

March 23, 2007

Mr. James Woolford, Director  
Office of Superfund Remediation  
and Technology Innovation  
U.S. Environmental Protection Agency  
M.S. 5201P  
1200 Pennsylvania Avenue, N.W.  
Washington, DC 20460

SUBJECT: MEMORANDUM OF UNDERSTANDING CONSULTATION FOR THE  
DECOMMISSIONING OF BATTELLE MEMORIAL INSTITUTE'S WEST  
JEFFERSON, OHIO SITE

Dear Mr. Woolford:

This letter is to notify you of the decommissioning oversight actions that the U.S. Nuclear Regulatory Commission (NRC) has taken, and intends to take, for the Battelle Memorial Institute's (BMI's) former North Nuclear Sciences Site, located in West Jefferson, Ohio.

On October 9, 2002, NRC and the U.S. Environmental Protection Agency (EPA) entered into a Memorandum of Understanding (MOU) on "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites." The MOU provides that, unless an NRC-licensed site exceeds any of three trigger criteria contained in the MOU, EPA agrees to a policy of deferral to NRC decision-making on decommissioning without the need for consultation.

For sites that trigger the criteria in the MOU, NRC will consult with EPA at two points in the decommissioning process: (1) before NRC's approval of the license termination plan (LTP) or decommissioning plan (DP), (Level 1 consultation); and (2) after completion of the final status survey (FSS), (Level 2 consultation). Although NRC's plan for consulting with EPA calls for the initial Level 1 consultation to occur early in the decommissioning process, at the time the MOU was signed, NRC had several sites that were in the later stages of the decommissioning process. Because these sites were further along in the decommissioning process, the next opportunity to consult with EPA would be a Level 2 consultation after the completion of the FSS.

This letter is to notify you that the BMI site will require a Level 2 consultation because post-remediation residual radioactivity levels in groundwater exceed the EPA's maximum contaminant levels (MCLs), one of the three criteria that trigger consultation. The licensee submitted a DP, which was approved by the NRC in a letter dated December 6, 1993 (ML070300232). The DP was subsequently incorporated into BMI's NRC SNM-00007 license on August 25, 2000 (ML010410001). On August 3, 2006, the licensee submitted a request to terminate its NRC

Special Nuclear Materials License. The NRC staff has completed its review of BMI's license termination request, including FSSs, and did not identify concentrations of residual radioactivity in the soil, which would trigger consultation as prescribed in the MOU. However, the NRC and licensee assessment of historical groundwater monitoring results, identified a number of groundwater monitoring wells, in non-potable aquifers, with concentrations of strontium-90 that exceeded the EPA MCL of 8 picocuries per liter (pCi/L) for this radionuclide. Specifically, the maximum measured concentration of strontium-90 in the shallow surface unit, the Bog Area, was 29 pCi/L.

It was BMI's primary objective to decommission the contaminated buildings and surrounding grounds, making them suitable for release without restrictions (i.e., unrestricted release), at or below levels consistent with NRC's and U.S. Department of Energy's (DOE) applicable requirements. In 1990, in accordance with the National Environmental Policy Act (NEPA), DOE issued an Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI) addressing all project activities (DOE 1990). Although NRC maintained regulatory oversight of Battelle's decommissioning activities through an approved DP, it chose not to become the lead agency for NEPA compliance. Instead, it adopted DOE's 1990 EA, in support of BMI's DP. In a letter from NRC to the licensee dated April 17, 1992 (ML070180226), the licensee was informed that it would need to comply with NRC's Policy and Guidance Directive FC 83-23, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," and the EPA's "National Primary Drinking Water Standards" in 40 CFR Part 141.

The NRC staff has completed its review of Battelle's license termination documentation, and has preliminarily concluded that BMI complied with the release criteria in the approved DP, except for the MCL for strontium-90 in the Bog Area. However, the Bog Area is unsuitable as a source of drinking water due to its low yield and its shallow depth to the water table. Therefore, the NRC staff believes that the exceedance of the MCL in the Bog Area does not pose an adverse impact to public health and safety. In addition, Battelle demonstrated that the potential dose from residual radioactivity to an average member of the critical group is below the requirements in NRC's 10 CFR Part 20 Subpart E, "Radiological Criteria for License Termination."

We have enclosed background information which summarizes the history and decommissioning of the site. The details of the NRC review of BMI's radiological FSSs, site-wide dose assessment, and groundwater documentation are discussed in the NRC staff's Safety Evaluation Report (SER) (ML063170165). The SER references relevant documents, which have been placed in the NRC Agencywide Documents Access and Management System.

J. Woolford

-3-

The NRC anticipates terminating the BMI license during the month of May 2007. After your staff's review of the enclosed materials and other relevant documents, please contact Mr. Keith McConnell, Deputy Director, Decommissioning and Uranium Recovery Licensing Directorate at (301) 415-7295 to establish the time frame and conditions for the Level 2 consultation for the BMI West Jefferson site. We look forward to working with you on this site in furtherance of our joint responsibilities under the MOU.

Sincerely,

**/RA/**

Charles L. Miller, Director  
Office of Federal and State Materials  
and Environmental Management Programs

Docket No. 070-00008  
License No. SNM-00007

Enclosure:  
"Background Information for Level 2  
Consultation on Battelle Memorial Institute's  
West Jefferson Ohio Site"

The NRC anticipates terminating the BMI license during the month of May 2007. After your staff's review of the enclosed materials and other relevant documents, please contact Mr. Keith McConnell, Deputy Director, Decommissioning and Uranium Recovery Licensing Directorate at (301) 415-7295 to establish the time frame and conditions for the Level 2 consultation for the BMI West Jefferson site. We look forward to working with you on this site in furtherance of our joint responsibilities under the MOU.

Sincerely,

**/RA/**

Charles L. Miller, Director  
 Office of Federal and State Materials  
 and Environmental Management Programs

Docket No. 070-00008  
 License No. SNM-00007

Enclosure:  
 "Background Information for Level 2  
 Consultation on Battelle Memorial Institute's  
 West Jefferson Ohio Site"

**DISTRIBUTION:**

FSME r/f      DWMEP r/f      DURLD r/f      RidsFsmeOd      RidsRgn3MailCenter

**ML070080126**

OFFICE	RIII/DNMS	DWMEP	OGC	RIII/DNMS	DWMEP
NAME	GMcCann	RRodriguez	JHull	JCameron	APersinko
DATE	12/ 15 / 06	02/ 15 / 07	02/ 20 / 07	12 / 19 / 06	02/ 21 / 07
OFFICE	RIII/DNMS	DWMEP	DWMEP	TechEd	FSME
NAME	SReynolds by T. Reis for	KMcConnell	LCamper	CPoland	CMiller
DATE	12 / 20 / 06	3/16/ 07	3/20/ 07	03/22/07	03/ / 07

OFFICIAL RECORD COPY

## **BACKGROUND INFORMATION FOR LEVEL 2 CONSULTATION ON BATTELLE'S WEST JEFFERSON SITE**

The Battelle Memorial Institute (Battelle) West Jefferson North site (WJN) is located near West Jefferson, Ohio. Battelle performed atomic energy research and development for the U.S. Department of Energy (DOE) and its predecessor agencies between 1943 and 1986. The site is located approximately 15 miles west of Columbus, Ohio, and consists of a 1,000-acre tract of land, with the site comprising about 32 acres. Four major buildings, a guardhouse, and several smaller structures were located on the site. Three of the major buildings, the guard house and their support structures were the focus of Battelle's decommissioning project. Specifically, the JN-1 building, which was a hot cell facility, was the most highly contaminated. The other two buildings at the area were the JN-2 building, which contained a critical assembly laboratory, and the JN-3 building, which contained a decommissioned research reactor. Several active and abandoned filter beds, and part of the site sanitary sewer system, were also included in the project.

The Decommissioning Plan (DP) for the Battelle WJN site was originally approved by the U.S. Nuclear Regulatory Commission (NRC) in 1993 (ML003711118). The NRC's approval occurred before implementation of the current NRC "License Termination Rule." Thus, Battelle's unrestricted release criterion was based on regulatory guidance in effect at that time, that is, concentration and surface release tables, and consistent with criteria outlined in an NRC letter to the licensee dated April 17, 1992 (ML070180226). On August 25, 2000, the DP was incorporated through Amendment No. 23 to NRC License No. SNM-00007 (ML010410001). This licensing action did not change the previously approved release criteria. However, Battelle voluntarily implemented an administrative "as low as reasonably achievable" limit of 25 millirem per year (mrem/yr) dose limit for the project. In February 2006, Battelle completed all on-site decommissioning activities with the demolition of all above ground structures, remediation and backfilling of building excavation sites following the final status surveys (FSSs).

In an August 3, 2006, letter, Battelle requested termination of its NRC License SNM-00007 (ML062200140), which would result in the release of the site for unrestricted use. Attached to the termination request was a document titled, "Final Certification of Completion Columbus Closure Project . . ." (ML062860606 and ML062890357), which summarizes the results of the FSSs of the affected and unaffected areas of the WJN site. A decommissioning contractor from DOE performed FSSs per established site requirements, and the Oak Ridge Institute for Science and Education performed independent verification surveys and reviews of the contractor's FSS reports. In addition, Battelle performed quality reviews of the FSSs. The results of the FSSs are discussed below.

**Surface Contamination:** The licensee conducted radiological surveys of Buildings JN-2, JN-3, JN-6, a transuranic waste staging pad area, the North Site Well House, related materials and equipment. They included scanning and static measurements, and smear surveys for removable contamination. The results demonstrated that residual surface contamination levels met the NRC release criteria specified in the DP. The JN-1 building (i.e., the Hot Cell facility) was not free released. The building was demolished and the rubble and wastes were disposed of at an authorized disposal site for radioactive waste.

Enclosure

**Soil Contamination:** The licensee derived guidelines for soil contamination which are included in Attachment 2 of the DP, "Volumetric Release Criteria Technical Basis Document." In a July 17, 2006, letter to the NRC, the licensee transmitted the "West Jefferson North Site Dose Assessment." The NRC staff has reviewed the site-wide dose assessment and concluded that the licensee met the DP criteria for soil contamination, and that there are no residual contamination levels that exceed the MOU criteria.

**Groundwater Contamination:** In a letter from the NRC to Battelle dated April 17, 1992 (ML070180226), Battelle was informed that it would need to comply with NRC's Policy and Guidance Directive FC 83-23, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" and EPA's "National Primary Drinking Water Standards" in 40 CFR Part 141. NRC conducted a technical evaluation of Battelle's groundwater monitoring plan and the radiological impact of site activities on the groundwater at the West Jefferson North site near West Jefferson, Ohio (ML063600048).

The Battelle WJN site has seven hydrogeological units: 1) the surface till unit (containing the shallow water table); 2) the 885 sand layer; 3) the dense till; 4) the 855 sand layer; 5) the dense till; 6) the basal (805) sand layer; and 7) the limestone bedrock. Four of these groundwater-bearing units could have been impacted by past site activities. These units are within the unconsolidated material above the bedrock. The units are: 1) the shallow surface unit, which includes the shallow groundwater bearing fill layer known as the Bog Area near Lake Battelle; 2) the 885 foot sand layer, about 30 feet below land surface; 3) the 855 foot sand layer, about 60 feet below land surface; and 4) the 805-foot basal sand layer, about 100 feet below land surface.

Radiological sampling results since 1970 indicate that aquifers served by Battelle's water supply wells in and around the site are not impacted by site-generated radionuclides. The shallow groundwater units (i.e., the surface till unit, the alluvial unit, and the 885 sand layer) are impacted by site-generated radionuclides. However, they are not considered a source of drinking water because of their low yield. In addition, any wells drilled in these units would not comply with regulations from the State of Ohio, which require that any wells to be used for drinking water purposes should be screened at a minimum depth of 25 feet. Regarding the 855-sand layer and the basal sand unit, the results indicate that they are not impacted by site-generated radionuclides.

The groundwater in the 885-foot and 855-foot layers, and the shallow surface unit near the Battelle Lake are not suitable as drinking water sources because the water yields are too low. However, Battelle assumed that the groundwater from the 885-foot layer could migrate to Battelle Lake, resulting in a potential aquatic food pathway. The monitoring information for this layer was used in the Battelle's site-wide RESRAD dose projection model, which is discussed below. The 855-foot layer was not used for the aquatic pathway in the RESRAD dose projections, because the radionuclide travel times from the residual radioactivity in surface soil to the 855-foot layer would be longer than for the 885-foot layer, resulting in lower radiation doses due to slow transport through the soil and resultant decay.

The 855 and 805 sand layers are confined hydrostratigraphic units. The limestone bedrock, which lies below the 805 basal sand layer, contains the regional drinking water aquifer and is hydraulically connected to the 805 basal sand layer. The groundwater from the limestone

bedrock is suitable as a drinking water supply and for irrigating crops and watering stock. Battelle draws water from this unit using three active pumping wells. NRC's review of Battelle's radiological monitoring results on these wells concluded that contamination levels have never exceeded the EPA's MCLs for drinking water.

As stated earlier, the shallow surface unit, which includes the Bog Area, is unsuitable as a source of drinking water. During the remedial work conducted in Fall 2005, the unsaturated, historically contaminated soils above this groundwater layer were successfully remediated. Other than the Bog Area, the licensee concluded in its report that the 805 basal layer and the 855 layer met the EPA MCLs for gross alpha, beta particle/photon emitters, and uranium. There was a slight exceedance of the EPA MCLs for gross-alpha and uranium in the 885 layer. Battelle's evaluation of the sample determined that the exceedance of both MCLs are most likely due to natural radioactivity present in excessive soil fines present in the samples, as well as the site procedure to apply acidification/preservation procedures prior to filtration. An October 6, 2006, ORISE letter to the NRC (ML062860125) reported results consistent with the Battelle's findings.

Battelle believed that the detection of slightly elevated strontium-90 levels in the shallow surface unit, the Bog Area, were due to past discharges of slightly radiologically contaminated storm water drainage to the Bog Area associated soils, and subsequent movement to the shallow water table from normal percolation and infiltration of rain water. The maximum measured concentration of strontium-90 in the Bog Area was 29 picocuries per liter (pCi/L). The last sampling campaign conducted during April 2006 identified one well with a strontium-90 concentration of 22 pCi/L. Battelle has noted that the strontium-90 concentration in these wells has not been consistently above the EPA limits. The water from the Bog Area unit was not used in Battelle's RESRAD dose model, because it is not suitable for drinking water purpose.

The site-wide dose assessment (ML061990464) was performed using maximum radionuclide concentrations in conjunction with a resident farmer scenario and summed the radiation doses from all the former impacted areas and the groundwater, which resulted in a worst case peak radiation site dose of 21 mrem/yr. This resultant worst case dose projection is below the licensee's DP commitment, as well as below the NRC's unrestricted release criteria in 10 CFR Part 20, Subpart E "Radiological Criteria for License Termination." Battelle concluded that the radiation dose projection of 21 mrem/yr represents a conservative estimate for several reasons:

- Maximum surface soil concentrations were used to estimate radionuclide concentrations. Using average concentrations would reduce the radiation doses by a factor of about 70 percent, to about 6 mrem/yr.
- The entire WJN Site was assumed to contain residual radioactivity at the maximum radionuclide concentrations. In reality, a substantial portion of the WJN Site would not contain residual radioactivity at these levels.
- A resident farmer scenario was used to estimate radiation doses. Although agricultural activities are common near the site, agricultural activities are not likely to occur in the Filter Bed Area because of topography. In addition, the resident farmer was assumed to get a substantial portion of their food from the WJN Site. This is also not likely to occur.

- The leaching of radionuclides from surface soil and subsequent transport to surface water and ground water was not partitioned. All the radioactivity leached from the surface soil was assumed to be transported to the 885-foot layer and then transported to surface water, exposing the resident farmer through the aquatic foods pathway. In addition, all the radioactivity leached from the surface soil was assumed to be transported to the 805-foot layer and then transported to a well, exposing the resident farmer through drinking water and other water dependent pathways. The radiation doses from these two routes of exposure were added, which overestimates the radiation dose to the resident farmer.
- The Upper Area and Filter Bed Area were assumed to contain residual radioactivity to a depth of 20 feet. In reality, residual radioactivity is not present to this depth over the entire Upper Area and Filter Bed Area.
- All residual radioactivity was assumed to be present at the surface with no cover. In reality, much of this residual radioactivity is present below the surface and is covered by clean soil or by soil with lower radionuclide concentrations.
- The radiation doses from strontium 90-in the 805-foot groundwater bearing unit layer were assumed to be constant over the assessment period, which was 1,000 years. Given the half-life of strontium-90, about 29 years, this is not likely to occur. Additionally, subsequent water sampling of this groundwater bearing unit with the new monitoring wells supported Battelle's conservative assessment.

The NRC staff has completed a "Safety Evaluation for License Amendment No. 32 to Special Nuclear Materials License No. SNM-00007," (SER) (ML063170165). The State of Ohio has reviewed the SER. On November 2, 2006, the representative from the State indicated in an e-mail message (ML070360083) that the State found the SER to be comprehensive and that it did not have any comments.