. The first alternative is treatment at the Idaho Nuclear Technology and Engineering Center (INTEC) at INL. Following treatment at INTEC, the FFTF components and residuals would be disposed of with other INL waste at the Nevada National Security Site (NNSS) or returned to Hanford for disposal at ERDF. The second alternative is to treat these components at a new facility constructed at Hanford possibly at the T Plant. This new facility would be designed and constructed to be the same as the INL facility, and disposal of the treated components and residuals would be at ERDF.

There is currently no NRC-licensed transportation cask with the capacity to handle these traps for shipment to INL, so the EIS assumed that a transportation cask or other shielded container would exist at the time of removal to transport the RH-SCs to an interim storage facility either at Hanford or at INL.

Hanford Bulk Sodium Processing

There are approximately 1.1 million liters (300,000 gallons) of sodium that will need to be disposed of at the Hanford site. This inventory consists of the FFTF sodium contained in the Sodium Storage facility and the following:

- **Hallam sodium.** The Hallam Reactor, located in Hallam, Nebraska, shut down in 1964, and its approximately 128,700 liters (34,000 gallons) of sodium were received at Hanford in 1967. This sodium is stored in solid form under an inert cover gas in five storage tanks at the 2727-W Hallam Sodium Storage Building in the 200-West Area at Hanford.
- **SRE sodium.** The SRE sodium, approximately 26,500 liters (7,000 gallons), was received at Hanford in 1975 from the SRE, located at the Santa Susanna Field Laboratory, California. This sodium is stored in solid form in 158 208-liter (55-gallon) drums sealed within 322-liter (85-gallon) overpacks. The SRE sodium is stored in eight South Alkali Metal Storage Modules in the 200-West Area CWC at Hanford.

Two options for disposal of Hanford's sodium inventory are being considered: the Hanford Reuse Option (HRO) and the Idaho Reuse Option (IRO). Both would produce a 50 weight-percent caustic sodium hydroxide solution that would be used by DOE for the Hanford WTP. The capability to process the bulk sodium does not currently exist at Hanford, thus a new treatment facility would need to be constructed in close proximity to the SSF. The capability to process bulk metallic sodium currently exists at the INL Materials and Fuels Complex (MFC) in the existing Sodium Processing Facility (SPF), with modifications, which previously has been used to process metallic sodium from the Experimental Breeder Reactor II (EBR-II) and other facilities. Following processing, the caustic sodium hydroxide solution would be returned to Hanford for use in the WTP or for supporting Hanford tank corrosion controls.

Contaminant Inventory Remaining at the Conclusion of Planned Active Cleanup Period

The TC&WM EIS[10] contains an estimate of the inventory that would remain at the FFTF site after completion of decommissioning Alternative 2:

Carbon-14: 52.4 curies

[10] *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS),* (EIS-0391-FEIS, 2012), Appendix D.

Tritium: 1.73×10^{-5} curies

Technetium-99: 27.2 curies

Total Uranium: 37,700 Kg

Risks and Potential Impacts Associated with Cleanup

Cleanup of FFTF and related components will involve multiple steps and separate processes. No Hazard Assessment or Safety Analysis have been prepared except as it relates to S&M of the FFTF building.

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

Facility Worker

Specific risks to the facility Worker, if any cannot be determined at this time

Co-located Person

Specific risks to the Co-located Person, if any cannot be determined at this time

Public

Specific risks to the Public, if any cannot be determined at this time

Groundwater and Columbia River

Not applicable

Ecological Resources

Remove, Treat and Dispose of waste involves personnel through the target (remediation) area, car and pickup truck traffic through the non-target and target (remediation) area, truck, heavy equipment (including drill rigs) traffic on roads through the non-target and target area, caps (and other containment), soil removal and contamination in the soil, vegetation control, and irrigation (for revegetation) will cause the following disturbance from remediation activities: Carry seeds or propagules (pieces of vegetation or other biological parts that can grow and/or reproduce) on tires of vehicles or blowing from heavy equipment; injure or kill vegetation or small invertebrates or small animals; vehicle traffic can make paths, compact soil, scare or displace animals, can impact animal behavior or reproductive success; affect animal dispersion and habitat use (e.g., some birds avoid nesting near roads because of song masking); displacement of animals from near roads due to increased noise or other disturbances; and heavy equipment may permanently destroy areas of the site with intense activity. Soil removal can cause more severe effects because of blowing soil (and seeds). During remediation, radionuclides or other contaminants could be released or spilled on the surface, and depending upon the type and quantity, could have adverse effects on the plants and animals on-site. Use of non-specific herbicides for vegetation control results in some mortality of native vegetation (especially native forbes), and allows exotic species to move in; it may change species composition of native communities, but it also could make it easier for native species to move in; improved methods could yield positive results. Irrigation requires a system of pumps and water, resulting in physical disturbance; repeated irrigation from the same locations could result in some soil compaction, which can decrease plant growth in those areas, decrease abundance and diversity of soil invertebrates, and prevent fossorial snakes or mammals from using the area.

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

Cultural Resources

Potential direct effects are possible from personnel, car, pick-up, truck and heavy equipment traffic/use through both target (remediation) and non-target areas during active cleanup. These activities may inadvertently expose resources close to the surface. Additionally, traffic through these areas may lead to the introduction of invasive species and/or a decrease in the presence of native plants used for medicinal or tribal religious purposes. Heavy equipment use for remedial activities (such as the remediation of equipment, structures and the stabilization of sub-structures) may lead to an alteration of the landscape, and earth moving activities may destroy resources; if resources are not destroyed, then, these activities may disturb or adversely affect resources. Utilization of caps, barriers and/or other containments may destroy resources located close to the surface. If resources are not destroyed, containments may disturb or adversely affect resources. Lastly, during remediation, radionuclides or other contamination released or spilled on the surface could have long-term effects if the contamination remains and resources become contaminated and/or plants having cultural importance to Tribes do no recolonize or thrive.

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

Additional Risks and Potential Impacts if Cleanup is Delayed

There does not appear to be any additional risks or potential impacts if the current S&M program and containment of the frozen sodium in the SSF is maintained, and D&D delayed. There is no schedule currently in place on when the large sodium inventory would be removed from SSF and processed and when D&D of the FFTF buildings would commence.

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

As stated in the *Final TC&WM EIS*[11]*,* for FFTF Decommissioning, DOE's preference is for Alternative 2 Entombment, which would decontaminate and remove all above-grade structures. The RCB structures below grade level, as well as the FFTF reactor vessel and radioactive and contaminated equipment, components, piping, and other materials that have become radioactive or otherwise contaminated, would remain in place. Sodium residuals would be either removed from the RCB and treated in existing 400 Area facilities or treated in place. In addition, the RCB below grade level would be filled with grout or other suitable fill material to immobilize remaining hazardous chemicals and radioactive materials to the maximum extent practicable and to prevent subsidence. A modified RCRA Subtitle C barrier would be constructed over the filled area to provide long-term containment and hydrologic protection for a performance period of 500 years, assuming no maintenance is performed after a 100-year institutional control period. As such, there should be no remaining risks or potential adverse impacts to human or other potential receptors.

[11] *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)* (EIS-0391-FEIS, 2012).

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

Table F.5-7. 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)	There would be no Facility Workers present after cleanup
	Co-located Person	ND	There would be no access to the site after cleanup
	Public	ND	There would be no access to the site after cleanup
Environmental	Groundwater	*ND*	Reported inventories are in process building and isolated from the environment.
	Columbia River	*ND*	
	Ecological Resources[a]	Low to Medium	Monitoring activities for entombment are expected to occur away from burrowing owl habitat. Medium impacts are likely if exotic species are introduced to buffer area with level 4 resources.
Social	Cultural Resources[a]	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: Unknown **Manhattan/Cold War** Direct: Known Indirect: None	Permanent direct and indirect effects are likely from entombment of structure and the structure remaining in place for indeterminate amount of time. Permanent direct effects are likely from entombment of structure and the structure remaining in place for indeterminate amount of time. No Manhattan Project/Cold War Era buildings within 500 meters of the EU removed. Plants having cultural importance to Tribes may not recolonize or thrive. If contamination remains, access to and/or use of resources may be prohibited. Potential indirect effects are possible from the use of caps and/or other containment options due to periodic monitoring of the cap and continued traffic through the area. Indirect effects due to

Population or Resource		Risk/Impact Rating	Comments
			personnel, car and truck traffic may decrease viewshed values and/or impact viewshed through the introduction of increased dust, the creation of trails, changes in vegetation and other potential alterations to the landscape. Potential indirect effects are possible (and potentially permanent) if contamination remains and/or resources are contaminated. If contamination remains, access to and/or use of resources may be prohibited.

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

Long-Term, Post-Cleanup Status – Inventories and Risks and Potential Impact Pathways

A modified RCRA Subtitle C barrier would be constructed over the filled area to provide long-term containment and hydrologic protection for a performance period of 500 years, assuming no maintenance is performed after a 100-year institutional control period. As such, there should be no remaining risks or potential adverse impacts to human or other potential receptors.

PART VII. SUPPLEMENTAL INFORMATION AND CONSIDERATIONS

Table F.5-8. RC-DD-4 (FFTF) 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	Exc	Comments
400-42	400-42; Demolished 4722-A Building Slab; Legacy	Waste	Inactive	Accepted	None	Dumping Area	Burial Ground	TBD		
400-40	400-40; 403 Building Fuel Storage Facility (FSF); 4718 ISA; 400 Area Interim Storage Area (ISA); 400 Area Waste Management Unit	Waste Site	Active	Accepted	None	Storage	Storage Pad	Not Applicable		
400-37	400-37; Fuel Oil Tank South of 4732-B	Waste Site	Inactive	Accepted	None	Storage Tank	Underground Storage Tank	300-FF-2		
400-38	400-38; Fuel Oil Tank East of 4722-A Building Slab	Waste Site	Inactive	Accepted	None	Storage Tank	Underground Storage Tank	300-FF-2		
400 SBT	400 SBT; Cooling Tower Overflow Trench; 400 Area Retired Sand Bottom Trench; 400 Area Sand Bottom Trench	Waste Site	Inactive	Not Accepted	None	Trench	Crib - Subsurface Liquid	Not Applicable	X	Not Accepted
400-15	400-15; Diesel Fuel Tank Fitting Leak	Waste Site	Inactive	Not Accepted	None	Unplanned Release	Unplanned Release -	Not Applicable	X	Not Accepted
400-17	400-17; Buried Construction Waste Area; Buried Construction Waste Area #1	Waste Site	Inactive	Accepted	Rejected	Burial Ground	Burial Ground	Not Applicable	X	Rejected
400-18	400-18; Buried Construction Waste Area; Buried Construction Waste Area #2	Waste Site	Inactive	Accepted	Rejected	Burial Ground	Burial Ground	Not Applicable	X	Rejected
400-35	400-35; Miscellaneous Stream #734; Southwest Surface Water Drainage Ditch	Waste Site	Active	Not Accepted	None	Ditch	Pond/Ditch – Surface Liquid	Not Applicable	X	Not Accepted
400 STF	400 STF; 4608 Sanitary Tile Field; 4608 STF; 400 Area Sanitary Tile Field	Waste Site	Inactive	Accepted	Rejected	Drain/Tile Field	Septic System	Not Applicable	X	Rejected
400-8	400-8; Construction Material Dumping Area (North of FFTF)	Waste Site	Inactive	Accepted	Rejected	Dumping Area	Burial Ground	Not Applicable	X	Rejected
400 FD10	400 FD10; 482A Building - T-58 Stormwater; Injection Well #10; Miscellaneous Stream #25; 400 Area French Drain 10	Waste Site	Active	Not Accepted	None	French Drain	Crib - Subsurface Liquid Disposal Site	Not Applicable	X	Not Accepted

400 FD10A	400 FD10A; 482A Building -T-87 Stormwater; Injection Well #10A; Miscellaneous Stream #24; 400 Area French Drain 10A	Waste Site	Active	Not Accepted	None	French Drain	Crib - Subsurface Liquid Disposal Site	Not Applicable	X	Not Accepted
400 FD1A	400 FD1A; 4717 Reactor Service Building HVAC Condensate; Injection Well	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
400 FD1B	400 FD1B; 4703 Building (FFTF Control Building) HVAC Condensate; Injection Well #1B; Miscellaneous Stream #15; 400 Area French Drain	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
400 FD2	400 FD2; 4621E Building HVAC Condensate and Stormwater; Injection Well #02; Miscellaneous Stream #16; 400 Area French	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
400 FD3	400 FD3; 408A East Dump Heat Exchanger Stormwater; Injection Well #03; Miscellaneous	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface	Not Applicable	X	Rejected
400 FD4	400 FD4; 491E Heat Transport Building Stormwater and HVAC Condensate;	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface	Not Applicable	X	Rejected
400 FD5	400 FD5; 408 South Building Stormwater and Condensate; Injection Well	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface	Not Applicable	X	Rejected
400 FD6	400 FD6; 408C West Dump Heat Exchanger Sump	Waste Site	Inactive	Accepted	Rejected	French Drain	Crib - Subsurface	Not Applicable	X	Rejected
400 FD7	400 FD7; 453C Switch Gear Pad Stormwater; 4621W Auxiliary Equipment Building HVAC Condensate and Stormwater; Injection Well #07; Miscellaneous Stream #21; Miscellaneous Stream #27; 400 Area French	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid Disposal	Not Applicable	X	Rejected
400 FD8	400 FD8; 4621W Auxiliary Equipment Building HVAC Condensate; Injection Well #08; Miscellaneous Stream #22; 400 Area French	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
400 FD9	400 FD9; 481 Pumphouse Sanitary Water and Salt Water; Injection Well #09; Miscellaneous Stream	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface	Not Applicable	X	Rejected
400 RFD	400 RFD; 400 Area Retired French Drains	Waste Site	Inactive	Not Accepted	None	French Drain	Crib - Subsurface	Not Applicable	X	Not Accepted

400-10	400-10; 453B Switch Gear Pad Stormwater; Injection Well #11; Miscellaneous Stream #26; 400	Waste Site	Active	Not Accepted	None	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Not Accepted
400-20	400-20; Altitude Valve Pit T-58; Miscellaneous Stream #31	Waste Site	Active	Not Accepted	None	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Not Accepted
400-21	400-21; Altitude Valve Pit T-87; Miscellaneous Stream #32	Waste Site	Active	Not Accepted	None	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Not Accepted
400-22	400-22; Altitude Valve Pit T-330 French Drain; Miscellaneous Stream #30	Waste Site	Active	Not Accepted	None	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Not Accepted
400-23	400-23; 480-A Pump House French Drain; Miscellaneous Stream #34; Well Pump P-14 French Drain	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
400-24	400-24; Miscellaneous Stream #35; Well Pump P-15 French Drain	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
400-25	400-25; Miscellaneous Stream #36; Well Pump P-16 French Drain	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
400-26	400-26; 451-A Substation and B/N Plant French Drain	Waste Site	Active	Not Accepted	None	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Not Accepted
4713-B FD	4713-B FD; 4713-B French Drain; Miscellaneous Stream #33	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
4713-B LDFD	4713-B LDFD; 4713-B Loading Dock French Drain; Miscellaneous Stream #469	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
4721 FD	4721 FD; 4721 French Drain; Miscellaneous Stream #28; 400 Area French Drain Discharge from 4721 Building	Waste Site	Active	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
4722-B FD	4722-B FD; 4722-B French Drain	Waste Site	Inactive	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
4722-C FD	4722-C FD; 4722-C French Drain; French Drain South of 4722-C; Miscellaneous Stream	Waste Site	Inactive	Accepted	Rejected	French Drain	Crib - Subsurface Liquid	Not Applicable	X	Rejected
403 FD	403 FD; 403 French Drain; Discharge Point from the 403 Building; Miscellaneous Stream #37; 400 Area Drain Discharge from 403; 400 Area French Drain Discharge from	Waste Site	Active	Accepted	Rejected	Injection/Reverse Well	Crib - Subsurface Liquid Disposal	Not Applicable	X	Rejected
437 MASF	437 MASF; 400 Area Maintenance and Storage Facility; 437 Maintenance and Storage Facility	Waste Site	Active	Accepted	Closed Out	Maintenance Shop	Storage Pad	Not Applicable	X	Closed Out

400 RSP	400 RSP; 400 Area Retired Sanitary Pond	Waste Site	Inactive	Accepted	Rejected	Pond	Septic System	Not Applicable	X	Rejected
400-9	400-9; 400 Area Retired Portable Sanitary Sewer Treatment Plant; 400 RPSSTP	Waste Site	Inactive	Accepted	Rejected	Sanitary Sewer	Septic System	Not Applicable	X	Rejected
427 HWSA	427 HWSA; 427 Building Fuel Cycle Plant Hazardous Waste Storage Area; 427 Building Fuels and Materials Exam. Facility HWSA	Waste Site	Inactive	Accepted	Rejected	Satellite Accumulati on Area	Storage Pad	Not Applicable	X	Rejected
400 RST	400 RST; 400 Area Retired Septic Tanks	Waste Site	Inactive	Accepted	Rejected	Septic Tank	Septic System	Not Applicable	X	Rejected
400 SS	400 SS; 4608 Sanitary Sewer; 4608 SS; 400 Area Sanitary Sewer	Waste Site	Inactive	Accepted	Rejected	Septic Tank	Septic System	Not Applicable	X	Rejected
4843	4843; 4843 Alkali Metal Storage Facility; 4843 AMSF; 4843 Building; 4843 FFTF Sodium Storage; 4843 Laydown Area Warehouse	Waste Site	Inactive	Accepted	Closed Out	Storage	Storage Pad	Not Applicable	X	Closed Out
400-16	400-16; 4831 Flammable Storage Facility; 4831 FSF	Waste Site	Inactive	Accepted	Rejected	Storage	Storage Pad	Not Applicable	X	Rejected
400-31	400-31; 402 Building; Sodium Storage Facility	Waste Site	Inactive	Accepted	Closed Out	Storage	Storage Pad	Not Applicable	X	Closed Out
400-36	400-36; 4843 Building Temporary Transfer Station; 4843 Waste Inspection Facility; Sanitary Waste Check Station	Waste Site	Inactive	Accepted	Rejected	Storage	Storage Pad	TBD	X	Rejected
400-19	400-19; 400-30; 440 Building 90-Day Waste Accumulation Area; Hazardous Waste Temporary Storage Facility	Waste Site	Active	Accepted	Rejected	Storage Pad (<90 day)	Storage Pad	Not Applicable	X	Rejected
4713-B HWSA	4713-B HWSA; 4713-B Hazardous Waste Storage Area	Waste Site	Active	Accepted	Rejected	Storage Pad (<90 day)	Storage Pad	Not Applicable	X	Rejected
4722 PSHWSA	4722 PSHWSA; 4722-C Hazardous Waste Storage Area; 4722 Paint Shop Hazardous Waste Storage Area; 4722 Paint Shop HWSA	Waste Site	Active	Accepted	Rejected	Storage Pad (<90 day)	Storage Pad	Not Applicable	X	Rejected
4831 LHWSA	4831 LHWSA; 4831 Flammable Storage Facility; 4831 Laydown Hazardous Waste Storage Area; 4831 Laydown HWSA	Waste Site	Inactive	Accepted	Rejected	Storage Pad (<90 day)	Storage Pad	Not Applicable	X	Rejected
400-39	400-39; 400 Area Bioremediation Pad; 400 Area Soil Cell	Waste Site	Inactive	Accepted	Rejected	Surface Impoundment	Burial Ground	Not Applicable	X	Rejected

UPR-400-1	UPR-400-1; 400 Area Coolant Spill; UN-400-1	Waste Site	Inactive	Accepted	Rejected	Unplanned Release	Unplanned Release - Surface/ Near Surface	Not Applicable	X	Rejected
436	TRAINING FACILITY	Facility	INACTIV			BUILDING	Infrastructure			
481	WATER PUMP HOUSE BUILDING	Facility	ACTIVE			BUILDING	Infrastructure			
4220	TELECOMMUNICATIONS	Facility	ACTIVE			BUILDING	Infrastructure			
4221	TELECOMMUNICATIONS	Facility	ACTIVE			BUILDING	Infrastructure			
4707	400 AREA SITE SUPPORT OFFICE	Facility	ACTIVE			BUILDING	Infrastructure			
4710	FFTF OFFICE BUILDING	Facility	INACTIV			BUILDING	Infrastructure			
4716	FFTF RIGGING LOFT	Facility	INACTIV			BUILDING	Infrastructure			
4802	CONSTRUCTION SUPPORT BUILDING	Facility	INACTIV			BUILDING	Infrastructure			
4862	FMEF ENTRY WING OFFICE	Facility	INACTIV			BUILDING	Infrastructure			
408A	MAIN HEAT DUMP EAST	Facility	INACTIV			BUILDING	Infrastructure			
408B	MAIN HEAT DUMP SOUTH	Facility	INACTIV			BUILDING	Infrastructure			
408C	MAIN HEAT DUMP WEST	Facility	INACTIV			BUILDING	Infrastructure			
409A	CLOSED LOOP HEAT DUMP EAST #1	Facility	INACTIV			BUILDING	Infrastructure			
409B	CLOSED LOOP HEAT DUMP EAST #2	Facility	INACTIV			BUILDING	Infrastructure			
432A	INTERIM COVERED EQUIPMENT STORAGE	Facility	INACTIV			BUILDING	Infrastructure			
4621E	AUXILIARY EQUIPMENT BUILDING EAST	Facility	INACTIV			BUILDING	Infrastructure			
4621W	AUXILIARY EQUIPMENT BUILDING WEST	Facility	INACTIV			BUILDING	Infrastructure			
4701A	GUARD STATION AT KENTUCKY BLVD	Facility	INACTIV			BUILDING	Infrastructure			
4701C	FMEF GATE BUILDING AT HAYES STREET	Facility	INACTIV			BUILDING	Infrastructure			
4704N	CHREST STORAGE	Facility	ACTIVE			BUILDING	Infrastructure			
4704S	400 AREA FIRE STATION	Facility	ACTIVE			BUILDING	Infrastructure			
4713A	RIGGERS AND DRIVERS OPERATIONS FACILITY	Facility	INACTIV			BUILDING	Infrastructure			
4713B	FFTF MAINTENANCE SHOP	Facility	INACTIV			BUILDING	Infrastructure			
4713C	WAREHOUSE	Facility	ACTIVE			BUILDING	Infrastructure			
4722C	PAINTERS SHOP	Facility	ACTIVE			BUILDING	Infrastructure			
4732A	WAREHOUSE	Facility	ACTIVE			BUILDING	Infrastructure			
4732B	WAREHOUSE	Facility	ACTIVE			BUILDING	Infrastructure			

4732C	WAREHOUSE	Facility	ACTIVE			BUILDING	Infrastructure			
4734B	RECYCLE CENTER	Facility	ACTIVE			BUILDING	Infrastructure			
4734C	VEHICLE MAINTENANCE SHOP	Facility	ACTIVE			BUILDING	Infrastructure			
4790A	TELECOMMUNICATIONS	Facility	ACTIVE			BUILDING	Infrastructure			
480A	WELLHOUSE BUILDING P-14	Facility	ACTIVE			BUILDING	Infrastructure			
480B	WELLHOUSE BUILDING P-15	Facility	ACTIVE			BUILDING	Infrastructure			
480D	WELL HOUSE BUILDING P-16	Facility	ACTIVE			BUILDING	Infrastructure			
481A	WATER PUMP HOUSE BUILDING	Facility	INACTIV			BUILDING	Infrastructure			
4842A	SWITCHGEAR 451B SUBSTATION	Facility	ACTIVE			BUILDING	Infrastructure			
4842B	SWITCHGEAR BLDG FOR PUMP HOUSES	Facility	ACTIVE			BUILDING	Infrastructure			
491E	HTS SERVICE BUILDING EAST	Facility	INACTIV			BUILDING	Infrastructure			
491S	HTS SERVICE BUILDING SOUTH	Facility	INACTIV			BUILDING	Infrastructure			
491W	HTS SERVICE BUILDING WEST	Facility	INACTIV			BUILDING	Infrastructure			
402	SODIUM STORAGE FACILITY	Facility	INACTIV			BUILDING	Process Building			
403	FUEL STORAGE FACILITY	Facility	INACTIV			BUILDING	Process Building			
405	FFTF REACTOR CONTAINMENT BUILDING	Facility	INACTIV			BUILDING	Process Building			
427	FUELS AND MATERIAL EXAMINATION FACILITY	Facility	INACTIV			BUILDING	Process Building			
437	MAINTENANCE AND STORAGE FACILITY (MASF)	Facility	ACTIVE			BUILDING	Process Building			
440	HAZARDOUS WASTE TEMP STORAGE	Facility	ACTIVE			BUILDING	Process Building			
483	COOLING TOWERS CHEMICAL ADDITION BUILDING	Facility	INACTIV			BUILDING	Process Building			
484	FFTF IN-CONTAINMENT CHILL WATER EQUIP BLDG	Facility	INACTIV			BUILDING	Process Building			
4703	FFTF CONTROL BUILDING	Facility	INACTIV			BUILDING	Process Building			
4717	REACTOR SERVICE BUILDING	Facility	INACTIV			BUILDING	Process Building			
4721	FFTF EMERGENCY TURBINE GENERATOR BUILDING	Facility	INACTIV			BUILDING	Process Building			
427A	ARGON/HYDROGEN MIXING BUILDING	Facility	INACTIV			BUILDING	Process Building			
4713D	INTERIM MAINTENANCE AND STORAGE FACILITY	Facility	INACTIV			BUILDING	Process Building			
483B	WATER TREATMENT BUILDING	Facility	INACTIV			BUILDING	Process Building			
451A	ELECTRICAL SUBSTATION 115KV (FFTF)	Facility	ACTIVE			STRUCTURE	Infrastructure			
451B	ELECTRICAL SUBSTATION 115KV	Facility	ACTIVE			STRUCTURE	Infrastructure			
4734A	NITROGEN DEWAR PAD	Facility	INACTIV			STRUCTURE	Process Building			
483A	COOLING TOWER FMEF	Facility	INACTIV			STRUCTURE	Process Building			
4718	400 AREA INTERIM STORAGE AREA PAD	Facility	INACTIV			STRUCTURE	Storage Pad			

482A	WATER STORAGE TANK (T-58)	Facility	ACTIVE			TANK	Infrastructure				
482B	WATER STORAGE TANK (T-87)	Facility	ACTIVE			TANK	Infrastructure				
482C	WATER STORAGE TANK (T-330)	Facility	INACTIV			TANK	Infrastructure				
MO141	RESTROOM TRAILER ON WISCONSIN AND CYPRESS	Facility	ACTIVE			BUILDING	Infrastructure			X	Mobile

BIBLIOGRAPHY

CH2MHill Plateau Remediation Company, *Documented Safety Analysis for the Fast Flux Test Facility*, FFTF-36419, Revision 2, August 22, 2012

CH2MHill Plateau Remediation Company, *Evaluation of the Hazard Categorization of the Interim Storage Area Pad at the Fast Flux Test Facility,* WMP-52507, Revision 0, May 14, 2012.

CRESP 2015. *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/.

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

Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement (DOE/EIS-0222-F, September 1999)

Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS) (EIS-0391-FEIS, 2012)

Hanford, *400 Area/Fast Flux Test facility*, http://www.hanford.gov/page.cfm/400areafftf

PNNL, *Hanford Site-Wide Risk Review, RC-DD-4_FFTF_DataSheet*

US Department of Energy, Richland Operations Office, *Hanford Site Waste Management Units Report*, DOE/RL-88-30, Revision 24, February 2015

US Department of Energy*, Record of Decision, Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington*, Federal Register, Vol. 78, No. 240, p75913, December 13, 2013.

US Department of Energy, *Surveillance and Maintenance Plan for the Fast Flux Test Facility (FFTF*), DOE/RL-2009-26, Revision 0, May 18, 2009.

Westinghouse Hanford Company, *Conceptual Design Report, Sodium Storage Facility, Fast Flux Test Facility, Project F-031*, prepared for the U.S. Department of Energy Contract DE-AC06-87RL10900, October 1994