APPENDIX F.1

DEACTIVATION, DECOMMISIONING, DECONTAMINATION, AND DEMOLITION OF FACILITIES (D4) EVALUATION UNITS

DEACTIVATION, DECOMMISIONING, DECONTAMINATION, AND DEMOLITION OF INACTIVE FACILITIES

Deactivation is usually the first disposition activity undertaken following operational shutdown and transition of a facility. The deactivation mission is to place a facility in a safe shutdown condition that is economical to monitor and maintain until the eventual decommissioning of the facility. Facilities may be held for an extended period in safe shutdown while awaiting decommissioning. During decommissioning, the facility is taken to its ultimate end state through decontamination and/or dismantlement to demolition or entombment. After decommissioning is complete, the facility or surrounding area may require DOE control to protect the public and the environment or for environmental remediation.

Evaluation units (EUs) composed of a set of inactive facilities undergoing deactivation and decommissioning (D&D) have been identified based on major processing complexes or facilities with a common history of operations and geographic proximity. The EUs for facilities undergoing D&D are organized around the three principal operational functions and design attributes: reactors, canyon "chemical separations plants," and plutonium production and supporting facilities (including radioactive material storage, waste processing, and laboratory facilities). In addition, contaminated soils as a result of facility operations or unplanned releases underneath or in the immediate vicinity of the facility (such as Building 324) may be included within the specified EU.

The reactor EUs include eight of the nine plutonium production reactors (C Reactor, D Reactor, DR Reactor, F Reactor, H Reactor, K-East Reactor, K-West Reactor and N Reactor) that were built on the Hanford Site from 1943 through 1965. The last operating reactor, the N Reactor, was shut down in 1988. B Reactor, the world's first nuclear reactor, is being preserved as a National Historic Landmark and is not included. The K-West Reactor building is currently managed as less than a Hazard Category 3 facility for authorized surveillance and maintenance activities. D&D of buildings and structures ancillary to the reactor core building will begin when the contaminated sludge is removed from the KW fuel basin, which is expected to occur in the next two years. The K-East Reactor building achieved cold & dark status in February 2010. The final deactivation phase of these two K-Reactors will be different than the other reactors as they will not be encased in a concrete shell. Instead, a structurally independent building supported on a newly poured concrete foundation outboard of the existing K reactor building structures will be constructed. No structural connection will be made to the existing buildings, and all roofing, siding, and structural steel will be left in place. The safe storage enclosure (SSE) will consist of a steel framework covered by sheet metal paneling. This construction approach is expected to expose workers to fewer industrial, radiological, and waste management hazards while enclosing this reactor. Once modified in this way, these two reactors, along with the six reactors that were cocooned several years earlier, will be left in place until at least 75 years from the issuance of the Record of Decision (58 Federal Register [FR] 48509) that followed the environmental impact statement, *Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland Washington* (DOE 1992). The 75-year safe-storage period was determined to be an adequate time for decay of cobalt-60 and partial decay of cesium-137, radionuclides that contribute significantly to occupational dose. Once safer radiation levels are achieved, final decommissioning will be undertaken.

The Fast Flux Test Facility (FFTF), formerly an operating 400-megawatt (thermal) liquid-metal (sodium)-cooled nuclear research and test reactor, is currently undergoing entombment. Deactivation was completed in 2009, including removal of all nuclear fuel, bulk drain of all sodium and sodium-potassium alloy 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. 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. 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.

The canyon "chemical separations plants" EUs include the B Plant, REDOX (S Plant), U Plant, and PUREX (A Plant) facilities at Hanford. T Plant is the only canyon facility at Hanford that remains in operation. Currently, the mission of T Plant is to support decontamination; headspace sampling; and repackaging, remediation, and verification of containerized waste as noted in the Operating Facilities discussion. All of these chemical separations plants look similar to one another. They are hundreds of feet long, and most stand about 80 feet high and 70 feet wide. The first phase of decommissioning the U Plant was completed in 2011. All equipment from the decks was placed inside the below ground level processing cells and then the cells were filled with a cement-like grout. The last two phases of this "close-in-place/partially-demolish" approach consist of demolishing the upper structure of the canyon, leaving demolition debris in place, and placing a protective barrier over the demolished building, adjacent waste sites and demolished structures. The other canyon facilities are in a safe, low-cost, low-maintenance deactivation status pending future decommissioning similar to the U Plant.

The Plutonium Finishing Plant (PFP) was used to process plutonium nitrate solution into hockey puck-sized plutonium metal "buttons" or oxide powder for shipment to the nation's weapons production facilities or for the fabrication of mixed-oxide reactor fuel. When processing ended, approximately 20 tons of plutonium-bearing material remained and needed to be removed as TRU or LLW. The operational history of the complex indicates that former waste management practices, failures of equipment, accidents, and spills resulted in the release of radionuclides in the facilities and surrounding soils. Based on the potential threat posed to human health and the environment by the residual plutonium in the buildings and external piping, the facilities and structures are currently being removed to slab-on grade and the sub-grade structures and sites within the complex are being stabilized.

The 324 Building is a Hazard Category 2 nonreactor nuclear facility currently undergoing stabilization, deactivation, decontamination, decommissioning of equipment and systems, and limited demolition of some adjoining structures and nonessential support buildings. In 2009, a breach in the B-Cell liner was discovered during grout removal in the trench and sump. Research determined that a spill of approximately 510 L of a highly radioactive waste stream (approximately 1.3 million curies) containing Cs-137 and Sr-90 occurred in the B-Cell in October 1986. High radiation levels at failed liner locations led to concerns that contamination had spread to the soil beneath the cell. In 2010, closed casings (Geoprobes) installed beneath B-Cell indicated contamination up to 8,900 rad/hour in soils up to 4 m directly below B-Cell. This contaminated area was designated as waste site 300-296. One of the biggest challenges facing DOE is how to safely remove or contain the highly radioactive soils beneath the Building's B-Cell. The current plan is to extract the soil up through the B-Cell floor, followed by grouting and transfers to the C and D hot cells. The outer shell of Building 324 would be demolished, and the hot cells would be cut into monoliths and transported to ERDF for disposal.