<table>
<thead>
<tr>
<th>Project Name:</th>
<th>OR-ORNL 2000 Complex-D&amp;D-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name (Expanded)</td>
<td>Oak Ridge 2000 Complex-D&amp;D [Decommissioning of eight facilities and structures totaling 60,776 SF; the facilities were used in support of the Manhattan Research Project in the late 1940s, were in severe disrepair and contain asbestos, beryllium, heavy metals, (e.g., cadmium and lead), polychlorinated biphenyls, and radiological contamination.]</td>
</tr>
<tr>
<td>Project Type:</td>
<td>Building / Facility D&amp;D Project Type</td>
</tr>
<tr>
<td>Building Type:</td>
<td>04 Radiological Facility (previous Building Type 2)</td>
</tr>
<tr>
<td>Project Type Detail:</td>
<td>Generic Radiological Facility(ies)</td>
</tr>
<tr>
<td>Supplementary Reference Documents</td>
<td>CORP_WBS_Description_DOE-ORO-ARRA</td>
</tr>
</tbody>
</table>

**Site Context:**
The initial Oak Ridge National Laboratory (ORNL) mission included the technical support for weapons development, and uranium separations during WWII, followed by scientific support in a wide range of fields. The current mission is science research, mostly in the basic and applied sciences, and includes facilities housing nuclear research reactors, particle accelerators, hot cells, radiisotope production facilities, and other research facilities, support operations, waste management units, and other research facilities. Major contaminants include uranium (various isotopes), fission products, transuranic isotopes, heavy metals, beryllium, and organic constituents consistent with laboratory operations. The site consists of approximately 4,470 acres including several hundred buildings of varying sizes. There are two major areas, the Bethel Valley area containing the bulk of the scientific facilities (along with some surplus facilities being removed under ARRA projects), and the Melton Valley area containing the TRU Waste Packaging Complex, legacy burial grounds, and a number of additional contaminated reactors, and test areas or facilities, many of which are being removed or remediated. There were numerous environmental releases. The management and operating (M&O) contractor at ORNL is UT-Battelle, who provides technical oversight for environmental projects at ORNL. The Oak Ridge Office of Environmental Management (OREM) provided ARRA funding, additional technical oversight, and project management support for this project. The project used an existing DOE IDIQ contract to perform the work.

This project falls under the Defense Remedial Action WBS (identified as OR-0042.C, Nuclear Facility D&D-ORNL in PARS), included as; this work was associated with WBS elements from the American Recovery and Reinvestment Act of 2009 WBS (identified as OR-0042.R or OR-0042.NEW.R in PARS). These ARRA projects include waste and legacy material removal from buildings; preparation for decontamination and decommissioning (D&D); D&D of buildings and associated structures to grade or slab; removal or stabilization of below grade structures; remediation of burial grounds, contaminated soils and below grade structures; as well as monitoring and treatment of groundwater. Supporting projects include surveillance and
maintenance and waste operations including construction, reconfiguration and demolition of select waste management facilities.

**ECAS Level 4/Parent Project Context:**
The ARRA projects grouping constitutes the Parent Project grouping, since the ORNL site is not a closure project. ORNL EM projects that are not part of the ARRA program are not included (except for the OR-W1A Tank (Non-ARRA)-ER and OR-X-3042 Reactor Pool-D&D projects that were added for the 2017 ECAS OR supplemental update). Note that the ECAS projects identified below are contained under several different higher-level WBS elements. However, ECAS Level 4 has been defined to encompass all ORNL ARRA projects because the WBS structure above the ECAS Project level supports funding and legacy considerations not relevant to ECAS. The following projects are included in ECAS at level 5, under the ORNL ARRA project, which is at level 4 in ECAS:

- OR-Melton Valley Monitoring Wells-ER-R
- OR-Tank W-1A-ER-R
- OR-W1A Tank (Non-ARRA)-ER (Added in 2017)
- OR-Site Boundary-ER-R
- OR-Bethel Valley Burial Grounds-ER-R
- OR-B3038-D&D-R
- OR-B3026C&D Hot Cell-D&D-R
- OR-Small Facilities Complex-D&D-R (renamed in 2017)
- OR-Central Campus LMR-WM-R (renamed in 2017)
- OR-2026 Complex-D&D-R
- OR-General Maintenance Facilities-D&D-R
- OR-Southeast Lab Complex-D&D-R
- **OR-ORNL 2000 Complex-D&D-R (renamed in 2017)**
- OR-B3026C&D Superstructure-D&D-R
- OR-Beta 3 Characterization-D&D-R
- OR-4500 Stack Removal-D&D-R
- OR-West Quad Soil Rem-ER-R
- OR-TWPC Operations-WM-R

**D&D Facility Data:**

<table>
<thead>
<tr>
<th>Building (Property ID)</th>
<th>Title (Property Name)</th>
<th>Area (SF)</th>
<th>Unit of Measure</th>
<th>Year Built</th>
<th>Hazard Category</th>
<th># of Floors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Information Center Complex</td>
<td>25,925</td>
<td>Sqft</td>
<td>1948</td>
<td>12 Not Applicable</td>
<td>1</td>
</tr>
<tr>
<td>2019</td>
<td>Solar Energy Lab/Laser Lab</td>
<td>878</td>
<td>Sqft</td>
<td>1951</td>
<td>12 Not Applicable</td>
<td>1</td>
</tr>
<tr>
<td>2024</td>
<td>Quality Assurance and Inspection</td>
<td>10,296</td>
<td>Sqft</td>
<td>1969</td>
<td>04 Radiological Facility</td>
<td>2</td>
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<tr>
<td>2034</td>
<td>Manhole 95 Monitoring Station</td>
<td>75</td>
<td>Sqft*</td>
<td></td>
<td>12 Not Applicable</td>
<td></td>
</tr>
<tr>
<td>2087</td>
<td>Storage I-E</td>
<td>187</td>
<td>Sqft</td>
<td>1948</td>
<td>12 Not Applicable</td>
<td>1</td>
</tr>
<tr>
<td>2088</td>
<td>Emergency Generator Building for 2000</td>
<td>162</td>
<td>Sqft</td>
<td>1948</td>
<td>12 Not Applicable</td>
<td>1</td>
</tr>
<tr>
<td>2092</td>
<td>Storage</td>
<td>116</td>
<td>Sqft</td>
<td>1959</td>
<td>12 Not Applicable</td>
<td>1</td>
</tr>
</tbody>
</table>

*Estimated (not in FIMS)
<table>
<thead>
<tr>
<th>Building (Property ID)</th>
<th>Title (Property Name)</th>
<th>Asset Type</th>
<th>RPV Description</th>
<th>Usage Code</th>
<th>Disposition Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Information Center Complex</td>
<td>501 Buildings</td>
<td>Office-Small</td>
<td>101 Office</td>
<td>04/01/2010</td>
</tr>
<tr>
<td>2019</td>
<td>Solar Energy Lab/Laser Lab</td>
<td>501 Buildings</td>
<td>Labs-Test/Blast (80/20)</td>
<td>751 Materials Laboratory</td>
<td>04/10/2010</td>
</tr>
<tr>
<td>2024</td>
<td>Quality Assurance and Inspection</td>
<td>501 Buildings</td>
<td>Office-Small</td>
<td>101 Office</td>
<td>04/08/2010</td>
</tr>
<tr>
<td>2034</td>
<td>Manhole 95 Monitoring Station</td>
<td>550 Other Structures</td>
<td></td>
<td>7008 Other, Communications Monitoring Systems</td>
<td>10/27/2010</td>
</tr>
<tr>
<td>2087</td>
<td>Storage I-E</td>
<td>501 Buildings</td>
<td>Warehouse/Storage(pre-eng)</td>
<td>400 General Storage</td>
<td>04/10/2010</td>
</tr>
<tr>
<td>2088</td>
<td>Emergency Generator Building for 2000</td>
<td>501 Buildings</td>
<td>Warehouse/Storage(pre-eng)</td>
<td>694 Other Service Buildings</td>
<td>04/10/2010</td>
</tr>
<tr>
<td>2092</td>
<td>Storage</td>
<td>501 Buildings</td>
<td>Warehouse/Storage(pre-eng)</td>
<td>400 General Storage</td>
<td>04/10/2010</td>
</tr>
</tbody>
</table>

The 2000 Complex was comprised of four primary research facilities (Buildings 2000, 2001, 2019, and 2024), associated outbuildings (Buildings 2034, 2087, 2088, and 2092), a filter house and stack, and service utilities. **Building 2000**

Building 2000 was a steel-framed Quonset hut that was originally developed as a metallurgy laboratory, later used by the Manhattan Research Project in the late 1940s, and then the ORNL Metals and Ceramics Division in the 1950s. The most recent occupants of Building 2000 were the ORNL Solid State Division and Quality Service Division, who occupied the building from 2000 until 2002 when the building was shut down and emptied of loose materials. The facility contained metal casting and fabrication equipment to produce fuel elements containing highly-enriched uranium, laboratories for testing the mechanical, chemical, and physical properties of uranium and fuel elements, and office space. Aluminum-clad, aluminum-uranium fuel elements were developed in Building 2000 for use in the ORNL Materials Test Reactor (MTR) and the Light Isotope Test Reactor (LITR). The Building 2000 High Bay contained the metalworking, melting, casting, and heat-treating equipment for uranium and thorium metal processing; beryllium machining work was also performed in the facility. The building’s once-through ventilation system removed radioactive materials from the air using a cyclone separator system and absolute filters before release to the environment. Categorized as a radiological facility, the structure had extensive contamination within the air-handling systems and contamination bonded onto many of the building surfaces. **Building 2001**

Building 2001 was a steel-framed Quonset hut with a single-story, concrete block addition on the east side. It was originally used as health physics laboratories for the development of health physics instrumentation and subsequently used by the ORNL Environmental Sciences Division for basic research until the late 1970s. The facility was remodeled and used as office space by the ORNL Information Division Complex from early 1980 until 1992. During remodeling the laboratories were converted to office space, slab process drains were covered with vinyl floor tile, and fume hoods were removed, however, the fume hood ductwork and ventilation equipment remained in place. From 1992 until the facility was shut down 2002, Building 2001 was used for temporary offices. Building 2001 exhibited low levels of radioactive contamination, primarily in the interior portions of the air-handling units and process drains.
Building 2019
Building 2019 was constructed in 1951, south of Building 2000. This small single-story, light steel frame was first operated by the ORNL Environmental Sciences Division as the original “Mouse House” and later was used for laser research by the Thin Film Nanostructure and Materials Physics Group.

Building 2024
Building 2024 was constructed between the Buildings 2000 and 2001 Quonset huts, and expanded in 1969 to its final configuration as a two-story concrete block structure. It originally served as an annex to Building 2000, providing additional office and laboratory space to support early radiological operations. Later, the ORNL Solid State Division performed research in the laboratories, and multiple divisions have used the office space. The facility was shut down in 2002, and emptied of loose material, equipment, and furniture in 2002 and 2003. Radiological contamination was generally limited to the process drains, hoods, and associated ductwork.

2000 Complex Outbuildings
There were four small outbuildings that were free of radiological contamination or had limited radiological contamination that was easily abated prior to demolition.

Construction Details:
The two largest of these buildings were “Quonset Hut” type construction from the 1940s. Of the remaining buildings associated with this ECAS project, most of the rest were steel frame with either steel or transite siding. Several also had masonry or CMU portions and all had concrete annexes, foundations or basements.

Facility Use:
There were numerous uses for these buildings, as described in their titles; in general they were industrial facilities with minor process activities. All buildings had been vacant for at least six years at the time of the projects and were in deteriorated condition. Additional information and pictures of the buildings are available in the PCCR identified in the reference documents and available on the referenced web site.

Processes causing contamination:
A number of the facilities are identified as radiological facilities; however any contamination would be minor resulting from storage of contaminated materials or maintenance of contaminated equipment decades ago.

Contaminants of concern (including extent of contamination by major contaminant):

<table>
<thead>
<tr>
<th>Building</th>
<th>Chemical Hazard</th>
<th>Location/Extent</th>
<th>Radiological Hazard</th>
<th>Location/Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Asbestos, Lead, various solvents and metals</td>
<td>Multiple, including roofing material, panels, tiles &amp; insulation.; various areas and equipment</td>
<td>Minimal Radiological Contamination</td>
<td></td>
</tr>
</tbody>
</table>

Picture of Facilities:
The 2000 Complex (Fig. 1) was comprised of four primary research facilities (Buildings 2000, 2001, 2019, and 2024), associated outbuildings (Buildings 2034, 2087, 2088, and 2092), a filter house and stack, and service utilities.
D&D Project Execution

Site WBS Organization within the ECAS Project Scope:

During the period prior to approval and execution of the CERCLA TCRA, UT-Battelle implemented several activities at the 2000 Complex to stabilize and reduce risks associated with the site hazards in preparation for final D&D of the facilities. UT-Battelle conducted Building inspections and “condition assessment” walk-downs, a dedicated characterization campaign, developed documents to demonstrate waste acceptance requirement compliance for the Oak Ridge Reservation’s (ORR) Environmental Management Waste Management Facility (EMWMF), and tested several fixative agents on the peeling PCB-containing paint that covered the exterior surface of Buildings 2000 and 2001. UT-Battelle also remediated a small area of beryllium contamination in the 2000 Complex to eliminate beryllium as an IH concern during subsequent D&D work. Additionally, all utilities were isolated to remove hazardous energy sources, rendering the complex “cold and dark.”

Final demolition of the facilities in the 2000 Complex was divided into two separate activities based primarily on:

• the extent of radiological contamination expected to be encountered within the buildings;
• the ultimate disposal location of the bulk of the demolition waste; and
• the physical arrangement of the facilities at the site.

Structures with discrete locations of contamination that could be readily abated prior to demolition were packaged as the 2000 Complex East D&D Project; the first of two fixed-price, competitively-bid subcontracts. This subcontract included Buildings 2001, 2019, 2024, and three of the four outbuildings. With removal of the contaminated materials, the balance of the
demolition of these structures would be handled as a non-radiological activity, thus allowing waste disposal at the DOE ORR Sanitary/Industrial Landfill.

Building 2000, identified as containing extensive radiological contamination, and Building 2034, a small enclosure over a process waste sampling station were included in the 2000 Complex West D&D Project. The intent of this project was to stabilize radiologically-contaminated systems and equipment in-place, and manage the final facility demolition and the subsequent debris as radiologically contaminated. Demolition waste would be destined for disposal at the EMWMF, the ORR’s CERCLA disposal cell, and would also include the abated radiological waste from the 2000 East D&D Project.

In the fall of 2009, UT-Battelle awarded the 2000 Complex East D&D Project to the Safety and Ecology Corporation (SEC). SEC’s team for the 2000 Complex East D&D included E. Luke Greene for asbestos abatement, and Washington Safety Management Solutions LLC (WSMS) for waste transportation. Concurrent with the field work for the 2000 Complex East D&D Project, UT-Battelle pursued procurement of a subcontractor for the second fixed-price work package, the 2000 Complex West D&D Project. This effort was timed to minimize the delay between completion of the 2000 Complex East D&D Project site work and field mobilization for the 2000 Complex West D&D Project work. In the spring of 2010, the SEC team performing the 2000 Complex East D&D Project was also awarded the subcontract for the 2000 Complex West D&D scope. The WBS separates the East and West subprojects, and appears to separate out the preparation work from the execution work for each.

The two demolition subcontracts tasked the SEC team to perform all activities needed to safely and compliantly demolish the structures. Major elements of this work included hazardous material abatement, asbestos abatement, radiological material abatement, structural demolition, waste disposal, and site restoration.

**Hazardous Material Abatement**

Initial field activities for both subcontracts consisted of identification and removal of hazardous materials from the facilities. Chemicals, oils and lubricants, lead, and universal wastes were collected, consolidated, and packaged under the guidance and direction of UT-Battelle personnel for disposal by UT-Battelle’s Laboratory Waste Services Group. Additionally, other items prohibited from disposal at the ORR EMWMF and Sanitary/Industrial Landfill were identified and segregated. In Building 2000, shielding in the form of lead sheet was identified with spray paint and recovered following demolition of the building to minimize the physical and potential exposure hazards posed by pre-demolition manual removal inside of the building. The lead sheet was containerized and arrangements made for reconfiguring this material for use as shield blocks.

**Asbestos Abatement**

The use of asbestos-containing materials (ACM) was standard practice at the time the 2000 Complex was constructed. A significant abatement phase was required to remove friable and selected non-friable ACM from the buildings. Thermal system insulation (TSI), transite items, and some floor tiles and mastic were systematically removed, packaged, and shipped to the appropriate DOE-ORO disposal facility. Some Category I and Category II non-friable ACM materials were left in the buildings after a qualified asbestos inspector determined that these items were not in poor condition and not likely to become friable during demolition. One area of Building 2000 was structurally compromised to the extent that access for friable ACM abatement was not feasible. A small quantity of friable ACM was left in this area and demolished with the
structure. This material was recovered intact and segregated from the balance of the debris following demolition.

**Radiological Material Abatement**

The facilities associated with the 2000 East D&D Project were radiologically “clean” with the exception of several fans, air handling units, lab hoods, and some associated ventilation ducts. Radiologically contaminated items were removed and packaged prior to building demolitions for disposal at the EMWMF with the 2000 West D&D Project waste. This allowed the balance of the structures included in the 2000 East D&D Project to be disposed at the ORR Sanitary/Industrial Landfill following demolition. Several sections of original Building 2000 ventilation system duct that exhibited levels of radiological activity substantially higher than the rest of the contaminated systems were removed from Building 2000 prior to demolition. This activity was performed as an additional contamination control measure to address concerns that radioactive contamination could become loose (due to the overall deteriorated condition of the duct) during demolition and size reduction. No abatement of the remaining radiological material from facilities included in the 2000 West D&D Project was attempted; all materials, including abated asbestos, was managed as radiologically contaminated following the application a fixative to known contaminated systems within the structure.

**Structure Demolition**

Following completion of the abatement phases of the projects, each facility was safely demolished to slab using a trackhoe outfitted with appropriate demolition tools (e.g., grapple, hammer, shear), with the exception of Building 2034, which was disassembled manually. Prior to demolition, the metal skin of Buildings 2000 and 2001 was covered with a sprayed-on elastomeric coating to minimize the flaking of PCB-contaminated paint during demolition and subsequent size-reduction. Non-amended water was used for dust control during trackhoe operations. The project conducted continuous perimeter air monitoring for airborne asbestos and radiological contaminants throughout the demolition process.

**Waste Disposal**

Approximately 153 m³ (200 yd³) of abated radiological waste from the 2000 East D&D Project were packaged in intermodal containers and disposed at the EMWMF. The 2000 West D&D Project generated approximately 2,725 m³ (3,560 yd³) of demolition debris that was disposed at the EMWMF under a separate waste profile. Approximately 4,380 m³ (approximately 5,730 yd³) of demolition debris from the 2000 East D&D Project and Building 2034 from the 2000 West D&D Project, was disposed at the ORR Sanitary/Industrial Landfill. In addition, approximately 46 m³ (60 yd³) of low-volume waste streams, including universal and mixed wastes, were disposed at commercial treatment and disposal facilities.

**Site Restoration**

Little site restoration beyond repairing and re-vegetating small areas of disturbed soil around the former footprint of the large structures was required, as plans for follow-on slab removal, scheduled for 2011, are well underway. Temporary safety barriers were installed around the perimeter of the remaining slabs where the potential for fall hazards existed (Fig. 3). Known areas of fixed radiological contamination in/on the slabs were identified with yellow and magenta paint and affixed with appropriate signage.

**Methods of execution:**

*Management:* The scope was planned, managed, and executed as a single element.
**Regulatory:** The project was performed in accordance with the requirements of the Federal Facility Agreement for the Oak Ridge Reservation and an Action Memorandum for a time-critical removal action which was prepared by DOE-EM. A Waste Handling Plan including a Sampling and Analysis Plan, as well as characterization, preparation of waste profiles, sorting/segregation, and size reduction prior to transportation to an approved disposal site was included in this work scope. Waste profiles were developed and submitted to the Environmental Management Waste Management Facility (EMWMF) Waste Acceptance Criteria (WAC) Attainment Team for approval prior to waste disposal at the EMWMF. Some waste was shipped to an approved off-site facility for treatment and/or disposal. This project scope included preparation of a Removal Action Report for regulatory approval following completion of all project activities.

**Physical Approach:** The prime contractor initially removed, packaged, and dispositioned any legacy materials that had to be removed prior to demolition. Subcontractors performed the asbestos abatement, removed transite panels, and removed any universal waste to allow the demolition waste to be dispositioned at either the Y-12 Landfill or the EMWMF. Construction contractors demolished the facilities and transported the demolition debris to the appropriate disposal location. The voids were backfilled to grade.

**Technologies:** The contractor used standard asbestos abatement and demolition technologies (e.g., glovebags/plastic/water sprays and excavators). Some fixatives were used for exterior PCB-contaminated paint.

**Activities self-performed:**
- All management and key technical positions along with a portion of the technical staff
- Waste management
- Used significant professional services contracted (i.e., seconded) labor inter-mixed with prime contractor staff
- Characterization of surfaces prior to demolition

**Activities subcontracted:**
- Asbestos Abatement
- Waste treatment of mixed wastes (on-site and off-site)
- Demolition of structures

**Issues that impacted the project:**
- None

**Scope Growth:**
No identified scope growth

**Notes Regarding Use of Data**
- The Asbestos Abatement and Facility Demolition activities appear to have been co-mingled in the WBS.