F.0614.025.0018

ORR-10-0199

US Department of Energy, Office of Environmental Management

Action Memorandum for the Y-12 Facilities
Non-Time-Critical Removal Action
Deactivation/Demolition Project
Oak Ridge, Tennessee
(DOE/OR/01-2462&D2)

This document is approved for public release per review by:

9/27/2010

USDOE/Oak Ridge – Classification Officer Date

September 9, 2010

1. PURPOSE

The purpose of this Action Memorandum (AM) is to document the approval of the non-time-critical removal action for the demolition of approximately 500 process, auxiliary and support facilities at the Y-12 National Security Complex site that are to be included in Integrated Facility Disposition Program (IFDP) scope. (A facility is defined as a building or any above-grade structure other than a building and includes any associated wastes or ancillary equipment.) Several facilities, which are being considered for National Historic Preservation, will only be deactivated. This AM documents the decision to implement the proposed action as a non-time critical removal action under CERCLA. Appendix A of the EE/CA lists and describes the facilities associated with this AM.

All facilities at the Y-12 site that are included in the scope of this AM, and that have not been covered by other Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) decision documents or National Environmental Policy Act (NEPA) documents, were screened for actual or potential elevated concentrations of radiological and/or hazardous substances from past operations.

These remaining facilities are part of the near-term demolition action proposed and described as Alternative 2 in the Engineering Evaluation/Cost Analysis (EE/CA) for the Y-12 Facilities Deactivation/ Demolition Project, Oak Ridge, Tennessee (DOE/OR/01-2424&D2).

The controlled removal and disposition of the Y-12 facilities was determined to be within the scope and purpose of this non-time-critical removal action based on the EE/CA's criteria for performance as a non-time-critical removal action. Like the facilities addressed by the EE/CA, the facilities included in this AM have actual or potential elevated concentrations of radiological and/or other hazardous substances from past operations or have been determined to have the potential for releases of contaminants or the threat of release of contaminants. Therefore, the subject facilities were included in this removal action.

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Two removal action alternatives are evaluated for their effectiveness, implementability and cost. The alternatives differ primarily in scheduling. Alternative 1 includes continued surveillance and maintenance with needed repairs and eventual demolition. Alternative 2 includes near-term demolition of buildings and facilities. Alternative 2 is the preferred removal action alternative because it will meet the removal action objectives now rather than at some point in the future. Alternative 1 is more costly and simply defers the inevitable demolition of the structures to a future date.

Demolition project activities include characterization, decontamination, demolition, material disposition, and site stabilization. The demolition process will leave foundations, slabs, soil, and underground utilities, which will be addressed by existing and future CERCLA Records of Decision for the Y-12 site. Scope of work will include the following:

- characterization of the facilities for radiological and hazardous/toxic materials to demonstrate compliance with waste acceptance criteria and to determine safety and health requirements for D&D workers;
- decontamination of the facilities for radiological and hazardous/toxic materials in accordance with project specifications;
- removal of equipment and piping;
- demolition of structural and architectural components; and
- disposal of low-level waste in approved on-site or off-site facilities, and site stabilization.

Demolition activities described under this AM, and its companion EE/CA, are consistent with and will not preclude the final remedies to be considered under future CERCLA documentation for the Y-12 site. These facilities are included in Appendix C of the Federal Facility Agreement (FFA).

2. SITE DESCRIPTION AND CONTAMINANTS

The 34,516-acre DOE ORR is located within and adjacent to the corporate limits of the city of Oak Ridge, Tennessee, in Roane and Anderson counties. The ORR is bounded to the east and north by the developed portion of the city of Oak Ridge. The ORR hosts three major industrial research and production facilities originally constructed as part of the World War II-era Manhattan Project: East Tennessee Technology Park (ETTP, formerly the K-25 Site), Oak Ridge National Laboratory (ORNL, formerly X- 10), and the Y- 12 National Security Complex (Y- 12, formerly the Oak Ridge Y- 12 Plant).

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The boundaries of the Y-12 Site encompass the industrialized area, extend along the top of Pine Ridge to the north, the top of Chestnut Ridge to the south, the eastern boundary of the Bear Creek Watershed to the west, and the DOE property line to the east. Historical processes, programs, and waste management practices associated with the Y-12 mission have contaminated soil, surface water, sediment, and groundwater. These processes included the following:

- isotope separation techniques;
- weapons manufacturing;
- research and development;
- waste storage, management, and disposal; and
- physical plant maintenance activities.

In 1989, the ORR, which includes the Y-12 site, was placed on the CERCLA National Priorities List. A Federal Facilities Agreement (FFA), effective January 1, 1992, now governs environmental restoration as well as decontamination and decommissioning activities conducted under CERCLA at ORR.

Y-12 is an active manufacturing and developmental engineering facility. It occupies approximately 600 acres within Bear Creek Valley near the northeast corner of the ORR, adjacent to the city of Oak Ridge. Built in 1943 by the U.S. Army Corps of Engineers as part of the World War II-era Manhattan Project, Y-12's original mission was to separate and produce fissile ^{235}U from ^{238}U using an electromagnetic separation process (calutron process) and to manufacture weapon components as part of the national effort to produce the atomic bomb. As other uranium enrichment processes were developed and implemented at other installations, the role of Y- 12 expanded to include weapon components manufacturing and precision machining, research and development, lithium isotope separation, and special nuclear materials storage and management. Historical manufacturing processes, programs, and waste management practices associated with Y-12's mission have contaminated soil, surface water, sediment, and groundwater.

In 2007, DOE Environmental Management (EM) began the initial planning phases of the next major remediation program for the ORR. These planning efforts resulted in the conceptual development of the Integrated Facilities Disposition Program (IFDP). IFDP has defined its scope to cover primarily

facilities at Y-12 and ORNL. This AM has been developed to cover the buildings portion of Y-12 and generally includes those facilities that have been, or will be, deemed no longer needed for Y-12 plant operations as a result of modernization efforts. The NTCRA IFDP buildings covered in AM have been included in the IFDP Critical Decision-1 (CD-1) package developed by DOE. As DOE develops the next step of the detailed baseline documents for budget and schedule forecast as part of the CD-2/3 process, exact building groupings and the associated schedule/sequence of these demolition efforts will be refined.

This AM and the associated EE/CA for Y-12 is intended to streamline the required documentation for remaining IFDP facilities at Y-12 whose final end point is deactivation or demolition, thus expediting these actions, and ultimately the remediation of the Y-12 site and surrounding areas. A general layout of the Y-12 Site is provided in Figure 1.

3. THREATS TO PUBLIC HEALTH AND THE ENVIRONMENT

As determined by the EE/CA, the short-term health risk from the demolition of the facilities included in this AM was compared to that presented by the demolition of the K-1131 Building at ETTP. The EE/CA describes the range of buildings and facilities within the scope for the Y-12 Site. To the extent possible, a comparison is made between the most contaminated Y-12 buildings and the ETTP Building K-1131, considered to be the worst-case building on the ORR for this evaluation. It is understood that there are limited data available for these IFDP facilities at Y-12, and thus a comprehensive contaminant comparison cannot be accomplished. However, given the remedial decisions previously made at ETTP, Y-12 and ORNL – this EE/CA is consistent with those decision-making processes and precedent setting actions.

The short-term health risk from the demolition of the K-1131 Building was identified as the baseline for comparison with other ORR facility demolition actions because the K-1131 Building was the most chemically and radiologically contaminated process support facility on the ETTP site. The K-1131 Building was one of the buildings included in the ETTP Group I Buildings Project that has been demolished, and has similar characteristics to those facilities found at the Y-12 site.

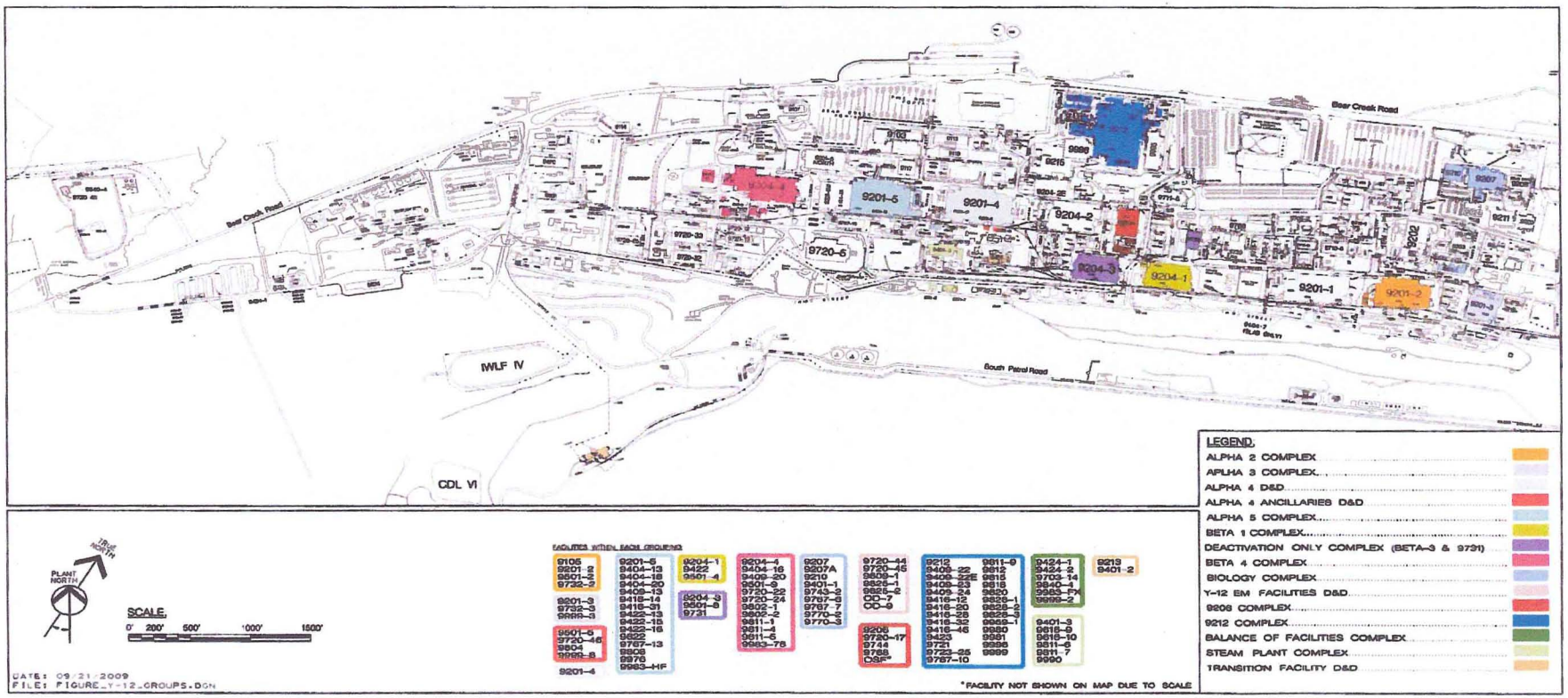

Figure 1. Y-12 Site Base

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The objective of this action is to eliminate potential future contamination releases, and/or threats to the general public and the environment. Long-term risks will he effectively eliminated by the action; thus, long-term risk estimates are not required. That is, long-term risks to potential future members of the general public will be effectively eliminated because the facilities will be removed and the waste will be properly dispositioned. Although the action precludes long-term residual exposures, short-term risks may exist and must be addressed to safely and effectively complete the action. Potential short-term risks may be divided into four categories:

- off-site receptors;
- demolition (i.e., remediation) workers;
- transportation; and
- disposal cell.

Each risk category is discussed below.

Off-Site Receptors

Off-site receptors may be exposed to existing contaminants if fugitive dust is allowed, during demolition activities, to migrate into public areas. The U.S. Department of Energy (DOE) and its remediation contractors have established procedures for minimizing off-site emissions and will comply with all applicable promulgated regulations [National Emission Standards for Hazardous Air Pollutants (e.g., NESHAPS)]. There are no other exposure pathways for the general public as related to this action; thus, it is assumed that the exposure to off-site receptors will be controlled according to existing procedures and regulations.

Demolition Worker

Exposures to demolition workers will be controlled using existing regulations [e.g., 10 Code of Federal Regulations (CFR) 835] and administrative guidelines. Given that existing regulations and procedures will be utilized to monitor and otherwise limit exposures to these workers, it is assumed that associated short-term risks will be managed to within acceptable levels and exposures will be kept as low

as reasonably achievable (ALARA). It is also noted the some sampling will be completed to compare against U.S. Department of Transportation (DOT) regulations and waste acceptance criteria (WAC) at the designated disposal facility. These data may be used to limit potential worker exposures by optimizing ALARA-related work practices.

Transportation

All materials shipped off-site will be subject to DOT regulations, including packaging requirements, posted speed limits, etc.On-sight shipments will be made with similar controls as appropriate. It is assumed that potential short-term risks associated with the shipment of materials to the designated disposal facility are acceptable when managed within the framework of existing regulations and controls.

Disposal Cell

The on-site designated disposal facilities [Oak Ridge Reservation (ORR) Industrial Landfill and the Environmental Management Waste Management Facility (E,MWMF)] are comprised of engineered cells specifically designed to accept materials like those found in the approximately 500 facilities, site controls that preclude inadvertent access, and a sampling program to monitor potential impacts to the environment, if any. Off-site facilities are constructed and managed with similar features and controls as appropriate. Disposal workers are subject to existing regulations and administrative controls similar to demolition workers. It is assumed that the existing engineering controls, - control of site access, monitoring program, and worker-related limitations are sufficient to demonstrate short-term effectiveness.

Summary

In summary, it is not appropriate to subject the approximately 500 facilities targeted for demolition to long-term (i.e., residual) risk evaluations, and short-term protectiveness may be demonstrated through compliance with existing state and federal regulations, administrative guidelines, and established procedures for defined actions. The qualitative assessment presented above demonstrates that both long-term and short-term risks and associated potential exposures are either *de minimis* or may be managed to within acceptable limits by obeying existing regulations, guidelines, and procedures. Contaminants within the facilities addressed by this AM are contained by the structures themselves; therefore, the current risk

to the environment and on-site personnel who do not enter is low. However, the probability of future contaminant release to the environment will increase over time if the building deterioration continues because of structural failure and subsequent contaminant migration. Although the magnitude of risk to human health and the environment is considered small, the intent of CERCLA is to eliminate the potential for future releases. The controlled demolition of these facilities will ensure that the intent of CERCLA is met.

4. PROPOSED ACTIVITIES

The demolition alternative involves pre-demolition cleanout of excess materials/equipment as needed, demolition of building to slab, basement, crawl space, wind tunnel, or sump, as the case may be, and disposition of all associated wastes. The proposed action will effectively eliminate the threat of release and reduce the potential health and environmental risks from exposure to radiation and hazardous substances present in the remaining facilities and areas.

The following are key components of this alternative:

- Building characterization will be conducted to facilitate the segregation of waste streams and to support worker safety. The amount of characterization required will depend on the individual facility.
- Decontamination of building components will be performed as needed to protect workers, meet regulatory requirements, facilitate conventional demolition, or meet waste acceptance criteria for a disposal facility. The manner and scope of decontamination will be left up to the judgment of the contractor with the agreement of DOE. The contractor will evaluate the ability and cost to perform decontamination for release versus disposal in accordance with the receiving facility's waste acceptance criteria.
- ACM and ballasts will be removed, bagged, and/or disposed of appropriately.
- Equipment and piping will be removed, disassembled, and processed for disposition.
- Structural and architectural components will be disassembled or demolished.

- Controls will be used to minimize fugitive dust, as appropriate, during demolition.
- Waste streams will be segregated into appropriate categories. Categories of waste materials expected are RCRA waste; low-level (radioactive) waste (LLW); mixed waste; Toxic Substances Control Act (TSCA) mixed waste; PCB-contaminated materials; sanitary waste; construction debris; earthen materials suitable for use as on-site fill; and recyclable metals.
- On-site and off-site facilities approved for the disposal of CERCLA wastes will be used.
- Disposition of equipment and scrap metal will take advantage of recycling, reuse, or unrestricted release when appropriate.
- Drains will be plugged; piping leaving the footprint of buildings will be cut or disconnected and capped.
- Concrete floor slabs, basements, wind tunnels, sumps, and foundations will be left in place. These may require some limited decontamination or a cover (e.g., earthen, asphalt, concrete, etc.) for protection of on-site workers and to minimize S&M costs until final remedial actions.
- Surface surveys on structures left in place and other exposed surfaces that remain following D&D will be performed and summarized in the removal action report. These data will be used to support future CERCLA documents and/or backfilling decisions.

Conventional tools and technologies are anticipated for all phases of demolition work. The removal/disassembly of equipment and materials will likely be accomplished using hand-held tools with saws and hydraulic shears for size-reduction (of piping, for example). Decontamination technologies, when needed, will include manual techniques of wiping/vacuuming as well as scabbling and/or coating with a fixative/stabilizer coating. Demolition will likely use conventional technologies, such as cable-suspended and excavator-mounted attachments (pulverizers, shears, grapples, rams) for controlled demolition.

The demolition of the facilities covered by this removal action will be accomplished by grouping similar facilities into contract packages to achieve economies of scale. The demolition sequence for the

facilities is risk-based considering industrial hazards, contamination levels, infrastructure cost burden, and integration with the Y-12 soil remediation schedule. Additionally, operational requirements to support the ongoing Y-12 mission related activities must be considered. Based on DOE's past experience in implementing similar actions, this action will be successfully implemented and will comply with all applicable or relevant and appropriate requirements (ARARs). ARARs for this project are shown in Appendix D of the EE/CA.

Current institutional controls, in place to restrict access to the facilities and areas covered by this removal action, will be minimized because these facilities will be removed. No additional institutional controls will be required as a result of this non-time-critical removal action, unless required to protect remaining contaminated soils. Removal and disposition of the facilities covered by this removal action is compatible with and will facilitate the implementation of any future CERCLA decisions required to address residual contamination (e.g., subsurface soils) in these areas following the removal of these facilities.

The Y-12 Core Team jointly developed a process flow chart to assist in guiding activities during implementation of Y-12 D&D activities. The overall sequence of actual D&D activities is shown in Figure 2. Individual contractors may propose to perform the work in a slightly different order or fashion. (Details will be enumerated in the work plans.) DOE cumulative experience has shown the activity scenario presented here to be fairly common and conventional and thus will be assumed in the cost estimates given in this EE/CA. However, it is important to note that this flow chart does not supersede FFA or NCP requirements, and is subject to change.

The total unescalated cost for NTCRA IFDP facility D&D at the Y-12 Site, as estimated in the CD-1 package, ranges from $1.2B to $1.9B. Given the complexity of many of the structures, this value falls well within the ranges experienced for other D&D projects on the ORR. Pursuant to Section XXXV of the FFA, the DOE shall take all necessary steps to obtain sufficient funding for activities required by this AM. This is to be accomplished, as set forth in that section of the FFA, through consultation with EPA and TDEC and the submission of timely budget requests. The schedule for completion of this project is estimated to be more than 10 years. The enforceable and non-enforceable FY milestones for performance of removal actions for the facilities included in this AM are set forth in Appendix E and Appendix J of the FFA, respectively.

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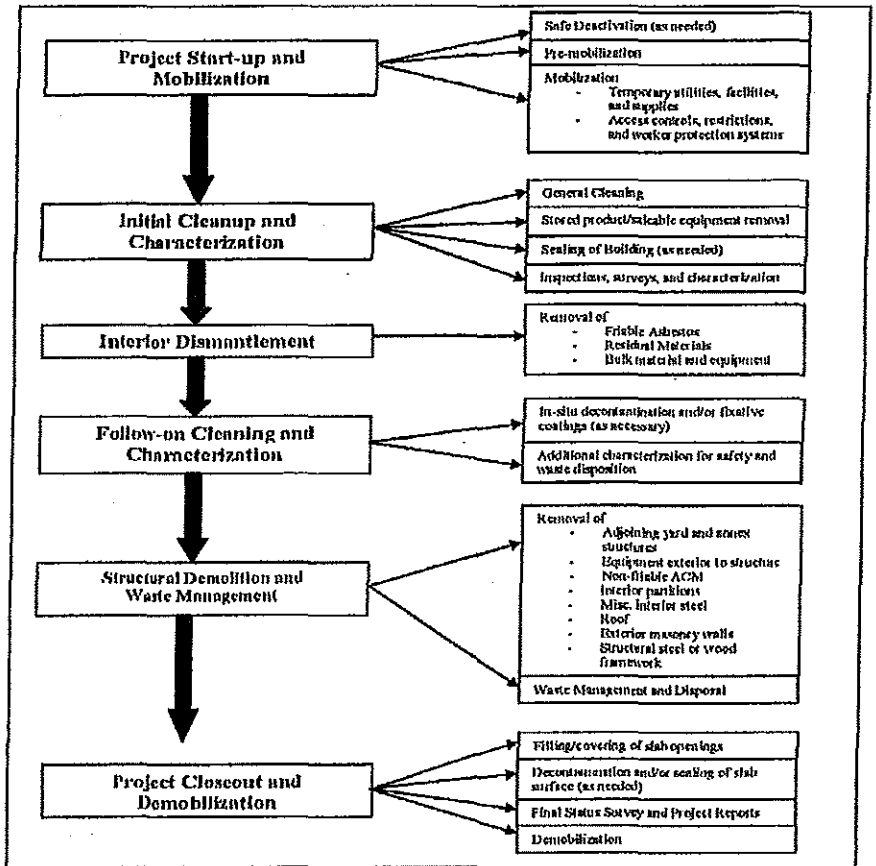

Figure 2: Sequence of demolition activities at Y-12

5. STATUTORY AND REGULATORY AUTHORITY

The proposed removal action is being undertaken by DOE, as the lead agency, pursuant to the CERCLA, as amended by the SARA, Section 104(a), and the FFA for the ORR, Section XIII. In accordance with 40 *CFR* 300.415(j) and DOE guidance, on-site removal actions conducted under CERCLA, as amended by SARA, are required to meet ARARs of other environmental laws to the extent practicable, considering the exigencies of the situation. DOE intends to meet all ARARs and "to be considered" guidance as set forth in Appendix D of this AM when conducting this removal action. For a more detailed discussion of ARARs, please refer to Appendix D of the EE/CA.

In addition, consistent with DOE's "Secretarial Policy Statement on the National Environmental Policy Act" (June 13, 1994), DOE has relied on the CERCLA process for evaluation of the proposed activities to be taken and has incorporated the analysis of National Environmental Policy Act of 1969 values into the documentation for this project.

6. PUBLIC PARTICIPATION

DOE held a 30-day public comment period on the EE/CA which ended on May 30, 2010. Notice of the public comment period was published in local newspapers, including *The Oak Ridger* and the *Knoxville News Sentinel.* In addition, a notice of availability was published in the DOE Public Involvement News. No public comments were received. As such, no changes were made to the preferred alternative.

7. RECOMMENDATION

Based on the analyses performed, reviews conducted, it is recommended that the action described in this AM and the associated EE/CA be approved for implementation. If the selected removal action of demolition to slab of the Y-12 facilities identified in the EE/CA is not taken, risk to human health and the environment will not be mitigated and will increase over time as the contaminants remain in place and the facilities and equipment and materials deteriorate. Both the U.S. Environmental Protection Agency and the Tennessee Department of Environment and Conservation have endorsed the EE/CA for this removal action. Based on the analysis presented in the EE/CA, the recommended action is appropriate and will be

implemented in accordance with CERCLA requirements. This non-time-critical removal action is consistent with the provisions of the FFA for the ORR. Based on the analysis presented here and in the EE/CA, and on review and consideration of the public comments, this action is appropriate and will be implemented in accordance with CERCLA, as amended by SARA.

APPROVAL

John Eschenberg, Assistant Manager for Environmental Management

8/29/10
Date

The following appendices/attachments are enclosed with this action memorandum:

Appendix A: Description of Facilities Addressed by this Action Memorandum

Attachment 1: Public Comments received on the *Engineering Evaluation/Cost Analysis for Y-12 Facilities Deactivation/Demolition Project, Oak Ridge, Tennessee* (DOE/OR/01-2424&D2)

Attachment 2: *Engineering Evaluation/Cost Analysis for the Y-12 Facilities Deactivation/Demolition Project, Oak Ridge, Tennessee* (DOE/OR/01-2424&D2)

APPENDIX A

Summary Complex/Grouping Description and Listing of Y-12 NTCRA IFDP Facilities Scheduled for Deactivation or D&D

SUMMARY Y-12 D&D FACILITIES DESCRIPTION BY MAJOR BUILDING GROUPING/COMPLEX

ALPHA-2 Complex:

- Building 9201-2 Fusion Energy Building (ALPHA 2) Fusion (324,448 square feet)
- Building 9105 Office Building (7,667 square feet)
- Building 9501-4 161 KV Steel Transformer (The square footage has been included in the 9201-2 building totals)
- Building 9732-2 Carpentry Shop (480 square feet)

The Alpha-2 Complex is located within the property protected area of the Y-12 Site and includes facilities: 9105, 9501-2 and 9732-2. These four facilities combined have a total of 324,448 gross square feet. The Alpha-2 Facility (Building 9201-2) is the largest at 324,448 square feet. It is a 2.1 floor facility with a partially concreted basement with varying depths from 7.5 to 15' deep. The footprint occupies 107,619 SF. There are 4 roof lines with the highest vertical distance from first floor finished elevation being 82.25'. The basement has reinforced poured concrete foundation, support pier structures and floors with thick hollow core clay tile block external walls. The external walls have a brick facade on portions of the building. The interior walls are constructed of heavy hollow core clay tile block, masonry hollow core block, concrete, metal, wood or gypsum board. The roof is a flat bituminous built-up roof with a gravel weather cover that is supported by a concrete panel and structural steel support system in portions of the high bay area. Alpha-2 was constructed in 1943 to house 2 alpha-stage calutrons for uranium enrichment and operated until 1951. During this same time frame, an 86" cyclotron was constructed around 1948 and operated until 1957. The cyclotron is still present in the facility but the sources have been removed. D&D of the calutrons occurred between 1951 and 1952 when most of the associated operations were removed and reconfiguration efforts began for the ELEX and COLEX Lithium/Mercury enrichment operations. The Elex process involved an electro-chemical and solvent extraction method that required substantial quantities of mercury as a solvent agent to separate the lithium-6 isotope from lithium-7 (in the form of lithium hydroxide). During this production large amounts of mercury were lost and the building structures have contaminated. The Lithium separation and enrichments operations continued until 1963 when the equipment was drained of the majority of process materials (including mercury). However, all systems/components were not cleaned, and some recoverable quantities of mercury and lithium hydroxide may remain in the equipment and lines.

The facility was transferred from Y12 operations control to ORNL operations for development and research operations in 1963. The facility is still today operated by ORNL with minimal research activities being conducted. Currently the Alpha 2 facility houses office space, maintenance operations and possible small scale experiments.

The facility also has a mercury contaminated basement and soils. As a result, airborne mercury is a continual hazard for workers in the facility and is a minor contributor to ambient

air mercury concentrations at the Y-12 Site. Contaminants of concern include, but are not limited to, mercury, asbestos, PCBs, beryllium and radiological contamination.

ALPHA-3 Complex:

- Building 9201-3 – Office Complex/Alpha 3 (191,978 Square Feet)
- Building 9732-3 – Utility Room/Painter Facility (2,447 Square Feet)
- Building 9999-3 – Switchgear Building (2,447 Square Feet)

The Alpha 3 Complex is located within the propert[illegible]ted area of the Y-12 Site on Second Street. The Alpha 3 Complex comprises a[illegible] or 196,872 square feet. There are a total of 3 facilities that make up this complex [illegible]pha 3 (Building 9201-3) being the largest facility at 191,978 square feet. Ancillary [illegible]tures 9732-3 and 9999-3 occupy the remaining 4,894 square feet in this complex [illegible] Alpha 3 Facility is a 3.1 storied facility having a partially concreted basement with an average depth of 13.5'. The footprint occupies 68,895 SF. The facility has 4 roof lines with the highest vertical distance from first floor finished elevation being 75'.The remaining basement surface is occupied by reinforced concrete foundation system or earthen floor. The basement walls are constructed of reinforced formed and poured concrete. The exterior of the facility is constructed of heavy hollow clay tile blocks with a peeling painted surface, and to a lesser extent, a reinforced concrete. The interior walls are constructed of reinforced concrete, heavy hollow clay tile block, hollow core cinder block, wood, gypsum board and or metal. The roof has a dual layering of a flat bituminous built-up roof with a gravel weather cover that is supported by a concrete panel and structural steel support system in portions of the high bay area. Alpha-3 facility was constructed in 1943 to house 96 Calutron "racetracks", track 5 and alpha -1 calutrons for uranium enrichment. It operated until 1949 when other uranium enrichment operations were conducted. Uranium enrichment operations ended in 1951 at which time uranium salvage operations began. Salvage operations ended in 1964. The building was transferred to ORNL research and development and operations continued until 1995. The building has been occupied and operated for many years by the ORNL Engineering Technology Division. The building was turned over to Y-12 in October 2001. ORNL operations included management and development offices, maintenance and machine shops, laboratories for multidisciplinary research and development relevant to energy conservation and utilization, mechanical, structural, and thermal sciences, and manufacturing technologies. Many areas of the facility have been emptied of everything except basic furniture. Currently, the building houses offices and space for Maintenance, Human Resources (which includes Legal, Staffing, Compensation and Equal Opportunity Concerns), Fire Protection Engineering, Radiation Control (RADCON) and the Development Prototype Center. It is believed that most of the calutron equipment, components and systems have been removed and drained (including mercury). However, the smaller self-contained experimental systems still have hazardous chemical hold-up present. The facility is considered to have up to 60 to 65% radiologically contaminated floors and up to 8 feet on the walls. The remaining portions of the floors are not accessible due to floor tile covering or no survey data has been created. Beryllium contamination characterization surveys have been completed for floors, lower walls and some equipment within the facility. The Be survey has shown levels of Be in excess of the guidelines

in rooms first floor center bay, room 225 and 276, the women's second floor bathroom, o change area and in the east side scrap yard. The facility also contains large quantities of asbesto containing material, PCB's, Pb, and universal waste. The facility is considered to be 30% contaminated with Hg form past enrichment operations. The basement has to be monitored prior to entry for Hg vapors.

Building 9732-3 – Utility room/painters facility is assumed to have been constructed during the same time frame as the Alpha-3 facility. Building 9732-3 is currently empty and is constructed similarly as 9201-3. The only exception is this facility has a wood-framed pitched roof. Both radiological and chemical concerns are also assumed to be the same in the main facility 9201-3.

Building 9999-3 – The Switchgear building is currently used for storage of janitorial supplies and clean PPE supplies. The facility is constructed on an elevated concrete pad with a pre-engineered, mild steel framed metal sided building in place. The facility is considered rad clean and is not posted. Chemically there is one area of potential PCB contamination on the floor from the past switchgear operations. This facility is ready for D&D after utility disconnection is completed.

ALPHA-4 Complex:

- Building 9201-4 – General Plant Maintenance (ALPHA 4) – (510,218 GSF)
- Building 9501-5 – 161 KV Steel Transformer
- Building 9720-46 – Storage - (3,026GSF)
- Building 9720-46 – Storage - (130 GSF)
- Building 9999-8 – Switchgear Building - (2,332 GSF)

The Alpha-4 Facility (Building 9201-4) is a 600,000 square foot transite-covered structural steel and concrete facility with three floors and a subbasement located in the protected area of the Y-12 Site. Alpha-4 began operating in 1945 as a uranium enrichment facility using the electromagnetic separation process for uranium separation and enrichment until 1947 when the electromagnetic process was abandoned. The building was not used again until 1953 when the installation of the column exchange (Colex) process began and within fifteen months retrofits were completed and the system was in operation. The Colex process involved an electrochemical and solvent extraction method that required substantial quantities of mercury as a solvent agent to separate the lithium-6 isotope from lithium-7 (in the form of lithium hydroxide). Production continued until 1962 when the equipment was drained of the majority of process materials (including mercury). However, all systems/components were not cleaned, and some recoverable quantities of mercury and lithium hydroxide remained in the equipment and lines. As a result, airborne mercury is a continual hazard for workers in the facility and is a minor contributor to ambient air mercury concentrations at the Y-12 Site.

Ancillary facility 9720-46 (Storage) – This is a pre-engineered metal building measuring approximately 100' long by 30' wide and approximately 20' tall having a pitched metal roof. The structure is located on an on grade concrete slab. The current function of this

facility is to provide storage space for drummed waste associated with Y-12 operations. It is assumed to have the potential for radiological surface contamination, asbestos piping, mold, mildew and animal intrusions

Ancillary structure 9501-5 (161 kV Steel Transformer) - This is a transformer that currently feeds power to 9999-8 switchgear, power distribution, building. Reconfiguration of power distribution is required prior to D&D. The only known hazards associated with this structure is PCB oils at < 5ppm.

Ancillary structure 9804 (Utilities) Fire Sprinkler Valve House – This facility is approximately 12' long by 12' wide and 12' in height, constructed of formed and poured concrete walls with a reinforced concrete foundation and poured concrete floor. The facility has a flat concrete roof. The facility currently houses the fire sprinkler valve for 9999-8. There are no known hazards associated with this structure. It is assumed to have the potential for radiological surface contamination, asbestos piping, mold, mildew and animal intrusions.

Ancillary structure 9999-8 (Switchgear Building) – This is a pre-engineered metal building measuring approximately 54' long by 42' wide and approximately 28' tall having a pitched metal roof. The structure is located on an on grade reinforced concrete slab. Currently the facility is a major distribution hub for the west end electrical services. Reconfiguration or transfer of services will have to be completed prior to D&D. It is assumed to have the potential for radiological surface contamination, asbestos, PCB's mold, mildew and animal intrusions.

<u>ALPHA-5 Complex</u>

- Building 9201-5 - *Production* (613,642 square feet)
- Building 9622 - *Steam House (Inactive)* (218 square feet)
- Building 9983-HF - *Change House* (375 square feet)
- Building 9808 - *Maintenance* (7,540 square feet)
- Building 9404-20 - *Laborer Shack* (2,751 square feet)
- Building 9422-15 - *Storm Drain Monitoring #16* (62 square feet)
- Building 9422-16 - Storm Drain Monitoring #5 (64 square feet)
- Building 9976 - *Utilities* (2,797 square feet)
- Building 9767-13 - *Chiller Building* (20,724 square feet)
- Building 9422-13 - *Storm Drain Monitoring #6* (362 square feet)
- Building 9404-13 - *Pumphouse* (953 square feet)
- Building 9409-13 - *Cooling Tower* (8,387 square feet)
- Building 9416-31 - *Fire Protection Valve House* (162 square feet)
- Building 9416-14 - *Utilities (management)* (44 square feet)
- Building 9404-18 - *Demineralizer Facility* (4,760 square feet)

The Alpha-5 Complex is located within the protected area of the Y-12 Site and includes facilities: 9201-5, 9622, 9983-HF, 9808, 9404-20, 9422-15, 9422-16, 9976, 9767-13, 9422-13, 9404-13, 9409-13, 9416-31, 9416-14, and 9404-18. These 15 facilities combined have a total of 662,841 gross square feet. The Alpha-5 Facility (Building 9201-5) is the largest at 613,642

square feet. It is a transite-covered, structural steel and concrete facility with 4 floors and an 11 feet deep concrete basement. The basement is continually flooded with up to 6 feet of water.

Alpha-5 was constructed in 1946 to house alpha-stage Calutrons for uranium enrichment. The facility was used from 1946 until 1951 for uranium enrichment operations, from 1951 until 1963 for COLEX Lithium/Mercury enrichment operations, from 1963 until 1995 for various metallurgical and machining processes involving uranium and beryllium and from 1995 to the present for the following 5 operations: arc melt/skull cast, ceramic machining, product certification, programmatic support and numeric control maintenance. The Colex process involved an electrochemical and solvent extraction method that required substantial quantities of mercury as a solvent agent to separate the lithium-6 isotope from lithium-7 (in the form of lithium hydroxide). Production continued until 1963 when the equipment was drained of the majority of process materials (including mercury) and removed from the building. However, some quantities of mercury and lithium hydroxide may remain.

The facility also has a mercury contaminated basement and soils. As a result, airborne mercury is a continual hazard for workers in the facility and is a minor contributor to ambient air mercury concentrations at the Y-12 Site. Contaminants of concern include, but are not limited to, mercury, asbestos, PCBs, beryllium and radiological contamination.

BETA-1 Complex:

- Building 9204-1 – Office Maintenance Shops and Storage/Beta-1 (210,491 Sq. Ft.)
- Building 9422 – Helium Compressor Building (2,671 Sq. Ft.)
- Structure 9501-4 – 161KV Steel Transformer (square feet included in Beta-1)

The Beta-1 Complex is located in the property protected area of the Y-12 Site on Second Street and the corner of "E" Street. The Beta-1 Complex comprises a total of 213,162 square feet. There are a total of 3 facilities that make up this complex; Beta-1 (Building 9204-1) being the largest facility at 210,491 square feet. Ancillary structures 9422 and 9501-4 occupy the remaining 2,671 square feet in this complex. The Beta-1 Facility is a 2.1 storied facility having a partially concreted basement with an average depth of 9.5'. The footprint occupies 75,012 SF. The facility has 3 roof lines with the highest vertical distance from first floor finished elevation being 71'. The remaining basement surface is occupied by reinforced concrete foundation system or earthen floor. The basement walls are constructed of reinforced formed and poured concrete. The exterior of the facility is constructed of heavy hollow clay tile blocks. The interior walls are constructed of reinforced concrete, heavy hollow clay tile block, hollow core cinder block, wood, gypsum board and or metal. The roof has a flat bituminous built-up roof with a gravel weather cover that is supported by a concrete panel and structural steel support system in portions of the high bay area. Beta-1 facility was constructed in 1943-44 timeframe to house Beta calutrons "racetracks", track 1 and 2. The calutrons operated until 1945. The facility was placed in operational stand by for a short period and decommissioned by 1947. The facility spent the next three years performing various R&D and uranium recovery operations. In 1950 the facility was transitioned to ORNL research and development and operations and continued R&D work until 1995. During that period the stable isotopes such as

depleted uranium and thorium were used in some of the research. The facility is currently home to shutdown R&D experiments, office space, maintenance operations and possible small scale research projects. It is believed, in 1947 most of the calutron equipment, components and systems were removed and drained. Radiological scoping surveys show, however, that piping and other components have residual radiological hold-up. The smaller self-contained experimental systems typically did not involve radiation in their processes but they still have hazardous chemical hold-up present. The facility is considered a "fixed contamination area" as noted on the entry ways to the building. TRU limits apply. The facility also contains large quantities of asbestos containing material and universal wastes. The objective of the Beta-1 Complex D&D Project is to remove the hazardous materials such as asbestos, deactivate the buildings, remove the equipment and appurtenances and demolish all above grade facilities and ancillary structures within the complex to grade level.

Deactivation Only Complex:

- Building 9204-3 – CTD – Isotope Separations (Beta-3) (255,656 Square Feet)
- Building 9731 – Laboratory and Storage (37,159 Square Feet)
- Structure 9501-8 – 161 KV Steel Transformer (square feet included in 9204-3)

The Deactivation Only Complex addresses those facilities which are considered for National Historic Preservation (NHP) as historical buildings. The complex consists of the Beta-3 (9204-3 Building) and Building 9731. Building 9204-3 is located in the protected area of the Y-12 Site on Second Street while 9731 is located First Street in the property protected area. The 9204-3 building totals of 255,656 square feet and has one named ancillary facility, 9501-8, a 161 KeV transformer. The transformers square footage has been assumed into the main facility square footage and does not have an associated square footage noted. Building 9731 has no named ancillary facilities.

The Beta-3 Facility is a 2.1 story facility having a fully utilized concrete basement with a depth of 14'. The building occupies 88,419 SF. The facility has 3 roof lines with the highest vertical distance from first floor finished elevation being 72'. The 9731 Facility is small in comparison, only having a footprint of 17,255 square feet and a total square footage of 37,159. Building 9731 is a 1.1 story facility having a fully utilized concrete basement with a depth of 16'. The facility has three distinct roof lines with the highest roof line being approximately 63'. The basement walls and floors for both facilities are constructed of reinforced formed and poured concrete. The exterior of each facility is constructed of heavy hollow core clay tile blocks. The interior walls are constructed of reinforced concrete, heavy hollow clay tile block, hollow core cinder block, wood, gypsum board and or transite wall board. The roofs have a flat bituminous built-up roof with a gravel weather cover that is supported by a concrete panel and structural steel support system in portions of the high bay area.

The Beta-3 facility was constructed in the 1943 time-frame for the second pass separation of U-235 through the Beta tracks 5 and 6. The calutrons operated until 1951 in this capacity at which time they were converted over to produce stable isotopes for medical, business and agricultural uses. The facility operated in this capacity until 1985, at which time

the east beta track was taken out of service. The west calutron was utilized until July of 1998. The west calutron has been maintained periodically and brought to 85% power as late as 2005. This facility is considered to be in operational stand-by today and represents what the calutron operation of the past resembled. The eastern track is still radiologically contaminated with the actinide series of nuclides and no decontamination or dismantlement performed. Hold up within the process lines have not been drained or characterized. The western beta track was cleaned with minimal D&D performed in preparation of being placed on the NHP List. The remaining equipment in the basement and above floors still remain intact and requiring decontamination, but not dismantlement. The facility houses a large amount of oils, 35,000 gallons of "Z oil", calutron coolant oil, 42,000 of gallons of transformer/capacitor oils that are contaminated with PCB's and possible other constituents. Oils have varying levels of PCB content from <2ppm up to 100% (1 million parts) pure PCB oils. Labs contain much of the equipment that was used during operations with hoods, ventilation, building surfaces and equipment being contaminated. Currently this facility has a very well defined inventory list of hazards, stored equipment and product inventories within the facility. Pounds of stable isotope bulk powders are still currently stored in this facility. Asbestos containing materials are throughout the facility in varying degrees of degradation. Beryllium has been identified in several rooms. Other universal waste also remains in the facility.

Building 9731 was constructed in 1943 as the calutron pilot plant. It housed 2 alpha and 2 beta calutrons. The separation of isotopes was stopped shortly after construction and then became the full scale training facility for the operations of the calutrons. Stable isotope production and testing was conducted in 1945 into the mid 1960's. The facility is intact with a majority of systems and components still in place. The facility is posted as a Fixed Contamination Area using TRU Limits. The facility has no supporting radiological characterization data to support this statement. The process pipe systems have been drained but not flushed in this facility. The main concern is PCB's that still remain in the process lines. Other chemical concerns are Hg contaminated sumps and floors, falling ACM, universal wastes, potential for perchlorate associated with one hood still remaining in the basement and the potential for Be in the facility. Currently the facility has several Lithium experiments being conducted and serves as office space and storage of equipment.

BETA-4 Complex:

- Building 9204-4 – Production (Beta-4) (313,771 GSF)
- Building 9404-16 – Storage Building (1,526 GSF)
- Building 9409-20 – Cooling Tower (1,600 GFS)
- Building 9501-9 – 161 kV Transformer (--[1] GFS)
- Building 9720-22 – Warehouse Building (12,712 GFS)
- Building 9720-24 – Storage Building (11,192 GFS)
- Building 9802-1 – Steam Valve Room (151 GFS)
- Building 9802-2 – Steam Valve Room (151 GFS)
- Building 9811-1 – Waste Oil Storage (OD8) (4,917 GFS)
- Building 9811-4 – Tanker Transfer Station (1,112 GFS)
- Building 9811-5 – Waste Coolant Facility (4,800 GFS)
- Building 9983-78 – Office (200 GFS)

The 9204-4 Complex is located within the protected area of the Y-12 Site just east of Old Bear Creek Road and south of Bear Creek Road. The Beta-4 Complex comprises a total of 352,132 square feet. There are a total of 12 facilities that make up this complex; 9204-4 being the largest facility at 313,771 square feet and 9404-16, 9409-20, 9501-9, 9720-22, 9720-24, 9802-1, 9802-2, 9811-1, 9811-4, 9811-5, and 9983-78 being ancillary structures occupying the remaining 38,361 square feet in this complex. Beta-4 is a 2.1 story facility having a 15' deep concrete basement footprint of 87,450 square feet. The facility exterior is constructed of a heavy hollow core clay block supported by both reinforced concrete columns and structural steel columns with an overall height just over 71 feet. The exterior is covered in 26,637 square feet of corrugated transite siding. The interior walls are constructed of heavy hollow core clay tile block, masonry hollow core block, concrete, metal, wood or gypsum board. The roof is a flat bituminous built-up roof with a gravel weather cover. It is supported by a concrete panel and structural steel system.

The 9204-4 Facility was constructed in 1944–45, housing two beta calutrons. The calutron process was discontinued the next year, 1946, and the process of removal continued until the early 1950's. The building began reconfiguration efforts to accommodate the ELEX Lithium Isotope Separation Program which produced Lithium-6. The electroexchange separation process (ELEX) operated in Beta-4 from 1953 to 1956 to produce Lithium-6 for use in weapon production. The ELEX program was ended and equipment removed in the late 1950's. Reconfiguration efforts were completed in the 1960's and early 1970's to support weapon fabrication and support operations. Currently, the facility houses the Quality Evaluations laboratory, a reclamation area, DSO storage, metal press operations, facility maintenance operations and general storage. Beta-4 is currently listed as a Hazard Category 2 facility, but is currently reducing its radiological inventory to reduce that classification. DU, HEU and Thorium are considered the main radiological contaminants with TRU limits applying to surface release criteria. The primary chemical hazards include lead, PCBs, freon, oils, mold, mildew, and asbestos. Other chemical concerns include the potential for beryllium contamination on surfaces in excess of 8' and the worst case potential for mercury contamination on 50% of the surfaces and structural components in the facility.

Biology Complex:

- Building 9207 – Biology Building (256,660 GSF)
- Building 9207 A – Biology Building Annex (8,108 GSF)
- Building 9210 – BD Mammalian Genetics (64,737 GSF)
- Building 9401-1 – Steam House (Old Steam Plant Building) (13,227 GSF)
- Building 9743-2 – Pigeon House (2,371 GSF)
- Building 9767-6 – Utilities (400 GSF)
- Building 9767-7 – Utilities (Fan House for 9207) (393 GSF)
- Building 9770-2 – Lead-lined Source Shed (Radiation Source Building) (155 GSF)

- Building 9770-03 – Emergency generator (166 square feet)

The Biology Complex is located in the northeast portion of the Y-12 Site outside of the Property Protection Area and includes facilities 9207, 9207-A, 9210, 9211, 401-1, 9743-2, 9767-6, 9767-7, and 9770-2. These facilities have a combined total of ~462,000 gross square feet. With the exception of 9401-1 (Old Steam Plant), the Biology complex is "cold and dark" (i.e., all service utilities are deactivated and air gapped in shutdown status pending D&D). The Biology Building (9207) is a 256,660 GSF, 6-story building with terracotta block external walls as high as 95'. The building was constructed in 1943 and originally used for uranium salvage and recovery operations. Later, the facility was used for ORNL biological research operations. All combustibles have been removed from the facility prior to becoming "cold and dark." Current access is restricted due to questionable structural integrity and the presence of mold and mildew. It is estimated that 2,936 CF of legacy waste remains in the facility. The primary chemical hazards include lead, PCBs, freon, oils, perchloric acid, and asbestos. Radiological contamination is present and TRU limits apply. A smaller office annex, 9207-A is attached to the Biology building.

Building 9210 (BD Mammalian Genetics) – This is the next largest facility in the Biology complex at 64,737 GSF. Also built in 1945, this 3-story building's structure and characteristics are similar to those described above.

Building 9401-1 Steam House (old steam plant) – This facility was built in 1943 and is 13,227 GSF. This single story facility has 30' high walls and is constructed of heavy clay hollow core block, hollow core cinder block, and brick exterior on portions of the building. This facility is posted "fixed contamination." This facility served as the Y-12 east end steam plant and now supports Y-12 storage. Chemical hazards are similar to those described above. It is estimated that 2,125 CF of legacy waste remains in the facility.

The remaining facilities within the Biology complex 9743-2, 9767-6, 9767-7, 9770-2, and 9770-3 are ancillary support facilities or small biological research facilities that have similar characteristics as those facilities already described above.

9206 Complex:

- Building 9206 – Production (57,812 square feet)
- Building 9720-17 – Butler Building/Storage (4314 square feet)
- Building 9744 – Utilities (9081 square feet)
- Building 9768 – Power House (1243 square feet)
- Tank Farm – 3200 square feet

The 9206 Complex is located within the protected area of the Y-12 Site and includes facilities 9720-17, 9744, 9768, and the OSF tank farm. These facilities combined have a total of 75,650 gross square feet. The 9206 Facility (Building 9206) is a 57,812 square feet, on slab, clay tile block, structural steel and concrete facility having 1 floor and two elevated 2 story sections with a height of 32'. Building 9206 was constructed in 1945 with an original mission

to recover HEU and process salvaged uranium from the electromagnetic separation process until 1946. From 1947 until 1994, Building 9206 operated as a uranium product recovery and salvage facility. In addition, operations consisted of uranium chemical processing and metal production operations between 1951 and 1994. From 1994 until present, the facility has been undergoing deactivation of systems, has had minimal surveillance and maintenance activities and serves as a storage facility for in-process materials. However, all systems/components have not been cleaned and some recoverable quantities of HEU may remain in equipment and processes. In 2006, the southwestern corner of the facility was decontaminated and demolished.

9212 Complex:

- Building 9212 - Production (442,317 square feet)
- Building 9409-22 - Cooling Tower (1,829 square feet)
- Building 9409-22E - Cooling Tower (4,519 square feet)
- Building 9409-23 - Cooling Tower (3,454 square feet)
- Building 9409-24 - Cooling Tower (3,200 square feet)
- Building 9416-12 - Utilities (management) (126 square feet)
- Building 9416-20 - Utilities Building (90 square feet)
- Building 9416-28 - Fire Protection Valve House (149 square feet)
- Building 9416-32 - Utility Support for Cooling Tower (200 square feet)
- Building 9416-46 - Valve House (54 square feet)
- Building 9423 - Maintenance Shop (6,263 square feet)
- Building 9721 - Office/Support Trailer (157 square feet)
- Building 9723-25 - Changehouse/Offices (18,974 square feet)
- Building 9767-10 - Chiller Building (12,000 square feet)
- Building 9811-9 - Tanker Loading Station (756 square feet)
- Building 9812 - Abandoned Tanker Station (Tank Pit) (1,190 square feet)
- Building 9815 - Material Recovery (Nitrate Facility) (1,722 square feet)
- Building 9818 - Material Recovery (Acid Waste Neutralization) (7,561 square feet)

- Building 9820 - Old Butler Building (Electrical Storage) (408 square feet)
- Building 9828-1 - Dry Exhaust System (Bag Filter System) (557 square feet)
- Building 9828-2 - Dry Exhaust System (Probe House) (568 square feet)
- Building 9828-3 - Dry Exhaust System (Bag Filter System) (568 square feet)
- Building 9959-1 - Cylinder Storage (106 square feet)
- Building 9980 - Storage and Office (Physical Testing, X-ray) (4,361 square feet)
- Building 9981 - Vaults (Physical Testing, X-ray) (4,972 square feet)
- Building 9996 - Tooling Storage (34,233 square feet)
- Building 9999 - Emergency Generator Room (460 square feet)

The 9212 Complex is located within the northeast portion of the protected area at the Y-12 Site and includes 27 facilities/structures totaling 548,805 square feet. Fourteen of the 27 facilities including 9212 are designated Nuclear Hazard Category 2 facilities.

The 9212 Building is a 442,317 square foot, 2 story reinforced concrete, concrete block, and steel building that was constructed in 1949 and is used for the recovery, purification, and

processing of enriched uranium into usable products. The building is comprised of multiple wings performing different manufacturing and production functions. The first and second floors are primarily concrete and the third and fourth floors are primarily metal grating. Some rooms have stainless steel sheets up to three-sixteenths of an inch thick. There is a tremendous amount (i.e., miles) of stainless steel process piping and equipment throughout the facility as well as an extensive HVAC duct system that runs throughout the facility. There are numerous radiological hazards present in the facility including fixed contamination and removable surface contamination. Fissile material is also present in the facility and hold up material in process equipment is likely to be encountered during D&D activities. Asbestos, PCBs, lead, and other chemical hazards including nitric acid, ammonium hydroxide, hydrogen peroxide, and hydrofluoric acid are present in the facility. There are also beryllium contaminated material storage areas in the facility. The facility also has a basement averaging 9' deep.

The following paragraphs below provide a brief description of a few of the larger, supporting, facilities within the 9212 Complex.

Just south of 9212 is Building 9996 (Tooling Storage), which is the second largest facility in the complex having 34,233 square feet. Building 9996 is a 2-story concrete block facility with a main level/high bay area and a second floor change house on the east side of the building. Fixed and removable contamination exists in the facility. Two 10-ton cranes are present in the high bay area, and an estimated 10-15% legacy material and process waste occupy the facility.

Building 9818 (Material Recovery) is a 7,561 square feet facility located west of 9212. This basement and three-floor concrete facility is non operational. Stainless steel plate covers the concrete flooring. The basement has 8 stainless steel tanks ranging in size from 80 – 10,000 gallons. It is estimated that 10% of the building's volume is occupied with process equipment. Both fixed and removable contamination exists, as well as asbestos, PCBs, mold and animal wastes. A natural spring exists beneath the basement which will need to be managed during RA activities.

Building 9423 (Maintenance Shop), east of Building 9212, is a 6,263 square feet Butler Type structure (i.e., concrete floor, insulated roof over structural metal frame) and has a mezzanine in the southwest corner of the facility. The facility contains a 10-ton crane and is estimated to contain 10% of the building's volume in legacy material/waste. The facility is expected to have fixed contamination and ACM.

Sitting adjacent to 9212 on its east side, is Building 9981 (Vaults/Physical Testing, X-ray). This facility is 4,972 square feet and is similar to 9980 which sits just north of 9981. This facility has hollow concrete block offices, as well as three vault rooms with concrete walls 3 feet thick which contain hoists and X-ray equipment. There are numerous radiological hazards associated with this facility in addition to lead and ACM.

Steam Plant Complex:

- Building 9401-3 – Steam Plant Building (62,124 GSF)

- Building 9616-10 – Unloading Station (438 GSF)
- Building 9616-9 – Waste Water Treatment Building (3,400 GSF)
- Building 9811-6 – Dry Ash Handling Facility (1,546 GSF)
- Building 9811-7 – Wet Ash Handling Facility (1,363 GSF)
- Building 9990 – Monitoring Station (80 GSF)

The Steam Plant Complex (Building 9401-3) is located in the south-southwest portion of the Y-12 Site inside of the Protection Area. The complex includes facilities 9616-9, 9616-10, 9811-6, 9811-7, and 9990. These facilities have a combined total of 68,951 gross square feet. The Steam Plant (9401-3) is a 62,124 GSF, approximately 5-story, 85' high, pre-engineered steel building with corrugated aluminum and transite external walls and roof. The building was constructed in 1955 and consists of 4 boiler steam generation setup having two 190' tall emission stacks. The west stack is 12.5' diameter and the east stack is 15 in diameter. It is estimated that 35,757 CF of legacy waste remains in the facility. The primary chemical hazards include Hg, Pb, PCBs, asbestos, with biological hazards such as mold and animal wastes. Another concern involves the issues surrounding remaining coal dust in the facility. To D&D this facility, hot work will be required and the coal dust remaining is highly flammable. Radiologically, there is no known contamination present except naturally occurring radionuclides present in the coal and those that are concentrated in the remaining fly ash.

The next largest facility is the Waste Water Treatment Facility Building 9616-9. This 2-story facility is 3,400 GSF and of similar design/construction as 9401-3, but having no asbestos siding or roofing material. Built in 1985, it serves as the waste water treatment facility. The facility has no known radiological hazard or chemical hazards. There are currently stored chemicals that support current operations.

Building 9811-6 Dry Ash Handling Facility and Building 9811-7 Wet Ash Handling Facility combine for a total of 2,909 GSF. The facilities were constructed in 1995 and 1990, respectfully. Each structure is similar in construction of the main facility. Currently the facility is not known to contain any chemical or radiological hazards.

Building 9616-10 Unloading Station is associated and attached to Building 9616-9. It is a one story building built of similar construction as 9401-3 having 438 GSF. The facility has no known asbestos siding or roofing material. Built in 1986, it has been used as an unloading and tank storage area for the steam plant. There are no known chemical or radiological hazards associated with this facility other than chemicals that are currently in use. Currently the facility is not known to contain any chemical or radiological hazards.

Building 9990 Monitoring Station was built in 1973 and is 80 GSF. This is a single story facility with a portion of the facility constructed of metal walls and roof on an elevated concrete pad that adjoins a concrete block structure having a corrugated asbestos roof. Chemical hazards are similar to those described above.

Balance of Facilities Complex:

- Building 9424-1 – Foam House for OD-9 – (359 GSF)

- Building 9424-2 – Foam House for OD-10 – (357 GSF)
- Building 9703-14 – Guard Booth Ancillary to 9213 – (123 GSF)
- Building 9840-4 – Drum Cleaning Station – (312 GSF)
- Building 9983-FX – FRC Field Support Trailer – (680 GSF)
- Building 9999-2 – Motor Generator – (266 GSF)

The Balance of Facilities D&D Complex includes numerous facilities located in both the limited land areas; property protected areas, and protected areas of the Y-12 Site. The Balance of Facilities D&D Complex comprises a total of 2,097 square feet. There are 6 ancillary support facilities/structures that make up this complex. The facilities included are; 9424-1, 9424-2, 9703-14, 9840-4, 9983-FX, and 9999-2. The bullets below briefly discuss each of the facilities/structures.

- 9424-1 and 9424-2 (Foam House for OD-9 and Foam House for OD-10 respectively). These are pre-engineered metal buildings occupying 359 square feet each having a sloped metal roof. The structures are constructed on an on-grade concrete slab with 9424-2 having an elevated concrete pad. The current functions of these facilities are fire water valve controls. There are no known hazards or postings associated with these facilities. It is assumed they have the potential for radiological surface contamination, asbestos insulation, mold, mildew and animal intrusions
- 9703-14 (Guard Booth Ancillary to 9213) and 9999-2 (Motor Generator). These ancillary facilities were constructed in 1950 and served as a guard booth or storage facility and housing for motor generator or auxiliary power generator. 9703-14 occupies 123 square feet and 9999-2 occupies 266 square feet. Both facilities are constructed of reinforced formed and poured concrete walls having a poured reinforced concrete foundation and flat concrete roof. Currently the facilities are unoccupied and are "Cold and Dark." There are no known hazards or postings associated with this facility. It is assumed they have the potential for radiological surface contamination, asbestos insulation, mold, mildew and animal intrusions
- 9840-4 (Drum Cleaning Station). This facility occupies 312 square feet and is a portable unit. It is constructed of a steel I-Beam frame with metal exterior. It is located on a concrete pad measuring approximately 750 square feet. There are no known hazards or postings associated with these facilities. It is assumed to have the potential for radiological surface contamination, asbestos piping, mold, mildew and animal intrusions.
- 9983-FX (FRC Field Support Trailer). This facility is a mobile modular home converted to office space, experimental R&D, and radiological source storage. It is constructed of wooden stud, metal frame and metal roof. It occupies 680 square feet. The structure is anchored down by use of concrete jersey barriers and underpinned with a corrugated fiberglass board that potentially contains asbestos. Currently the facility is unoccupied. It is assumed to have the potential for radiological surface contamination, asbestos, PCB's mold, mildew, and animal intrusions.

Transition Facility D&D:

- Building 9213 – Old Criticality Experiment Laboratory (23,635 GSF)

- Building 9401-2 – Plating Shop (13,673 GSF)

9213 – Building 9213 is a two-story concrete and concrete block structure about 200 ft. long and 80 ft. wide with three test cells of floor area between 900 and 1,520 ft^2. It is located in a remote area in the southeast portion of the Y-12 Plant and is surrounded by large hills. The Critical Experiment Facility (CEF) is 30% of Building 9213 and consists of Rooms 101, 102, 201, 202, and 204, generally referred to as the West Test Cell Area. The building operations, critical and near critical experiments with fissile uranium isotopes, began in 1950. During the years 1950 through 1961, more than 9,700 experiments were performed with approximately 95% of the assemblies having been made critical. The CEF was also used to make preoperational reactivity measurements on fresh High Flux Isotopes Reactor fuel elements beginning in 1965. The CEF ceased operations in March 1987. All nuclear fuel elements have been removed. Contamination has only been observed in the West Test Cell Area. Maximum alpha is 1, 7600,000 dpm fixed and 50,000 removable. Maximum beta/gamma is 210,000 dpm fixed and 30,000 dpm removable. No hazardous materials, as defined in the OSHA Hazardous Communication Standard, remain in the building.

9401-2 (General Plating Shop) - The General Plating Shop is a single-story, steel-framed, 42 ft. high structure. It was constructed in 1946 as part of the Y-12 Plant construction and housed the steam plant until 1955 when the facility was converted to a plating shop.

The facility is a non-radiological facility that once supported the following plating/coating processes: acid copper, aluminum anodizing and dyeing, nickel plating, electrolysis nickel plating, black oxide, acid zinc, chrome plating, chromate conversion, alodine coating, and stainless steel passivation. Other operations included cyanide plating, alkaline cleaning, pickling, masking, surface polishing, and waste handling. There are 44 process chemical plating tanks that range from 39 to 3,925 gallon capacity. The tanks contain residual hazardous chemical contamination and are currently covered with plastic sheeting. Point source exhaust systems were installed for many of the plating tanks due to the chemical fumes created. Hoods and process tanks are considered contaminated with chemical residues. The tanks are located on wooden platforms that were integrated as a single platform that occupies the majority of the facility. The platform is elevated approximately 5 ft from the floor with an extensive array of chemical supply and drain piping associated with the plating tanks. A dike was constructed on the concrete floor under the plating area. It was breached during a stabilization campaign in 1998.

Two additional storage tanks (4,000 and 6,500 gallon capacities) are located in a dike and are outside of the facility near the northwest corner. During operations, these tanks were used for waste collection. The tanks would store waste until it could be pumped into a transport tanker for shipment to a waste disposal site. All tanks, inside and outside of the facility, have been drained and flushed. Since stabilization in 1998, the facility is no longer occupied, with all process materials and chemicals having been removed.

There are no nuclear materials present in the facility and there is no indication that any nuclear materials were ever stored. Although process history does not indicate radiological processes or the plating of radioactive materials, fixed contamination exists inside the building in four small floor areas. The fixed contamination level does not require further decontamination. All process materials, unused chemicals, and generated waste have been stabilized and removed from the facility, with residual chemical contaminants remaining. The facility is categorized as Other Industrial and classified as Other Industrial.

EM Facilities D&D:

- Building 9825-01 – Depleted Oxide Vault (1,608 GSF)
- Building 9825-02 – Depleted Oxide Vault (1,608 GSF)
- Building 9809-1 – Depleted Uranium Oxide Shed (1,564 GSF)
- Structure OD-7 – Waste Oil Storage (Bulk Oil/Solvent Waste) (16,439 GSF)
- Structure OD-9 – Waste Oil Tanks (27,911 GSF)
- Building 9720-44 – Sludge Handling Facility (2,993 GSF)
- Building 9720-45 – Liquid Organic Facility (Bay and Tanks) (2,190 GSF)

The Uranium Oxide Storage Vault (UOSV) Complex is located at the southwest end of the Y-12 Plant, on Chestnut Ridge, and northeast of Building 9213. Access to the area is from Mt. Vernon Rd., via a 20 ft-wide asphalt surface. The UOSV Complex is situated significantly higher than the access road to the facility. The UOSV Complex is comprised of two underground storage vaults (9825-1 and 9825-2); a temporary storage enclosure (Bldg. 9809-1); a portable office (Bldg. 9809-2); and BCS No. 9 (9983-CF), which serves as the entry point for the storage vault Radiation Control Area. The UOSV Complex also includes an asphalt loading/unloading area adjacent to buildings 9825-1, 9825-2, and 9809-1, plus all above grade materials and structures within 15 ft of any of the buildings mentioned, such as a skid mounted building and three-sided storage building.

The UOSV Complex was constructed in 1985 to provide indefinite retrievable bulk storage for uranium oxides, saw fines, and uranium metal scrap generated at Y-12. Vault 9825-1 is partially filled (~38%) with uranium oxide. In 1992, all dumping into this vault was suspended and the uranium oxide material in the vault is now a solid, hardened mass. Vault 9825-2 was never used for its intended purpose and is empty. There are no plans to resume uranium oxide dumping into either vault. Building 9809-1 provided staging and temporary storage of depleted uranium oxide drums. This facility is empty and will not receive additional waste for storage. Building 9809-2 is an ancillary facility with no inventory.

The UOSV Complex has a nuclear hazard categorization of Radiological and a non-nuclear hazard classification of Low (BJC 2004d).

There is no permanent staff located at the UOSV Complex. Staff is only present during S&M activities associated with the performance of periodic surveys, inspection of the drainage system and vault structures, periodic inspections in the 9825-1 vault, and maintenance activities associated with vegetation control and facility repairs.

OD-7 (Hazardous Waste Storage Facility and Building 9811-1). Oil Dike (OD-) 7, also known as Bldg. 9981-1, is the Hazardous Waste Storage facility. It was constructed for bulking and storing wastes prior to shipment to the TSCA Incinerator at ETTP and was operated for approximately 14 years. It was RCRA closed in February of 2003. It received hazardous chemicals, primarily waste oils and solvents, contaminated with < 50 ppm PCBs and low levels of uranium and beryllium, from various Y-12 Plant operations. The facility is located near the corner of K Road and West 2nd Street and is a 51 by 58 ft concrete dike approximately 4 ft high. It has six above ground storage tanks [four 30,000 gal tanks (F1-F4), one 10,000 gal tank (F7), and two 10,000 gal tanks (F5 and F6)], concrete secondary containment around the tanks, loading/unloading stations, material handling/staging/storing areas, sumps, pumps, piping, instrumentation and accessories. Building 9981-1 is a one story metal frame building adjacent to Oil Dike 7 that was previously used to store drums. It does not contain any hazardous material.

Tank interiors, ancillary equipment and secondary containment met the clean debris surface standard [as defined in 10CFR40 Part 268.45 and incorporated into Tennessee Rule 1200-1-11-.10(3) (a)] with some piping being removed and disposed. RCRA closure has been certified. The interior of the tanks have been posted as a radiological area. There were no other hazards identified on the Preliminary Hazard Screening Worksheet. The area is categorized as Other Industrial based on process knowledge in that the site met the clean debris surface standard and classified as Other Industrial based on RCRA closure.

OD-9 (Waste Oil/Solvent Storage Unit, Building 9811-8). OD-9, including Building 9811-8, was constructed for bulking and storing wastes prior to shipment to the TSCA Incinerator at ETTP. It was operated for approximately 13 years and RCRA closed in late summer of 2001. There is no active fire suppression system associated with the facility. It had six above ground storage tanks, concrete secondary containment around the tanks, loading/unloading stations, material handling/staging/storing areas, sumps, pumps, piping, instrumentation and accessories. There is a boundary control station, an office trailer (9983-CE), and abandoned equipment (e.g., a sanitary dumpster, metal spill pallets, trailer-mounted pressure washer) on the facility footprint. There a 4 garage sheds (9720-87, 9720-88, 9720-89 and one not numbered) also on the facility footprint. The unnumbered shed contains abandoned equipment waiting disposal (e.g. drum crushers and torpedo heater) and a flammable storage cabinet. There is a flammable storage cabinet in the office trailer. The office trailer (9983-CE) has been cleaned, locked and is scheduled to be removed from the site by the end of 2007. There are six forklifts on the facility footprint available for use or disposal.

Wastes were compatible, aqueous, organic, RCRA (toxicity and listed) hazardous/TSCA-PCB/radiologically-contaminated liquids/oils. Wastes were predominately liquid with some sludge/solids that were generated at Y-12; delivered and stored at OD-9 until sufficient volume accumulated; and then transported to an outside recovery/disposal facility. OD-9 was for non-ignitable wastes—typically oil and organic solvents (chlorinated and non-chlorinated), some of which contained trace metals, radionuclides, and PCBs (typically <50 ppm); the maximum allowable inventory was 200,000 gallons in tanks and 8,800 gal in containers. Fissile radionuclides other than U-235 were not allowed without prior approval. Wastes occasionally included segregated streams of non-hazardous waste and oil regulated

under the used-oil standards. Pesticides and herbicides were not permitted. Wastes were not classified.

Tank interiors, ancillary equipment and secondary containment met the clean debris surface standard [as defined in 10 CFR 40 Part 268.45 and incorporated into Tennessee Rule 1200-1-11-.10(3) (a)] with some piping being removed and disposed. RCRA closure has been certified. The interior of the tanks as well as the drum crusher at the loading/unloading station have been posted as radiological areas. There were no other hazards identified on the Preliminary Hazard Screening Worksheet. The chemical inventory, including the flammable storage cabinet, is being maintained less than RQ. The area is categorized as Other Industrial based on process knowledge in that the site met the clean debris surface standard and classified as Other Industrial based on RCRA closure.

Sludge Handling Facility (Building 9720-44). The Sludge Handling Facility is a rectangular area located along the Y-12 Plant South Patrol Road, and is designated as Building 9720-44. Building 9720-44 is a single-story, metal structure approximately 25 ft high with no walls. The structure is surrounded by gravel and grass. Two holding tanks are inset into the floor of the structure and are connected to a central channel that runs to the west approximately 30 ft and connects with an elevated, inactive pump unit and small tank. Approximately 20 ft to the east of these holding tanks is another small, inactive, pumping unit and holding tank. Electrical switchgear is present; however, electrical service to the facility been disconnected. The facility footprint extends south to the South Patrol Road, east to the access road, and north and west to the drainage swales. A concrete storage pad located east of the access road is no longer part of this facility, but was once used to store containers of low-level mixed (LLMW), waste and asbestos-contaminated waste. The pad is now managed separately by BWXT.

Historically, the facility was used to support a sludge dewatering operation for sludge that had accumulated over many years in the Y-12 storm drain system. The facility was constructed in 1986 for the "Reduction in Mercury in Plant Effluents" project. The dewatering operation was conducted for less than a year before completing its mission. After the dewatering activities were completed, the filters were removed, the equipment was cleaned, and the operation shut down. The remaining sludge was cleaned out and removed from the facility. The dewatering equipment remains at the facility. Since that time, the only operation at the facility has been to store and retrieve waste containers from the adjacent storage pad. The waste containers have all been removed.

The facility is in S&M awaiting D&D with periodic inspections, radiological monitoring surveys, etc being performed. The facility also may be used as a laydown area for items such as construction materials and equipment. Heavy equipment and vehicles (e.g., fork trucks, transfer trucks, cranes, etc.) may be used at the facility for movement of heavy objects.

Facility maintenance activities range from simple tasks such as installation of locks on doors, removing and placement of signage, housekeeping (cleaning, trash removal, etc.), and hot work (welding) to larger tasks such as improvements and repairs to facility structures and utilities, and improvements to facility grounds. Water that accumulates in the sump and pit areas is occasionally pumped out using standard industrial equipment. Welding and cutting equipment

may be used at the facility. Gasoline is present in vehicles, and may be used for yard maintenance equipment (weed-eaters, etc.).

The facility radiological inventory is less than the 40 CFR 302.4 reportable quantities (RQs). The hatch at the west end of the channel covers the pit where sludge was input to start the dewatering process. This area is posted as a radiation material area. Process knowledge and radiological survey data indicate that there is only negligible residual radioactivity present at the facility. After the dewatering activities were completed, the filters were removed, the equipment was cleaned, and the operation shut down. The remaining sludge was cleaned out and removed from the facility. The dewatering equipment remains at the facility. Since that time, the only operation at the facility was to store and retrieve waste containers and dumpsters from the adjacent storage pad. The waste containers have all been removed, and there are no plans to store waste at the facility. The facility chemical waste inventory is less than the 40 CFR 302.4 RQs. Small quantities of commercially available cleaning supplies, pesticides, herbicides, paints, etc. may be stored for facility and yard maintenance activities. The chemicals associated with these materials are standard industrial hazards, and the constituent ingredients are not counted towards the facility inventory. The Sludge Handling Facility, Building 9720-44 is categorized and classified as Other Industrial.

OD-10 (Liquid Organic Solvent Storage Facility, Building 9720-45). OD-10 was constructed for bulking and storing wastes prior to being sent to the TSCA Incinerator at ETTP. It was operated for approximately 13 years and RCRA closed in late summer of 2001. There is no active fire suppression system associated with the facility. There is no fire detection or manual fire alarm activation equipment. It had six above ground storage tanks, concrete secondary containment around the tanks, loading/unloading stations, material handling/staging/storing areas, sumps, pumps, piping, instrumentation and accessories as well as a boundary control station (9983-FM) and a skid mounted office trailer.

Wastes were compatible, aqueous, organic, RCRA hazardous/TSCA-PCB/radiologically-contaminated liquids/oils. Wastes were predominately liquid with some sludge/solids that were generated at Y-12; delivered and stored at OD-10 until sufficient volume accumulated; and then transported to an outside recovery/disposal facility. OD-10 was for ignitable waste—typically liquid organic solvents with a flash point <100F, some of which contained radionuclides, PCBs (typically <50 ppm), and beryllium.

There is a drum cleaning station (9840-4) at the site, a single-story metal building approximately 26 ft by 12 ft by 9 ft with a metal grated floor, resting on a concrete pad. The facility design includes spark-resistant construction materials, appropriate grounding and explosion-proof electrical fixtures and controls for handling hazardous materials (NFPA 70 Article 500 Class I, Division I design). There is a hot water heater that provides water for cleaning it, and an electrical lighting unit is located within the enclosed structure of the building, but accessed from the exterior. While the facility has never been used, it is intended to clean empty 55-gal drums. The drums would have contained various types of waste material and contaminated with residual quantities of toxic/hazardous material, PCBs and possibly low-level radioactively contaminated materials. The building contains two self-contained, pneumatically

operated drum-wash machines to clean the interior of drums with an aqueous alkaline cleaning solution.

The site is now an inactive, RCRA clean, closed, fenced, patrolled, inspected area. The tank interiors, ancillary equipment and secondary containment met the 'clean debris surface' standard [as defined in 10CFR40 Part 268.45 and incorporated into Tennessee Rule 1200-1-11-.10(3) (a)] with some piping being removed and disposed. RCRA closure has been certified. The area is categorized as Other Industrial based on process knowledge in that the site met the clean debris surface standard and classified as Other Industrial based on RCRA closure.

ATTACHMENT 1

PUBLIC COMMENTS ON EE/CA

No public comments were received during the 30 day review period which ended on May 30, 2010.

ATTACHMENT 2

Engineering Evaluation/Cost Analysis

for the Y-12 Facilities

Deactivation/Demolition Project

Oak Ridge, Tennessee

DOE/OR/01-2424&D2

DOE/OR/01-2424&D2

Engineering Evaluation/Cost Analysis for the Y-12 Facilities Deactivation/Demolition Project Oak Ridge, Tennessee

This document is approved for public release per review by:

Ronald J. Sentelle 2/17/10

NNSA Y-12 Site Office – Classification Officer Date

DOE/OR/01-2424&D2

Engineering Evaluation/Cost Analysis for the Y-12 Facilities Deactivation/Demolition Project Oak Ridge, Tennessee

Date Issued—February 2010

Prepared by
Environmental Dimensions, inc.
Oak Ridge, Tennessee
Under contract DE-EM0000106

Prepared for the
U.S. Department of Energy
Office of Environmental Management

PREFACE

DOE/OR/01-2424&D2 has been prepared to support the demolition of process, auxiliary and support facilities at the Y-12 National Security Complex site that are to be included in Integrated Facility Disposition Program (IFDP) scope. This report documents the proposed action as a non-time critical removal action under CERCLA. The objectives of this report are to (1) describe a decision flowchart to determine the scope of buildings covered under this engineering evaluation/cost analysis, (2) present and evaluate two removal action alternatives, (3) describe demolition activities and possibilities for waste disposition, (4) assess qualitatively the associated risk by comparison with previous demolition actions at the ORR, including Bldg. K-1131 at East Tennessee Technology Park (ETTP), and (5) address the approximate cost of the entire project. This document provides the basis for a subsequent action memorandum.

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ACRONYMS

ACM	asbestos-containing material
ARAR	applicable or relevant and appropriate requirement
BMP	Best Management Practices
CA	cost analysis
CD	Critical Decision
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	*Code of Federal Regulations*
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EE	engineering evaluation
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
EM	environmental management
EMWMF	Environmental Management Waste Management Facility
ETTP	East Tennessee Technology Park
FEMP	Fernald Environmental Management Project
FFA	Federal Facility Agreement
FR	Federal Register
FY	fiscal year
g/cc	grams per cubic centimeter
IFDP	Integrated Facility Disposition Program
LLW	low-level (radioactive) waste
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act of 1969
NHPA	National Historical Preservation Act
NTCRA	non-time critical removal action
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Office
ORR	Oak Ridge Reservation
PCB	polychlorinated biphenyl
Ra	radium
RAO	remedial action objective
RmAWP	~~Remedial~~ Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act of 1976
RME	residual maximum exposure
ROD	record of decision
SHPO	State Historic Preservation Office
S&M	surveillance and maintenance
TBC	to be considered
TDEC	Tennessee Department of Environment and Conservation
Th	thorium
TRU	transuranic
TSCA	Toxic Substances Control Act of 1976
UOSV	uranium oxide storage vault
U	uranium
UF_4	uranium tetrafluoride
UF_6	uranium hexafluoride

EXECUTIVE SUMMARY

The 34,516-acre U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR) is located within and adjacent to the corporate limits of the city of Oak Ridge, Tennessee, in Roane and Anderson counties. The ORR is bounded to the east and north by the developed portion of the city of Oak Ridge. The ORR hosts three major industrial research and production facilities originally constructed as part of the World War II-era Manhattan Project: East Tennessee Technology Park (formerly the K-25 Site), Oak Ridge National Laboratory (ORNL, formerly X- 10), and the Y- 12 National Security Complex (Y- 12, formerly the Oak Ridge Y-12 Plant).

The boundaries of the Y-12 Site encompass the industrialized area, extend along the top of Pine Ridge to the north, the top of Chestnut Ridge to the south, the eastern boundary of the Bear Creek Watershed to the west, and the DOE property line to the east. Historical processes, programs, and waste management practices associated with the Y-12 mission have contaminated soil, surface water, sediment, and groundwater. These processes included the following:

- isotope separation techniques;
- weapons manufacturing;
- research and development;
- waste storage, management, and disposal; and
- physical plant maintenance activities.

In 1989, the ORR, which includes the Y-12 Site, was placed on the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) National Priorities List. A Federal Facility Agreement, effective January 1, 1992, now governs environmental restoration as well as decontamination and decommissioning activities conducted under CERCLA at ORR.

In 2007, DOE Environmental Management (EM) began the initial planning phases of the next major remediation program for the ORR. These planning efforts resulted in the conceptual development of the Integrated Facilities Disposition Program (IFDP). IFDP has defined its scope to cover primarily facilities at Y-12 and ORNL. This engineering evaluation/cost analysis (EE/CA) has been developed to cover the buildings portion of Y-12 and generally includes those facilities that have been deemed no longer needed or necessary for Y-12 plant operations as a result of modernization efforts. The buildings covered in this EE/CA have been included in the IFDP Critical Decision-1 (CD-1) package developed by DOE. As DOE develops the next step of the detailed baseline documents for budget and schedule forecast as part of the CD-2/3 process, exact building groupings and the associated schedule/sequence of these demolition efforts will be refined.

This EE/CA documents and describes the deactivation or demolition of the Y-12 Facilities as described in the CD-1 package with the exception of the facilities to be addressed by the Time-Critical Action Memoranda. This EE/CA is a comprehensive document that encompasses non-time critical removal action (NTCRA) IFDP facilities on the Y-12 Site. Based on building and facility prioritization, a subsequent action memorandum will serve as the decision documentation. This EE/CA is thus intended to streamline the required CERCLA documentation for all NTCRA IFDP facilities at Y-12.

Most of the facilities, identified as appropriate for the IFDP, exhibit actual or potential elevated concentrations of radiological and/or other hazardous substances from past operations are presented in Appendix A. Some ancillary or support facilities may not be contaminated by hazardous substances but need to be demolished to facilitate decommissioning and demolition (D&D) work on contaminated

facilities. The identification process resulted in a list of more than 100 buildings or facilities at the Y-12 Site to be included within the scope of this EE/CA. Removal of buildings in the scope of this EE/CA will meet the intent of CERCLA to reduce potential risk to human health and the environment and also eliminates the potential for future contaminant releases.

Facilities included in this EE/CA are listed in Appendix C of the ~~DOE will amend Appendix C of the~~ Federal Facility Agreement (FFA) ~~in accordance with Appendix J 11 of the FFA (DOE 1992), to indicate required changes to include these facilities and document it in the Administrative Record~~.

Two removal action alternatives are evaluated for their effectiveness, implementability and cost. The alternatives differ primarily in scheduling. Alternative 1 includes continued surveillance and maintenance with needed repairs and eventual demolition. Alternative 2 includes near-term demolition of buildings and facilities. Alternative 2 is the preferred removal action alternative because it will meet the removal action objectives now rather than at some point in the future. Alternative 1 is more costly and simply defers the inevitable demolition of the structures to a future date.

Demolition project activities include characterization, decontamination, demolition, material disposition, and site stabilization. The demolition process will leave foundations, slabs, soil, and underground utilities, which will be addressed by existing and future CERCLA Records of Decision for the Y-12 site. Scope of work will include the following:

- characterization of the facilities for radiological and hazardous/toxic materials to demonstrate compliance with waste acceptance criteria and to determine safety and health requirements;
- decontamination of the facilities for radiological and hazardous/toxic materials in accordance with project specifications;
- removal of equipment and piping;
- demolition of structural and architectural components; and
- disposal of low-level waste in approved on-site or off-site facilities, and site stabilization.

Demolition activities described under this EE/CA are consistent with and will not preclude the final remedies to be considered under future CERCLA documentation for the Y-12 site.

The U.S. Department of Energy, U.S. Environmental Protection Agency, and the state of Tennessee consider the 30-day public comment period integral in the decision of the removal action of the Y-12 buildings and facilities described in this EE/CA. Responses to the comments will be summarized and attached to the first of a series of action memoranda documenting this removal action.

1.0 INTRODUCTION

This engineering evaluation/cost analysis (EE/CA) documents and describes deactivation or demolition of NTCRA IFDP facilities at the Y-12 Site in Oak Ridge, Tennessee. Demolition of these buildings, in accordance with joint U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (EPA) policy (DOE and EPA 1995), will be performed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as a non-time-critical removal action process.

This EE/CA is a comprehensive document that encompasses decommissioning and demolition of contaminated structures at the Y-12 Site. As such, it provides a vehicle for public involvement in the overall decision-making process for removal of these facilities. Based on building and facility prioritization, a subsequent action memorandum will serve as a decision document. Because numerous demolition efforts have already been carried out on the Oak Ridge Reservation (ORR), a comparable risk analysis was performed as the basis of this action. Most of the previous demolition actions have occurred at East Tennessee Technology Park (ETTP), and as such, previously approved EE/CAs for that site were used to evaluate the Y-12 facilities considered for this removal action. This comparative risk analysis is intended to demonstrate that, similar to previous CERCLA decisions at the ORR, deactivation/demolition at Y-12 can be safely implemented, as well as to demonstrate the need for the action based on the limited characterization data currently available for these facilities.

1.1 SITE DESCRIPTION AND BACKGROUND

The 34,516-acre DOE ORR is located within and adjacent to the corporate limits of the city of Oak Ridge, Tennessee, in Roane and Anderson counties. The ORR is bounded to the east and north by the developed portion of the city of Oak Ridge. The ORR hosts three major industrial research and production facilities originally constructed as part of the World War II-era Manhattan Project: East Tennessee Technology Park (ETTP, formerly the K-25 Site), Oak Ridge National Laboratory (ORNL, formerly X- 10), and the Y- 12 National Security Complex (Y- 12, formerly the Oak Ridge Y- 12 Plant).

The boundaries of the Y-12 Site encompass the industrialized area, extend along the top of Pine Ridge to the north, the top of Chestnut Ridge to the south, the eastern boundary of the Bear Creek Watershed to the west, and the DOE property line to the east. Historical processes, programs, and waste management practices associated with the Y-12 mission have contaminated soil, surface water, sediment, and groundwater. These processes included the following:

- isotope separation techniques;
- weapons manufacturing;
- research and development;
- waste storage, management, and disposal; and
- physical plant maintenance activities.

In 1989, the ORR, which includes the Y-12 site, was placed on the CERCLA National Priorities List. A Federal Facilities Agreement (FFA), effective January 1, 1992, now governs environmental restoration as well as decontamination and decommissioning activities conducted under CERCLA at ORR.

Y-12 is an active manufacturing and developmental engineering facility. It occupies approximately 600 acres within Bear Creek Valley near the northeast corner of the ORR, adjacent to the city of Oak Ridge. Built in 1943 by the U.S. Army Corps of Engineers as part of the World War II-era Manhattan Project, Y-12's original mission was to separate and produce fissile ^{235}U from ^{238}U using an

electromagnetic separation process (calutron process) and to manufacture weapon components as part of the national effort to produce the atomic bomb. As other uranium enrichment processes were developed and implemented at other installations, the role of Y- 12 expanded to include weapon components manufacturing and precision machining, research and development, lithium isotope separation, and special nuclear materials storage and management. Historical manufacturing processes, programs, and waste management practices associated with Y-12's mission have contaminated soil, surface water, sediment, and groundwater.

In 2007, DOE Environmental Management (EM) began the initial planning phases of the next major remediation program for the ORR. These planning efforts resulted in the conceptual development of the Integrated Facilities Disposition Program (IFDP). IFDP has defined its scope to cover primarily facilities at Y-12 and ORNL. This EE/CA has been developed to cover the buildings portion of Y-12 and generally includes those facilities that have been, or will be, deemed no longer needed for Y-12 plant operations as a result of modernization efforts. The NTCRA IFDP buildings covered in this EE/CA have been included in the IFDP Critical Decision-1 (CD-1) package developed by DOE. As DOE develops the next step of the detailed baseline documents for budget and schedule forecast as part of the CD-2/3 process, exact building groupings and the associated schedule/sequence of these demolition efforts will be refined.

This EE/CA is intended to streamline the required documentation for remaining IFDP facilities at Y-12 whose final end point is deactivation or demolition, thus expediting these actions, and ultimately the remediation of the Y-12 site and surrounding areas. A general layout of the Y-12 Site is provided in Figure 1.

1.2 PURPOSE AND SCOPE

The purpose of the removal action is to eliminate the potential for future contaminant releases from the buildings, thereby protecting human health and the environment. This EE/CA is being prepared in support of DOE EM's IFDP. This EE/CA addresses the controlled demolition of more than 100 processes, auxiliary and other support facilities at the Y-12 site and provides for the opportunity of meaningful public involvement in the CERCLA process. Should it be determined that an additional building is found to be contaminated, this building would be screened in accordance with operating instruction 1-15 (entitled CERCLA Screening Process for the ORR) of the FFA. The addition or deletion of buildings to the scope of this EE/CA will be documented in the action memorandum and in required modifications to Appendix C of the FFA based on Core Team recommendations.

This action is being documented with an EE/CA under CERCLA in accordance with the Policy on Decommissioning of Department of Energy Facilities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (DOE and EPA 1995). This policy states that "DOE will utilize CERCLA response authority whenever a hazardous substance is released, or there is a substantial threat of release, into the environment, and response is necessary to protect public health, welfare or the environment." The FFA (DOE 1992) for the ORR requires DOE to conduct a comprehensive investigation and, if necessary, respond to any release or substantial threat of a release of hazardous substances, pollutants or contaminants as defined by CERCLA. Based on past usage, the NTCRA IFDP facilities represent a potential threat of release of contaminants into the environment. The contaminants may be present in building equipment, construction materials of the building shell itself, or both. However, there are no known uncontrolled situations which currently present a threat of release which would endanger human health or the environment. Because no imminent danger exists that would necessitate an early cleanup, the removal action is categorized as non-time critical.

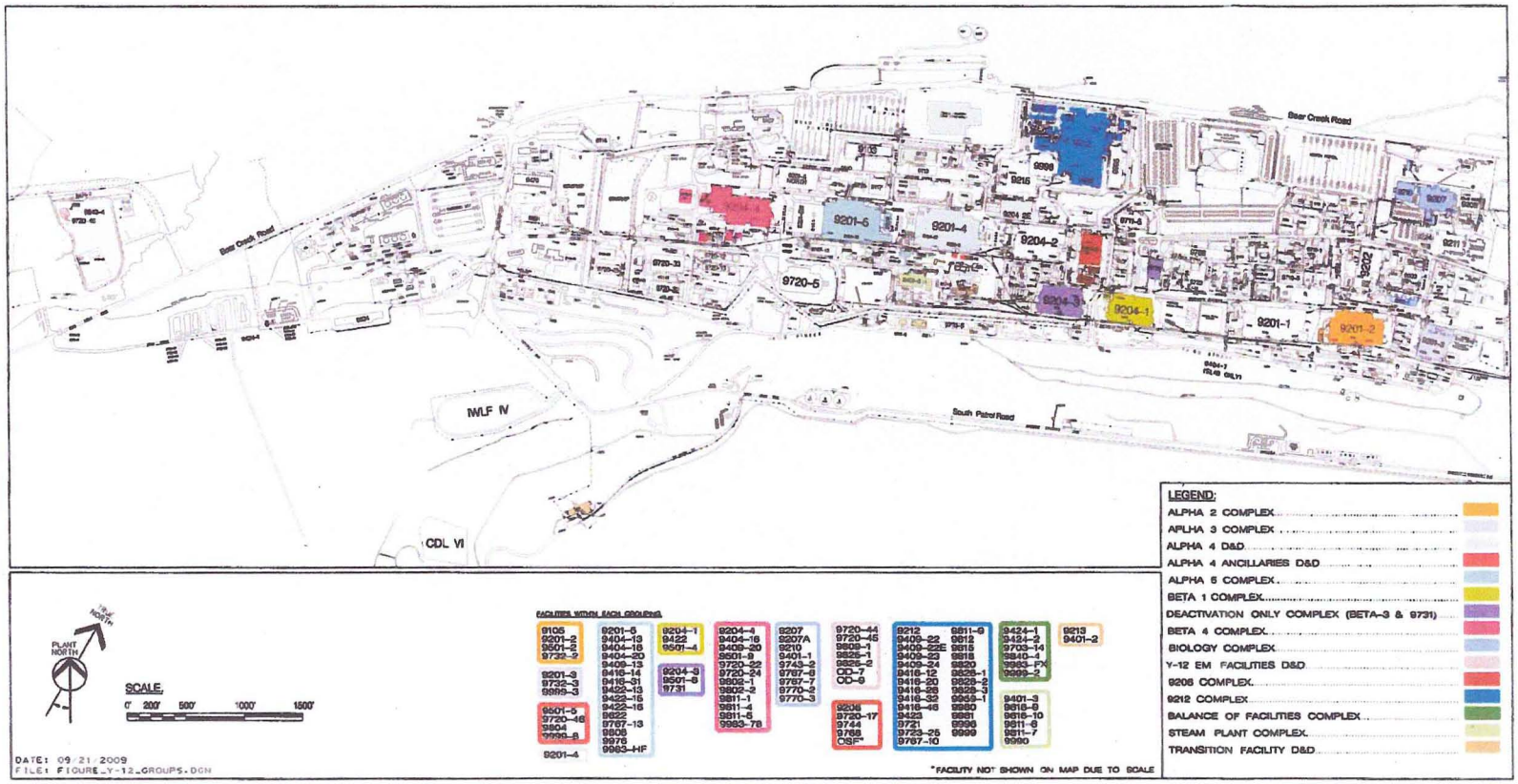

Figure 1. Y-12 Base Map

Y-12 buildings and facilities were screened for actual or potential elevated concentrations of radiological and/or other hazardous substances from past operations. This screening resulted in a set of buildings that is appropriate for the CERCLA process. Some of the data sources used to screen facilities included radiological surveys and DOE property management databases. If no data existed for a particular facility, personnel interviews, walkdowns, and process knowledge were used to determine whether a building was contaminated.

The screening effort resulted in the group of more than 100 buildings as provided in Appendix A. Timing of the removal action implementation will be influenced by:

- existing and future CERCLA Record of Decisions (RODs);
- safety and environmental issues;
- budget constraints;
- site operational requirements; and
- reuse potential.

1.3 PREVIOUS RELEVANT REMOVAL ACTIONS AT OTHER DOE SITES

DOE has accumulated a substantial amount of experience in the demolition of buildings associated with uranium contamination. These demolition projects were handled under the CERCLA process and completed safely in every case. The following are brief accounts of DOE-managed demolition projects at other related sites:

Fernald. Three major removal actions were performed at the Fernald Environmental Management Project (FEMP) site between 1993 and 1997. These included the Plant 7, the Bldg. 4A Complex, and Plant I Complex.

Removal action for Plant 7, the tallest and most visible structure at FEMP, began in May 1993 and continued through November 1994. The building was constructed in May 1953 to reduce uranium hexafluoride (UF_6) to uranium tetrafluoride (UF_4). The objective of removal was to eliminate the potential for release of radiologic contaminants and to dismantle Plant 7 to grade level. Radiation survey results before decontamination revealed beta and gamma levels as high as 5824 dpm/100 cm and alpha levels up to 1249 dpm/100 cm. Removal action consisted of removal of inventory and friable asbestos; gross decontamination and application of a lockdown encapsulant; removal of interior ductwork, piping, conduit, and equipment; and dismantlement of the exterior transite (asbestos- cement material) and structural steel. Controlled detonation proved to be a safe, environmentally sound, and cost-efficient method of dismantling Plant 7 and resulted in an accelerated completion schedule. Dismantlement produced approximately 780 tons of recoverable steel, 21 tons of friable asbestos, 138 tons of transite, 8 tons of lead, and large volumes of construction debris, concrete, and light gauge metal. Perimeter air monitoring at six locations around the work site during detonation revealed asbestos, lead, uranium, and nuisance dust levels all well below permissible exposure limits or standards (DOE 1995).

Decontamination and dismantling activities for the Bldg. 4A Complex at FEMP began in December 1994 and continued through September 1996. Historical processes and operations within the building converted uranium trioxide to UF, using a multistep hydrofluorination process. Dismantlement generated 2300 tons of metal, 570 ft. of concrete, 303 tons of friable asbestos, as well as large volumes of transite panels and miscellaneous construction debris. Removal was completed in a safe and environmentally sound manner. Ambient air monitoring during D&D activities showed airborne

radiological activities well below the FEMP administrative action level (DOE 1997b).

Plant 1 Complex D&D activities began in January 1996 and continued through June 1997. Historical processes and operations within the Plant 1 Complex included the preparation of uranium and thorium ore stock for on-site processing, reconditioning of used storage drums, and waste storage. These primary and secondary operations used both radioactive and chemical constituents. Debris generated from dismantling included approximately 730 tons of metal, 7300 cubic feet of concrete, 3 tons of friable asbestos, 160 tons of transite panels as well as large volumes of miscellaneous debris. Remediation activities were completed ahead of schedule. There were no lost time accidents or injuries during D&D activities, a result of appropriate training and proper use of safety equipment. Air emissions controls and work practices maintained air emission below FEMP project action levels (DOE 1997c). Low-level waste generated as a result of demolition activities was disposed of in a permitted on-site disposal facility. Portions of the demolition waste were shipped off site to approved facilities.

Weldon Spring. From March 1992 to January 1995, the 44 buildings that made up the former Weldon Spring Uranium Feed Materials Plant in St. Charles County, Missouri, were safely and successfully demolished ahead of schedule and below original cost estimates. The group of buildings was involved directly or in support of processing raw uranium into usable feed form for enrichment at plants such as ETTP. The contaminants of concern were uranium (U), radium (Ra), and thorium (Th).

Dismantlement produced approximately 100,000 linear feet of pipe, nearly 30,000 tons of carbon steel, over 8000 cubic yards of concrete, and vast volumes of stainless steel, aluminum, copper, and asbestos-containing material (ACM). The bulk of the waste streams were stored temporarily, monitored, and placed in final disposition in an engineered, on-site disposal facility. During the period of demolition, 475,000 labor-hours were expended with only a small number of Occupational Safety and Health Administration-recordable injuries and no fatalities. In addition, both perimeter air monitoring and air monitoring at a local high school, located within 0.5 mile of the site, revealed no additional particulate collection during the demolition phase. Standard engineering precautions, such as dust suppression, were credited with the control of fugitive particles emission (DOE 1996a).

Formerly Utilized Site Remedial Action Program Site—Colonie, New York. This 11.2-acre site near Albany, New York, comprised what was once the property and buildings used by National Lead Industries to manufacture a variety of products from depleted uranium. Past manufacturing operations had resulted in radioactive, hazardous, and mixed wastes containing uranium and thorium. Fixed beta-gamma readings on the wall were orders of magnitude higher than the DOE Order 5400.5 free release guidelines for fixed beta-gamma surface contamination. Following waste removal and building decontamination, DOE demolished the main 120,000 square foot facility in September 1995. During demolition, construction materials such as wood, concrete, brick, block, structural steel, and roofing materials were separated for processing. Much of the building construction debris could be disposed of on site after demonstration that the resulting material was below volumetric release guidelines. The effort was completed safely, within budget, and on schedule. (DOE 1997d).

These projects demonstrate DOE familiarity with similar demolition projects at other sites across the country. In addition, demolition of facilities at the ETTP site (Bldgs. K-724, K-725, K-1031, K-1131, K-1410, K-29, K-27, K-25) has either been fully completed or partially completed on the ORR and by the DOE-EM program. As will be shown later in this EE/CA, the buildings to be included in this EE/CA are less contaminated and less problematic than the worst of the ETTP facilities.

1.4 COMMUNITY PARTICIPATION

Community involvement is an integral part of the CERCLA process. DOE encourages the public to review this and other documents in the Administrative Record file to gain an understanding of this non-time-critical removal action. The review also affords the public an opportunity to comment on the incorporation of National Environmental Policy Act of 1969 (NEPA) values into this CERCLA action. The public is welcome to submit written comments on the preferred alternative and on any part of this EE/CA during the public comment period to be announced in local newspapers.

Comments may be addressed to:

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2.0 DESCRIPTION OF BUILDINGS AND FACILITIES

This chapter describes the range of buildings and facilities within the EE/CA scope for the Y-12 Site. To the extent possible, a comparison is made between the most contaminated Y-12 buildings and the ETTP Building K-1131, considered to be the worst-case building on the ORR for this evaluation. It is understood that there are limited data available for these IFDP facilities at Y-12, and thus a comprehensive contaminant comparison cannot be accomplished. However, given the remedial decisions previously made at ETTP, Y-12 and ORNL – this EE/CA is consistent with those decision-making processes and precedent setting actions.

2.1 NTCRA IFDP FACILITIES

The activities and processes performed at the Y-12 site were conducted in various types of buildings and resulted in a number of contaminants. Some of the buildings housed activities that provided support to the larger process buildings. These activities included uranium operations, the removal of product and process tails from uranium operations, and the testing of process equipment under production conditions. Waste processing, various activities associated with mercury and related compound reactions, and laboratory services (including research and development) also occurred in the buildings. Because most of the buildings were built in the same approximate time period (mid-1940s to mid-1950s), they tend to have similar structural composition and used many of the same building materials. Most will have asbestos present in the form of transite siding, pipe lagging, floor and acoustical ceiling tiles, and insulation. Some will have polychlorinated biphenyls (PCBs) in transformer fluids, light ballasts, and paint. Mercury may be found contained in some mercoid switches and other process components. The greatest contamination concern will come from uranium, uranium compounds, and mercury compounds.

These will be present in vaults, equipment, and piping or as loose contamination on interior surfaces. In addition, these facilities are contaminated to varying degrees with radioactive contaminants, beryllium, mercury, and other Resource Conservation and Recovery Act of 1976 (RCRA) constituents and PCBs.

2.2 TANKS, STACKS, OVERHEAD PIPELINES, AND MISCELLANEOUS ASSOCIATED FACILITIES

In addition to actual buildings, a number of associated above-ground facilities served various functions in direct or indirect relation to the processes of the buildings themselves. The types of structures represented by these facilities are identified below. Contaminants found in these facilities will be the same as those found in the associated process buildings.

Aboveground Tanks. Numerous aboveground tanks may be considered as part of this removal action. Examples include clarifier tanks for water treatment and caustic/acid or other chemical storage tanks.

Stacks. These stacks were once used for normal operations or to discharge gaseous emissions. Stacks were also used for discharge of combustion products from power plants. Stacks may be constructed of metal or of unreinforced brick masonry on a concrete base.

Overhead Pipelines. The overhead pipelines are used for transferring liquids, gases, or steam for different process operations. The overhead pipelines are generally supported by hangers at specified spacings on structures attached to the ground. The pipes may be insulated and have expansion loops and fittings.

Electrical Substations. Electrical substations decrease voltage from a distribution level of 1[illegible]8 kV to a supply level of 480V. Substations may be inside or outside a building. Located inside the substations are transformers, oil-cooled or air-cooled circuit breakers, and equipment used for relaying and metering. Some of this equipment may contain PCB contaminated oil.

Valve Vault. This is typically an enclosure, constructed of either concrete block or reinforced concrete that houses a collection of valves that are part of media transfer systems.

2.3 COMPARISON WITH BUILDING K-1131 AT ETTP

This section, along with Section 6.4, compares Bldg. K-1131 and a number of facilities covered under this EE/CA. Building K-1131, known as the Feed and Tails Withdrawal Building at ETTP, was part of the Group I Facilities demolition project that was demolished in fiscal year (FY) 1999. Based on available historical characterization data as well as process knowledge, Building K-1131 is considered to have the highest contamination levels of any of the auxiliary facilities at ETTP. Given that much more demolition work has been accomplished at ETTP than at Y-12, this ETTP facility is used as the basis of comparison to evaluate demotion of the Y-12 IFDP facilities. More detail about K-1131 may be found in the EE/CA for Group I Auxiliary Facilities (DOE 1996b). Appendix A describes the buildings that meet the criteria for consideration in this EE/CA.

As noted in Section 6, K-1131 contained residuals of uranium and uranium compounds that remained in equipment or piping or settled on exposed surfaces. These accounted for the delineation of some building portions as radiological contamination areas. General practice in this building was to put layers of paint over areas of contamination, and through the years many such layers were added, Thus,

actual contamination levels may have been much higher than the readings convey, Contamination is known to pervade the structure.

3.0 REMOVAL ACTION JUSTIFICATION AND OBJECTIVES

This chapter discusses DOE's response authority under CERCLA for D&D actions, general D&D removal action objectives (RAO's), the justification for demolition of the NTCRA IFDP facilities, and a schedule for documentation.

3.1 RESPONSE AUTHORITY AND STATUTORY LIMITS

Section 104 of CERCLA addresses the response to releases or threats of release through removal actions. Executive Order 12580, "Superfund Implementation," delegates to DOE the response authorities for DOE facilities. As lead agency, DOE is authorized to conduct response measures (e.g., removal actions) under CERCLA. A response under CERCLA is appropriate when (1) hazardous substances or contaminants are released or (2) there is a substantial threat of a release into the environment and response is necessary to protect human health and the environment. DOE and EPA have issued a joint policy statement (DOE and EPA 1995) that building D&D may be conducted as non-time-critical removal actions, unless circumstances at the facility make it inappropriate.

The National Environmental Policy Act of 1969 (NEPA) requires all federal agencies to consider the possible effects (both adverse and beneficial) of their proposed activities before taking action. DOE has promulgated regulations for EPA under 10 Code of Federal Regulations (CFR) 1021 ("National Environmental Policy Act Implementing Procedures"). In addition, DOE issued a "Secretarial Policy Statement on NEPA" (DOE 1994) stating that DOE will hereafter rely on the CERCLA process for review of actions to be taken under CERCLA and will address and incorporate NEPA values in CERCLA documents to the extent practicable. Such values may include socioeconomic, historic, cultural, ecological, aesthetic, and health effects, both short- term and cumulative, as well as environmental justice and land use issues and the impacts of off-site transportation of wastes, Guidance states that NEPA values will be incorporated to the extent practicable, with more attention given to those aspects of the proposed action having the greater anticipated effects. In keeping with this policy, NEPA values have been incorporated into this EE/CA.

Some of the buildings under this action may be contributing structures to the National Historic Register. Demolition activities under this removal action will adversely affect these contributing structures. Therefore, consultation with the Tennessee State Historic Preservation Officer is required for this non-time-critical removal action pursuant to Section 106 of the National Historic Preservation Act (NHPA) and the Programmatic Agreement among the DOE, Oak Ridge Operations (ORO) Office, the Tennessee State Historic Preservation Office, and the Advisory Council on Historic Preservation Concerning Management of Historical and Cultural Properties at the ORR. This issue will be addressed further in the action memoranda for the particular buildings or groups of buildings.

The activities described in this EE/CA will be spaced out over a period of 10 years or more and are thus not anticipated to have significant impacts on the surrounding community. Approximately 92 percent of ORR employees reside in the five neighboring counties of Anderson, Knox, Loudon, Morgan, and Roane. Based on this projection and the size of the local population, the action described in this document is not expected to result in a significant change to either the local labor force or community infrastructure.

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority

Populations and Low-Income Populations," requires that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or socioeconomic effects of their programs and activities on minority and low-income populations. Minority populations and low- income populations are near the Y-12 site. The analysis of the impacts in this EE/CA indicates that there would be minimal impacts to both the off-site populations and potential work force by implementing the proposed actions because actions analyzed in this EE/CA are expected to be conducted in increments over a period of 10+ years. Therefore, it is not expected that there would be any disproportionate impacts to any minority or low-income portion of the community.

3.2 OBJECTIVES

The removal action objectives (RAOs) for the Y-12 buildings are the basis for identifying and evaluating appropriate response actions. The RAOs of this action include the following:

- Remove the potential health and safety hazards to on-site personnel from deterioration of the contaminated structures.
- Reduce the potential health and environmental hazards of radiation and hazardous material exposure caused by uncontrolled release of hazardous substances.
- Allow access for remediation of underlying contaminated soils.

3.3 JUSTIFICATION FOR A REMOVAL ACTION

Most of the facilities identified for this IFDP removal action (Appendix A) exhibit elevated concentrations of radiological and/or other hazardous substances from past operations. The contaminants are contained by the structures themselves; therefore, the current risk to the environment and on-site personnel who do not enter the buildings is controlled. However, the threat of future contaminant release to the environment will increase over time if the building deterioration (termed "natural degradation") continues because of structural failure and subsequent contaminant migration. (The risk evaluation presented in Chap. 6 offers a qualitative comparison of risk associated with natural degradation and that associated with controlled demolition.) The controlled demolition of these facilities will eliminate the threat of release.

There is, in addition, non-CERCLA justification for performing demolition at the facilities:

1. There is no present or foreseeable future need for these facilities. Since shutdown of the uranium operations or consolidation of operations in new, modernized facilities, the facilities have no identified function or mission.
2. Demolition will reduce the exposure and safety risk to workers resulting from surveillance and maintenance (S&M) actions within or adjacent to these deteriorating buildings. These actions include walk-through inspections for regulatory compliance, structural integrity, radiological protection, and maintenance needs; regular maintenance of boundary systems, roofs, and environmental controls; and corrective actions such as asbestos abatement and spill cleanup. The potential for health and safety threats to workers will increase over time as deterioration continues. For example, the potential for asbestos release and exposure will increase as the panels, tiles, and protective coverings of ACM age; thus, increasing the potential for worker exposures.
3. Controlled demolition, using engineered safety measures, is both safer and more cost-effective than uncontrolled collapse (i.e., the building "falling in on itself"). The latter scenario produces commingled waste streams that are more difficult to dispose of, whereas the former can utilize waste segregation to simplify waste disposition.

Demolition of these facilities will meet DOE-EM objectives to control legacy hazards while promoting reduction of the federal footprint. These objectives stipulate that buildings unsuitable for reuse will be demolished and the buildings suitable for potential reuse will be decontaminated to a level consistent with their future use. The recommended removal action meets program objectives while reducing the inventory of surplus buildings. It is expected that very few, if any, of the Y-12 IFDP buildings will be slated for reuse.

3.4 REMOVAL ACTION DOCUMENTATION SCHEDULE

This EE/CA describes the removal action of demolition of contaminated process, auxiliary and support facilities at Y-12. Based on prioritization, demolition of these facilities may be divided into one or more sub-projects, each involving one or more buildings or facilities. A subsequent action memorandum for these various demolition sub-projects will be issued after the EE/CA has been approved. These sub-projects will contain scope and schedule in accordance with the budget process and annual planning meetings with FFA managers. A single action memorandum will be followed by other CERCLA submittals for describing characterization and disposition of waste [i.e., Sampling and Analysis Plan/Quality Assurance Project Plans, Waste Handling Plans, one Removal Action Work Plan (RmAWP)]. Interface, through scoping, review, and approval of these deliverables, will be accomplished through the Upper East Fork Poplar Creek Remedial Action Core Team. The overall anticipated time frame for the project is more than 10 years. This time frame will be further developed as part of the CD-2/3 process for the IFDP baseline planning effort.

4.0 REMOVAL ACTION ALTERNATIVES

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and EPA guidance (EPA 1993), removal action alternatives should be evaluated based on the criteria of effectiveness, implementability, and cost. This chapter identifies two alternatives, evaluates the alternatives qualitatively using these three criteria, and then identifies the preferred alternative.

4.1 IDENTIFICATION OF ALTERNATIVES

DOE has identified two possible alternatives for the disposition of unused contaminated buildings at the Y-12 site. These are described in Sects, 4.1.1 and 4.1.2.

4.1.1 Alternative 1---Continued S&M with Needed Repairs and Eventual Demolition

The continued S&M alternative is a baseline condition to compare with the desired action of removal. This alternative is carried out for comparison for a period of 10 years, from the signing of the action memorandum to the year 2019. Demolition activities for Y-12 are projected over more than a 10 year period according to the IFDP CD-1 report.

The following are key components of this alternative:

- DOE will continue current levels of minimal S&M activities. These activities may include maintenance of critical building systems, such as the security and fire protection system, and sump operations, if any. They also may include periodic inspections for asbestos management and assessment of contaminant migration.
- Minor repairs, such as replacement of broken windows and doors, will be performed on an as-needed basis. Major repairs may be performed and could include roof replacement during

this time period.

- DOE will continue to maintain existing institutional controls that control access to buildings and delineate radiation posted areas. The maintenance of fences and check-in gates are also included.
- Deactivation or demolition of the building at some future date. This includes pre-demolition cleanout of excess materials/equipment as needed. (See Alternative 2 for additional details.)

4.1.2 Alternative 2—Near-Term Demolition to Slab

The demolition alternative involves pre-demolition cleanout of excess materials/equipment as needed, demolition of building to slab, basement, crawl space, wind tunnel, or sump, as the case may be, and disposition of all associated wastes.

The following are key components of this alternative:

- Building characterization will be conducted to facilitate the segregation of waste streams and to support worker safety. The amount of characterization required will depend on the individual facility.
- Decontamination of building components will be performed as needed to protect workers, meet regulatory requirements, facilitate conventional demolition, or meet waste acceptance criteria for a disposal facility. The manner and scope of decontamination will be left up to the judgment of the contractor with the agreement of DOE. The contractor will evaluate the ability and cost to perform decontamination for release versus disposal in accordance with the receiving facility's waste acceptance criteria.
- ACM and ballasts will be removed, bagged, and/or disposed of appropriately.
- Equipment and piping will be removed, disassembled, and processed for disposition.
- Structural and architectural components will be disassembled or demolished.
- Controls will be used to minimize fugitive dust, as appropriate, during demolition.
- Waste streams will be segregated into appropriate categories. Categories of waste materials expected are RCRA waste; low-level (radioactive) waste (LLW); mixed waste; Toxic Substances Control Act (TSCA) mixed waste; PCB-contaminated materials; sanitary waste; construction debris; earthen materials suitable for use as on-site fill; and recyclable metals.
- On-site and off-site facilities approved for the disposal of CERCLA wastes will be used.
- Earthen debris may be reduced to rubble and used as earthen fill on various site locations.
- Disposition of equipment and scrap metal will take advantage of recycling, reuse, or unrestricted release when economically feasible.
- Drains will be plugged; piping leaving the footprint of buildings will be cut or disconnected and capped.
- Concrete floor slabs, basements, wind tunnels, sumps, and foundations will be left in place. These may require some limited decontamination or a cover (e.g., earthen, asphalt, concrete, etc.) for protection of on-site workers and to minimize S&M costs until final remedial actions.
- Surface surveys on structures left in place and other exposed surfaces that remain following D&D will be performed and summarized in the removal action report.

A strategy for implementing this removal action is described in greater detail in Chap. 5.

4.2 EVALUATION OF ALTERNATIVES

In accordance with the NCP and EPA guidance (EPA 1993), the two alternatives presented are

briefly evaluated using the criteria of effectiveness, implementability, and cost. The three criteria were used to draw sufficient qualitative distinctions between the alternatives to allow an alternative to be selected. These criteria are briefly described below. Table 1 summarizes and compares the evaluations of the two alternatives.

The effectiveness of each alternative is based on the alternative's ability to meet the RAOs presented in Sect. 3.3, to provide protection of human health and the environment via reduction of potential hazards, and to comply with Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are provided in Appendix B.

The implementability of each alternative is based on the technical and administrative feasibility. In addition, availability of services and materials is evaluated with assumptions being made for future availability. Impact of the demolition on the local community is taken into consideration for both alternatives.

The cost of each alternative is presented for comparison purposes. This is done by first using a generic equation giving important cost variables, and then providing an example cost comparison using an actual building in scope.

Table 1. Qualitative Alternative Comparison using Broad Criteria of Effectiveness, Implementability, and Cost, Y-12 Buildings - Oak Ridge, Tennessee

CRITERIA	ALTERNATIVE1	ALTERNATIVE 2
Effectiveness	• Not as effective in meeting RAOs • Defers potential hazard reduction to the future • Complies with ARARs	• Effective in meeting RAOs now • Reduces potential hazards now • Complies with ARARs
Implementability	• Highly implementable and feasible; procedures/protocol for S&M already in place • Conventional decontamination and demolition methods used in the future • Services and materials needed will be available in the future	• Highly implementable and feasible • Conventional decontamination and demolition methods used now • Services and materials needed are available now
Cost	• High costs associated with maintenance and capital repairs • Escalated cost of demolition is higher at a later date	• Reduced costs associated with maintenance; capital repair costs have been eliminated • Lower cost of demolition in current dollars

4.2.1 Compliance with ARARs

In accordance with Section 300.415(1) of the NCP and DOE Headquarters guidance, DOE on-site removal actions conducted under CERCLA are required to attain ARARs to the extent practicable,

considering the requirements and needs of the situation. Both removal action alternatives would comply with ARARs. ARARs are provided in Appendix B.

ARARs are typically divided into three groups: 1) location-specific, (2) chemical-specific, and (3) action-specific. Location-specific ARARs are based on the specific setting and nature of a site such as the presence of archaeological resources, historic properties or wetlands. Chemical-specific ARARs establish an acceptable amount or concentration of chemicals that may remain in or may be discharged to the ambient environment [53 Federal Register (FR) 51437]. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances, or requirements to conduct certain actions to address particular circumstances at a site (53 FR. 51437).

A specific list of ARARs will be drawn from the comprehensive list of ARARs presented in Appendix B and included in the project's implementation plans. Best management practices (BMPs), where appropriate, will be presented in the work plan documents. In addition to ARARs, other to-be-considered (TBC) information may be used in developing CERCLA remedies [40 CFR 300.400(g)(3)]. Although not ARARs, TBCs may be useful in determining the necessary level of cleanup for protection of human health and the environment in the absence of ARARs. TBCs can include non-promulgated advisories, guidance, or standards issued by federal or state governments (e.g., DOE Orders).

Under Alternative 1, Continued S&M with Needed Repairs and Eventual Demolition, the buildings would not be substantially altered in the near term, and minimal waste will be generated. Rules of the Tennessee Department of Environment and Conservation (TDEC), Chapter 1200-1 -13-.08(3)(a),(iv), "Inactive Hazardous Substance Site Remedial Action Program," effective February 19, 1994, requires institutional controls whenever a remedial action does not address concentrations of hazardous substances that pose an unreasonable threat to public health, safety, or the environment. The institutional control requirements would be ARAR for this alternative until the point of demolition and subsequent clearance for any remaining site contamination. This alternative will comply with ARARs.

Under Alternative 2, Near-Term Demolition, the demolition of all the buildings is expected to include removal of scrap metal, excess equipment, and any waste residuals followed by demolition and removal of the structures so that only the slab, basement, wind tunnel, sump, and/or foundation remains. Location-specific ARARs include the NHPA Section 106 process requirements for taking into account the impacts to buildings/historic structures that are considered historic properties, and coordinating this assessment with the State Historic Preservation Officer as outlined in the Programmatic Agreement among the DOE-Oak Ridge Operations Office, the Tennessee State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation Concerning Management of Historic and Cultural Properties at the Oak Ridge Reservation (approved by Advisory Council, May 6, 1994). ARARs also include avoiding and/or minimizing impacts to nearby wetlands or land within a floodplain. In addition, in the event that demolition activities adjacent to surface waters could disturb or otherwise alter those waters, Aquatic Resource Alteration Permit requirements would be considered. Sensitive resources not expected to be impacted include threatened and endangered species, "in-need-of-management" species, rare plants, state-designated natural areas, and cemeteries.

Action-specific ARARs for this alternative include requirements related to radionuclide emissions, waste characterization, waste storage, transportation of hazardous materials, treatment and disposal of PCB/RCRA/LLW and debris, asbestos, and scrap metal removal, as well as decontamination of buildings. Some of the buildings in the scope of the EE/CA have RCRA permitted container storage units located inside. These units are expected to be "clean closed" under the requirements of RCRA before any removal action.

Waste generated during the course of the D&D will be characterized and managed according to the ARARs. Most waste will be stored or disposed of within the boundaries of ORR. However, there may be some wastes that will need to be transported off site for treatment and/or disposal. primarily if the waste exceeds the waste acceptance criteria of the on-site cell, For those remediation wastes that are either considered RCRA or TSCA wastes, the provisions of the CERCLA "off-site rule" will be followed (see 40 CF R 300.440).

A large variety of waste streams will be generated, including PCB bulk product waste and PCB remediation waste. PCB bulk product waste, as defined by 40 CFR 761.3, is waste derived from manufactured products containing PCBs in a non-liquid state at any concentration where the concentration at the time of designation for disposal was greater than or equal to 50 ppm. It includes non-liquid bulk wastes and debris from demolition that was manufactured, coated, or serviced with PCBs. Examples of bulk PCB product waste are insulation, dried paints, varnishes, sealants, and caulking. PCB remediation waste, as defined in 40 CFR 761.3, is waste containing PCBs as a result of a spill, release, or other unauthorized disposal. Certain PCB-containing materials/wastes are excluded from this definition depending on the date of the disposal and the PCB concentration. PCB remediation waste includes rags and other debris generated as a result of any PCB-spill cleanup in buildings and other man-made structures containing concrete, wood floors or walls contaminated from leaking PCBs or PCB-contaminated transformers. PCB-remediation waste also includes PCB- contaminated nonporous surfaces such as smooth glass, unpainted marble or granite, or porous surfaces such as fiberglass, painted stone, and corroded metal.

4.2.2 Impact on the Community

Local workers would be the primary support for this action. The work force needed for each building/facility-specific removal action would be small with respect to total current employment (<5 percent) for both alternatives. Therefore, no changes in local population or nearby industrial or commercial operations would be expected in the short term. It is anticipated that effects will include a contribution toward local goals of modernization of Y-12 and process operations consolidation for Alternative 2. Alternative 2 would promote use of the area in general by making it safer for workers and nearby residents in the more immediate future. Alternative I would do so in the long term only.

The sum of an action's incremental effects when added to other ongoing and anticipated effects is called cumulative effects. These can result in the action having a greater impact than anticipated because of coincidences in timing or multiple effects to the same resource. In the case of building demolition, air quality impacts would be limited to any dust and emissions generated during building takedown. Because most decontamination activities would be conducted within enclosures or by using engineering methods specifically designed to control such emissions, hazardous substances releases such as asbestos and radiological constituents would be minimal. Traffic and noise levels could be affected during the actual implementation of the action. These effects, even when added to effects of other activities taking place at the site, are not expected to have an adverse impact on either on-site workers or nearby communities.

4.2.3 Cost Comparison

A generic cost equation may be used to compare Alternatives I and 2 on the basis of cost:

- Alternative 1 Cost (for Bldg.) SM x 10 years + CR + Demo
- Alternative 2 Cost (for Bldg. X) = Demo

where

- SM= annual costs assigned to Bldg. X S&M ($/year)
- CR = one-time major capital repairs attributed to Bldg. X ($)
- Demo= cost to demolish Bldg. X ($)

For example, S&M costs for a facility may be $500,000 annually. A typical roof replacement for a 20,000 square foot building would be about $250,000 in capital repair expenditures. A cost for demolition of this building falls in the range for 'medium' of $200/sq. ft. – resulting in a demolition value of $4,000,000 (see Chap. 7).

Thus, using unescalated costs and completing the equations for this scenario,

Alternative 1 Cost ($500,000 x 10 years) +$250,000 + $4,000,000 = $9,250,000
Alternative 2 Cost = $4,000,000

Application of an escalation rate would increase the cost of Alternative 1 and reflect an even greater cost difference between the two alternatives.

4.2.4 Conclusions

As seen in Table 1, both alternatives will meet RAOs and reduce potential hazards, but Alternative 1 does so only in the future. Alternative 2 thus provides greater protection of human health and the environment in the more immediate term (10+ years for some facilities). Both alternatives comply with ARARs. The alternatives fare equally well using the criterion of implementability as both are highly implementable and feasible and will utilize services and materials that are readily available now or will be in the future. In the final category of cost, Alternative 2 is much more desirable than Alternative 1 because high maintenance costs are greatly reduced or eliminated, capital repair costs are no longer incurred, and the costs of demolition are lower now than in the future when costs will be escalated due to inevitable structural degradation and rising equipment, material, and labor costs.

As stated in Sect. 3.3, controlled demolition now (Alternative 2) will reduce the exposure and safety risk to S&M workers and will meet DOE EM objectives while reducing the inventory of surplus buildings.

Thus, based on the criteria of effectiveness, implementability, and cost, and on these additional considerations, Alternative 2 is the preferred removal action alternative.

5.0 STRATEGY FOR IMPLEMENTATION OF THE PREFERRED ALTERNATIVE

The primary driver for facilities removal strategies is risk. To facilitate this risk-based approach the preferred alternative will be implemented through sub-project groupings of buildings, structures, facilities, and appurtenances. These groupings will be based on several factors including facility contamination and worker hazards, facility maintenance requirements, and structural composition; the need to remove buildings before remedial actions; and on efficiencies that would allow the best value to the government for its D&D work. These groupings and associated sequencing for implementation will be reflected in the Life Cycle Baseline for IFDP which will be a part of the CD-2/3 package. ~~A future action memorandum will be issued as funding and schedules are finalized through both the baseline process and FFA milestone establishment process.~~

This chapter describes the general scope of the removal action, including the list of specific activities and the manner in which the action will be conducted.

5.1 OVERALL SEQUENCE OF ACTIVITIES

As mentioned here, the D&D activities are preceded by preparation of the action memorandum. A ~~remedial action work plan (~~RmAWP~~)~~ ~~is~~ will be prepared next. ~~following the D&D contractor procurement.~~ Then, subsequent to determining the contracting strategy and/or after selection of the D&D contractor, it is expected that WHPs will be prepared. Core activities include initial cleanup and characterization (as needed), interior dismantlement and removal of equipment, follow-on cleaning and characterization for safety and waste disposition, and structural demolition and waste management. Demolition should only be required to slab or basement floor, or other horizontal foundation. Walls below grade may be left. For facilities with basements and potential rain water or groundwater post-D&D issues, these issues are to be addressed in the RmAWP and WHPs for the facility. All post D&D issues will be addressed in the RmAWP and WHPs, which will be reviewed and approved by the FFA parties. Facility groupings will be documented in the RmAWP and in future Core Team interactions, with details documented in future WHPs. Additionally, any contamination remaining below grade, as defined by the end state, will be identified and addressed by the Core Team in existing and future CERCLA documents.

The overall sequence of actual D&D activities is shown in Figure 2. Individual contractors may propose to perform the work in a slightly different order or fashion. (Details will be enumerated in the work plans.) DOE cumulative experience has shown the activity scenario presented here to be fairly common and conventional and thus will be assumed in the cost estimates given in this EE/CA.

Conventional tools and technologies are anticipated for all phases of demolition work. The removal/disassembly of equipment and materials will likely be accomplished using hand-held tools with saws and hydraulic shears for size-reduction (of piping, for example). Decontamination technologies, when needed, will include manual techniques of wiping/vacuuming as well as scabbling and/or coating with a fixative/stabilizer coating. Demolition will likely use conventional technologies, such as cable-suspended and excavator-mounted attachments (pulverizers, shears, grapples, rams) for controlled demolition.

5.2 WASTE MANAGEMENT

Demolition of Y-12 buildings and facilities will generate numerous material waste streams that will fall into a number of waste categories for disposition. Appropriate on-site and off-site disposal facilities will be used. Additional discussions on these topics are found in Sections 5.2.1-5.2.3.

In addition to the disposal facilities likely to be used, waste may also be disposed at a number of other permitted facilities. Table 2 summarizes this section by listing expected waste streams from demolition and cleanup activities followed by corresponding waste stream type and category. The last column gives the appropriate and most likely disposition for each waste category.

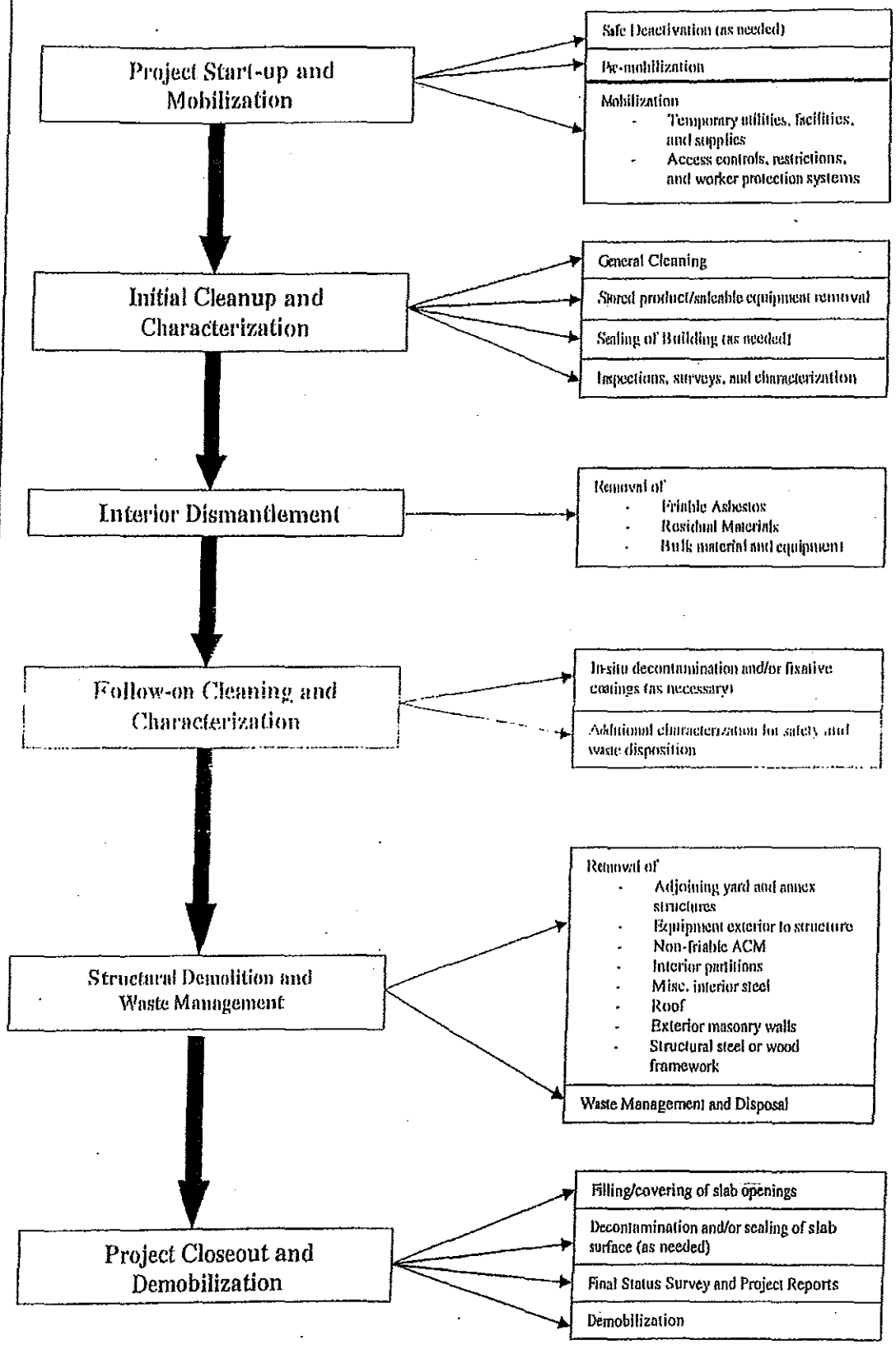

Figure 2: Sequence of demolition activities at Y-12

Table 2. Waste Streams and Disposition for Contaminated Buildings, Y-12, Oak Ridge, Tennessee

WASTE TYPE	MATERIAL	CATEGORY	DISPOSAL
Residual materials	PCB-containing liquids	TSCA PCB	TSCA-permitted TSDF
	Petroleum, oils and lubricants, hydraulic fluids, etc.	Clean fluids	Permitted TSDF
	Sludges, liquids	RCRA/mixed	Permitted TSDF
Process equipment and Piping	Noncontaminated steel and piping	Clean	Recycle/reuse/construction debris landfill
	Contaminated steel and piping	LLW	EMWMF disposal cell or disposed at permitted facility
Nonprocess equipment and piping	Noncontarninated steel and piping	Clean	Recycle/reuse/construction debris landfill
	Some electrical components	TSCA PCB	Licensed disposal facility
Structural and architectural materials	Transite siding	ACM	CD landfill
	Steel, wood, and gypsum	Clean	CD landfill
	Concrete and masonry	Clean	Rubblized for on-site fill
	Concrete, gypsum, transite, steel, wood	LLW	EMWMF disposal cell
Secondary *waste* streams	PPE	LLW	Drummed for disposition at permitted facility or EMWMF disposal cell
	Decontamination solutions	LLLW	Sent to an on-site wastewater treatment facility
Classified materials	All	Clean	Y-12 Industrial Waste Landfill
	All	LLW	NTS, EMWMF or on-site interim storage

ACM = asbestos-containing material
CD = construction/demolition
EMWMF = Environmental Management Waste Management Facility
LLLW = liquid low-level (radioactive) waste
LLW = low level (radioactive) waste
NTS = Nevada Test Site
PCB = polychlorinated biphenyl
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act of 1976
TSCA = Toxic Substances Control Act of 1976
TSDF = treatment, storage, and disposal facility

5.2.1 Description of Material Waste Streams and Waste Categories

Waste streams generated from building and facility demolition at Y-12 will likely produce the following general waste streams:

- Residual material is primarily liquid material within equipment or reservoirs that will be drained where possible and containerized for proper disposal. If the liquids contain PCBs, the liquids will be handled as TSCA waste. Other fluids and sludge may be considered clean or RCRA-mixed waste depending on levels of radioactive contamination and hazardous constituent.
- Process equipment and piping may include vessels, tanks, compressors, pumps, associated piping, lathes, furnaces, presses and plating facilities, and miscellaneous equipment and piping. Major contaminants of concern include uranium and uranium compounds, beryllium and beryllium compounds, mercury, and LiOH.
- Nonprocess equipment and piping includes all equipment and piping not considered part of a process system and materials such as sanitary plumbing components, hydraulic units, bridge cranes, and miscellaneous equipment and piping. These materials may be contaminated on the surface but not likely contaminated on the interior. Some non-building facilities, such as tanks and overhead pipelines, will fall into this category. This category also includes building electrical and heating, ventilation, and air conditioning components. There may be incidental contamination because of the presence of PCBs or asbestos-containing materials.
- Structural and architectural materials include transite siding, roofing and flooring materials, structural steel, concrete, brick, wood, gypsum, and other miscellaneous building materials. Contamination associated with this stream, if present at all, is likely localized and removable, allowing the possibility of recycling, free release, or on-site disposal.
- Secondary waste streams will be produced in the process of cleanup of loose contamination and in demolition itself. The waste streams may include rags, wipes, vacuum bags, personal protective equipment, and decontamination fluids. By nature of its generation, this waste stream is typically LLW.
- Classified materials are any materials that, because of form, design, usage, etc., must be carefully disposed of in a secured place.

5.2.2 Strategies for Waste Management

The following approaches will be used in the managing of wastes:

Sufficient characterization will be performed to ensure that disposed materials and wastes will meet the acceptance criteria of the facility receiving them. Based on the expertise and the boundaries established by specifications, the contractor would have the flexibility in determining if a waste stream can be economically decontaminated for recycle or reuse. Mechanisms, such as DOE-approved independent verification procedures for material with recycle or reuse potential, will be used to ensure proper free-release to the public for unrestricted use. These will be described in the work plans. DOE is committed to waste minimization and will decontaminate where economically practicable. Subcontractors will be encouraged to minimize generation of waste that must be landfilled and to maximize material recycling and reuse. The latter may be obtained by standard engineering methods, such as waste stream segregation.

Construction debris materials, such as concrete, masonry, and block, with incidental amounts of wood, wallboard, etc., and containing low levels of residual contamination may be rubblized and left in

place or used as earthen fill material at another nearby site within DOE-owned and -controlled property. Construction debris materials remaining on site will be characterized in accordance with Risk Assessment Guidance for Superfund to ensure protectiveness with the anticipated use for the site.

Specific waste volumes will be determined on a sub-project basis.

5.2.3 Waste Disposal Options

Disposition selections presented in Table 2 are those considered most likely to be used for each waste category. They are not, however, the only options available for the project.

Clean wastes, TSCA wastes (such as PCB-contaminated liquids), and RCRA wastes may either be disposed of on-site as mentioned previously (Table 1), or they may be taken to a number of licensed commercial treatment, storage and disposal facilities that are currently being used.

Likewise, there are alternative disposal options for the disposition of LLW or mixed waste. The on-site Environmental Management Waste Management Facility (EMWMF) will accept LLW and mixed waste from demolition. Should EMWMF not be available, there are other approved facilities, such as the Nevada Test Site, that will accept wastes in this category. These off-site facilities are currently being used. The packaging and transportation of wastes off site has not been problematic but is typically more costly. Some waste streams may require interim storage because of classification issues, recycle potential, and lack of disposal options, etc. Generally, it is DOE's intention that waste will not be stored from a project.

6.0 RISK EVALUATION

The potential threat to human health and the environment from the release of contaminants from NTCRA IFDP facilities is the focus of this risk evaluation. The ~~auxiliary~~ NTCRA IFDP facilities are located in an industrial setting typical of similar federal facilities and have institutional controls, such as zoning, posted areas, fencing, engineering controls, and security features. Access to contaminated areas is restricted, and employees working in these facilities receive special training and are medically monitored. Because of these active institutional controls, current exposures are acceptable and well below DOE and EPA criteria.

As mentioned previously, natural degradation occurs when a building is allowed to continue to deteriorate over time, resulting in structural failure and contaminant migration. This scenario is a true "no action" scenario that has the potential to release contamination to the environment, thereby increasing the potential for human or ecological exposure and increased risk of toxic effect or cancer. Controlled demolition, which appears as a future activity in Alternative 1 and as the primary activity in Alternative 2, also has a potential to release contamination to the environment.

The risk evaluation presented here qualitatively addresses the potential for exposure resulting from (1) building collapse due to natural degradation (i.e., no action) and (2) controlled demolition, using Bldg. K-1131 as a model for ~~the worst~~ a high risk case condition likely to be encountered during the undertaking of the action (Alternatives 1 and 2). This analysis is intended to show that buildings with a risk at least the levels of Bldg. K-1131 can and should be safely deactivated/demolished. Although the evaluation alone does not justify the preferred alternative, it does provide support, from the perspective of risk, for the decision to use controlled demolition as a removal action, whether in the immediate or long-term future.

6.1 DESCRIPTION OF THE AUXILIARY AND OTHER SUPPORT FACILITIES

The NTCRA IFDP facilities may be characterized as having widespread, low concentrations or activities of contaminants with localized areas of high concentrations or activities known to exist in some of the buildings. The contamination may be fixed (adhering to equipment or building structural components) or transferable (dusts or powders that have settled on the surface of equipment or building structural components; residual solids or liquids in pipes, tanks, and sumps/pits, etc.). Vents, sumps/pits, tanks, piping, etc., may contain higher concentrations of contaminants and/or mixtures of contaminants.

6.2 NATURAL DEGRADATION (UNCONTROLLED STRUCTURAL COLLAPSE)

Contaminants are generally contained by the building structures. However, in the absence of major facility repairs (e.g., roof replacement) and maintenance, structural degradation will proceed. This degradation, including roof and wall deterioration, will allow rainwater to infiltrate the buildings. Infiltration of rainwater can wash transferable or soluble contaminants out of the buildings through cracks in the floors or walls. In addition, as the components degrade into finer sized particles or transferable contaminants become exposed to the air, airborne dispersion of fugitive dust becomes a concern.

Natural structural degradation is a slow process characterized by incremental deterioration punctuated by episodic collapse. Because of the dispersed nature of the residual contamination and the slow rate of building degradation, the release of contaminants will occur over a long period of time from deteriorating piping systems or equipment exposed to the elements or increased stressed loads and is not likely to result in exposures leading to unacceptable risk. However, employees entering deteriorated facilities will be at risk of injury from the physical hazards created by structural degradation and possible collapse.

6.3 CONTROLLED DEMOLITION (ALTERNATIVES 1 AND 2)

Under controlled demolition, the most likely routes of contaminant migration are airborne dispersion of fugitive dust and runoff during rainfall. Controlled demolition of a building occurs over a very short time period and includes a sequence of actions to ensure the containment afforded by the building structure is maintained during removal of most contaminated pieces. In addition, engineering controls are used to prevent fugitive dust emissions and stormwater runoff during demolition activities. Therefore, short duration, proper sequencing of activities, and engineering controls result in contaminant releases that are controlled and exposures that do not exceed acceptable levels. Project experience such as that performed at Fernald, Ohio; Weldon Spring, Missouri; Colonic, New York; and on the ORR ETTP has confirmed this to be true.

6.4 RISK FROM A DEBRIS PILE AND COMPARISON WITH BLDG. K-1131

An evaluation of the potential risk to a receptor was evaluated for Bldg. K-1131 in the Engineering Evaluation/Cost Analysis for the Group I Auxiliary Facilities, K-25 Site, Oak Ridge, Tennessee (Jacobs ER Team 1996). Building K-1131 was selected because it exhibited the highest concentrations of contaminants of potential concern for this scenario. Because such a waste configuration would require engineering controls to prevent rain water infiltration, surface water run-on and runoff, and air dispersion of contaminants to the surrounding environment, the model assumed a thin, impermeable liner would be used to cover the wastes. The model assumed engineered controls would prevent surface or groundwater infiltration into the waste pile.

The estimated debris volume would be equivalent to a 6-ft-high pile across the entire building pad, which covers an area of 40,000 ft2. In addition, the model assumed that all of the uranium contamination would remain in the building debris and that the upper limit of the estimated total activities was present in the debris. An average density of 1.5 g/cc (grams per cubic centimeter) was assumed to derive an upper limit to the average concentrations within the hypothetical building debris pile. This resulted in an estimate of 56 pCi/g total uranium, which was then rounded up to 100 pCi/g total uranium to add an extra degree of conservatism.

This concentration was used to model exposures to a hypothetical worker. Because the waste form would be isolated and because it is reasonable to assume workers would not intrude into the waste form, the only pathway for exposure was external exposure to gamma radiation (Note: mercury and beryllium exposures are not considered here because of the impermeable liner). To bound the risks to a worker from contaminants within the pile and in accordance with EPA guidance documents, the model assumed that the hypothetical employee was placed near the pile for 8 hours/day, 250 days/year, and 25 years total duration. This employee was not assumed to be a radiation worker.

The residual maximum exposure (RME) risk calculations yielded a total excess cancer risk at the time of maximum dose of 3 x 10-5, which occurred immediately after the creation of the hypothetical debris pile. The maximum dose rate was calculated to be 6 mrem/year. Because the resultant risk of such a conservative scenario was well within the EPA target risk range of 1 x 10-6 to 1 x 10-4, no other exposure scenarios were explored. Because the contaminants in K-1131 are not uniformly distributed, the actual concentrations released from a pile of debris would be much less than those postulated.

The following information is given to facilitate the comparison between Building K-1131at ETTP and the NTCRA IFDP facilities on the Y-12 Site. A listing of the major processes that have occurred historically in select Y-12 buildings is provided in Appendix A.

As a comparison to Bldg. K-1131 at ETTP, the K-1131 summary contaminant conditions are:

- Radiological Contamination – fixed and removable alpha and beta-gamma up to 7,100,000 dpm/100cm2; gamma dose rates up to 2,000 uR/hr.
- Radiological Constituents – uranium, trace levels of transuranic.
- Chemical contaminants – PCBs, lead, multiple fluorine compounds (hydrogen, cobalt), selenium oxide, chromium, various lubricating oils, ACM.

This building, based on process knowledge and historical data, is considered to present the greatest risk of all the buildings at the ETTP site for which demolition has occurred. The Y-12 facilities, based on process history and the historical data, are generally expected to be within the bounds of, or not significantly exceed, the risk level of Building K-1131. For some facilities, such as Alpha-4, Alpha-5, Beta-4, and the uranium oxide storage vault (UOSV), and/or for different release scenarios and assumptions, higher risks could result. DOE has the ability as noted in Section 1.3 to demolish facilities with a higher risk than Bldg. K-1131, and increased risks~~, however,~~ would result in further justification for the preferred alternative.

7.0 COST

The work performed under this EE/CA and in the subsequent action memorandum will be conducted in a number of incremental work packages that each will include the demolition of a building or group of buildings. As such, costs associated with each package are highly variable and unable to be predetermined. However, to more fully describe the magnitude of work associated with this EE/CA, a total estimated cost for demolition of all the CERCLA, or contaminated buildings are given here. The total unescalated cost for NTCRA IFDP facility D&D at the Y-12 Site, as estimated in the CD-1 package, ranges from $1.2B to $1.9B. Given the complexity of many of the structures, this value falls well within the ranges experienced for other D&D projects on the ORR.

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APPENDIX A

Summary Complex/Grouping Description and Listing of Y-12 NTCRA IFDP Facilities Scheduled for Deactivation or D&D

SUMMARY Y-12 D&D FACILITIES DESCRIPTION BY MAJOR BUILDING GROUPING/COMPLEX

ALPHA-2 Complex:

- Building 9201-2 Fusion Energy Building (ALPHA 2) Fusion (324,448 square feet)
- Building 9105 Office Building (7,667 square feet)
- Building 9501-4 161 KV Steel Transformer (The square footage has been included in the 9201-2 building totals)
- Building 9732-2 Carpentry Shop (480 square feet)

The Alpha-2 Complex is located within the property protected area of the Y-12 Site and includes facilities: 9105, 9501-2 and 9732-2. These four facilities combined have a total of 324,448 gross square feet. The Alpha-2 Facility (Building 9201-2) is the largest at 324,448 square feet. It is a 2.1 floor facility with a partially concreted basement with varying depths from 7.5 to 15' deep. The footprint occupies 107,619 SF. There are 4 roof lines with the highest vertical distance from first floor finished elevation being 82.25'. The basement has reinforced poured concrete foundation, support pier structures and floors with thick hollow core clay tile block external walls. The external walls have a brick facade on portions of the building. The interior walls are constructed of heavy hollow core clay tile block, masonry hollow core block, concrete, metal, wood or gypsum board. The roof is a flat bituminous built-up roof with a gravel weather cover that is supported by a concrete panel and structural steel support system in portions of the high bay area. Alpha-2 was constructed in 1943 to house 2 alpha-stage calutrons for uranium enrichment and operated until 1951. During this same time frame, an 86" cyclotron was constructed around 1948 and operated until 1957. The cyclotron is still present in the facility but the sources have been removed. D&D of the calutrons occurred between 1951 and 1952 when most of the associated operations were removed and reconfiguration efforts began for the ELEX and COLEX Lithium/Mercury enrichment operations. The Elex process involved an electro-chemical and solvent extraction method that required substantial quantities of mercury as a solvent agent to separate the lithium-6 isotope from lithium-7 (in the form of lithium hydroxide). During this production large amounts of mercury were lost and the building structures have contaminated. The Lithium separation and enrichments operations continued until 1963 when the equipment was drained of the majority of process materials (including mercury). However, all systems/components were not cleaned, and some recoverable quantities of mercury and lithium hydroxide may remain in the equipment and lines.

The facility was transferred from Y12 operations control to ORNL operations for development and research operations in 1963. The facility is still today operated by ORNL with minimal research activities being conducted. Currently the Alpha 2 facility houses office space, maintenance operations and possible small scale experiments.

The facility also has a mercury contaminated basement and soils. As a result, airborne mercury is a continual hazard for workers in the facility and is a minor contributor to ambient air mercury concentrations at the Y-12 Site. Contaminants of concern include, but are not limited to, mercury, asbestos, PCBs, beryllium and radiological contamination.

ALPHA-3 Complex:

- Building 9201-3 – Office Complex/Alpha 3 (191,978 Square Feet)
- Building 9732-3 – Utility Room/Painter Facility (2,447 Square Feet)
- Building 9999-3 – Switchgear Building (2,447 Square Feet)

The Alpha 3 Complex is located within the property protected area of the Y-12 Site on Second Street. The Alpha 3 Complex comprises a total of 196,872 square feet. There are a total of 3 facilities that make up this complex; Alpha 3 (Building 9201-3) being the largest facility at 191,978 square feet. Ancillary structures 9732-3 and 9999-3 occupy the remaining 4,894 square feet in this complex. The Alpha 3 Facility is a 3.1 storied facility having a partially concreted basement with an average depth of 13.5'. The footprint occupies 68,895 SF. The facility has 4 roof lines with the highest vertical distance from first floor finished elevation being 75'.The remaining basement surface is occupied by reinforced concrete foundation system or earthen floor. The basement walls are constructed of reinforced formed and poured concrete. The exterior of the facility is constructed of heavy hollow clay tile blocks with a peeling painted surface, and to a lesser extent, a reinforced concrete. The interior walls are constructed of reinforced concrete, heavy hollow clay tile block, hollow core cinder block, wood, gypsum board and or metal. The roof has a dual layering of a flat bituminous built-up roof with a gravel weather cover that is supported by a concrete panel and structural steel support system in portions of the high bay area. Alpha-3 facility was constructed in 1943 to house 96 Calutron "racetracks", track 5 and alpha -1 calutrons for uranium enrichment. It operated until 1949 when other uranium enrichment operations were conducted. Uranium enrichment operations ended in 1951 at which time uranium salvage operations began. Salvage operations ended in 1964. The building was transferred to ORNL research and development and operations continued until 1995. The building has been occupied and operated for many years by the ORNL Engineering Technology Division. The building was turned over to Y-12 in October 2001. ORNL operations included management and development offices, maintenance and machine shops, laboratories for multidisciplinary research and development relevant to energy conservation and utilization, mechanical, structural, and thermal sciences, and manufacturing technologies. Many areas of the facility have been emptied of everything except basic furniture. Currently, the building houses offices and space for Maintenance, Human Resources (which includes Legal, Staffing, Compensation and Equal Opportunity Concerns), Fire Protection Engineering, Radiation Control (RADCON) and the Development Prototype Center. It is believed that most of the calutron equipment, components and systems have been removed and drained (including mercury). However, the smaller self-contained experimental systems still have hazardous chemical hold-up present. The facility is considered to have up to 60 to 65% radiologically contaminated floors and up to 8 feet on the walls. The remaining portions of the floors are not accessible due to floor tile covering or no survey data has been created. Beryllium contamination characterization surveys have been completed for floors, lower walls and some equipment within the facility. The Be survey has shown levels of Be in excess of the guidelines in rooms first floor center bay, room 225 and 276, the women's second floor bathroom, old change area and in the east side scrap yard. The facility also contains large quantities of asbestos containing material, PCB's, Pb, and universal waste. The facility is considered to be 30% contaminated with Hg form past enrichment operations. The basement has to be monitored prior to entry for Hg vapors.

Building 9732-3 – Utility room/painters facility is assumed to have been constructed during the same time frame as the Alpha-3 facility. Building 9732-3 is currently empty and is constructed similarly as 9201-3. The only exception is this facility has a wood-framed pitched

roof. Both radiological and chemical concerns are also assumed to be the same in the main facility 9201-3.

Building 9999-3 – The Switchgear building is currently used for storage of janitorial supplies and clean PPE supplies. The facility is constructed on an elevated concrete pad with a pre-engineered, mild steel framed metal sided building in place. The facility is considered rad clean and is not posted. Chemically there is one area of potential PCB contamination on the floor from the past switchgear operations. This facility is ready for D&D after utility disconnection is completed.

ALPHA-4 Complex:

- Building 9201-4 – General Plant Maintenance (ALPHA 4) – (510,218 GSF)
- Building 9501-5 – 161 KV Steel Transformer
- Building 9720-46 – Storage - (3,026GSF)
- Building 9720-46 – Storage - (130 GSF)
- Building 9999-8 – Switchgear Building - (2,332 GSF)

The Alpha-4 Facility (Building 9201-4) is a 600,000 square foot transite-covered structural steel and concrete facility with three floors and a subbasement located in the protected area of the Y-12 Site. Alpha-4 began operating in 1945 as a uranium enrichment facility using the electromagnetic separation process for uranium separation and enrichment until 1947 when the electromagnetic process was abandoned. The building was not used again until 1953 when the installation of the column exchange (Colex) process began and within fifteen months retrofits were completed and the system was in operation. The Colex process involved an electrochemical and solvent extraction method that required substantial quantities of mercury as a solvent agent to separate the lithium-6 isotope from lithium-7 (in the form of lithium hydroxide). Production continued until 1962 when the equipment was drained of the majority of process materials (including mercury). However, all systems/components were not cleaned, and some recoverable quantities of mercury and lithium hydroxide remained in the equipment and lines. As a result, airborne mercury is a continual hazard for workers in the facility and is a minor contributor to ambient air mercury concentrations at the Y-12 Site.

Ancillary facility 9720-46 (Storage) – This is a pre-engineered metal building measuring approximately 100' long by 30' wide and approximately 20' tall having a pitched metal roof. The structure is located on an on grade concrete slab. The current function of this facility is to provide storage space for drummed waste associated with Y-12 operations. It is assumed to have the potential for radiological surface contamination, asbestos piping, mold, mildew and animal intrusions

Ancillary structure 9501-5 (161 kV Steel Transformer) - This is a transformer that currently feeds power to 9999-8 switchgear, power distribution, building. Reconfiguration of power distribution is required prior to D&D. The only known hazards associated with this structure is PCB oils at < 5ppm.

Ancillary structure 9804 (Utilities) Fire Sprinkler Valve House – This facility is approximately 12' long by 12' wide and 12' in height, constructed of formed and poured concrete walls with a reinforced concrete foundation and poured concrete floor. The facility has a flat concrete roof. The facility currently houses the fire sprinkler valve for 9999-8. There are no known hazards associated with this structure. It is assumed to have the potential for radiological surface contamination, asbestos piping, mold, mildew and animal intrusions.

Ancillary structure 9999-8 (Switchgear Building) – This is a pre-engineered metal building measuring approximately 54' long by 42' wide and approximately 28' tall having a pitched metal roof. The structure is located on an on grade reinforced concrete slab. Currently the facility is a major distribution hub for the west end electrical services. Reconfiguration or transfer of services will have to be completed prior to D&D. It is assumed to have the potential for radiological surface contamination, asbestos, PCB's mold, mildew and animal intrusions.

ALPHA-5 Complex

- Building 9201-5 - *Production* (613,642 square feet)
- Building 9622 - *Steam House (Inactive)* (218 square feet)
- Building 9983-HF - *Change House* (375 square feet)
- Building 9808 - *Maintenance* (7,540 square feet)
- Building 9404-20 - *Laborer Shack* (2,751 square feet)
- Building 9422-15 - *Storm Drain Monitoring #16* (62 square feet)
- Building 9422-16 - Storm Drain Monitoring #5 (64 square feet)
- Building 9976 - *Utilities* (2,797 square feet)
- Building 9767-13 - *Chiller Building* (20,724 square feet)
- Building 9422-13 - *Storm Drain Monitoring #6* (362 square feet)
- Building 9404-13 - *Pumphouse* (953 square feet)
- Building 9409-13 - *Cooling Tower* (8,387 square feet)
- Building 9416-31 - *Fire Protection Valve House* (162 square feet)
- Building 9416-14 - *Utilities (management)* (44 square feet)
- Building 9404-18 - *Demineralizer Facility* (4,760 square feet)

The Alpha-5 Complex is located within the protected area of the Y-12 Site and includes facilities: 9201-5, 9622, 9983-HF, 9808, 9404-20, 9422-15, 9422-16, 9976, 9767-13, 9422-13, 9404-13, 9409-13, 9416-31, 9416-14, and 9404-18. These 15 facilities combined have a total of 662,841 gross square feet. The Alpha-5 Facility (Building 9201-5) is the largest at 613,642 square feet. It is a transite-covered, structural steel and concrete facility with 4 floors and an 11 feet deep concrete basement. The basement is continually flooded with up to 6 feet of water.

Alpha-5 was constructed in 1946 to house alpha-stage Calutrons for uranium enrichment. The facility was used from 1946 until 1951 for uranium enrichment operations, from 1951 until 1963 for COLEX Lithium/Mercury enrichment operations, from 1963 until 1995 for various metallurgical and machining processes involving uranium and beryllium and from 1995 to the present for the following 5 operations: arc melt/skull cast, ceramic machining, product certification, programmatic support and numeric control maintenance. The Colex process involved an electrochemical and solvent extraction method that required substantial quantities of mercury as a solvent agent to separate the lithium-6 isotope from lithium-7 (in the form of lithium hydroxide). Production continued until 1963 when the equipment was drained of the majority of process materials (including mercury) and removed from the building. However, some quantities of mercury and lithium hydroxide may remain.

The facility also has a mercury contaminated basement and soils. As a result, airborne mercury is a continual hazard for workers in the facility and is a minor contributor to ambient air mercury concentrations at the Y-12 Site. Contaminants of concern include, but are not limited to, mercury, asbestos, PCBs, beryllium and radiological contamination.

BETA-1 Complex:

- Building 9204-1 – Office Maintenance Shops and Storage/Beta-1 (210,491 Sq. Ft.)
- Building 9422 – Helium Compressor Building (2,671 Sq. Ft.)
- Structure 9501-4 – 161KV Steel Transformer (square feet included in Beta-1)

The Beta-1 Complex is located in the property protected area of the Y-12 Site on Second Street and the corner of "E" Street. The Beta-1 Complex comprises a total of 213,162 square feet. There are a total of 3 facilities that make up this complex; Beta-1 (Building 9204-1) being the largest facility at 210,491 square feet. Ancillary structures 9422 and 9501-4 occupy the remaining 2,671 square feet in this complex. The Beta-1 Facility is a 2.1 storied facility having a partially concreted basement with an average depth of 9.5'. The footprint occupies 75,012 SF. The facility has 3 roof lines with the highest vertical distance from first floor finished elevation being 71'. The remaining basement surface is occupied by reinforced concrete foundation system or earthen floor. The basement walls are constructed of reinforced formed and poured concrete. The exterior of the facility is constructed of heavy hollow clay tile blocks. The interior walls are constructed of reinforced concrete, heavy hollow clay tile block, hollow core cinder block, wood, gypsum board and or metal. The roof has a flat bituminous built-up roof with a gravel weather cover that is supported by a concrete panel and structural steel support system in portions of the high bay area. Beta-1 facility was constructed in 1943-44 timeframe to house Beta calutrons "racetracks", track 1 and 2. The calutrons operated until 1945. The facility was placed in operational stand by for a short period and decommissioned by 1947. The facility spent the next three years performing various R&D and uranium recovery operations. In 1950 the facility was transitioned to ORNL research and development and operations and continued R&D work until 1995. During that period the stable isotopes such as depleted uranium and thorium were used in some of the research. The facility is currently home to shutdown R&D experiments, office space, maintenance operations and possible small scale research projects. It is believed, in 1947 most of the calutron equipment, components and systems were removed and drained. Radiological scoping surveys show, however, that piping and other components have residual radiological hold-up. The smaller self-contained experimental systems typically did not involve radiation in their processes but they still have hazardous chemical hold-up present. The facility is considered a "fixed contamination area" as noted on the entry ways to the building. TRU limits apply. The facility also contains large quantities of asbestos containing material and universal wastes. The objective of the Beta-1 Complex D&D Project is to remove the hazardous materials such as asbestos, deactivate the buildings, remove the equipment and appurtenances and demolish all above grade facilities and ancillary structures within the complex to grade level.

Deactivation Only Complex:

- Building 9204-3 – CTD – Isotope Separations (Beta-3) (255,656 Square Feet)
- Building 9731 – Laboratory and Storage (37,159 Square Feet)
- Structure 9501-8 – 161 KV Steel Transformer (square feet included in 9204-3)

The Deactivation Only Complex addresses those facilities which are considered for National Historic Preservation (NHP) as historical buildings. The complex consists of the Beta-3 (9204-3 Building) and Building 9731. Building 9204-3 is located in the protected area of the Y-12 Site on Second Street while 9731 is located First Street in the property protected area. The 9204-3 building totals of 255,656 square feet and has one named ancillary facility, 9501-8, a 161 KeV transformer. The transformers square footage has been assumed into the main facility

square footage and does not have an associated square footage noted. Building 9731 has no named ancillary facilities.

The Beta-3 Facility is a 2.1 story facility having a fully utilized concrete basement with a depth of 14'. The building occupies 88,419 SF. The facility has 3 roof lines with the highest vertical distance from first floor finished elevation being 72'. The 9731 Facility is small in comparison, only having a footprint of 17,255 square feet and a total square footage of 37,159. Building 9731 is a 1.1 story facility having a fully utilized concrete basement with a depth of 16'. The facility has three distinct roof lines with the highest roof line being approximately 63'. The basement walls and floors for both facilities are constructed of reinforced formed and poured concrete. The exterior of each facility is constructed of heavy hollow core clay tile blocks. The interior walls are constructed of reinforced concrete, heavy hollow clay tile block, hollow core cinder block, wood, gypsum board and or transite wall board. The roofs have a flat bituminous built-up roof with a gravel weather cover that is supported by a concrete panel and structural steel support system in portions of the high bay area.

The Beta-3 facility was constructed in the 1943 time-frame for the second pass separation of U-235 through the Beta tracks 5 and 6. The calutrons operated until 1951 in this capacity at which time they were converted over to produce stable isotopes for medical, business and agricultural uses. The facility operated in this capacity until 1985, at which time the east beta track was taken out of service. The west calutron was utilized until July of 1998. The west calutron has been maintained periodically and brought to 85% power as late as 2005. This facility is considered to be in operational stand-by today and represents what the calutron operation of the past resembled. The eastern track is still radiologically contaminated with the actinide series of nuclides and no decontamination or dismantlement performed. Hold up within the process lines have not been drained or characterized. The western beta track was cleaned with minimal D&D performed in preparation of being placed on the NHP List. The remaining equipment in the basement and above floors still remain intact and requiring decontamination, but not dismantlement. The facility houses a large amount of oils, 35,000 gallons of "Z oil", calutron coolant oil, 42,000 of gallons of transformer/capacitor oils that are contaminated with PCB's and possible other constituents. Oils have varying levels of PCB content from <2ppm up to 100% (1 million parts) pure PCB oils. Labs contain much of the equipment that was used during operations with hoods, ventilation, building surfaces and equipment being contaminated. Currently this facility has a very well defined inventory list of hazards, stored equipment and product inventories within the facility. Pounds of stable isotope bulk powders are still currently stored in this facility. Asbestos containing materials are throughout the facility in varying degrees of degradation. Beryllium has been identified in several rooms. Other universal waste also remains in the facility.

Building 9731 was constructed in 1943 as the calutron pilot plant. It housed 2 alpha and 2 beta calutrons. The separation of isotopes was stopped shortly after construction and then became the full scale training facility for the operations of the calutrons. Stable isotope production and testing was conducted in 1945 into the mid 1960's. The facility is intact with a majority of systems and components still in place. The facility is posted as a Fixed Contamination Area using TRU Limits. The facility has no supporting radiological characterization data to support this statement. The process pipe systems have been drained but not flushed in this facility. The main concern are PCB's that still remain in the process lines. Other chemical concerns are Hg contaminated sumps and floors, falling ACM, universal wastes, potential for perchlorate associated with one hood still remaining in the basement and the potential for Be in the facility. Currently the facility has several Lithium experiments being conducted and serves as office space and storage of equipment.

BETA-4 Complex:

- Building 9204-4 – Production (Beta-4) (313,771 GSF)
- Building 9404-16 – Storage Building (1,526 GSF)
- Building 9409-20 – Cooling Tower (1,600 GFS)
- Building 9501-9 – 161 kV Transformer (--[1] GFS)
- Building 9720-22 – Warehouse Building (12,712 GFS)
- Building 9720-24 – Storage Building (11,192 GFS)
- Building 9802-1 – Steam Valve Room (151 GFS)
- Building 9802-2 – Steam Valve Room (151 GFS)
- Building 9811-1 – Waste Oil Storage (OD8) (4,917 GFS)
- Building 9811-4 – Tanker Transfer Station (1,112 GFS)
- Building 9811-5 – Waste Coolant Facility (4,800 GFS)
- Building 9983-78 – Office (200 GFS)

The 9204-4 Complex is located within the protected area of the Y-12 Site just east of Old Bear Creek Road and south of Bear Creek Road. The Beta-4 Complex comprises a total of 352,132 square feet. There are a total of 12 facilities that make up this complex; 9204-4 being the largest facility at 313,771 square feet and 9404-16, 9409-20, 9501-9, 9720-22, 9720-24, 9802-1, 9802-2, 9811-1, 9811-4, 9811-5, and 9983-78 being ancillary structures occupying the remaining 38,361 square feet in this complex. Beta-4 is a 2.1 story facility having a 15' deep concrete basement footprint of 87,450 square feet. The facility exterior is constructed of a heavy hollow core clay block supported by both reinforced concrete columns and structural steel columns with an overall height just over 71 feet. The exterior is covered in 26,637 square feet of corrugated transite siding. The interior walls are constructed of heavy hollow core clay tile block, masonry hollow core block, concrete, metal, wood or gypsum board. The roof is a flat bituminous built-up roof with a gravel weather cover. It is supported by a concrete panel and structural steel system.

The 9204-4 Facility was constructed in 1944–45, housing two beta calutrons. The calutron process was discontinued the next year, 1946, and the process of removal continued until the early 1950's. The building began reconfiguration efforts to accommodate the ELEX Lithium Isotope Separation Program which produced Lithium-6. The electroexchange separation process (ELEX) operated in Beta-4 from 1953 to 1956 to produce Lithium-6 for use in weapon production. The ELEX program was ended and equipment removed in the late 1950's. Reconfiguration efforts were completed in the 1960's and early 1970's to support weapon fabrication and support operations. Currently, the facility houses the Quality Evaluations laboratory, a reclamation area, DSO storage, metal press operations, facility maintenance operations and general storage. Beta-4 is currently listed as a Hazard Category 2 facility, but is currently reducing its radiological inventory to reduce that classification. DU, HEU and Thorium are considered the main radiological contaminants with TRU limits applying to surface release criteria. The primary chemical hazards include lead, PCBs, freon, oils, mold, mildew, and asbestos. Other chemical concerns include the potential for beryllium contamination on surfaces in excess of 8' and the worst case potential for mercury contamination on 50% of the surfaces and structural components in the facility.

Biology Complex:

- Building 9207 – Biology Building (256,660 GSF)
- Building 9207 A – Biology Building Annex (8,108 GSF)
- Building 9210 – BD Mammalian Genetics (64,737 GSF)
- Building 9401-1 – Steam House (Old Steam Plant Building) (13,227 GSF)
- Building 9743-2 – Pigeon House (2,371 GSF)
- Building 9767-6 – Utilities (400 GSF)
- Building 9767-7 – Utilities (Fan House for 9207) (393 GSF)
- Building 9770-2 – Lead-lined Source Shed (Radiation Source Building) (155 GSF)
- Building 9770-03 – Emergency generator (166 square feet)

The Biology Complex is located in the northeast portion of the Y-12 Site outside of the Property Protection Area and includes facilities 9207, 9207-A, 9210, 9211, 401-1, 9743-2, 9767-6, 9767-7, and 9770-2. These facilities have a combined total of ~462,000 gross square feet. With the exception of 9401-1 (Old Steam Plant), the Biology complex is "cold and dark" (i.e., all service utilities are deactivated and air gapped in shutdown status pending D&D). The Biology Building (9207) is a 256,660 GSF, 6-story building with terracotta block external walls as high as 95'. The building was constructed in 1943 and originally used for uranium salvage and recovery operations. Later, the facility was used for ORNL biological research operations. All combustibles have been removed from the facility prior to becoming "cold and dark." Current access is restricted due to questionable structural integrity and the presence of mold and mildew. It is estimated that 2,936 CF of legacy waste remains in the facility. The primary chemical hazards include lead, PCBs, freon, oils, perchloric acid, and asbestos. Radiological contamination is present and TRU limits apply. A smaller office annex, 9207-A is attached to the Biology building.

Building 9210 (BD Mammalian Genetics) – This is the next largest facility in the Biology complex at 64,737 GSF. Also built in 1945, this 3-story building's structure and characteristics are similar to those described above.

Building 9401-1 Steam House (old steam plant) – This facility was built in 1943 and is 13,227 GSF. This single story facility has 30' high walls and is constructed of heavy clay hollow core block, hollow core cinder block, and brick exterior on portions of the building. This facility is posted "fixed contamination." This facility served as the Y-12 east end steam plant and now supports Y-12 storage. Chemical hazards are similar to those described above. It is estimated that 2,125 CF of legacy waste remains in the facility.

The remaining facilities within the Biology complex 9743-2, 9767-6, 9767-7, 9770-2, and 9770-3 are ancillary support facilities or small biological research facilities that have similar characteristics as those facilities already described above.

9206 Complex:

- Building 9206 – Production (57,812 square feet)
- Building 9720-17 – Butler Building/Storage (4314 square feet)
- Building 9744 – Utilities (9081 square feet)
- Building 9768 – Power House (1243 square feet)
- Tank Farm – 3200 square feet

The 9206 Complex is located within the protected area of the Y-12 Site and includes facilities 9720-17, 9744, 9768, and the OSF tank farm. These facilities combined have a total of 75,650 gross square feet. The 9206 Facility (Building 9206) is a 57,812 square feet, on slab, clay tile block, structural steel and concrete facility having 1 floor and two elevated 2 story sections with a height of 32'. Building 9206 was constructed in 1945 with an original mission to recover HEU and process salvaged uranium from the electromagnetic separation process until 1946. From 1947 until 1994, Building 9206 operated as a uranium product recovery and salvage facility. In addition, operations consisted of uranium chemical processing and metal production operations between 1951 and 1994. From 1994 until present, the facility has been undergoing deactivation of systems, has had minimal surveillance and maintenance activities and serves as a storage facility for in-process materials. However, all systems/components have not been cleaned and some recoverable quantities of HEU may remain in equipment and processes. In 2006, the southwestern corner of the facility was decontaminated and demolished.

<u>9212 Complex:</u>

- Building 9212 - Production (442,317 square feet)
- Building 9409-22 - Cooling Tower (1,829 square feet)
- Building 9409-22E - Cooling Tower (4,519 square feet)
- Building 9409-23 - Cooling Tower (3,454 square feet)
- Building 9409-24 - Cooling Tower (3,200 square feet)
- Building 9416-12 - Utilities (management) (126 square feet)
- Building 9416-20 - Utilities Building (90 square feet)
- Building 9416-28 - Fire Protection Valve House (149 square feet)
- Building 9416-32 - Utility Support for Cooling Tower (200 square feet)
- Building 9416-46 - Valve House (54 square feet)
- Building 9423 - Maintenance Shop (6,263 square feet)
- Building 9721 - Office/Support Trailer (157 square feet)
- Building 9723-25 - Changehouse/Offices (18,974 square feet)
- Building 9767-10 - Chiller Building (12,000 square feet)
- Building 9811-9 - Tanker Loading Station (756 square feet)
- Building 9812 - Abandoned Tanker Station (Tank Pit) (1,190 square feet)
- Building 9815 - Material Recovery (Nitrate Facility) (1,722 square feet)
- Building 9818 - Material Recovery (Acid Waste Neutralization) (7,561 square feet)
- Building 9820 - Old Butler Building (Electrical Storage) (408 square feet)
- Building 9828-1 - Dry Exhaust System (Bag Filter System) (557 square feet)
- Building 9828-2 - Dry Exhaust System (Probe House) (568 square feet)
- Building 9828-3 - Dry Exhaust System (Bag Filter System) (568 square feet)
- Building 9959-1 - Cylinder Storage (106 square feet)
- Building 9980 - Storage and Office (Physical Testing, X-ray) (4,361 square feet)
- Building 9981 - Vaults (Physical Testing, X-ray) (4,972 square feet)
- Building 9996 - Tooling Storage (34,233 square feet)
- Building 9999 - Emergency Generator Room (460 square feet)

The 9212 Complex is located within the northeast portion of the protected area at the Y-12 Site and includes 27 facilities/structures totaling 548,805 square feet. Fourteen of the 27 facilities including 9212 are designated Nuclear Hazard Category 2 facilities.

The 9212 Building is a 442,317 square foot, 2 story reinforced concrete, concrete block, and steel building that was constructed in 1949 and is used for the recovery, purification, and processing of enriched uranium into usable products. The building is comprised of multiple wings performing different manufacturing and production functions. The first and second floors are primarily concrete and the third and fourth floors are primarily metal grating. Some rooms have stainless steel sheets up to three-sixteenths of an inch thick. There is a tremendous amount (i.e., miles) of stainless steel process piping and equipment throughout the facility as well as an extensive HVAC duct system that runs throughout the facility. There are numerous radiological hazards present in the facility including fixed contamination and removable surface contamination. Fissile material is also present in the facility and hold up material in process equipment is likely to be encountered during D&D activities. Asbestos, PCBs, lead, and other chemical hazards including nitric acid, ammonium hydroxide, hydrogen peroxide, and hydrofluoric acid are present in the facility. There are also beryllium contaminated material storage areas in the facility. The facility also has a basement averaging 9' deep.

The following paragraphs below provide a brief description of a few of the larger, supporting, facilities within the 9212 Complex.

Just south of 9212 is Building 9996 (Tooling Storage), which is the second largest facility in the complex having 34,233 square feet. Building 9996 is a 2-story concrete block facility with a main level/high bay area and a second floor change house on the east side of the building. Fixed and removable contamination exists in the facility. Two 10-ton cranes are present in the high bay area, and an estimated 10-15% legacy material and process waste occupy the facility.

Building 9818 (Material Recovery) is a 7,561 square feet facility located west of 9212. This basement and three-floor concrete facility is non operational. Stainless steel plate covers the concrete flooring. The basement has 8 stainless steel tanks ranging in size from 80 – 10,000 gallons. It is estimated that 10% of the building's volume is occupied with process equipment. Both fixed and removable contamination exists, as well as asbestos, PCBs, mold and animal wastes. A natural spring exists beneath the basement which will need to be managed during RA activities.

Building 9423 (Maintenance Shop), east of Building 9212, is a 6,263 square feet Butler Type structure (i.e., concrete floor, insulated roof over structural metal frame) and has a mezzanine in the southwest corner of the facility. The facility contains a 10-ton crane and is estimated to contain 10% of the building's volume in legacy material/waste. The facility is expected to have fixed contamination and ACM.

Sitting adjacent to 9212 on its east side, is Building 9981 (Vaults/Physical Testing, X-ray). This facility is 4,972 square feet and is similar to 9980 which sits just north of 9981. This facility has hollow concrete block offices, as well as three vault rooms with concrete walls 3 feet thick which contain hoists and X-ray equipment. There are numerous radiological hazards associated with this facility in addition to lead and ACM.

Steam Plant Complex:

- Building 9401-3 – Steam Plant Building (62,124 GSF)
- Building 9616-10 – Unloading Station (438 GSF)
- Building 9616-9 – Waste Water Treatment Building (3,400 GSF)
- Building 9811-6 – Dry Ash Handling Facility (1,546 GSF)

- Building 9811-7 – Wet Ash Handling Facility (1,363 GSF)
- Building 9990 – Monitoring Station (80 GSF)

The Steam Plant Complex (Building 9401-3) is located in the south-southwest portion of the Y-12 Site inside of the Protection Area. The complex includes facilities 9616-9, 9616-10, 9811-6, 9811-7, and 9990. These facilities have a combined total of 68,951 gross square feet. The Steam Plant (9401-3) is a 62,124 GSF, approximately 5-story, 85' high, pre-engineered steel building with corrugated aluminum and transite external walls and roof. The building was constructed in 1955 and consists of 4 boiler steam generation setup having two 190' tall emission stacks. The west stack is 12.5' diameter and the east stack is 15 in diameter. It is estimated that 35,757 CF of legacy waste remains in the facility. The primary chemical hazards include Hg, Pb, PCBs, asbestos, with biological hazards such as mold and animal wastes. Another concern involves the issues surrounding remaining coal dust in the facility. To D&D this facility, hot work will be required and the coal dust remaining is highly flammable. Radiologically, there is no known contamination present except naturally occurring radionuclides present in the coal and those that are concentrated in the remaining fly ash.

The next largest facility is the Waste Water Treatment Facility Building 9616-9. This 2-story facility is 3,400 GSF and of similar design/construction as 9401-3, but having no asbestos siding or roofing material. Built in 1985, it serves as the waste water treatment facility. The facility has no known radiological hazard or chemical hazards. There are currently stored chemicals that support current operations.

Building 9811-6 Dry Ash Handling Facility and Building 9811-7 Wet Ash Handling Facility combine for a total of 2,909 GSF. The facilities were constructed in 1995 and 1990, respectfully. Each structure is similar in construction of the main facility. Currently the facility is not known to contain any chemical or radiological hazards.

Building 9616-10 Unloading Station is associated and attached to Building 9616-9. It is a one story building built of similar construction as 9401-3 having 438 GSF. The facility has no known asbestos siding or roofing material. Built in 1986, it has been used as an unloading and tank storage area for the steam plant. There are no known chemical or radiological hazards associated with this facility other than chemicals that are currently in use. Currently the facility is not known to contain any chemical or radiological hazards.

Building 9990 Monitoring Station was built in 1973 and is 80 GSF. This is a single story facility with a portion of the facility constructed of metal walls and roof on an elevated concrete pad that adjoins a concrete block structure having a corrugated asbestos roof. Chemical hazards are similar to those described above.

<u>Balance of Facilities Complex:</u>

- Building 9424-1 – Foam House for OD-9 – (359 GSF)
- Building 9424-2 – Foam House for OD-10 – (357 GSF)
- Building 9703-14 – Guard Booth Ancillary to 9213 – (123 GSF)
- Building 9840-4 – Drum Cleaning Station – (312 GSF)
- Building 9983-FX – FRC Field Support Trailer – (680 GSF)
- Building 9999-2 – Motor Generator – (266 GSF)

The Balance of Facilities D&D Complex includes numerous facilities located in both the limited land areas; property protected areas, and protected areas of the Y-12 Site. The

Balance of Facilities D&D Complex comprises a total of 2,097 square feet. There are 6 ancillary support facilities/structures that make up this complex. The facilities included are; 9424-1, 9424-2, 9703-14, 9840-4, 9983-FX, and 9999-2. The bullets below briefly discuss each of the facilities/structures.

- 9424-1 and 9424-2 (Foam House for OD-9 and Foam House for OD-10 respectively). These are pre-engineered metal buildings occupying 359 square feet each having a sloped metal roof. The structures are constructed on an on-grade concrete slab with 9424-2 having an elevated concrete pad. The current functions of these facilities are fire water valve controls. There are no known hazards or postings associated with these facilities. It is assumed they have the potential for radiological surface contamination, asbestos insulation, mold, mildew and animal intrusions

- 9703-14 (Guard Booth Ancillary to 9213) and 9999-2 (Motor Generator). These ancillary facilities were constructed in 1950 and served as a guard booth or storage facility and housing for motor generator or auxiliary power generator. 9703-14 occupies 123 square feet and 9999-2 occupies 266 square feet. Both facilities are constructed of reinforced formed and poured concrete walls having a poured reinforced concrete foundation and flat concrete roof. Currently the facilities are unoccupied and are "Cold and Dark." There are no known hazards or postings associated with this facility. It is assumed they have the potential for radiological surface contamination, asbestos insulation, mold, mildew and animal intrusions

- 9840-4 (Drum Cleaning Station). This facility occupies 312 square feet and is a portable unit. It is constructed of a steel I-Beam frame with metal exterior. It is located on a concrete pad measuring approximately 750 square feet. There are no known hazards or postings associated with these facilities. It is assumed to have the potential for radiological surface contamination, asbestos piping, mold, mildew and animal intrusions.

- 9983-FX (FRC Field Support Trailer). This facility is a mobile modular home converted to office space, experimental R&D, and radiological source storage. It is constructed of wooden stud, metal frame and metal roof. It occupies 680 square feet. The structure is anchored down by use of concrete jersey barriers and underpinned with a corrugated fiberglass board that potentially contains asbestos. Currently the facility is unoccupied. It is assumed to have the potential for radiological surface contamination, asbestos, PCB's mold, mildew, and animal intrusions.

Transition Facility D&D:

- Building 9213 – Old Criticality Experiment Laboratory (23,635 GSF)
- Building 9401-2 – Plating Shop (13,673 GSF)

9213 – Building 9213 is a two-story concrete and concrete block structure about 200 ft. long and 80 ft. wide with three test cells of floor area between 900 and 1,520 ft^2. It is located in a remote area in the southeast portion of the Y-12 Plant and is surrounded by large hills. The Critical Experiment Facility (CEF) is 30% of Building 9213 and consists of Rooms 101, 102, 201, 202, and 204, generally referred to as the West Test Cell Area. The building operations, critical and near critical experiments with fissile uranium isotopes, began in 1950. During the years 1950 through 1961, more than 9,700 experiments were performed with approximately

95% of the assemblies having been made critical. The CEF was also used to make preoperational reactivity measurements on fresh High Flux Isotopes Reactor fuel elements beginning in 1965. The CEF ceased operations in March 1987. All nuclear fuel elements have been removed. Contamination has only been observed in the West Test Cell Area. Maximum alpha is 1,7600,000 dpm fixed and 50,000 removable. Maximum beta/gamma is 210,000 dpm fixed and 30,000 dpm removable. No hazardous materials, as defined in the OSHA Hazardous Communication Standard, remain in the building.

9401-2 (General Plating Shop) - The General Plating Shop is a single-story, steel-framed, 42 ft. high structure. It was constructed in 1946 as part of the Y-12 Plant construction and housed the steam plant until 1955 when the facility was converted to a plating shop.

The facility is a non-radiological facility that once supported the following plating/coating processes: acid copper, aluminum anodizing and dyeing, nickel plating, electrolysis nickel plating, black oxide, acid zinc, chrome plating, chromate conversion, alodine coating, and stainless steel passivation. Other operations included cyanide plating, alkaline cleaning, pickling, masking, surface polishing, and waste handling. There are 44 process chemical plating tanks that range from 39 to 3,925 gallon capacity. The tanks contain residual hazardous chemical contamination and are currently covered with plastic sheeting. Point source exhaust systems were installed for many of the plating tanks due to the chemical fumes created. Hoods and process tanks are considered contaminated with chemical residues. The tanks are located on wooden platforms that were integrated as a single platform that occupies the majority of the facility. The platform is elevated approximately 5 ft from the floor with an extensive array of chemical supply and drain piping associated with the plating tanks. A dike was constructed on the concrete floor under the plating area. It was breached during a stabilization campaign in 1998.

Two additional storage tanks (4,000 and 6,500 gallon capacities) are located in a dike and are outside of the facility near the northwest corner. During operations, these tanks were used for waste collection. The tanks would store waste until it could be pumped into a transport tanker for shipment to a waste disposal site. All tanks, inside and outside of the facility, have been drained and flushed. Since stabilization in 1998, the facility is no longer occupied, with all process materials and chemicals having been removed.

There are no nuclear materials present in the facility and there is no indication that any nuclear materials were ever stored. Although process history does not indicate radiological processes or the plating of radioactive materials, fixed contamination exists inside the building in four small floor areas. The fixed contamination level does not require further decontamination. All process materials, unused chemicals, and generated waste have been stabilized and removed from the facility, with residual chemical contaminants remaining. The facility is categorized as Other Industrial and classified as Other Industrial.

<u>EM Facilities D&D:</u>

- Building 9825-01 – Depleted Oxide Vault (1,608 GSF)
- Building 9825-02 – Depleted Oxide Vault (1,608 GSF)
- Building 9809-1 – Depleted Uranium Oxide Shed (1,564 GSF)
- Structure OD-7 – Waste Oil Storage (Bulk Oil/Solvent Waste) (16,439 GSF)
- Structure OD-9 – Waste Oil Tanks (27,911 GSF)
- Building 9720-44 – Sludge Handling Facility (2,993 GSF)
- Building 9720-45 – Liquid Organic Facility (Bay and Tanks) (2,190 GSF)

The Uranium Oxide Storage Vault (UOSV) Complex is located at the southwest end of the Y-12 Plant, on Chestnut Ridge, and northeast of Building 9213. Access to the area is from Mt. Vernon Rd., via a 20 ft-wide asphalt surface. The UOSV Complex is situated significantly higher than the access road to the facility. The UOSV Complex is comprised of two underground storage vaults (9825-1 and 9825-2); a temporary storage enclosure (Bldg. 9809-1); a portable office (Bldg. 9809-2); and BCS No. 9 (9983-CF), which serves as the entry point for the storage vault Radiation Control Area. The UOSV Complex also includes an asphalt loading/unloading area adjacent to buildings 9825-1, 9825-2, and 9809-1, plus all above grade materials and structures within 15 ft of any of the buildings mentioned, such as a skid mounted building and three-sided storage building.

The UOSV Complex was constructed in 1985 to provide indefinite retrievable bulk storage for uranium oxides, saw fines, and uranium metal scrap generated at Y-12. Vault 9825-1 is partially filled (~38%) with uranium oxide. In 1992, all dumping into this vault was suspended and the uranium oxide material in the vault is now a solid, hardened mass. Vault 9825-2 was never used for its intended purpose and is empty. There are no plans to resume uranium oxide dumping into either vault. Building 9809-1 provided staging and temporary storage of depleted uranium oxide drums. This facility is empty and will not receive additional waste for storage. Building 9809-2 is an ancillary facility with no inventory.

The UOSV Complex has a nuclear hazard categorization of Radiological and a non-nuclear hazard classification of Low (BJC 2004d).

There is no permanent staff located at the UOSV Complex. Staff is only present during S&M activities associated with the performance of periodic surveys, inspection of the drainage system and vault structures, periodic inspections in the 9825-1 vault, and maintenance activities associated with vegetation control and facility repairs.

OD-7 (Hazardous Waste Storage Facility and Building 9811-1). Oil Dike (OD-) 7, also known as Bldg. 9981-1, is the Hazardous Waste Storage facility. It was constructed for bulking and storing wastes prior to shipment to the TSCA Incinerator at ETTP and was operated for approximately 14 years. It was RCRA closed in February of 2003. It received hazardous chemicals, primarily waste oils and solvents, contaminated with < 50 ppm PCBs and low levels of uranium and beryllium, from various Y-12 Plant operations. The facility is located near the corner of K Road and West 2nd Street and is a 51 by 58 ft concrete dike approximately 4 ft high. It has six above ground storage tanks [four 30,000 gal tanks (F1-F4), one 10,000 gal tank (F7), and two 10,000 gal tanks (F5 and F6)], concrete secondary containment around the tanks, loading/unloading stations, material handling/staging/storing areas, sumps, pumps, piping, instrumentation and accessories. Building 9981-1 is a one story metal frame building adjacent to Oil Dike 7 that was previously used to store drums. It does not contain any hazardous material.

Tank interiors, ancillary equipment and secondary containment met the clean debris surface standard [as defined in 10CFR40 Part 268.45 and incorporated into Tennessee Rule 1200-1-11-.10(3) (a)] with some piping being removed and disposed. RCRA closure has been certified. The interior of the tanks have been posted as a radiological area. There were no other hazards identified on the Preliminary Hazard Screening Worksheet. The area is categorized as Other Industrial based on process knowledge in that the site met the clean debris surface standard and classified as Other Industrial based on RCRA closure.

OD-9 (Waste Oil/Solvent Storage Unit, Building 9811-8). OD-9, including Building 9811-8, was constructed for bulking and storing wastes prior to shipment to the TSCA Incinerator at ETTP. It was operated for approximately 13 years and RCRA closed in late summer of 2001. There is no active fire suppression system associated with the facility. It had six above ground storage tanks, concrete secondary containment around the tanks, loading/unloading stations, material handling/staging/storing areas, sumps, pumps, piping, instrumentation and accessories. There is a boundary control station, an office trailer (9983-CE), and abandoned equipment (e.g., a sanitary dumpster, metal spill pallets, trailer-mounted pressure washer) on the facility footprint. There a 4 garage sheds (9720-87, 9720-88, 9720-89 and one not numbered) also on the facility footprint. The unnumbered shed contains abandoned equipment waiting disposal (e.g. drum crushers and torpedo heater) and a flammable storage cabinet. There is a flammable storage cabinet in the office trailer. The office trailer (9983-CE) has been cleaned, locked and is scheduled to be removed from the site by the end of 2007. There are six forklifts on the facility footprint available for use or disposal.

Wastes were compatible, aqueous, organic, RCRA (toxicity and listed) hazardous/TSCA-PCB/radiologically-contaminated liquids/oils. Wastes were predominately liquid with some sludge/solids that were generated at Y-12; delivered and stored at OD-9 until sufficient volume accumulated; and then transported to an outside recovery/disposal facility. OD-9 was for non-ignitable wastes—typically oil and organic solvents (chlorinated and non-chlorinated), some of which contained trace metals, radionuclides, and PCBs (typically <50 ppm); the maximum allowable inventory was 200,000 gallons in tanks and 8,800 gal in containers. Fissile radionuclides other than U-235 were not allowed without prior approval. Wastes occasionally included segregated streams of non-hazardous waste and oil regulated under the used-oil standards. Pesticides and herbicides were not permitted. Wastes were not classified.

Tank interiors, ancillary equipment and secondary containment met the clean debris surface standard [as defined in 10 CFR 40 Part 268.45 and incorporated into Tennessee Rule 1200-1-11-.10(3) (a)] with some piping being removed and disposed. RCRA closure has been certified. The interior of the tanks as well as the drum crusher at the loading/unloading station have been posted as radiological areas. There were no other hazards identified on the Preliminary Hazard Screening Worksheet. The chemical inventory, including the flammable storage cabinet, is being maintained less than RQ. The area is categorized as Other Industrial based on process knowledge in that the site met the clean debris surface standard and classified as Other Industrial based on RCRA closure.

Sludge Handling Facility (Building 9720-44). The Sludge Handling Facility is a rectangular area located along the Y-12 Plant South Patrol Road, and is designated as Building 9720-44. Building 9720-44 is a single-story, metal structure approximately 25 ft high with no walls. The structure is surrounded by gravel and grass. Two holding tanks are inset into the floor of the structure and are connected to a central channel that runs to the west approximately 30 ft and connects with an elevated, inactive pump unit and small tank. Approximately 20 ft to the east of these holding tanks is another small, inactive, pumping unit and holding tank. Electrical switchgear is present; however, electrical service to the facility been disconnected. The facility footprint extends south to the South Patrol Road, east to the access road, and north and west to the drainage swales. A concrete storage pad located east of the access road is no longer part of this facility, but was once used to store containers of low-level mixed (LLMW), waste and asbestos-contaminated waste. The pad is now managed separately by the BWXT.

Historically, the facility was used to support a sludge dewatering operation for sludge that had accumulated over many years in the Y-12 storm drain system. The facility was constructed in 1986 for the "Reduction in Mercury in Plant Effluents" project. The dewatering operation was conducted for less than a year before completing its mission. After the dewatering activities were completed, the filters were removed, the equipment was cleaned, and the operation shut down. The remaining sludge was cleaned out and removed from the facility. The dewatering equipment remains at the facility. Since that time, the only operation at the facility has been to store and retrieve waste containers from the adjacent storage pad. The waste containers have all been removed.

The facility is in S&M awaiting D&D with periodic inspections, radiological monitoring surveys, etc being performed. The facility also may be used as a laydown area for items such as construction materials and equipment. Heavy equipment and vehicles (e.g., fork trucks, transfer trucks, cranes, etc.) may be used at the facility for movement of heavy objects.

Facility maintenance activities range from simple tasks such as installation of locks on doors, removing and placement of signage, housekeeping (cleaning, trash removal, etc.), and hot work (welding) to larger tasks such as improvements and repairs to facility structures and utilities, and improvements to facility grounds. Water that accumulates in the sump and pit areas is occasionally pumped out using standard industrial equipment. Welding and cutting equipment may be used at the facility. Gasoline is present in vehicles, and may be used for yard maintenance equipment (weed-eaters, etc.).

The facility radiological inventory is less than the 40 CFR 302.4 reportable quantities (RQs). The hatch at the west end of the channel covers the pit where sludge was input to start the dewatering process. This area is posted as a radiation material area. Process knowledge and radiological survey data indicate that there is only negligible residual radioactivity present at the facility. After the dewatering activities were completed, the filters were removed, the equipment was cleaned, and the operation shut down. The remaining sludge was cleaned out and removed from the facility. The dewatering equipment remains at the facility. Since that time, the only operation at the facility was to store and retrieve waste containers and dumpsters from the adjacent storage pad. The waste containers have all been removed, and there are no plans to store waste at the facility. The facility chemical waste inventory is less than the 40 CFR 302.4 RQs. Small quantities of commercially available cleaning supplies, pesticides, herbicides, paints, etc. may be stored for facility and yard maintenance activities. The chemicals associated with these materials are standard industrial hazards, and the constituent ingredients are not counted towards the facility inventory. The Sludge Handling Facility, Building 9720-44 is categorized and classified as Other Industrial.

OD-10 (Liquid Organic Solvent Storage Facility, Building 9720-45). OD-10 was constructed for bulking and storing wastes prior to being sent to the TSCA Incinerator at ETTP. It was operated for approximately 13 years and RCRA closed in late summer of 2001. There is no active fire suppression system associated with the facility. There is no fire detection or manual fire alarm activation equipment. It had six above ground storage tanks, concrete secondary containment around the tanks, loading/unloading stations, material handling/staging/storing areas, sumps, pumps, piping, instrumentation and accessories as well as a boundary control station (9983-FM) and a skid mounted office trailer.

Wastes were compatible, aqueous, organic, RCRA hazardous/TSCA-PCB/radiologically-contaminated liquids/oils. Wastes were predominately liquid with some sludge/solids that were generated at Y-12; delivered and stored at OD-10 until sufficient volume

accumulated; and then transported to an outside recovery/disposal facility. OD-10 was for ignitable waste—typically liquid organic solvents with a flash point <100F, some of which contained radionuclides, PCBs (typically <50 ppm), and beryllium.

There is a drum cleaning station (9840-4) at the site, a single-story metal building approximately 26 ft by 12 ft by 9 ft with a metal grated floor, resting on a concrete pad. The facility design includes spark-resistant construction materials, appropriate grounding and explosion-proof electrical fixtures and controls for handling hazardous materials (NFPA 70 Article 500 Class I, Division I design). There is a hot water heater that provides water for cleaning it, and an electrical lighting unit is located within the enclosed structure of the building, but accessed from the exterior. While the facility has never been used, it is intended to clean empty 55-gal drums. The drums would have contained various types of waste material and contaminated with residual quantities of toxic/hazardous material, PCBs and possibly low-level radioactively contaminated materials. The building contains two self-contained, pneumatically operated drum-wash machines to clean the interior of drums with an aqueous alkaline cleaning solution.

The site is now an inactive, RCRA clean, closed, fenced, patrolled, inspected area. The tank interiors, ancillary equipment and secondary containment met the 'clean debris surface' standard [as defined in 10CFR40 Part 268.45 and incorporated into Tennessee Rule 1200-1-11-.10(3) (a)] with some piping being removed and disposed. RCRA closure has been certified. The area is categorized as Other Industrial based on process knowledge in that the site met the clean debris surface standard and classified as Other Industrial based on RCRA closure.

APPENDIX B

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

APPLICABLE OR APPROPRIATE AND RELEVANT REQUIREMENTS

In accordance with NCP Sect, 300.415(j) and DOE Headquarters guidance, on-site removal actions conducted under CERCLA are required to meet ARARs "to the extent practicable, considering the exigencies of the situation." The NCP identifies two factors that should be considered in determining whether complying with ARARs is practicable: (1) the urgency of the situation, and (2) the scope of the removal action to be taken. Waste streams expected from the D&D of the auxiliary buildings include nonhazardous solid waste, mixed hazardous waste or debris, asbestos, PCBs and LLW. The DOE/EPA joint "Policy on Decommissioning DOE Facilities under CERCLA," (May 22, 1995) supports conducting D&D operations as CERCLA removal actions, including identifying regulatory requirements as ARARs.

It is possible that some buildings covered in this action are nominated to be Historic Structures at the Y-12 Site. A Cultural Resources Survey may be required and because this removal action could adversely affect the structures, consultation with the Tennessee State Historic Preservation Officer (SHPO) is required for this removal action pursuant to Sect, 106 of the National Historic Preservation Act and the programmatic agreement among DOE-ORO, the Tennessee SHPO and the Advisory Council on Historic Preservation.

The significant waste streams generated as a result of D&D activities are RCRA-hazardous and solid waste, PCBs, mixed waste, and LLW in the form of debris, asbestos, miscellaneous equipment, and scrap metal. The ARARs addressing the handling, storage, treatment, and disposal of these waste streams are found in the following tables.

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	Chemical-specific		
Radionuclides in the environment	Exposure to individual members of the public from radiation shall not exceed a total EDE of 0.1 rem/year (100 mrem/year), exclusive of the dose contributions from background radiation, any medical administration the individual has received, or voluntary participation in medical/research programs.	Activities causing the release of radionuclides into the environment—**relevant and appropriate**	10 *CFR* 20.1301(a)(1)
	Shall use, to the extent practicable, procedures and engineering controls based on sound radiation protection principles to achieve doses to members of the public that are ALARA.		10 *CFR* 20.1101(b)
Release of radionuclides into the environment from decommissioning	For unrestricted use of the site, residual radioactivity that is distinguishable from background radiation shall not cause a total EDE 25 mrem/year, to an average member of the critical group as defined in 10 *CFR* 20.1003), including that from groundwater sources of drinking water.	Residual radioactivity shall be reduced to levels that are ALARA—**relevant and appropriate**	10 *CFR* 20.1403(a) and (b)
	A site will be considered acceptable under restricted conditions if provisions are made for legally enforceable institutional controls (e.g., deed restrictions, government control or ownership, engineered barriers as appropriate) that provide reasonable assurance that the TEDE from residual radioactivity, which has been reduced to ALARA levels (distinguished from background), to the average member of the critical group will not exceed 25 mrem/year.	-- **relevant and appropriate**	

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
Location-specific			
Historic Properties			
Presence of historic properties (includes artifacts, records, remains, located within such property)	Must take into account adverse effects of the undertaking.	Undertaking (action) that will impact historic property on or eligible to be on the National Register of Historic Places—**applicable**	36 *CFR* 800.1(a) 36 *CFR* 800.11(c)
	Determine adverse effects per 36 *CFR* 800.9 and seek ways to avoid or reduce effects on property.		36 *CFR* 800.5(a) and (e)
Wetlands			
Presence of wetlands as defined in 10 *CFR* 1022.4	Avoid, to the extent possible, the long- and short-term adverse effects associated with destruction, occupancy, and modification of wetlands. Measures to mitigate adverse effects of actions in a wetlands include, but are not limited to: minimum grading requirements, runoff controls, design and construction constraints, and protection of ecology-sensitive areas as provided in 10 *CFR* 1022.13(a)(3):	Federal actions that involve potential impacts to, or take place within, wetlands—**applicable**	10 *CFR* 1022..3(c)
	Take action, to extent practicable, to minimize destruction., loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.		10 *CFR* 1022..3(a)(7) and (8)
Presence of wetlands as defined in 10 *CFR* 1022.4 (cont.)	Potential effects of any new construction in wetlands shall be evaluated. Identify, evaluate, and as appropriate, implement alternative actions that may avoid or mitigate adverse impacts on wetlands.		10 *CFR* 1022.3(b) and (d)
Floodplains			
Presence of wetlands as defined in 10 *CFR* 1022.4	Avoid, to the extent possible, the long- and short-term adverse effects associated with occupancy and modification of floodplains. Measures to mitigate adverse effects of actions in a floodplain include, but	Federal actions that involve potential impacts to, or take place within, floodplains—**applicable**	10 *CFR* 1022..3(c)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	are not limited to: minimum grading requirements, runoff controls, design and construction constraints and protection of ecology-sensitive areas as provided in 10 *CFR* 1022.13(a)(3).		
	Potential effects of any action taken in a floodplain shall be evaluated. Identify, evaluate, and implement alternative actions that may avoid or mitigate adverse impacts on floodplains.		10 *CFR* 1022.3(b) and (d)
	Design or modify selected alternatives to minimize harm to or within floodplains and restore and preserve floodplain values.		10 *CFR* 1022.3(d)
	Aquatic Resources		
Within an area potentially impacting waters of the state as defined in TCA 69-3-103(33)	Must comply with the substantive requirements of the ARAP for erosion and sediment control to prevent pollution; and protect fish and aquatic and water quality.	Action potentially altering the properties of any waters of the state—applicable	*TCA* 69-3-108(j)
Within an area potentially impacting waters of the state as defined in TCA 69-3-103(33) (cont.)	Erosion and sediment control requirements include, but are not limited to: • Limit clearing, grubbing, and other disturbances in areas in or immediately adjacent to waters of the state to the minimum necessary to accomplish the proposed activity • Unnecessary vegetation removal is prohibited and all disturbed areas must be properly stabilized and revegetated as soon as practicable • Limit excavation, dragging, bank reshaping, or grading to the minimum necessary to install authorized structures, accommodate stabilization, or prepare banks for revegetation	Action potentially altering the properties of any waters of the state—TBC	TDEC Aquatic Resource Alteration General Permit Program Requirements

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	• Maintain the erosion and sedimentation control measures throughout construction period • On achievement of a final grade, stabilize and revegetate, within 30 days, all disturbed areas by sodding, seeding, or mulching, or using appropriate native riparian species		
	Action-specific		
	General Construction Standards – site preparation, excavation, etc. activities		
Activities causing fugitive dust emissions	Shall take reasonable precautions to prevent particulate matter from becoming airborne; reasonable precautions shall include, but are not limited to, the following:	Fugitive emissions from demolition of existing buildings or structures, construction operations, grading of roads, or clearing of land - **applicable**	Rules of the TDEC Chap. 1200-3-8-.01(1)
	• Use, where possible, of water or chemicals for control of dust; and		Rules of the TDEC Chap. 1200-3-8-.01(1)(a)
	• Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces that can create airborne dusts.		Rules of the TDEC Chap. 1200-3-8-.01(1)(b)
	Shall not cause or allow fugitive dust to be emitted in such a manner as to exceed 5 min/hr or 20min/d beyond property boundary lines on which emission originates.		Rules of the TDEC Chap. 1200-3-8-.01(2)
Activities causing radionuclide emissions	Shall not exceed those amounts that would cause any member of the public to receive an EDE of 10 mrem/year.	Radionuclide emissions from point sources, as well as diffuse or fugitive emissions, at a DOE facility - **applicable**	40 *CFR* 61.92; Rules of the TDEC Chap. 1200-3-11-.08(6)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
Activities causing storm water runoff (e.g., clearing grading, and excavation)	Implement good construction management techniques (including sediment and erosion controls, vegetative controls, and structural controls) in accordance with the substantive requirements of General Permit No. TNR 10-0000, Appendix F, to ensure that storm water discharge:	Dewatering or storm water runoff discharges from land disturbed by construction activity – disturbance of ≥ 1 acre total – **applicable**	*TCA* 69-3-108(j) Rules of the TDEC Chap. 1200-4-10-.03(2)
	• Does not violate water quality criteria as stated in TDEC 1200-4-3.03, including, but not limited to, prevention of discharges that cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the designated uses for that water body by TDEC 1200-4-4;	Storm water discharges from construction activities – **TBC**	General Permit No. TNR 10-0000, Part III D.2.a
	• Does not contain distinctly visible floating scum, oil, or other matter;		General Permit No. TNR 10-0000, Part III D.2.b
	• Does not cause an objectionable color contrast in the receiving stream; and		General Permit No. TNR 10-0000, Part III D.2.c
	• Results in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.		General Permit No. TNR 10-0000, Part III D.2.d
	Water treatment—on-site transfer and treatment of collected dewatering and decontamination fluids		
Transport to Y-12 wastewater treatment facility	All tank systems, conveyance systems, and ancillary equipment used to store or transport waste to an on-site, NPDES-permitted wastewater treatment facility are exempt from the requirements of RCRA Subtitle C standards.	On-site wastewater treatment units that are subject to regulation under Sect. 402 or Sect. 307(b) of CWA (NPDES-permitted)—**applicable**	40 *CFR* 270.1 (c)(2)(v); Rules of the TDEC Chap. 1200-1-11.07(1)(b)(4)(iv)
	Are not prohibited from land disposal if such	Restricted RCRA characteristically	40 *CFR* 268.1(c)(4)(i);

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	wastes are managed in a treatment system that subsequently discharges to Waters of the United States pursuant to a permit issued under Sect. 402 of the CWA, unless the wastes are subject to a specified method of treatment other than DEACT in 40 *CFR* 268.40 or are D003 reactive cyanide.	hazardous waste intended for disposal—**applicable**	Rules of the TDEC Chap. 1200-1-11.10(1)(a)(3)(iv)(1)
Waste generation, characterization, segregation, and storage—excavated soil, scrap metal, secondary wastes			
Characterization of solid waste (*all primary and secondary wastes*)	Must determine if solid waste is hazardous waste or if waste is excluded under 40 *CFR* 261.4(b) *AND*	Generation of solid waste as defined in 40 *CFR* 261.2 and which is not excluded under 40 *CFR* 261.4(a)—**applicable**	40 *CFR* 262.11(a): Rules of the TDEC Chap. 1200-1-11-.03(1)(b)(1)
	must determine if waste is listed under 40 *CFR* Part 261 *OR*		40 *CFR* 262.11(b): Rules of the TDEC Chap. 1200-1-11-.03(1)(b)(2)
	must characterize waste by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used.		40 *CFR* 262.11(c): Rules of the TDEC Chap. 1200-1-11-.03(1)(b)(3)
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Title 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous - **applicable**	40 *CFR* 262.11(d): Rules of the TDEC Chap. 1200-1-11.03(1)(b)(4)
Characterization of hazardous waste (*all primary and secondary wastes*)	Must obtain detailed chemical and physical analyses on a representative sample of the waste(s) that, at a minimum, contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 *CFR* 264–268.	Generation of RCRA-hazardous waste for storage, treatment, or disposal—**applicable**	40 *CFR* 264.13(a)(1): Rules of the TDEC Chap. 1200-1-11-.06(2)(d)(1)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	Must determine the underlying hazardous constituents [as defined in 40 *CFR* 268.2(i)] in the waste.	Generation of RCRA-characteristic hazardous waste (and is not D001 non-wastewater treated by CMBST, RORGS, or POLYM of Sect. 268.42, Table 1) for storage, treatment or disposal—**applicable**	40 *CFR* 268.9(a); Rules of the TDEC Chap. 1200-1-11-.10(1)(i)(1)
	Must determine if the waste is restricted from land disposal under 40 *CFR* 268 et seq. by testing in accordance with prescribed methods or use of generator knowledge of waste.		40 *CFR* 268.7; Rules of the TDEC Chap. 1200-1-11-.10(1)(g)(1)(i)
	Must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 *CFR* 268.40 et seq.		40 *CFR* 268.9(a); Rules of the TDEC Chap. 1200-1-11-.10(1)(i)(1)
Characterization of LLW (e.g., contaminated PPE, scrap metal, soil)	Shall be characterized using direct or indirect methods and the characterization documented in sufficient detail to ensure safe management and compliance with the WAC of the receiving facility.	Generation of LLW for storage or disposal at a DOE facility - **applicable**	DOE M 435.1-1(IV)(I)
Characterization of LLW (e.g., contaminated PPE, scrap metal, soil)	Characterization data shall, at a minimum, include the following information relevant to the management of the waste:	**Applicable for all**	DOE M 435.1-1(IV)(I)(2)(a)
	• Physical and chemical characteristics;		DOE M 435.1-1(IV)(I)(2)(a)
	• Volume, including the waste and any stabilization or absorbent media;		DOE M 435.1-1(IV)(I)(2)(b)
	• Weight of the container and contents;		DOE M 435.1-1(IV)(I)(2)(c)
	• Identities, activities, and concentrations of major radionuclides;		DOE M 435.1-1(IV)(I)(2)(d)
	• Characterization date;		DOE M 435.1-1(IV)(I)(2)(e)
	• Generating source; and		DOE M 435.1-1(IV)(I)(2)(f)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	• Any other information that might be needed to prepare and maintain the disposal facility performance assessment or demonstrate compliance with performance objectives.		DOE M 435.1-1(IV)(I)(2)(g)
Temporary storage of LLW (e.g., contaminated PPE, scrap metal, soil)	Shall not be readily capable of detonation, explosive decomposition, reaction at anticipated pressures and temperatures, or explosive reaction with water.	Management of LLW at a DOE facility—**TBC**	DOE M 435.1-1 (IV)(N)(1)
	Shall be stored in a location and manner that protects the integrity of waste for the expected time of storage.		DOE M 435.1-1 (IV)(N)(3)
	Shall be managed to identify and segregate LLW from mixed waste.		DOE M 435.1-1 (IV)(N)(6)
Packaging of solid LLW (e.g., contaminated PPE, scrap metal, debris)	Shall be packaged in a manner that provides containment and protection for the duration of the expected storage period and until disposal is achieved or until the waste has been removed from the container.	Storage of LLW in containers at a DOE facility—**applicable**	DOE M 435.1-1(IV)(L)(1)(a)
	Vents or other measures shall be provided if the potential exists for pressurizing or generating flammable or explosive concentrations of gases within the waste container.		DOE M 435.1-1(IV)(L)(1)(b)
	Containers shall be marked such that their contents can be identified.		DOE M 435.1-1(IV)(L)(1)(c)
Management of PCB waste (e.g., contaminated PPE, scrap metal, soil, debris)	Any person storing or disposing of PCB waste must do so in accordance with 40 *CFR* 761, Subpart D.	Generation of waste containing PCBs at concentrations ≥50 ppm— **applicable**	40 *CFR* 761.50(a)
	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which PCBs are found.	Generation of PCB remediation waste as defined in 40 *CFR* 761.3—**applicable**	40 *CFR* 761.61
Management of PCB items	Must dispose of in accordance with 40 *CFR* 761.60(b) or decontaminate in accordance with 40	Removal from use of a PCB Item containing intact, nonleaking PCB	40 *CFR* 761.50(b)(2)

Table B-1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	CFR 761.79.	Article – **applicable**	
	Must dispose of as bulk product waste in accordance with 40 *CFR* 761.62(a) or (c).	Removal from use of a PCB Item where PCB Article is no longer intact and nonleaking —**applicable**	40 *CFR* 761.50(b)(2)
Management of PCB/radioactive waste (e.g., contaminated PPE, scrap metal, soil, debris)	Any person storing such waste must do so taking into account both its PCB concentration and radioactive properties, except as provided in 40 *CFR* 761.65(a)(1), (b)(1)(ii) and (c)(6)(ii).	Generation for disposal of PCB/radioactive waste with ≥ 50 ppm PCBs—**applicable**	40 *CFR* 761.50(b)(7)(i)
	Any person disposing of such waste must do so taking into account both its PCB concentration and its radioactive properties. If, after taking into account only the PCB properties in the waste, it meets requirements for disposal in a facility permitted, licensed, or registered by a state as a municipal or nonmunicipal nonhazardous waste landfill, the person may dispose of such waste without regard to the PCBs, based on its radioactive properties alone, in accordance with applicable requirements.		40 *CFR* 761.50(b)(7)(ii)
Management of empty containers	Empty containers per 40 *CFR* 261.7(b)(1) are exempt from RCRA Subtitle C requirements: any hazardous waste remaining in an empty container is not subject to RCRA regulations in Parts 261-265 or Parts 267, 268, 270 or 124 this chapter or to the notification requirements of section 3010 of RCRA	Management of empty containers that held RCRA hazardous waste - **applicable**	40 *CFR* 261.7(a)(1) Rules of the TDEC 1200-1-11-.02(1)(g)
	A container is considered empty if all wastes have been removed using common practices and no more than 3% by weight of total capacity remains if the container is ≤ 119 gal; or if no more than 0.3% by weight of total capacity remains if container is 119 gal.		40 *CFR* 261.7(b)(1) Rules of the TDEC 1200-1-11-.02(1)(g)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
Temporary storage of PCB waste (e.g., contaminated PPE, debris, soil)	Container(s) shall be marked as illustrated in 40 *CFR* 761.45(a).	Storage of PCBs and PCB items at concentrations ≥ 50 ppm for disposal—**applicable**	40 *CFR* 761.40(a)(1)
	Storage area must be properly marked as required by 40 *CFR* 761.40(a)(10).		40 *CFR* 761.65(c)(3)
	Any leaking PCB items and their contents shall be transferred immediately to a properly marked non-leaking container(s).		40 *CFR* 761.65(c)(5)
	Container(s) shall be in accordance with requirements set forth in DOT HMR at 49 I 171–180.		40 *CFR* 761.65(c)(6)
	The date shall be recorded when PCB items are removed from service, and the storage shall be managed such that PCB items can be located by this date. (Note: Date should be marked on the container).	PCB items (includes PCB wastes) removed from service for disposal - **applicable**	40 *CFR* 761.65(c)(8)
Storage of PCB waste and/or PCB/radioactive waste in a RCRA-regulated container storage area	Does not have to meet storage unit requirement in 40 *CFR* 761.65(b)(1) provided unit:	Storage of PCBs and PCB items designated for disposal —**applicable**	40 *CFR* 761.65(b)(2)
	• is permitted by EPA under RCRA Sect. 3004, or		40 *CFR* 761.65(b)(2)(i)
	• qualifies for interim status wider RCRA Sect. 3005; or		40 *CFR* 761.65(b)(2)(ii)
	• is permitted by an authorized state under RCRA Sect. 3006 and,		40 *CFR* 761.65(b)(2)(iii)
	• PCB spills cleaned up in accordance with subpart G of 40 *CFR* 761		40 *CFR* 761.65(b)(2)(i) and (ii) and (iii)

Table B-1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
Storage of PCB/radioactive waste in containers	For liquid wastes, containers must be nonleaking.	Storage of PCB/radioactive waste in containers other than those meeting DOT HMR performance standards - applicable	40 *CFR* 761.65(c)(6)(i)(A)
	For nonliquid wastes, containers must be designed to prevent buildup of liquids if such containers are stored in an area meeting the containment requirements of Sect. 761.65(b)(1)(ii).		40 *CFR* 761.65(c)(6)(i)(B)
	For both liquid and nonliquid wastes, containers must meet all requirements pertaining to nuclear criticality safety.		40 *CFR* 761.65(c)(6)(i)(C)
Temporary storage of bulk PCB-remediation waste or PCB bulk product waste in a waste pile	Waste must be placed in a pile that:	Storage of PCB-remediation waste or PCB bulk product waste at cleanup site or site of generation for up to 180 days - applicable	40 *CFR* 761.65(c)(9)
	• is designed and operated to control dispersal by wind, where necessary, by means other than wetting;		40 *CFR* 761.65(c)(9)(i)
	• does not generate leachate through decomposition or other reactions.		40 *CFR* 761.65(c)(9)(ii)
	• at a storage site with a liner designed, constructed, and installed to prevent any migration of wastes off or through liner into adjacent subsurface soil, groundwater or surface water.		40 *CFR* 761.65(c)(9)(iii)(A)
	Liner must be:		40 *CFR* 761.65(c)(9)(iii)(A)(1)
	• constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure because of pressure gradients, physical contact with waste or leachate to which they are exposed, climatic conditions, the stress of installation, and		

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	the stress of daily operation;		40 *CFR* 761.65(c)(9)(iii)(A)(2)
	• placed on foundation or base capable of providing support to liner and resistance to pressure gradients above and below the liner to present failure because of settlement compression or uplift;		40 *CFR* 761.65(c)(9)(iii)(A)(3)
	• installed to cover all surrounding earth likely to be in contact with waste;		40 *CFR* 761.65(c)(9)(iii)(B)
	• has a cover that meets the above requirements and installed to cover all of the stored waste likely to be contacted by precipitation, and is secured so as not to be functionally disabled by winds expected under normal weather condition; and		40 *CFR* 761.65(c)(9)(iii)(c)(1) and (2)
	• has a run-on control system designed, constructed, operated and maintained such that it prevents flow on the stored waste during peak discharge from at least a 25-year storm, and collects and controls at least the water volume resulting from a 24-hour, 25-year storm.		40 *CFR* 761.65(c)(9)(iv)
	Requirements of 40 *CFR* 761.65(c)(9) of this part may be modified under the risk-based disposal option of Sect. 761.61(c).		
Storage of PCB waste and/or PCB/radioactive waste in non-RCRA regulated unit	Storage facility must have or be:	Storage of PCBs and PCB items at concentrations ≥ 50 ppm for disposal - **applicable**	40 *CFR* 761.65(b)(1)
	• Adequate roof and walls to prevent rainwater from reaching stored PCBs and PCB items;		40 *CFR* 761.65(b)(1)(i)
			40 *CFR* 761.65(b)(1)(ii)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	• Adequate floor that has continuous curbing with a minimum 6-in. high curb. Floor and curb must provide a containment volume equal to at least two times the internal volume of the largest PCB article or container or 25% of the internal volume of all articles or containers stored there, whichever is greater. Note: 6 in. minimum curbing not required for area storing PCB/radioactive waste;		40 *CFR* 761.65(b)(1)(iii)
	• No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area;		40 *CFR* 761.65(b)(1)(iv)
	• Floors and curbing constructed of Portland cement, concrete, or a continuous, smooth, nonporous surface that prevents of minimizes penetration of PCBs;		40 *CFR* 761.65(b)(1)(v)
	• Not located at a site that is below the 100-year flood water elevation.		
Activity causing asbestos emissions	Discharge no visible emissions to the outside air or use one of the emission control and waste treatment technologies specified below: • adequately wet asbestos-containing waste material; • process asbestos-containing waste material into nonfriable form; • for facilities demolished before	Collection, processing, packaging or transporting of regulated asbestos-containing waste material - applicable	40 *CFR* 61.150(a) Rules of the TDEC 1200-3-11.02(2)(j)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	RACM removal, adequately wet asbestos-containing waste material at all times after demolition; or • use an alternative emission control and waste treatment method that has been received before EPA approval.		
Removal of RACM from a facility	Procedures for asbestos emission control per 40 *CFR* 61.145(e)(1-10) shall be followed.	Demolition of a facility containing RACM exceeding the volume requirements of 40 *CFR* 61.145(a)(1) - **applicable**	40 *CFR* 61.141(e)(1) Rules of the TDEC 1200-3-11.02(2)(d)(3)
Generation of scrap metal	Scrap metal is excluded from the requirements of RCRA Parts 262-266, Parts 268, 270, and 124 if it is intended for recycle or reuse.	Scrap metal as defined in 40 *CFR* 261.1(c)(6) intended for recycle or reuse - **applicable**	40 *CFR* 261.6(a)(3)(ii) Rules of the TDEC 1200-1-11.02(1)(a)
Release of scrap metal	Before being released, property shall be surveyed to determine, whether both removable and total surface contamination (including contamination present on or under any coating) is greater than the levels given in Figure IV-1 of the Order and that the contamination has been subjected to the ALARA process.	Radionuclide-contaminated scrap materials and equipment intended for recycle or reuse—**TBC**	DOE Order 5400.5(II)(5)(c)
Temporary storage of hazardous waste in containers	A generator may accumulate hazardous waste on site provided that: • waste is placed in containers that comply with 40 *CFR* 265.171-174 (Subpart I); and • container is marked with the words "hazardous waste" and the date the accumulation began.	Accumulation of RCRA-hazardous waste on site for ≤ 90 days—**applicable** More than 90 days—**relevant and appropriate**	40 *CFR* 262.34(a) Rules of the TDEC 1200-1-11.03(4)(c)
Storage of hazardous waste in containers	Subpart I container requirements: • maintain containers in good condition or transfer waste from containers not in good	Storage of RCRA-hazardous waste - **applicable**	40 *CFR* 264.171-174 Rules of the TDEC 1200-1-11.05(9)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	condition into such: • use container made or lined with materials compatible with waste to be stored; • keep containers closed during storage, except to add/remove waste; • open, handle and store containers in a manner that will not cause containers to rupture or leak; • inspect containers weekly too check for leaking or deterioration		
Storage of hazardous waste in container area	Area must have a containment system For containers with free liquids designed and operated in accordance with Sect 264.175(b) For containers that do not contain free liquids, area must be sloped or otherwise designed and operated to drain liquid from precipitation, or containers must be elevated or otherwise protected from contact with accumulated liquid	Storage of RCRA-hazardous waste in containers - **applicable**	40 *CFR* 264.175 Rules of the TDEC 1200-1-11.06(9)(f)
	Treatment/disposal of waste – excavated soils, debris, scrap metal, secondary wastes		
Disposal of RCRA hazardous waste in a land-based unit *(e.g., debris coated with lead-based paint)*	May be land-disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 *CFR* 268.40 before land disposal. May be land-disposed if meets requirements in the Table "Alternative Treatment Standards for Hazardous Debris" at 40 *CFR* 268.45 before land disposal or debris is treated to waste-specific treatment standard provided in 40 *CFR* 268.40 or	Land disposal, as defined in 40 *CFR* 268.2, of restricted RCRA waste—**applicable** Land disposal, as defined in 40 *CFR* 268.2, of restricted RCRA-hazardous debris—**applicable**	40 *CFR* 268.40(a); Rules of the TDEC Chap. 1200-1-11.10 (3)(a) 40 *CFR* 268.45(a); Rules of the TDEC Chap. 1200-1-11.10(3)(f)(1)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	waste contaminating the debris.		
	Must be treated in accordance with the alternative treatment standards of 40 *CFR* 268.49(c) or according to the UTSs specified in 40 *CFR* 268.48 applicable to the listed and/or characteristic waste contaminating the soil before land disposal.	Land disposal, as defined in 40 *CFR* 268.2, of restricted hazardous soil—**applicable**	40 *CFR* 268.49(b); Rules of the TDEC Chap. 1200-1-11.10(3)(i)(2)
	Are not prohibited if the wastes no longer exhibit a characteristic at the point of land disposal, unless the wastes are subject to a specified method of treatment other than DEACT in 40 *CFR* 268.40 or are D003 reactive cyanide.	Land disposal, as defined in 40 *CFR* 268.2, of restricted hazardous soil—**applicable**	40 *CFR* 268.1(c)(4)(iv); Rules of the TDEC Chap. 1200-1-11.10(1)(a)(3)(iv)(IV)
Disposal of hazardous debris treatment residues	Except as provided in 268.45 (d)(2) and (d)(4), residues from treatment of hazardous debris must be separated from debris, and such residues are subject to the waste-specific treatment standards for the waste contaminating the debris		40 *CFR* 265.45(d)(1). Rules of the TDEC 1200-1-11.10(3)(f)(3)
Packaging of LLW for disposal (*e.g., contaminated PPE, scrap metal*)	Must have structural stability either by processing the waste or placing it in a container or structure that provides stability after disposal.	Generation of LLW for disposal at an LLW disposal facility—**relevant and appropriate**	Rules of the TDEC Chap. 1200-2-11.17(7)(b)(1)
	Void spaces within the waste and between the waste and its package must be reduced to the extent practicable.		Rules of the TDEC Chap. 1200-2-11.17(7)(b)(3)
Treatment of LLW	Treatment to provide more stable waste forms and to improve the long-term performance of an LLW disposal facility shall be implemented as necessary to meet the performance objectives of the disposal facility.	Generation of LLW for disposal at an LLW disposal facility—**applicable**	DOE M 435.1-1(IV)(O)
Disposal of solid LLW (*e.g., debris, scrap metal, soil*)	LLW shall be certified as meeting waste acceptance requirements before it is transferred to the receiving facility.	Generation of LLW for disposal at a DOE facility - **applicable**	DOE M 435.1-1(IV)(J)(2)
Disposal of nonporous surfaces on site	Shall be cleaned on site or off site to levels in Sect. 761.61(a)(4)(ii) using:	Nonporous surfaces as defined in 40 *CFR* 761.3 – **applicable**	40 *CFR* 761.61(a)(4)(ii)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	• decontamination procedures under Sect. 761.79 • technologies approved under Sect. 761.60(e) • risk-based procedures/technologies under Sect. 761.61(c)		
Disposal of porous surfaces	In both high and low occupancy areas, must meet requirements of 761.61(a)(4)(i)	Porous surfaces as defined in 40 *CFR* 761.3 - **applicable**	40 *CFR* 761.61(a)(4)(iii)
Disposal of PCB capacitor(s)	Shall comply with all requirements of Sect 761.60 unless it is known from label or nameplate information, manufacturer's literature, or chemical analysis that the capacitor does not contain PCBs Any person must assume that a capacitor manufactured prior to July 2, 1979, whose PCB concentration is not established contains ≥ 500 ppm PCBs. If the date of manufacture is unknown any person must assume the capacitor contains ≥ 500 ppm PCBs	Generation of PCB Capacitors with ≥ 500 ppm PCBs for disposal – **applicable**	40 *CFR* 761.60(b)(2)(i)
	May dispose of in a municipal solid waste landfill	Generation of PCB Small Capacitors (as defined in 40 *CFR* 761.3) for disposal – **applicable**	40 *CFR* 761.60(b)(2)(ii)
	Shall dispose of in accordance with either of the following: • disposal in an incinerator that complies with 40 *CFR* 761.70; or • Until March 1, 1981, disposal in a chemical waste landfill that complies with 40 *CFR* 761.75	PCB Large Capacitor which contains 500 ppm or greater PCBs - **applicable**	40 *CFR* 761.60(b)(2)(iii)
Disposal of fluorescent	Must be disposed of in a TSCA-approved disposal	Generation of fluorescent light ballasts	40 *CFR* 761.60(b)(6)(iii)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
light ballasts	facility as bulk product waste under 40 *CFR* 761.62, or in accordance with the decontamination provisions of 40 *CFR* 761.79	containing PCBs in the potting material for disposal – **applicable**	
Disposal of PCB-contaminated articles	Must remove all free-flowing liquid from the Article, disposing of the liquid in compliance with the requirements of 40 *CFR* 761.60(a)(2) or (a)(3) and	Generation of PCB-contaminated Articles (as defined in 40 *CFR* 761.3) for disposal – **applicable**	40 *CFR* 761 .60(b)(6)(ii)
	Dispose by one of the following methods:	Disposal of PCB-Contaminated Articles with no free-flowing liquid - **applicable**	
	• in accordance with the decontamination provisions at 40 CFR 761.79;		40 *CFR* 761 .60(b)(6)(ii)(A)(1)
	• in a facility permitted, licensed, or registered by a State to manage municipal solid waste or nonmunicipal nonhazardous waste;		40 *CFR* 761 .60(b)(6)(ii)(A)(2)
	• in an industrial furnace operating in compliance with 40 CFR 761.72; or		40 *CFR* 761 .60(b)(6)(ii)(A)(3)
	• in a disposal facility approved under this part		40 *CFR* 761 .60(b)(6)(ii)(A)(4)
Disposal of PCB hydraulic machines	Shall dispose of by one of the following methods:	PCB hydraulic machines containing PCBs ≥ 50 ppm - **applicable**	40 *CFR* 761 .60(b)(3)(i)
	• in accordance with the decontamination provisions at 40 *CFR* 761.79;		40 *CFR* 761 .60(b)(3)(i)(A)
	• in a facility permitted, licensed, or registered by a State to manage municipal solid waste or nonmunicipal nonhazardous waste;		40 *CFR* 761 .60(b)(3)(i)(B)
	• in an industrial furnace operating in compliance with 40 *CFR* 761.72; or		40 *CFR* 761 .60(b)(3)(i)(C)
	• in a disposal facility approved under this part		40 *CFR* 761 .60(b)(3)(i)(D)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	Must remove all free-flowing liquid from the machine, and dispose of the liquid in accordance with the provisions of 40 *CFR* 761.60(a). If the PCB liquid contains ≥ 1000 ppm PCB, then the hydraulic machine must be decontaminated in accordance with 40 *CFR* 761.79 or flushed prior to disposal with a solvent listed at 40 *CFR* 761.61(b)(1)(i)(B) which contains < 50 ppm PCB		40 *CFR* 761.60(b)(3)(ii)
Disposal of PCB-contaminated electrical equipment (except capacitors)	Any person disposing of PCB-contaminated electrical equipment, except capacitors, shall do so in accordance with paragraph (b)(6)(ii)(A) of this section. Any person disposing of large capacitors that contain ≥ 50 ppm but < 500 ppm PCBs shall do so in a disposal facility approved under this part.	Generation of PCB-contaminated electrical equipment (as defined in 40 *CFR* 761.3) for disposal – **applicable**	40 *CFR* 761.60(b)(4)
Disposal of PCB cleanup wastes (*e.g., contaminated PPE, nonliquid cleaning materials*)	Shall be disposed of in one of the following methods: • in a facility permitted, licensed, or registered by a state to manage municipal solid waste under 40 *CFR* 258 or nonmunicipal, nonhazardous waste subject to 40 *CFR* 257.5–257.30; • in a RCRA Subtitle C landfill permitted by a state to accept PCB waste; • in an approved PCB disposal facility; or • through decontamination under 40 *CFR* 761.79(b) or (c).	Generation of nonliquid PCBs at any concentration during and from the cleanup of PCB remediation waste—**applicable**	40 *CFR* 761.61(a)(5)(v)(A)
Disposal of PCB cleaning solvents, abrasives, and equipment	May be reused after decontamination in accordance with 40 *CFR* 761.79.	Generation of PCB wastes from the cleanup of PCB remediation waste - **applicable**	40 *CFR* 761.61(a)(5)(v)(B)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
Disposal of PCB remediation waste *(e.g., soil)*	May be disposed of by one of the following methods:	Disposal of nonliquid PCB remediation waste as defined in 40 *CFR* 761.3— **applicable**	40 *CFR* 761.61(b)(2)
	• in a high-temperature incinerator approved under 40 *CFR* 761.70(b).		40 *CFR* 761.61(b)(2)(i)
	• by an alternate disposal method approved under 40 *CFR* 761.60(e).		40 *CFR* 761.61(b)(2)(ii)
	• in a chemical waste landfill approved under 40 *CFR* 761.75.		
	• in a facility with a coordinated approval issued under 40 *CFR* 761.77, or		
	• through decontamination in accordance with under 40 *CFR* 761.79.		
Decontamination of PCB-contaminated water	For discharge to a treatment works as defined in 40 *CFR* 503.9 (aa), or discharge to navigable waters, meet standard of < 3 ppb PCBs; or	Water containing PCBs regulated for disposal - **applicable**	40 *CFR* 761.79(b)(1)(ii)
	For unrestricted use meet standard of < 0.5 ppb PCBs		40 *CFR* 761.79(b)(1)(iii)
Decontamination of PCB-contaminated liquids	Meet standard of < 2 ppm PCBs	Organic liquids and non-aqueous inorganic liquids containing PCBs – **applicable**	40 *CFR* 761.79(b)(2)
Decontamination of PCB-nonporous surface (e.g., scrap metal)	For unrestricted use, meet standard of:	Nonporous surfaces previously in contact with liquid PCBs, where no free-flowing liquids are present – **applicable**	40 *CFR* 761.79(b)(3)(i)(A)
	• $\leq 10\ \mu g/100\ cm^2$ as measured by a standard wipe test		
	• (40 *CFR* 761.123) at locations selected in accordance with 40 *CFR* 761.300 et seq.	Nonporous surfaces in contact with nonliquid PCBs – **applicable**	40 *CFR* 761.79(b)(3)(i)(B)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	• clean to Visual Standard No. 2 of NACE Verify compliance by visually inspecting all cleaned areas For disposal in a smelter operating in accordance with Sect. 761.72(b) meet standard of	Nonporous surfaces previously in contact with liquid PCBs, where no free-flowing liquids are present – **applicable**	40 *CFR* 761.79(b)(3)(ii)(A)
	• < 100 µg/L 100 cm^2 as measured by standard wipe test under Sect. 761.123 at locations selected in accordance with 40 *CFR* 761.300 et seq. • clean to a visual standard No. 3 of NACE and verify compliance by visually inspecting all cleaned areas	Nonporous surfaces in contact with nonliquid PCBs (including nonporous surfaces covered with a porous surface, e.g., paint or coating on metal – **applicable**	40 *CFR* 761.79(b)(3)(ii)(B)
Decontamination of PCB containers (self-implementing option)	Must flush the internal surfaces of the container three times with a solvent containing < 50 ppm PCBs. Each rinse shall use a volume of the flushing solvent equal to approximately 10% of the PCB container capacity	PCB Container as defined in 40 *CFR* 761.3—**applicable**	40 *CFR* 761.79(c)(1)
Decontamination of movable equipment contaminated by PCBs (self-implementing option)	May decontaminate by: • swabbing surfaces that have contacted PCBs with a solvent; • a double wash/rinse as defined in 40 *CFR* 761.360-378; or • another applicable decontamination procedure under Sect. 761.79	Movable equipment contaminated by PCBs and used in storage areas, tools and sampling equipment –**applicable**	40 *CFR* 761.79(c)(2)
Decontamination of metal surfaces in contact with PCBs (self-implementing)	For surfaces in contact with liquid or nonliquid PCBs < 500 ppm, may be decontaminated in an industrial furnace for purposes of disposal in accordance with Sect. 761.72	Use of thermal processes to decontaminate metal surfaces as required by 40 *CFR* 761.62(a)(6) — **applicable**	40 *CFR* 761.79(c)(6)(i)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	For surfaces in contact with liquid or nonliquid PCBs ≥ 500 ppm, may be smelted in an industrial furnace operating in accordance with Sect. 761.72(h), but must first be decontaminated in accordance with Sect 761.72(a) or to a surface concentration of <100 μg/100 cm^2		40 *CFR* 761.79(c)(6)(ii)
Disposal of decontamination waste and residues	Such waste shall be disposed of at their existing PCB concentration unless otherwise specified in 40 *CFR* 761.79(g)(1-6)	Decontamination waste and residues – **applicable**	40 *CFR* 761.79(g)
	Are regulated for disposal at their original concentration	PCBs physically separated from regulated waste during decontamination, other than distillation bottoms and filter media - **applicable**	40 *CFR* 761.79(g)(2)
Decontamination of PCB – contaminated concrete	If commenced within 72 hours of initial spill ≤ 10 μg/100 cm^2 as measured by the standard wipe test (40 *CFR* 761.123)	Spill of liquid PCBs – **applicable**	40 *CFR* 761.79(b)(4)
Disposal of PCB-contaminated porous surfaces (self-implementing option)	Shall be disposed on site or off site as bulk PCB - remediation waste according to Sect. 761.61(a)(5)(i) or decontaminated for use according to Sect. 761.79(b)(4)	PCB-remediation waste porous surfaces (as defined in 40 *CFR* 761.3)—**applicable**	40 *CFR* 761.61(a)(5)(iii)
Disposal of PCB-contaminated non porous surfaces on site (self-implementing option)	Shall be cleaned on site or off site to levels in Sect. 761.61(a)(4)(ii) using: • decontamination procedures under Sect. 761.79 • technologies approved under Sect. 761.60(e) • risk-based procedures/technologies under Sect. 761.61(c)	PCB-remediation waste nonporous surfaces (as defined in 40 *CFR* 761.3)—**applicable**	40 *CFR* 761.61(a)(5)(ii)(A)
Disposal of PCB-contaminated nonporous surfaces off site (self-implementing option)	Shall be disposed of in accordance with 40 *CFR* 761.61(a)(5)(i)(B)(2)(ii) Metal surfaces may be thermally decontaminated in	PCB-remediation waste nonporous surfaces as defined in 40 *CFR* 761.3 having surface concentrations < 100 μg/100 cm^2 —**applicable**	40 *CFR* 761.61(a)(5)(ii)(B)(1)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	accordance with 40 *CFR* 761.79(c)(6)(i)		
	Shall be disposed of in accordance with 40 *CFR* 761.61(a)(5)(i)(B)(2)(iii)	PCB-remediation waste nonporous surfaces having surface concentrations ≥ 100 µg/100 cm^2 —applicable	40 *CFR* 761.61(a)(5)(ii)(B)(2)
	Metal surfaces may be thermally decontaminated in accordance with 40 *CFR* 761.79(c)(6)(ii)		
Disposal of PCB bulk product waste (e.g., building demolition debris) in solid waste landfill	May dispose of in a facility permitted, licensed, or registered by a state as a municipal or nonmunicipal nonhazardous waste landfill	Nonliquid PCB bulk product waste (known or presumed to leach < 10 mg/L PCBs) that is not RCRA-hazardous—**applicable**	40 *CFR* 761.62(b)(1)(i) and (ii)
	May dispose of in a facility permitted, licensed, or registered by a state as a municipal or nonmunicipal nonhazardous waste landfill if: • the PCB bulk product waste is segregated from organic liquids disposed of in the landfill • leachate is collected from the landfill and monitored for PCBs	Other PCB bulk product waste not meeting conditions of Sect. 761.62(b)(1) (e.g., paper/felt gaskets contaminated by liquid PCBs) - **applicable**	40 *CFR* 761.61(b)(2)(i) and (ii)
Disposal of PCB bulk product waste in an off-site solid waste landfill	Must provide written notice to the facility 15 days in advance of the first shipment from the same disposal waste stream The notice shall state that the PCB bulk product waste may include components containing PCBs at ≤ 50 ppm based on analysis of the waste in the shipment or general knowledge of the waste stream (or similar material) which is known to contain PCBs at those levels, and the waste is known as presumed to leach < 10 µg/L PCBs	Disposal of PCB bulk product waste regulated under Sect. 761.62(b)(1) at a facility without PCB approval—**applicable**	40 *CFR* 761.62(b)(4)(i)
	Must provide written notice to the facility 15 days in advance of the first shipment from the same	Disposal of PCB bulk product waste regulated under Sect. 761.62(b)(2) at a	40 *CFR* 761.62(b)(4)(ii)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	disposal waste stream and with each shipment thereafter The notice shall state that the PCB bulk product waste may include components containing PCBs at ≥ 50 ppm based on analysis of the waste in the shipment or general knowledge of the waste stream (or similar material) which is known to contain PCBs at those levels, and the waste is known as presumed to leach ≥ 10 µg/L PCBs	facility without PCB approval—**applicable**	
Disposal of bulk PCB remediation waste (self-implementing option)	Shall be disposed of: • in a hazardous waste landfill permitted by EPA under Sect. 3004 of RCRA, • in a hazardous waste landfill permitted by a state authorized under Sect. 3006 of RCRA, or • in a PCB disposal facility approved under 40 *CFR* 761.60	Bulk PCB-remediation waste (as defined in 40 *CFR* 761.3) which has been dewatered and with a PCB concentration ≥ 50 ppm—**applicable**	40 *CFR* 761.61(a)(5)(i)(B)(2)(iii)
Risk-based disposal of PCB remediation	May dispose of in a manner other then prescribed in 40 *CFR* 761.61(a) or (b) if approved in writing by EPA and method will not pose an unreasonable risk of injury to health or the environment	Disposal of PCB-remediation waste—**applicable**	40 *CFR* 761.61(c)
Disposal of PCB-contaminated precipitation, condensation, leachate, or load separation	May be disposed in a chemical waste landfill which complies with 40 CFR 761.75 if: • disposal does not violate 40 *CFR* 268.32(a) or 268.42(a)(I); • liquids do not exceed 500 ppm PCB and are not an ignitable waste as described in Sect. 761.75(b)(8)(iii)	PCB liquids at concentrations ≥ 50 ppm from incidental sources and associated with PCB articles or nonliquid PCB wastes—**applicable**	40 *CFR* 761.60(a)(3) 40 *CFR* 761.60(a)(3)(i) 40 *CFR* 761.60(a)(3)(ii)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
Performance-based disposal of PCB bulk product waste	May dispose of by one of the following:	Disposal of PCB bulk product waste as defined in 40 *CFR* 761.3–**applicable**	40 *CFR* 761.62(a)
	• in an incinerator approved under Sect. 761.70;		40 *CFR* 761.62(a)(1)
	• in a chemical waste landfill approved under Sect. 761.75;		40 *CFR* 761.62(a)(2) 40 *CFR* 761.62(a)(3)
	• in a hazardous waste landfill permitted by EPA under 3004 of RCRA or by authorized state under 3006 of RCRA;		40 *CFR* 761.62(a)(4)
	• under alternate disposal approved under Sec 761.60(e)		40 *CFR* 761.62(a)(5)
	• in accordance with decontamination provisions of Sect. 761.79;		40 *CFR* 761.62(a)(6)
	• in accordance with thermal decontamination provisions of Sect. 761.79(e)(6) for metal surfaces in contact with PCBs		
Risk-based disposal of PCB bulk product waste	May dispose of in a manner other than prescribed in Sect. 761.62(a) or (b) if receive approval in writing from EPA and the method (based on technical, environmental or waste specific characteristics will not pose an unreasonable risk of injury to human health or the environment	Disposal of PCB bulk product waste - **applicable**	40 *CFR* 761.62(c)
Disposal of RCRA-hazardous waste in a landfill	RCRA-restricted waste may be land disposed only if it meets the "Treatment Standards for Hazardous Waste" (40 *CFR* 268.40) before land disposal	Land disposal of RCRA restricted waste as defined in 40 *CFR* 268.2 - **applicable**	40 *CFR* 268.1 Rules of the TDEC 1200-1-11.10(1)(a)
Disposal of bulk or non-containerized liquids in a RCRA landfill	May not dispose of bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids in any landfill	Placement of bulk or non-containerized hazardous waste in a RCRA subtitle C landfill—**relevant and appropriate**	40 *CFR* 264.314(b)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
Disposal of containers in RCRA landfill	May not place containers holding free liquid in a landfill unless the liquid is mixed with an absorbent, solidified, or removed	Placement of containers in a RCRA subtitle C landfill—**relevant and appropriate**	40 *CFR* 264.314(d)
	Sorbents used to treat free liquids to be disposed of in landfills must be non-biodegradable as described in 246.315(e)(1)		40 *CFR* 264.314(e)
	Unless they are very small, containers must be either at least 90% full when placed in the landfill, or crushed, shredded, or similarly reduced in volume to maximum practical extent before burial in the landfill		40 *CFR* 264.315
Disposal of solid wastes in a landfill off site	May receive for disposal only those solid wastes it is allowed to manage under the terms of its permit (i.e., those which met its WAC) or "special wastes" as approved in writing by the TDEC Commissioner	Disposal of solid waste in a Class I, II, III, IV disposal facility regulated by TDEC - **relevant and appropriate**	Rules of the TDEC 1200-3-11.02(2)(j)
Disposal of asbestos-containing waste material	All asbestos-containing waste material shall be deposited as soon as practicable at an approved waste disposal site	Removal or RACM except Category I nonfriable asbestos containing material—**applicable**	40 *CFR* 61.150(b) Rules of the TDEC 1200-3-11.02(2)(j)
Disposal of PCB bulk product waste (e.g., debris or scrap metal with PCB painted surfaces)	May be disposed of by one of the following methods:	Disposal of PCB bulk product waste as defined in 40 *CFR* 761.3—**applicable**	40 *CFR* 761.62(a)
	• in an incinerator approved under 40 *CFR* 761.70,		40 *CFR* 761.62(a)(1)
	• in a chemical waste landfill approved under 40 *CFR* 761.75,		40 *CFR* 761.62(a)(2)
	• in a hazardous waste landfill permitted by EPA under RCRA Sect. 3004 or by authorized state under RCRA Sect. 3006,		40 *CFR* 761.62(a)(3)
	• under alternate disposal approved under 40 *CFR*		40 *CFR* 761.62(a)(4)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	761.60(e).		
	• in accordance with decontamination provisions of 40 *CFR* 761.79, or		40 *CFR* 761.62(a)(5)
	• in accordance with thermal decontamination provisions of 40 *CFR* 761.79(c)(6) for metal surfaces in contact with PCBs.		40 *CFR* 761.62(a)(6)
	Closure/Institutional controls—all contaminated soil left in place		
Decontamination of radioactively contaminated equipment and building structure	Must meet surface contamination guidelines for residual activity provided in Figure IV of the Order for specified radionuclides	Residual radioactive material on equipment and building structures for unrestricted use - **TBC**	DOE Order 5400.5(IV)(4)(d) and Figure IV-1
Demolition of radioactively contaminated buildings	Residual radioactive material above the guidelines shall be managed in accordance with Chapter II of this Order and specified operational and control requirements specified in other Orders including 5820.2A that apply to radioactive waste management	Residual radioactive material on equipment and building structures left in place—**TBC**	DOE Order 5400.5(IV)(6)(a)
Radioactive material left in place	Remedial action shall not be considered complete until the residual radioactive material levels meet the authorized limits as established pursuant to DOE Order 5400.5(IV)(5)(b) or supplemental limits as authorized pursuant to DOE Order 5400.5(IV)(6)	Residual radioactive material left in place for unrestricted use - **TBC**	DOE Order 5400.5(IV)(5)(b)
	A property may be maintained under interim management-provided administrative controls established to protect members of the public.	Residual radioactive material above guidelines in inaccessible locations that would be unreasonably costly to remove—**TBC**	DOE Order 5400.5(IV)(6)(c)(1)
	Controls include, but are not limited to, periodic monitoring as appropriate; appropriate shielding; physical barriers (i.e., fences, warning signs) to prevent access; appropriate radiological safety		DOE Order 5400.5(IV)(6)(c)(2)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	measures during maintenance, renovation, demolition, or other activities that might disturb the residual radioactive material or cause it to migrate.		
Clean closure of hazardous waste container storage area or tank	Must close the facility in a manner that: • minimizes the need for further maintenance; • controls, minimizes or eliminates, to the extent necessary to protect human health and environment, post-closure escape of hazardous waste, hazardous constituents, contaminated run-off or hazardous waste decomposition products to ground or surface waters or to the atmosphere; • complies with closure requirements of 40 CFR, 264.178, 264.197, 264.228, 264.258, 264.280, 264.310, 264.351, 264.601-603, and 264.1102	Management of RCRA hazardous waste in containers or tanks—**applicable**	40 *CFR* 264.111 Rules of the TDEC 1200-1-11.06(7)(b)
Clean closure of RCRA-container storage area	Must remove all hazardous waste and residues from containment system. Remaining containers, liners, bases and soil containing or contaminated with hazardous waste or residues must be decontaminated or removed		40 *CFR* 264.178 Rules of the TDEC 1200-1-11.06(9)(i)
Clean closure of tanks	Must remove or decontaminate all waste residues, contaminated components, structures and equipment and manage them as hazardous waste	Tank containing RCRA hazardous waste—**relevant and appropriate**	40 *CFR* 264.197(a) Rules of the TDEC 1200-1-11.06(10)(h)
Bulk PCB-remediation waste left in place (self-implementing option)	May remain on site if the site is covered with a cap meeting the requirements of 40 *CFR* 761.61(a)(7) and (8)	Bulk PCB-remediation waste remaining in a low occupancy area (as defined in 40 CFR 761.3) at concentrations > 25 ppm and ≤ 100 ppm—**applicable**	40 *CFR* 761.61(a)(4)(i)(B)(3)
Cap requirements for bulk PCB-remediation waste left in place (self-	Any person designing and constructing a cap must do so in accordance with 40 CFR 264.310(a) and ensure it complies with the permeability, sieve,		40 *CFR* 761.61(a)(7)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
implementing option)	liquid liner and plasticity index parameters in Sect 761.75(b)(1)(ii) through (b)(1)(v) • must be of sufficient strength to maintain its effectiveness and integrity • may not be contaminated at a level ≥ 1 ppm PCBs • a cap of compacted soil shall have a minimum thickness of 10 in. • a concrete or asphalt cap shall have a minimum thickness of 6 in.		
Waste left in place	Institutional controls are required and shall include, at a minimum, administrative restrictions for sale and use of property and securing area to prevent human contact with hazardous substances.	Hazardous substances left in place that might pose an unreasonable threat to public health, safety, or the environment—**relevant and appropriate**	Rules of the TDEC Chap. 1200-1-13.08(10)
		Transportation	
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 *CFR* 171–180.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material—**applicable**	49 *CFR* 171.1(c)
	Must meet the packaging requirements of 49 *CFR* 173.411 et seq.	Transportation of radioactive materials as defined in 173.403(y) by carriers and shippers – **applicable**	49 *CFR* 173.1(a)(2)
	Must meet the general requirements of Subpart B, C, and D, as well as the detailed requirements of Subpart 1 for Class 7 radioactive material as defined in 173.403(y) (49 *CFR* 174.700 et seq.) at	Transportation of hazardous materials by rail—**applicable**	49 *CFR* 174.1

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	this section		
	Must meet the description, marking, labeling, and placarding requirements of 49 *CFR* 172.200 et seq. for all materials listed as hazardous per 49 *CFR* 172.101	Initiation of a shipment of hazardous waste from a RCRA TSD facility-**applicable**	40 *CFR* 262.10(h)
	Must meet the requirements of Subparts A, B, C, and D of this section	Transportation of hazardous materials by air, highway, rail, or water—**applicable**	49 *CFR* 172.3(a)
		Acceptance and transportation of hazardous materials by private, common contract carriers by motor vehicle on public highway —**applicable**	49 *CFR* 177.800
Transportation of radioactive waste	Shall be packaged and transported in accordance with DOE Order 460.1A and DOE Order 460.2.	Shipment of LLW off-site—**TBC**	DOE M 435.1-(I)(I)(E)(1 1)
Transportation of LLW	To the extent practical, the volume of the waste and the number of the shipments shall be minimized.	Shipment of LLW off-site—**TBC**	DOE M 435.1-1(IV)(L)(2); DOE M 435.1-1(III)(L)(2)
Transportation of PCB wastes	Must comply with the manifesting provisions at 40 CFR 761.207 through 40 CFR 761.218.	Relinquishment of control over PCB wastes by transporting or offering for transport – **applicable**	40 *CFR* 761.207 (a)
Transportation of hazardous waste off site	Must comply with the generator requirements of 40 *CFR* 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping, and Sect. 262.12 to obtain EPA ID number. Must comply with the requirements of 40 *CFR* 263.11–263.31.	Off-site transportation of RCRA hazardous waste—**applicable**	40 *CFR* 262.10(h); Rules of the TDEC Chap. 1200-1-11.03(1)(a)(8)

Table B.1. ARARs and TBC guidance for Y-12 D&D EE/CA, Oak Ridge, Tennessee

Medium/action	Requirements	Prerequisite	Citation(s)
	A transporter who meets all applicable requirements of 49 *CFR* 171–179 and 40 *CFR* 263.11 and 263.31 will be deemed in compliance with 40 *CFR* 263.	Transportation of hazardous waste within the United States requiring a manifest—**applicable**	40 *CFR* 263.10(a); Rules of the TDEC Chap. 1200-1-11.04(1)(a)(1)
Transportation of hazardous waste on site	The generator manifesting requirements of 40 *CFR* 262.20–262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 *CFR* 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way—**applicable**	40 *CFR* 262.20(f); Rules of the TDEC Chap. 1200-1-11.03(3)(a)(6)

ALARA = as low as reasonably achievable
ARAR = applicable or relevant and appropriate requirement
CFR = Code of Federal Regulations
CWA = Clean Water Act of 1972
DEACT = deactivation
DOE = U.S. Department of Energy
DOE M = Radioactive Waste Management Manual
DOT = U.S. Department of Transportation
EDE = effective dose equivalent
EPA = U.S. Environmental Protection Agency
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
ID = identification
LLW = low-level (radioactive) waste
NPDES = National Pollutant Discharge Elimination System
PCB = polychlorinated biphenyl
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act of 1976 TBC = to be considered (guidance)
TCA = Tennessee Code Annotated
TDEC = Tennessee Department of Environment and Conservation
UEFPC = Upper East Fork Poplar Creek
UTS = universal treatment standard
WAC = waste acceptance criteria

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