

**Decommissioning Plan  
Battelle Memorial Institute Columbus Operations**

**Draft Revision 6**

**Disclaimer: This draft plan is believed to be technically correct as of the time of its preparation. It has not yet been reviewed by Battelle management or the NRC. Changes may or may not be required as a result of Battelle or NRC review, and contract negotiations between the DOE and Battelle.**

DD-93-19  
Revision 6

\_\_\_\_\_, 2003

**PLAN APPROVAL PAGE**

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# **Battelle Memorial Institute Columbus Operations Decommissioning Plan**

## **1. General Information**

Licensee Name: Battelle Memorial Institute  
Licensee Address: 505 King Avenue, Columbus, OH 43201-2693  
1425 Plain City - Georgesville Road, West Jefferson, OH 43162  
License Number: U.S. Nuclear Regulatory Commission Radioactive Materials License SNM-7

On April 16, 1943, Battelle Memorial Institute, acting through what is now its Columbus Operations (BCO), entered into Contract No. W-7405-ENG-92 with the Manhattan Engineering District to perform atomic energy research and development (R&D) activities. From that time until 1988, BCO performed nuclear materials R&D work at these privately-owned facilities for the Manhattan Engineering District and its successor agencies – the Atomic Energy Commission (AEC), the Energy Research and Development Agency (ERDA), and the Department of Energy (DOE). BCO also performed commercial nuclear operations and work for other Federal agencies such as the Department of Defense (U.S. Air Force, U.S. Army, U.S. Navy) and the National Aeronautics and Space Administration.

Fifteen BCO buildings and their associated grounds, located at BCO's King Avenue Site, Columbus, Ohio, and West Jefferson North and South Sites, West Jefferson, Ohio, became partially radiologically contaminated as a result of the performance of such work. Those facilities required decontamination to original status (i.e., unrestricted use).

It has been agreed that DOE, as the successor to the AEC and the Government's earlier work, has predominant liability and responsibility for decontamination and decommissioning (D&D) of the BCO facilities. At the direction of the Assistant Secretary for Nuclear Energy (May 29, 1986 memorandum, Voight to Vaughan, approved by Vaughan, June 10, 1986), D&D of the BCO facilities described herein was accepted into DOE's Surplus Facilities Management Program as a major project, entitled the Battelle Columbus Laboratories Decommissioning Project (BCLDP).

Battelle also holds U.S. Nuclear Regulatory Commission (NRC) license number SNM-7. Battelle has continually operated in full compliance with this NRC license and will perform this decommissioning in compliance with NRC regulations. Accordingly, this decommissioning plan was submitted to the NRC for review and approval.

## **2. Description of Planned Decommissioning Activities**

### **2.1 Decommissioning Objective, Activities, Tasks, and Schedules**

Revision 0 of this Decommissioning Plan addressed the plans and controls associated with decontaminating 15 buildings at Battelle's King Avenue and West Jefferson sites. The buildings at the West Jefferson South site were already completed at that time, and the original decontamination scope of work for the King Avenue buildings has been completed since that time. Some additional decontamination work scope at certain King Avenue facilities has been identified, but is not within the scope of this document.

This Decommissioning Plan addresses completion of the remaining decontamination activities at the West Jefferson North site (Figure 2.1). Much of the originally identified scope of work has already been completed, particularly material and utility removal and gross decontamination of most of the areas with highest contamination, such as the hot cells. Information regarding King Avenue and West Jefferson South site buildings and work already completed at West Jefferson North have been removed in this revision. Information and planning for those areas may be found in past revisions of this document.

Project support functions, such as Radiation Protection, Training, Documentation, Records, and Emergency Planning, remain essentially unchanged. The primary planning change is to demolish and remove the three West Jefferson North site buildings and return the site to an essentially 'green field' end state, rather than to decontaminate them to releasable levels and restore them.

#### **2.1.1 Need for Action**

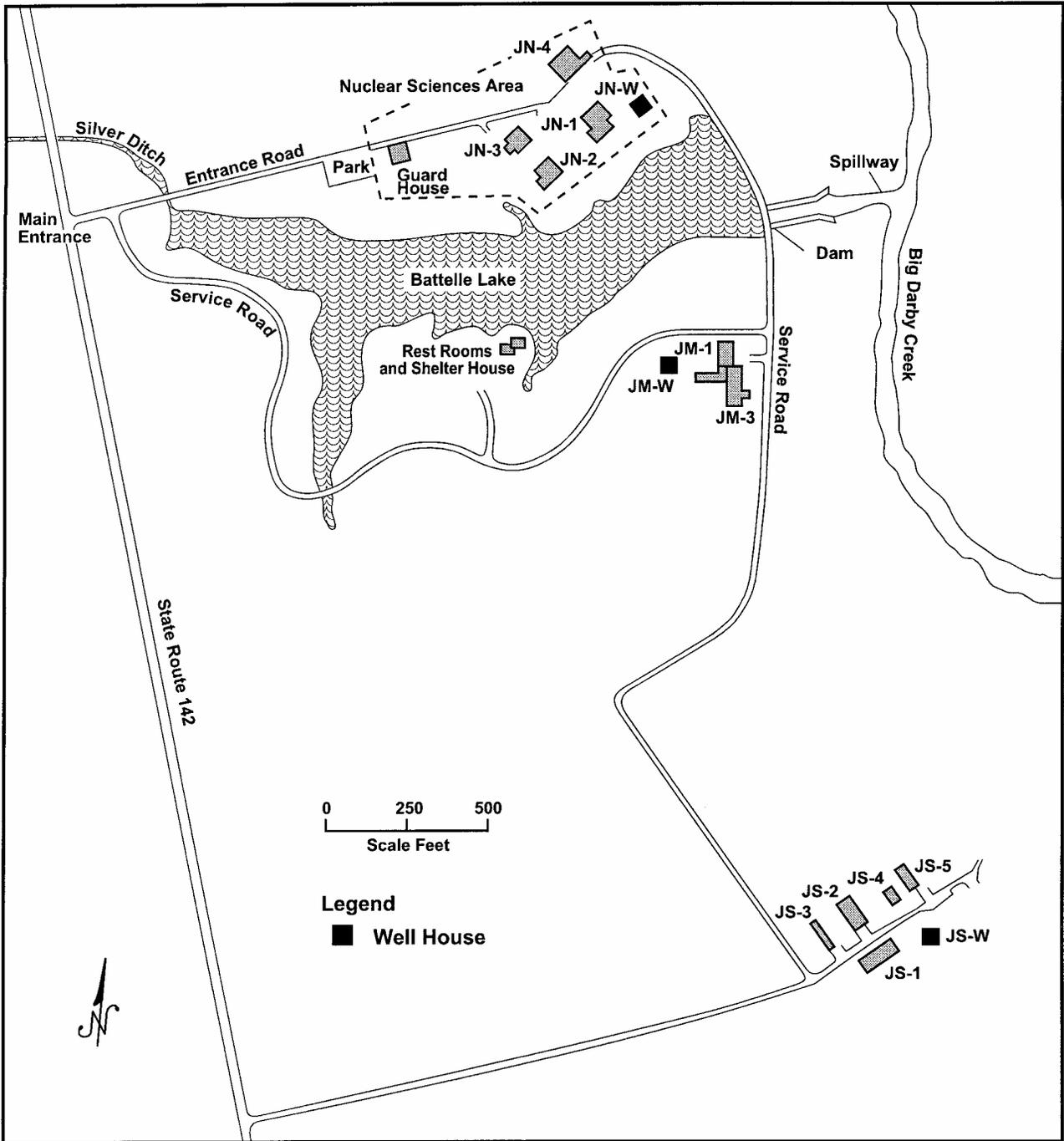
This Decommissioning Plan describes the planned D&D of three buildings or portions thereof, and underlying and/or adjacent soils and smaller structures that became radioactively contaminated as a result of performance of research and development (R&D) work under the U.S. Government contract.<sup>1,2</sup> The Battelle-owned buildings currently are undergoing materials removal and gross decontamination to prepare them for demolition and disposal.

The three buildings include a decommissioned reactor building, a chemical/nuclear laboratory, and a hot cell building that was highly contaminated. The D&D of the BCO facilities will enhance environmental quality and assure public health and safety.<sup>3</sup> D&D activities will be performed and managed in compliance with all applicable Federal, State, and local regulations. The Ohio Field Office of DOE shall maintain day-by-day operational cognizance of the D&D project.<sup>4,5</sup>

The NRC has reserved three statutory responsibilities:

- to conduct periodic inspections;
- to approve the release criteria used; and
- to certify the final releases.

The NRC has all rights of surveillance as agreed with DOE and Battelle<sup>6</sup> and as set forth in the SNM-7 license.



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**Figure 2.1**  
**West Jefferson Site**

### 2.1.2 Objective

The remaining objective of this D&D project is to demolish and dispose of the three contaminated buildings, remediate the surrounding grounds, and return the site to Battelle, free from radiological restrictions (i.e., unrestricted release), at or below levels consistent with U.S. NRC<sup>7</sup> and DOE applicable requirements in a timely manner. Several D&D alternatives were evaluated, as described in the BCLDP Environmental Assessment

Based on the evaluation of alternatives within the overall objective of returning the affected facilities to unrestricted use, immediate dismantlement was selected with the following technical objectives:

- Meet the requirements of the NRC regulations.
- Decontaminate or remove and dispose of all contaminated equipment, buildings, and grounds at minimum costs consistent with safety, health, security, and environmental considerations in accordance with all applicable Federal, State, and local regulations.
- Perform the decommissioning operations in accordance with ALARA (as low as reasonably achievable) principles.
- Perform the technical decommissioning operations within the budget and time allocations.

To accomplish the overall objective, the proposed activities and tasks of the D&D project will include the following:

- Conduct pre- and post- D&D radiological characterization surveys of each building and the surrounding areas.<sup>8,9</sup>
- Remove spent fuel fragments or fines, special nuclear and source material, low level waste, transuranic (TRU) waste, by-product material, and hazardous material required to prepare buildings for D&D.
- Plan, engineer, and procure equipment for the D&D tasks.
- Continue S&M of the buildings and site during D&D.
- Perform and/or manage D&D of three buildings and surrounding grounds, as necessary.
- Perform the necessary environmental, safety, and health support functions in compliance with applicable Federal, State, and local regulations.
- Package and transport all D&D waste to an appropriate storage or disposal facility.
- Contract for independent radiological release surveys by an independent verification contractor (IVC).
- Restore the site to an essentially “green field” end state.

### 2.1.3 Brief History of Battelle's Nuclear Activities

Battelle's first studies related to atomic energy development began in 1942, with the fabrication of uranium, a metal whose properties had yet to be characterized. Battelle's accomplishments during the war years helped to make it possible to build and operate plutonium-producing reactors, not long after the feasibility of the chain reaction had been demonstrated. Several different types of reactor systems were being assessed by the early 1950s. The scope of atomic energy research rapidly increased after 1954 when the AEC lifted restrictions on atomic energy R&D.

Nuclear-related research was greatly expanded at Battelle in the decade after World War II. Development work on extractive metallurgy and plant corrosion resulted in an ion-exchange process that is the basis for recovery of most of the world's uranium. Extensive work was performed on alloy and fabrication process development, corrosion chemistry studies, and engineering analyses for the Naval Reactor Branch via the Naval Reactor Program, beginning in the early 1950s. Reactor development was the main research theme throughout the first 20 years, and dominated Battelle's R&D program.

The very nature of research being performed made it mandatory that a remote-handling facility be built. Thus in 1955, Battelle expanded the existing nuclear facilities by building the first privately-owned nuclear research center in the world. This facility, the Nuclear Sciences Area, located at the north end of the West Jefferson site included a research reactor, critical assembly facility, hot cells, and later a plutonium laboratory which has since been fully decommissioned. At the south end of the West Jefferson site, several autoclaves were constructed for use in hot isostatic pressing, a Battelle-developed technique for fabricating nuclear reactor fuel elements. Experiments connected with the radiation stability of materials were conducted in the Hot Cell Facility. Evaluation of these experiments has formed the basis for developing better nuclear fuels, control rod materials, and reactor structural materials. An additional capability was added to the Hot Cell Facility by adding a mechanical test cell to study the mechanical properties of irradiated materials. Typical areas of research have included:

- Post-irradiation examination of commercial pressurized water reactor and boiling water reactor fuel and control rod materials
- Nuclear fuel failure inspection
- Spent fuel shipping and storage container development
- Nuclear plant reliability analysis and qualification for NRC licensing
- Commercial reactor hardware testing and refurbishment

### 2.1.4 Assessment of Contamination Levels

The original basis of assessment of the radiological contamination in the facilities at the West Jefferson North site was on a preliminary radiological survey performed in 1984. D&D of the King Avenue and West Jefferson South facilities in the original scope of work has been completed and is not addressed further in this document. The survey results for buildings at the West Jefferson North site are summarized in Table 2.1. It lists known or suspected locations of

contamination within each building, the types of operations performed, the estimated contamination inventory, and the types of isotopes involved. Detailed radiological surveys are ongoing in Buildings JN-1, JN-2, and JN-3.

**Table 2.1**  
**Summary of Radiological Contamination in the West Jefferson North Facilities**

Building	Type of Activity/Areas	Use	Survey Instrument Reading (dpm/100 cm <sup>2</sup> )	Estimated Contamination Inventory (Year of Inventory)	Radioisotopes	Location <sup>a</sup> / Type of Contamination
JN-1	Hot cells	Fuel element development; examination of irradiated fuel; criticality experiments	ND	6,000 Ci ('89)	MFP; U, Th, activation products (AP); Co-60	Drain lines (sludge), closed tank (water), equipment
JN-2	Former critical assembly lab; Accountability Lab; Radioanalytical Lab	Fuel element development; U-235, plutonium storage; radio-chemical analyses	ND	<1 Ci ('84)	TRU, MFP, AP	Tanks (closed); stored water; drain lines (sludge); trench (debris)
JN-3	Retired research reactor	Reactor studies; material irradiation	ND	ND	TRU, MFP, AP	Piping, trench base of containment), external hold-up tank (water); external drain system; drainage system (sludge)

<sup>a</sup> Building surface contamination is common to all buildings

<sup>b</sup> ND = not determined

Results indicate contamination in facilities/buildings that had been associated with handling nuclear material, with some contamination found in contiguous areas. Radioactive contaminants detected include TRU, mixed fission products (MFP), activation products, uranium, thorium, carbon-14, and cobalt-60.

**Building JN-1 (Hot Cells).** JN-1 was constructed to support fuel development research for the AEC. The facility was initially used for hot cell examination of irradiated fuel specimens. Subsequent work involved examination of fuel from commercial power reactors in support of DOE programs. High radiation fields and extensive contamination from TRU, MFP, activation products, uranium and decay products, and Co-60 existed throughout the hot cell laboratories. The equipment inside the cells was also highly contaminated. Other areas in the building have low levels of contamination. Decommissioning of this building's hot cells required some remote operations and extensive radiation protection precautions.

At present, material and utility removal and gross decontamination of the hot cells has been completed. Remaining contamination on interior surfaces of the hot cells has been fixed using a

fixative coating. Other areas of the building, particularly the walls above the six-foot level, ceilings, and overhead areas, equipment, and utilities, continue to have low levels of contamination.

**Building JN-2 (Former Critical Assembly Laboratory).** This building was used for a zero-power organic-moderated critical assembly and other criticality experiments. Subsequently, JN-2 housed a small plutonium laboratory, an instrument laboratory, and currently a radioanalytical laboratory for the D&D program. The building also contains a storage vault formerly used for storage of plutonium and highly enriched uranium. Contamination exists in those areas and in an underground storage tank and its associated hot drain system. The contamination is localized and primarily fixed. The plutonium laboratory was decontaminated and converted into the radioanalytical laboratory.

Little decontamination has been performed to date in Building JN-2 because of its continued use for the Radioanalytical Laboratory.

**Building JN-3 (Reactor Building).** Building JN-3 housed a research reactor that was operated in support of fuel development programs for the AEC. This reactor was partially decommissioned in the mid-seventies and retired. Subsequently, the building was used to store waste generated from previous D&D activities in the JN-2 plutonium laboratory and another plutonium laboratory (JN-4) at the same site. TRU, MFP, and activation products were present, either as surface contamination, or in sludge/water/soil media in drain lines and around the containment building itself, as a result of former reactor operations. Carbon-14 also was found around the old reactor and contractor pools.

Building JN-3 has been decontaminated and characterized. The only remaining contamination resides is piping buried in concrete and underground, in the underground reactor water storage tank and under a building column. These areas are scheduled for decontamination as part of building demolition.

**Subsurface Soil Contamination at the West Jefferson Nuclear Sciences Area.** Data presented in the Battelle annual site environmental reports<sup>10</sup> indicate that there have been no significant radionuclide releases to the environment from site activities. Furthermore, the ongoing environmental monitoring program indicates no significant site releases or migration of contamination.

Radionuclide activities of soil/sediment samples collected by Battelle and Argonne National Laboratory during limited characterization studies, show that there are several small areas on the West Jefferson North site that have elevated activities of Cs-137 and Am-241. One area is in two abandoned filter beds, which had been remediated previously, but not to current criteria. The second area is located near the sanitary outfall, which serves buildings JN-1 and JN-4 (the former plutonium laboratory). Low levels of MFP and TRU contamination have been identified along a narrow band that originates from this outfall. These areas had been remediated in the form of soil excavation, but were not submitted to the IVC. The extent of the remediation effort will be determined from the site characterization and excavation work.

### 2.1.5 Planning

The planning process at the BCLDP requires a detailed review of each task to be performed before work begins and the approval of work instructions. Decommissioning each facility or major part is conducted as a separate effort. The effort-specific planning package is based on a review of the following subjects:

- Decommissioning Operations Objectives
- Site Radiological and Chemical Characterization Report
- Site Decommissioning Operations Release Criteria
- Site Decommissioning Operations Schedule, and
- Support Functions (QA, Health Physics, Radiological Safety Training).

Effort-specific planning packages include, but are not limited to:

- Work Instructions
- Waste Management Checklists
- Industrial Safety Checklists
- Radiation Work Permits.

The **Site Characterization Plan (SCP)**<sup>11</sup> provides guidance for radiological characterization of buildings and the grounds surrounding the buildings to be decommissioned. The SCP sets forth the procedures for a detailed characterization. It includes the following subjects:

- Operational History
- Scoping Surveys
- Background Surveys
- Characterization Surveys of Buildings and Facility Surfaces
- Characterization Surveys of Grounds and Open Land Areas
- Post-Characterization Operations
- Training/Quality Assurance
- Instrumentation
- Radioanalytical Services
- Procedures

**Surveillance and Maintenance** operations are performed prior to, during, and after decontamination to assure that the contamination in the buildings remains controlled and is not inadvertently spread, and that safe working conditions are maintained. S&M activities include:

- Environmental Monitoring – An environmental monitoring program is required to assure that radioactive contamination has not escaped to the surrounding

environment. Environmental monitoring includes effluent monitoring at potential points of release and sampling and analyzing environmental media from areas on and off the West Jefferson North site.<sup>12</sup>

- Facility Surveillance and Maintenance – This includes regularly scheduled inspection and maintenance of buildings and grounds, and of health, safety, and radiation protection equipment and instrumentation. A detailed schedule of inspection and maintenance is followed. All S&M activities are conducted under an established nuclear quality assurance program. Emergency planning, training, and drills are also conducted as part of S&M.<sup>13</sup> Repair and replacement of equipment, air and water filtration, and clean-up of equipment are performed as required.
- Operational Health Physics – A program of health physics radiation monitoring is conducted, including training of site personnel, posting of contaminated areas, a detailed schedule of health physics surveillance monitoring, and personnel dosimetry.

#### 2.1.6 Decommissioning Operations

The D&D operations described in the following sections are based on the radiological survey information obtained at termination of research activities and more recent data generated during building characterization activities. The BCLDP Baseline, Revision 3, identifies the specific activities to be performed, as well as logical sequencing of activities and activity durations. More specific procedures (see Attachment 3) and work instructions are developed for each task within the buildings. Procedures and work instructions are prepared and controlled according to QD-AP-5.1, “Preparation of Procedures”<sup>14</sup>, QD-AP-5.2, “Work Instructions”<sup>15</sup>, and QD-AP-6.1, “Document Control”<sup>16</sup>, which conform to NRC requirements for preparation, management, and approval. Independent assessments are described in QD-AP-18.1<sup>17</sup> and QD-AP-18.2<sup>18</sup>.

At the direction of the DOE, Battelle has replanned the end state of JN-1, JN-2, and JN-3 to be demolition rather than restoration. This change does have an impact on the general outline of the workflow.

As the BCLDP has matured, its staff gaining experience in general operations, it has been determined that the generation of building specific documents such as Quality Assurance Plans (QAPs) are no longer required. In similar logic, the extensive, formal review process of the Readiness Review is no longer required or performed

##### 2.1.6.1 Building JN-1: Remaining D&D Operations

The following are the general decommissioning operations remaining to be performed. Schedules for specific activities are set forth in the BCLDP Baseline, Revision 3.

- (1) Dismantle the hot cell rooms using methods that may include cutting, concrete sawing, concrete breakers, core drilling, and other appropriate demolition methods.
- (2) Remove materials, equipment, cranes, and utilities from the remaining areas of the JN-1 building.
- (3) Remediate sumps, vertical and horizontal drain lines, and sewer lines.

- (4) Dispose of the waste from dismantling operations as low-level waste.
- (5) Clean the remaining rooms in the building using vacuum cleaning, wiping, and scabbling methods, as required. Fix any remaining loose contamination by applying a fixative.
- (6) Demolish and remove the remaining portions of the building as low-level waste.
- (7) Remove any soil contaminated to levels above release criteria.
- (8) Perform a final status survey of the excavation and any remaining sub-surface structures, and then notify DOE that the radiological survey indicates readiness to perform the IVC survey.
- (9) Restore the building excavation to essentially “green field” conditions. The restoration operations do not constitute a radiological hazard to the workers or the public.

#### 2.1.6.2 Building JN-2: Remaining D&D Operations

The following are the general decommissioning operations remaining to be performed. Schedules for specific activities are set forth in the BCLDP Baseline, Revision 3.

- (1) Relocate any staff and/or non-D&D operations from the areas to be decontaminated.
- (2) Relocate or isolate all activities from the clean areas adjacent to or near the contaminated areas.
- (3) Survey and remove uncontaminated items including office furniture and laboratory equipment.
- (4) Perform detailed radiological surveys of the contaminated areas and the equipment in those areas. This will assist in preparing the specific decontamination procedures for specific areas.
- (5) Remove contaminated furniture and equipment. Decontaminate at a suitable location or dispose of as radioactive waste, as deemed appropriate.
- (6) Remove exposed and contaminated plumbing, hoods, ducts, and electric equipment (including surface conduits and hanging lights) and dispose of as radioactive waste.
- (7) Decontaminate the ceilings, floors, and walls, using detailed procedures and work instructions and using information obtained from the radiological surveys. The decontamination methods will include, but not be limited to, pressure washing, scabbling, vacuum cleaning, wiping, and removal of the surface layers from the ceilings, walls, and floors.
- (8) Remediate sumps, vertical and horizontal drain lines, and sewer lines by decontamination or removal. Remove the underground storage tank and associated hot drain piping.
- (9) Perform interim radiological surveys to determine the progress and depth to which material must be removed to achieve complete decontamination.
- (10) Perform a final status survey, and then notify DOE that the building is ready for an IVC survey.
- (11) Demolish the building after it is certified for unrestricted release, and dispose of rubble as clean landfill.
- (12) Remove any soil contaminated to levels above release criteria.

- (13) Perform a final status survey and a confirmatory IVC survey of the excavation
- (14) Restore the excavation to essentially ‘green field’ conditions. The restoration operations do not constitute a radiological hazard to the workers or the public.

#### 2.1.6.3 Building JN-3: Remaining D&D Operations

The following are the general decommissioning operations remaining to be performed. Schedules for specific activities are set forth in the BCLDP Baseline, Revision 3.

- (1) Remove sumps, remaining vertical and horizontal piping, and sewer lines.
- (2) Perform a final status survey, and then notify DOE that the building is ready for an IVC survey.
- (3) Demolish the building after it is certified for unrestricted release, and dispose of the rubble as clean landfill. Remove the remaining contamination under the basement column at the appropriate time during demolition.
- (4) Remove any soil contaminated to levels above release criteria.
- (5) Perform a final status survey, and then notify DOE that the excavation is ready for an IVC survey.
- (6) Restore the building excavation to essentially “green field” conditions. The restoration operations do not constitute a radiological hazard to the workers or the public.

#### 2.1.6.4 Soil Contamination

The soils near or under the buildings may be contaminated. The ground near and under the buildings, especially along buried sewer lines, will be surveyed to determine the presence of radioactive contamination greater than naturally occurring for the vicinity. All soil found to be contaminated above background will be evaluated to determine the appropriate remedial action consistent with the NRC-approved release criteria. Such action could include leaving the soil undisturbed, using in-situ remediation, providing appropriate cover, or removal and shipment to a burial site. The areas affected by the soil removal will be restored as appropriate.

#### 2.1.7 Environmental Safety and Assessment

Key environmental safety and health aspects of the D&D project have been assessed in the Environmental Assessment and Finding of No Significant Impact and the Re-Evaluation of the 1990 Environmental Assessment<sup>3</sup>. In that assessment, the potential for radiological exposure, impacts on human health and the environment, and non-radiological impacts such as chemical, physical, biological, and socioeconomic impacts focusing on transportation and employment have been considered in detail.

Estimates of potential exposures that may be experienced by D&D workers, Battelle staff, or the public were derived based on information available about the source term. The results showed that under normal operations, the exposure rates in all D&D areas will be well below the appropriate guidelines.<sup>19,20,21</sup> Even under accident conditions where all mitigating measures become inoperable, the estimated exposure was three orders of magnitude below those

guidelines for the West Jefferson North site. Potential exposures continue to diminish with the source term as decontamination proceeds.

Various ALARA techniques have been adopted to help prevent the spread of contamination, including, as appropriate:

- Enclosure and isolation of the work areas
- Control of traffic and movement of equipment and materials in and out of work areas
- Use of local HEPA exhaust systems for decontamination and dismantlement activities, such as certain kinds of abrasive blasting, scabbling, drilling, sawing, and spalling
- Use of water or a fine water spray to reduce the amount of dust that becomes airborne
- Monitoring of contamination in surrounding areas
- Use of approved containers for waste transfers.

### **2.1.8 Procedures**

Decommissioning activities and tasks will be conducted in accordance with approved procedures and work instructions that satisfy the elements outlined in QD-AP-5.1, "Preparation of Procedures"; QD-AP-5.2, "Work Instructions"; QD-AP-6.1, "Document Control"; and the Quality Manual for the BCLDP. A quality plan may be incorporated into specific work plans as allowed by QD-AP-2.2<sup>22</sup>, "Quality Planning." Additional quality assurance requirements are set forth in procedures contained in the Quality Administrative Procedures Manual. The current index of project procedures/plans is included as Attachment 3.

Procedures are controlled as described in QD-AP-6.1<sup>16</sup>, "Document Control." The review and approval process for the procedures is set forth in that procedure. The original copy of procedures, including the approval page, is retained in Project Records. Copies of new and/or revised procedures are issued to designated individuals. Distribution records are maintained. Project personnel are required to have applicable, approved procedures and work instructions of the latest revision available at the work location before work is started. All project personnel working with a work instruction (WI) are required to be briefed on the work instruction and document by signature that they understand the WI being performed. For more critical procedures, they must demonstrate proficiency.

### **2.1.9 Schedules**

Each of the remaining three buildings will be decontaminated and demolished independently of one another, such activities being conducted in parallel. The critical path for the decommissioning activities runs through completion of the building that will require the most time, Building JN-1. Specific activities and milestones for decommissioning that building, as well as the other buildings, have been planned as part of the BCLDP baseline. The baseline schedule for decommissioning the remaining buildings and the associated soils has demolition, waste disposal, and remediation completed before the end of FY06.

## 2.2 Decommissioning Organization and Responsibilities

DOE has the lead responsibility for day-to-day management of this federally funded project. The NRC has responsibility for conducting periodic inspections; approving this Decommissioning Plan, the Financial/Assurance Plan, and the release criteria; and certifying the facilities for release. D&D activities will be conducted and/or managed by the Columbus Closure Project (CCP) Closure Contractor under contract to DOE through its Ohio Field Office. Battelle will retain the ultimate responsibility for complying with all the environmental, safety, and health requirements of the U.S. NRC license SNM-7 and will, therefore, maintain a project oversight function.

### 2.2.1 Department of Energy – Ohio Field Office

The DOE CCP Director (on site) is responsible for DOE oversight and field management of the CCP. As the DOE Contracting Officer's Technical Representative, he/she has technical and programmatic authority for overall project implementation. The DOE Contracting Officer is responsible for contract administration.

### 2.2.2 Decommissioning Operations

Completion of the CCP is the responsibility of the DOE's Closure Contractor. The Closure Contractor will manage, integrate, perform, and subcontract the decommissioning operations, as necessary, to ensure that all activities are performed within the requirements for occupational, radiological, and industrial safety; environmental protection; site security; cost and schedule baselines; and the technical objectives of the project, including the approved release criteria. Closure Contractor activities include preparation of detailed work procedures, engineering and design functions, decommissioning activities, property and waste disposal functions, and transportation of packaged waste material to a remote disposal site. In addition, the Closure Contractor will be responsible for all on-site work performance, including that of subcontractors. After the completion of decommissioning activities, a final status survey of all areas will be conducted to verify that decontamination is complete and that the facilities may be released without restriction. DOE will be notified and an IVC survey will be performed to verify that decommissioned facilities are suitable for release without radiological restrictions. A certification package will then be submitted to the NRC for its review and final certification of facility release.

The Closure Contractor may establish a project organization that it deems appropriate to complete the project in accordance with objectives and commitments contained in this Decommissioning Plan. Certain organizational positions are required, however, and the personnel assigned to those positions must meet specified qualification requirements. The positions and qualification requirements are set forth below.

**Program Manager** – The Program Manager is responsible for assuring performance of work in accordance with all applicable and mandatory external and internal requirements. Minimum qualifications include:

- A Bachelor's degree in one of the physical sciences, biological sciences, or engineering disciplines
- A minimum of ten years experience in DOE project management of multi-million dollar remedial action projects and experience with radiological process.

**Operations Manager** - The Operations Manager is responsible for deconstruction of buildings, environmental remediation of external areas, and waste management. The qualifications for the Operations Manager include:

- A Bachelor's degree in one of the physical sciences, biological sciences, or engineering disciplines
- A minimum of ten years experience in engineering or related disciplines.

**Site Radiation Safety Officer (RSO)** – The Site RSO has responsibility for day-to-day implementation of the Radiation Protection Program (RPP) and compliance with all applicable regulatory requirements. Specific duties and minimum qualifications of the Site RSO are included in the RPP Plan, DD-90-02, Section 0.1.2.

**Radiological Field Operations Manager (RFOM)** – The RFOM is responsible for implementing the field or operational elements of the RPP. The responsibilities and minimum qualifications for this position are included in the RPP Plan, DD-90-02, Section 0.1.3.

**Radiological Technical Support Manager (RTSM)** - The RTSM is responsible for implementation of technical and administrative aspects of the RPP. The responsibilities and minimum qualifications for this position are included in the RPP Plan, DD-90-02, Section 0.1.4.

**Quality Assurance (QA) Manager** - The Quality Assurance Manager is responsible for assisting managers and staff in establishing and implementing the Quality Program, which satisfies DOE contractual requirements including DOE Order 414.1A and NQA-1 (1989), and performing independent quality assessments of project activities. Minimum qualifications include:

- A Bachelor's degree in one of the physical sciences, biological sciences, or engineering disciplines
- A minimum of five years experience in engineering or quality assurance programs
- Be certified or certifiable as an NQA-1 lead auditor.

**Independent Oversight (IO) Manager** - The Independent Oversight Manager is responsible for assessing project activities and work conditions for compliance with external requirements on the project, e.g., regulations, licenses, contractual requirements, industry standards, and waste disposal facility acceptance criteria, in accordance with Procedure RC-AP-1.0. Minimum qualifications include:

- A Master's degree in a relevant physical science, biological science, or engineering discipline

- A minimum of fifteen years experience in the areas of licensing or regulatory compliance, with substantial experience on D&D-related projects.

**Associate BCO or Site RSO (ARSO)** – An ARSO may be assigned to fulfill BCO or Site RSO responsibilities during temporary absences of those individuals. If so assigned, the ARSO shall meet the requirements for that position as set forth in the RPP Plan, DD-90-02, Section 0.1.2.

More than one of the foregoing position titles may be assigned to a single individual, providing that all qualification requirements are met and the individual has adequate resources assigned to accomplish the assigned functions. Alternate position titles may be used, provided that responsibilities and qualifications remain the same as indicated above.

### 2.2.3 Battelle Role in CCP

Battelle will remain the owner of the West Jefferson North site and its facilities. Battelle will provide the CCP Closure Contractor with such services as are agreed to contractually between DOE and Battelle. The NRC SNM-7 license and associated responsibilities will be retained by Battelle. Battelle will maintain a project oversight presence until completion of the project, and will submit site release and license termination documentation to the NRC at that time.

Battelle will retain its BCO RSO position under the license. The BCO RSO will communicate with the Site RSO, as required, maintain a general awareness of the operations of the project RPP, and periodically assess compliance with RPP requirements by performing oversight and assessment of BCLDP operations. The BCO RSO may stop any operations involving licensed activities that are unsafe or non-compliant with NRC requirements. The BCO RSO will remain the Battelle point-of-contact for NRC issues that require Battelle involvement.

The BCO RSO is appointed by and reports to Battelle's Vice President for ESH&Q; the BCO RSO has direct access to the CEO when deemed appropriate. The BCO RSO position is filled by an employee of Battelle and may not be filled by a contractor. Qualifications for the BCO RSO are set forth below

- Bachelor's degree in one of the physical sciences, biological sciences, or engineering disciplines
- Have a minimum of five (5) years experience in operational health physics
- Be eligible for certification by the American Board of Health Physics
- Possess demonstrable judgment and technical capability sufficient to conduct and review radiological safety operations
- Have demonstrable management experience; and
- Have course work and/or experience with the following:
  - Principles and practices of radiation protection
  - Radioactivity measurements, monitoring techniques, and the use of instruments

- Mathematics and calculations basic to the use and measurement of radioactivity
- Biological effects of radiation applicable to the types and forms of radioactive material and radiation-producing machines at Battelle
- Safety practices applicable to protection from the radiation, chemical toxicity, and other properties of the radioactive materials in use at Battelle facilities
- Conducting radiological surveys and evaluating results
- Familiarity with applicable USNRC, United States Environmental Protection Agency (USEPA), United States Department of Energy (USDOE), and Occupational Safety and Health Administration (OSHA) regulations, as well as the terms and conditions of any licenses and permits issued to Battelle by these agencies.

### **2.3 Contractor Assistance**

It is expected that some of the decommissioning activities will be accomplished by using subcontractors. Administrative controls are in place to ensure adequate health and safety protection during D&D activities employing subcontractor personnel. Placement of a contract is based on objective evidence of the subcontractors' capability and quality program, and/or successful past performance, documented evidence of qualifications and certifications of the subcontractor employees, and successful completion of the radiological safety training program.

Contractors shall perform work under the RPP, using project procedures. Their own implementing procedures may be used provided that they have been reviewed and approved by the Site RSO prior to commencing work. The Site RSO shall provide oversight of contractor personnel and activities to verify compliance with project requirements.

The subcontractor's suppliers of goods and services are subject to quality surveys to assure performance to project standards, as well as audits and surveillance of subcontractor's work on site. The subcontractor implements the elements of the project's radiation protection procedures, or the procedures proposed by the subcontractor are reviewed and approved by the Site RSO. The records of audits and surveillance are kept in the project records.

A list of qualified bidders has been developed. In addition, the requirements of the RPP, specified in Section 3.7, Contractor Personnel, are imposed on subcontractor firms, their employees, and their sub-tier contractors.

### **3. Protection of Occupational and Public Health and Safety**

This chapter provides an overview of the methods that will be used to ensure protection of workers, the public, and the environment against radiation hazards during decommissioning.

#### **3.1 Operational Occurrence Reporting**

The project has a procedure for reporting of defects and noncompliance, HP-AP-7.0.<sup>23</sup> That procedure requires any staff member recognizing a “deviation” that has radiological implications to immediately notify the RSO, who determines whether the deviation is reportable to the NRC. The procedure contains the types of incidents that require reporting in Title 10 CFR. The RSO will notify NRC of a reportable deviation within the time constraints set forth in the regulations.

#### **3.2 Ensuring that Occupational Radiation Exposures are ALARA**

Ensuring that occupational radiation exposures, both internal and external, are as low as reasonably achievable is accomplished through an integrated radiation protection program. Project management, with a mandate and commitment from the Battelle Chief Executive Officer<sup>24</sup> and senior management, aggressively promotes a policy of ALARA among project staff. A thorough approach to ALARA is accomplished through a formal procedure-based program<sup>25</sup>, including the appointment of an ALARA Coordinator. Project staff are encouraged to actively participate in the ALARA process through suggestions, review, and feedback networks of a formal and informal nature. Senior project management encourages an “open door policy” where an environment of self-appraisal is highly desired.

Minimizing radiation exposure is accomplished by preliminary planning and scheduling, by using proven and innovative engineering techniques, by establishing and achieving challenging radiation exposure goals, and by equipping managers and workers to achieve ALARA goals. Refer to the RPP Plan and associated implementing procedures for details regarding the ALARA Program.

#### **3.3 Radiation Protection Program**

The project is committed to the safe use of radioactive materials. Management, through its ALARA Program, assures the review of decommissioning techniques and verification that the controls implemented to reduce personnel exposures to radiation and radioactive contamination are effective. The RPP Plan contains a detailed discussion of the systems and methods used to control radiation exposure.

#### **3.4 Packaging and Transportation of Radioactive Materials**

Shipments of radioactive materials are performed in accordance with approved procedures that are reviewed by the Site RSO or designee. Material deemed radioactive by the Department of Transportation (DOT) to be shipped from Battelle shall be packaged, surveyed, labeled, and shipped in accordance with 10 CFR 71 and applicable DOT regulations.

Prior to shipment of specifically licensed materials, the shipping department shall obtain confirmation that the receiver is licensed to receive the type, quantity, and form of radioactive material present in the shipment. Sealed sources shall be inspected and tested for construction defects, leakage, and removable contamination prior to shipment.

### **3.5 Emergency Response and Notifications**

The emergency plan and procedures for the West Jefferson North site identify the types of emergencies that might occur and the immediate responses to be taken. The plan also presents the emergency communications procedures to be followed. Communications with local fire, police, hospitals, and ambulance services have been formally established; and a unified command structure has been created among these groups. Each year since 1992, a full-scale emergency drill has occurred at the West Jefferson facilities.

The “Battelle Columbus Operations Emergency Action Plan,” BCO-EP-024<sup>13</sup>, describes Battelle’s emergency management program and the mechanism by which emergency resources are managed and mitigation strategies are implemented. It is based on the Incident Command System (ICS), which recognizes authorities who assume responsibility for command and control of personnel, facilities, equipment, and communications. The structure of the ICS can be established and expanded depending upon changing conditions of an incident. As such, the system can be utilized for any type or size of emergency ranging from a minor incident involving a single event to a major emergency involving several events. The ICS promotes the timely combining of resources and integration of activities along functional lines at all levels, and, to the extent possible, across all hazards. It is designed to be used in response to emergencies caused by fires, floods, tornadoes, riots, hazardous materials, or other natural or human-caused incidents.

For emergencies where radioactive materials may be involved, consideration shall be given to exposure to radioactive materials and ionizing radiation in addition to the other hazards present. If it is known or suspected that an internal or external dose limit has been exceeded:

- The Site RSO shall be notified immediately.
- The Site RSO shall evaluate the likelihood and magnitude of the exposure or contamination status, and shall implement appropriate follow-up actions as soon as possible after notification.
- The Site RSO shall notify the BCO RSO, who will notify the NRC as required in its regulations.

### **3.6 Training**

#### **3.6.1 Training Requirements**

All personnel working on the project are required to have appropriate and verified training for the task(s) assigned to them. The Training Program Plan<sup>26</sup> outlines the training program requirements for employees, subcontractors, consultants, visitors, and others engaged in the D&D operations. The training program addresses health, safety, and environmental concerns for

workers and the public. It meets Environmental Protection Agency, Occupational Safety and Health Administration, DOE, and NRC requirements for handling D&D tasks in a safe and environmentally sound manner.

The Training Program Plan details the minimum training requirements, the employee/visitor/subcontractor/consultant groups addressed, and the staff responsible for the successful implementation of the program. Finally, the plan discusses the training schedule, course evaluation process, and the system used to archive and track trainees' needs and accomplishments. Further details are provided in the Training Program Plan. The training program is implemented by a set of training procedures.

### **3.6.2 QA Training**

Project personnel receive quality indoctrination and training. The training is administered by means of classroom instruction and readings. The instructions are given to ensure adequate knowledge of the project requirements, familiarization with quality procedures, and documentation requirements. Project quality training is conducted as described in the Quality Manual.<sup>27</sup> Records of project personnel indoctrination and training are kept in the project records.

### **3.7 Control of Radioactive Waste**

Radioactive waste materials shall be controlled by the following:

- Preventing materials from becoming unnecessarily and/or excessively contaminated;
- Decontaminating and reusing radioactive materials such as tools and equipment;
- Monitoring materials for radioactivity and removing non-radioactive materials prior to disposal; and
- Using waste volume reduction techniques when practical.

Radioactive waste may be stored on site or disposed of by one of the following means:

- Transfer to an authorized recipient as provided for in 10 CFR 20.2001;
- Release into the sanitary sewer in conformance with 10 CFR 20.2003; or
- Any other means specifically approved in advance by the NRC.

Manifests, Certificates of Disposal, or other documentation to confirm transfer/disposal shall be maintained.

#### **4. Planned Final Radiation Survey**

Upon the completion of D&D activities in an area or building, a Final Status Survey will be conducted to verify that the decommissioning objectives have been met for all buildings, parts thereof, and associated grounds being released. The Final Status Survey will be conducted under a work instruction and will be specific for each area/building. Where appropriate, based on process knowledge and/or characterization information, the Final Status Survey will be a statistical survey or percent survey of the D&D area, consistent with NUREG/CR-5849<sup>28</sup> and DD-97-02<sup>29</sup>. In all cases, it will utilize the same basic methodologies as the site characterization processes and equivalent personnel, instruments, procedures, grid patterns, fixed reference locations, radioanalytical supports, and management review will be utilized.

##### **Release Criteria for Unrestricted Use**

The objective of the decommissioning project is to decontaminate areas so such that they are available for unrestricted use (i.e., without radiological restrictions). In order to clearly define the objective, the BCLDP has prepared two technical basis documents:

- “Surface Release Criteria Technical Basis Document,” DD-93-02, and
- “Volumetric Release Criteria Technical Basis Document,” DD-93-03.

These two documents provide the quantitative values for decommissioning objectives and discuss their technical basis. The documents also address how the project objectives meet the applicable NRC criteria, as well as DOE criteria, for unrestricted release. The documents are presented in Attachments 1 and 2. Implementation of the release process consistent with these technical basis documents is governed by procedures listed in Attachment 3.

To guide the Final Status Survey, the BCLDP has prepared and issued procedure DD-CP-002, “Facility Post-Decontamination Final Status Survey for Baseline Areas.” The latest revision of this procedure has been included as Attachment 4. The facility will meet the release criteria for unrestricted use as demonstrated by the Final Status Survey after decommissioning activities are complete.

## **5. Funding**

Not currently available - this section will be completed upon finalization of ongoing contract negotiations between the DOE and Battelle.

## **6. Physical Security Plan and Material Control and Accounting Plan Provisions in Place During Decommissioning**

This section is no longer applicable to the BCLDP facilities. The requirements for maintaining the NRC-approved physical security plan and special nuclear control and accounting plan were removed when the special nuclear material inventory requiring these controls were shipped off-site.

## Endnotes

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- <sup>1</sup> “The U.S. Government and Battelle – Partners in Nuclear Research. 1943 – Present”, Report prepared by Battelle for the U.S. Department of Energy, October 1985.
- <sup>2</sup> “Battelle-Columbus, 40 Years of Energy Research for the U.S. Government”, Internal Report, Battelle Columbus Division, June 1984.
- <sup>3</sup> “Environmental Assessment and Finding of No Significant Impact for the Battelle Columbus Laboratories Decommissioning Project”, June 1990. DOE document.  
“Re-Evaluation of 1990 Environmental Assessment for the Columbus Environmental Management Project (CEMP),” September 25, 2000, letter from T.A. Baillieul (DOE) to R. Grandfield (DOE).  
“Columbus Environmental Management Project (CEMP) Environmental Assessment (EA),” DOE memorandum from S.A. Brechbill to T.A. Baillieul.
- <sup>4</sup> “Battelle Columbus Laboratories Decommissioning Project, Project Plan, Revision 1”, July 1991.
- <sup>5</sup> “Battelle Columbus Laboratories Decommissioning Project, Project Management Plan, Revision 1”, October 1992.
- <sup>6</sup> U.S. NRC, Letter Pertaining to Oversight Responsibilities and Authority on BCLDP, Charles J. Haughey, US NRC to Martin A. Langsam, DOE-CH, December 18, 1990.
- <sup>7</sup> “Termination of Operating Licenses for Nuclear Reactors”, NRC Regulatory Guide 1.86, June 1974.
- <sup>8</sup> “Radioactive Contamination Monitoring Requirements for Facility Surface Characterization”, DD-CP-004.
- <sup>9</sup> “Facility Post- Decontamination Final Status Survey for Baseline Area”, DD-CP-002.
- <sup>10</sup> “Environmental Report on Radiological and Non-Radiological Parameters”, Annual Report, Submitted by Battelle to the U.S. Department of Energy, September 1989.
- <sup>11</sup> “Radiological Characterization and Final Status Plan for BCLDP West Jefferson Site”, DD-97-02.
- <sup>12</sup> “Environmental Monitoring Plan for the BCLDP Project”, EM-QAP-1.0.
- <sup>13</sup> “Emergency Action Plan”, Battelle Columbus Operations, BCO-EP-024.
- <sup>14</sup> “Preparation of Procedures”, QD-AP-5.1.
- <sup>15</sup> “Work Instructions”, QD-AP-5.2.
- <sup>16</sup> “Document Control”, QD-AP-6.1.
- <sup>17</sup> “Independent Programmatic Assessments”, QD-AP-18.1.
- <sup>18</sup> “Independent Activity Assessments”, QD-AP-18.2.
- <sup>19</sup> “Radionuclide Release into the Environment: Assessment of Doses to Man”, ICRP Publication 29, International Commission on Radiological Protection, 1978.
- <sup>20</sup> “Limits for Intakes of Radionuclides by Workers”, ICRP Publication 30, International Commission on Radiological Protection, 1979-1982.
- <sup>21</sup> “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings”, 40 CFR Part 192, *Code of Federal Regulations*, July 1988.
- <sup>22</sup> “Quality Planning”, QD-AP-2.2.
- <sup>23</sup> “Requirements for Reporting Information to the Nuclear Regulatory Commission”, HP-AP-7.0.
- <sup>24</sup> E-mail notice from Carl Kohrt, Battelle CEO, to Battelle Staff, ALARA Program, dated June 18, 2002.
- <sup>25</sup> “ALARA Program”, HP-AP-08.0.
- <sup>26</sup> “BCLDP Training Program Plan”, DD-93-04.
- <sup>27</sup> “Quality Manual, Decontamination and Decommissioning Operations”, DD-MN-01.
- <sup>28</sup> Nuclear Regulatory Commission, Manual for Conducting Radiological Surveys in Support of License Termination, NUREG/CR-5849, June 1992.
- <sup>29</sup> “Radiological Characterization and Final Status Plan for BCLDP West Jefferson”, DD-07-02.