



# **Assessment of Radioactive Waste Management at the Portsmouth Site**

**Interim Report**

**March 2020**

Office of Enterprise Assessments  
U.S. Department of Energy

# **Assessment of Radioactive Waste Management at the Portsmouth Site December 2-12, 2019 Interim Report**

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## **Overview**

This assessment is in response to the Deputy Secretary of Energy's July 9, 2019, memorandum directing the Office of Enterprise Assessments (EA) to undertake a U.S. Department of Energy (DOE)-wide assessment of the procedures and practices for packaging and shipping radioactive waste. The assessment activities focused on waste management performance at the Portsmouth Site, which is operated by the management and operating contractors, Fluor-BWXT Portsmouth, LLC (FBP) and Mid-America Conversion Services, LLC (MCS). Waste management activities include characterizing, packaging, and shipping low-level waste (LLW) and mixed low-level waste (MLLW) for disposal. Neither contractor generates transuranic waste. The assessment team, identified in Appendix A, examined a sample of waste generator operations representing about 80% of the total waste (by volume) shipped to four disposal facilities, mostly the DOE Nevada National Security Site (NNSS). FBP's diverse control strategy (defense-in-depth) for its waste management processes, from the generator to packaging, is illustrated in Appendix B.

This report provides the interim results of the assessment of LLW and MLLW management at Portsmouth, addressing non-compliances and apparent causes contributing to weaknesses. At the conclusion of the enterprise-wide assessment, a final compilation report will include the results of this summary. The perspective gained by conducting this assessment could change as additional information becomes available from subsequent site assessments. The final compilation report will identify best practices, lessons learned, and cross-cutting recommendations.

DOE Order 227.1A, *Independent Oversight Program*, describes and governs the DOE independent oversight program, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. DOE Order 227.1A defines the terms best practices, findings, deficiencies, opportunities for improvement, and recommendations. In accordance with DOE Orders 227.1A and 226.1B, *Implementation of Department of Energy Oversight Policy*, it is expected that the site will analyze the causes of findings and deficiencies identified in this summary, develop corrective action plans for findings, and implement compensatory corrective actions for program and performance deficiencies.

## **Summary**

### *Fluor-BWXT Portsmouth, LLC*

Overall, FBP has implemented a waste management program that ensures proper characterization, packaging, and shipping of radioactive waste for disposal. This assessment found no findings, two FBP deficiencies, and two opportunities for improvement for consideration by FBP. The two FBP deficiencies are in the areas of transportation security and independent assessments. Although these deficiencies did not result in mishandling of LLW or MLLW, management attention is warranted to reduce future risk.

Although not in service at the time of the assessment, FBP's On Site Waste Disposal Facility (OSWDF), under construction at the Portsmouth Site, is an engineered disposal system with multiple barriers for long-term environmental monitoring and protection. Waste emplacement in the OSWDF is scheduled to begin in the early fall of 2020. The waste acceptance criteria (WAC) for the OSWDF was recently

approved, and an implementation plan is under development. Waste streams for disposal at the OSWDF are being identified and characterized. The OSWDF is anticipated to be used for disposal of building rubble from the main process buildings at Portsmouth, after deactivation work is completed.

#### *Mid-America Conversion Services, LLC*

Overall, MCS appropriately ensures the characterization, packaging, and shipping of radioactive waste for disposal. MCS has limited waste streams and well-characterized source terms, and only ships radioactive waste three times per year. The assessment team spent minimal time assessing MCS, given the limited risk and small volume of waste produced. The assessment found no findings, no deficiencies, and no opportunities for improvement for MCS, and MCS is not discussed further in this report.

#### *Portsmouth/Paducah Project Office (PPPO)*

Overall, PPPO maintains adequate operational awareness of waste management activities, with well qualified staff and routine assessments and surveillances in the waste management functional area. However, a Facility Representative (FR) has been filling the vacant position of Waste Management Program Manager in an acting roll for two years, which may infringe on her normal FR duties. This assessment identified two opportunities for improvement for consideration by PPPO. The assessment team found that the self-assessment directed by the Principal Deputy Assistant Secretary for Environmental Management's July 23, 2019, memorandum and performed by PPPO met the intent of the directive. The expected peer reviews are under way but had not been completed for this site at the time of this assessment. The results of the peer reviews will be addressed in the final compilation report.

### **Positive Attributes**

#### *Waste Characterization*

- FBP has established a robust basis for characterizing the radiological source terms in the waste from the process equipment removed from the gaseous diffusion plant.
  - Detailed historical process knowledge supports the determination of the isotopes and enrichments in process equipment removed for disposal. In-situ surveys on all process equipment confirm process knowledge and support initial estimates for waste characterization.
  - Sampling and analysis for radiological and chemical constituents is performed for all process and auxiliary systems. In addition, non-destructive assay (NDA), including gamma spectroscopy and neutron slab measurements, supports waste characterization and criticality safety controls.
  - FBP uses surrogate waste matrices in varied configurations to assess the potential detection error caused by waste deposition geometries and self-shielding. In addition, blind sample testing validates NDA counting system performance.

#### *Waste Stream Control*

- FBP's Waste Management group incorporates three layers of defense-in-depth to ensure waste stream integrity. Prior to waste generating activities, a Waste Disposition Specialist partners with the generator to develop a Generator Waste Management Plan specifying constituents, characterization, and chemical compatibility of waste streams. Field services personnel advise waste generator operations in the field. In addition, Waste Packaging Certifiers (WPCs) independently observe 100% of the loading of waste into containers.
- The "eMWaste" waste management tracking system provides effective traceability of waste streams from generation through disposal. Waste stream entry into the system is initiated by a Waste Disposition Specialist prior to waste generation and provides a tracking number, which is applied to the

waste container. All information associated with waste stream constituents, characterization, chemical compatibility, disposal/treatment facility, container type, and other supporting information is included in the system.

- The Waste Operations group receives, sorts, and repackages all dry active waste to ensure that no prohibited items are introduced into the waste stream.
- Converter disassembly operations are conducted using a detailed procedure and controls to ensure that waste stream integrity is maintained and that classified materials are segregated from non-classified streams.

#### *Packaging and Shipping*

- FBP's process for accurately determining Department of Transportation (DOT) classification of radioactive waste shipments is systematic and well defined. FBP uses a verified proprietary software to perform calculations of radioactivity in containers (the determining factor in the DOT classification of material), packaging selection, and communications (marking, labeling, placarding, and emergency response information). Calculations are independently verified by multiple organizations.
- FBP provides defense-in-depth for waste containment during storage, transport, and disposal. Personnel exhibited expertise in the design, procurement, fabrication, inspection, and use of waste containers.

#### *Quality Assurance*

- FBP recently implemented a management self-assessment grading practice to provide feedback to the assessor and improve the quality of management assessments, resulting in the addition of more performance-based lines of inquiry.
- FBP's assessment process addresses waste management practices from origination through shipping. Eleven of 120 waste management field observations and two management self-assessments during fiscal year (FY) 2019 assessed waste generation activities at the point of origin, exceeding the level of review typically noted at other DOE sites.

#### *Federal Oversight*

- The FY 2018, FY 2019, and FY 2020 PPPO assessment and surveillance plans specified multiple assessments and surveillances within the waste management functional area, including a formal triennial assessment of the waste management program. Eighty percent of these assessments were completed as scheduled, and the rest had a documented justification for not being performed as scheduled.
- Both the PPPO triennial independent assessment of FBP's waste management program and the self-assessment of waste management performance directed by the Principal Deputy Assistant Secretary for Environmental Management comprehensively assessed waste management processing, characterization, and shipping. Identified issues were entered in the Management Tracking System (MTS) and are being addressed.
- PPPO maintains a strong field presence overseeing waste management work activities and routinely inspects waste storage areas. Interviews, briefings, and data printouts demonstrated that FRs and support service contractor personnel have the knowledge, responsibilities, and capabilities for conducting oversight on waste management, and entering observed non-conforming conditions into the PPPO MTS. Furthermore, they exhibited a good questioning attitude.

- PPPO staff maintains thorough knowledge of radioactive waste management. Two of the five FRs were extensively involved with radioactive waste management before joining PPPO and have knowledge, skills, and abilities in radioactive waste management above those required for FR qualification.

## Findings

The assessment identified no findings.

## Deficiencies

Deficiencies are inadequacies in the implementation of an applicable requirement or standard. Deficiencies that did not meet the criteria for findings are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

- **Deficiency D-FBP-1:** Contrary to 49 CFR 172.802, FBP-WM-PL-00102, *Transportation Security Plan*, does not include the following items:
  - An assessment of transportation security risks for applicable hazardous materials
  - Controls specific to the material types transported by FBP
  - Identification of the senior management official responsible for the plan.
 FBP explained that this was an inadvertent omission. Subsequent to the assessment, FBP issued a revision to the plan that adequately addresses this deficiency.
- **Deficiency D-FBP-2:** Contrary to the requirements of DOE/NV-325-16-00, *NNSS Waste Acceptance Criteria*, Section 5.10, and FBP-QP-PRO-00011, *Independent Assessment* procedure, the required annual independent assessment in 2019, which was a checklist incorporating the results of over 100 assessments conducted by various FBP organizations, was compiled and approved by the FBP Waste Certification Official (WCO), who is not independent from the Waste Management line organization. This approach has been applied over the years on the assumption that the FBP WCO does not perform a line function. However, the FBP WCO reports to the waste management line manager and thus is not independent of line management. Although the assessment format is acceptable, this reporting structure does not meet the intent of the WAC to ensure that assessors are free from any line management influence. FBP is evaluating this concern.

## Other Areas of Weakness

Other areas of weakness represent potential vulnerabilities that warrant site management consideration but do not rise to the level of a finding or deficiency as defined in DOE Order 227.1A. The site should review these vulnerabilities and take appropriate actions. EA will further review these weaknesses during subsequent site assessments across DOE to determine whether the vulnerability is cross-cutting and warrants an enterprise-wide response.

### *Waste Characterization*

- The working reference materials (WRMs) – radioactive sources used for verifying detection efficiencies of NDA counting systems – as designed and currently used constitute a potential radiological contamination hazard from source degradation. (See OFI-FBP-1.)
  - The WRMs, which are made in-house, are filled with powdered radioactive material of varied activities, enrichments, and encapsulation. These WRMs were not designed,

prototyped, or tested as pedigreed sealed sources in accordance with American National Standards Institute (ANSI) N43.6 criteria to ensure long-term structural integrity.

- Area contamination surveys and WRM leak testing is not required or performed just before or after WRMs are used. Gloves and other personal protective equipment are not required or used for handling or using WRMs, and personnel contamination monitoring is not required or performed after handling WRMs. These encapsulated WRMs are handled as pedigreed and tested sealed sources relying on semi-annual leak testing to periodically verify integrity.
- Under current practices, source leakage between semi-annual leak testing might not be identified and could result in personnel contamination and uptake doses.

#### *Waste Stream Control*

- Six steel (B-25) waste containers are stored outside east of building X-705. Only two of these six boxes have legible “eMWaste” tracking system labels; both have 2011 and 2012 prefixes, but have been annually extended in accordance with approved exemptions. Three of the six containers have “Nuclear Criticality Safety Requirement” labels with associated fissile material container labels that are weathered and unreadable. Inadequate labeling hinders FBP’s ability to manage waste containers effectively. FBP confirmed that all six boxes were appropriately stored and were not in violation of any nuclear criticality safety requirements. FBP is aware of this problem and has been systematically updating labels on containers stored outdoors.
- Radiologically contaminated, uncontainerized discarded scrap material was staged outdoors in five observed locations on permeable ground. There is no formal program for inspections, boundary control, or disposal of this material. In one location, collocated non-radioactive waste material was lying across the radioactive material boundary. These conditions pose a risk to effective contamination control and were discussed with FBP, which has acknowledged the need to correct these conditions. (See OFI-FBP-2.)

#### *Quality Assurance*

- The last two annual independent assessments required by the NNSS WAC were a roll-up of assessments performed on activities determined to be critical to the Waste Certification program by assessors not directly involved in the activities being assessed. Although these annual assessments provided some analysis in the summary section, there was no trending of the deficiencies that could identify common areas of weakness and provide feedback on program effectiveness.
- Trending of waste management performance issues is limited to broad categories and includes only the total number of issues, with limited details. This approach limits the ability to analyze common causes to prevent recurrence of issues.
- FBP does not use its established lessons-learned process effectively but instead relies on informal mechanisms to disseminate issues and concerns based on working experience.

#### *Federal Oversight*

- PPPO uses a draft procedure for entering information into MTS when documenting field observations and the associated significance level of the issues. Because the procedure has not been issued, there could be some variation and subjectivity in determining the significance level of issues, which could diminish the rigor of the required causal analysis and the resulting corrective actions. (See OFI-DOE-PPPO-1.)

- Due to Federal staffing level constraints, an FR has been filling the vacant position of Waste Management Program Manager in an acting role for two years while also maintaining the FR position, contrary to the FR's independent responsibilities as outlined in DOE-STD-1063-2017, *Facility Representatives*. (See OFI-DOE-PPPO-2.)

## **Recommendations**

There were no recommendations from this assessment.

## **Opportunities for Improvement**

Opportunities for improvement are suggestions that may assist cognizant managers in improving programs and operations.

### **Fluor-BWXT Portsmouth, LLC**

- **OFI-FBP-1:** FBP should consider reviewing the radiological controls for handling, using, and storing radiological sources used for instrument calibration and measurement system performance testing to minimize the potential for contamination due to worn or aging encapsulation. FBP should also consider disposing of aging and disused sources.
- **OFI-FBP-2:** FBP should consider ensuring that radiologically contaminated scrap materials are regularly inspected, monitored, and disposed of within a reasonable time, especially when staged outdoors.

### **Portsmouth/Paducah Project Office**

- **OFI-DOE-PPPO-1:** PPPO should consider completing the documented process for using MTS so as to provide formal guidance, minimize issue significance subjectivity, and ensure that appropriate corrective actions are assigned.
- **OFI-DOE-PPPO-2:** PPPO should consider filling the vacant position of Waste Management Program Manager expeditiously, which would allow the FR who is acting in this role to focus on her normal duties.

## **Appendix A Supplemental Information**

### **Dates of Office of Enterprise Assessments (EA) Onsite Assessment**

December 2-12, 2019

### **Assessment Team**

Rosemary B. Reeves – EA, Team Lead

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## Appendix B

### Description of Waste Control Defense-in-Depth as Applied at Portsmouth

This figure shows the various engineering and administrative controls implemented throughout the radioactive waste management process to ensure that waste shipped to a disposal site meets all waste acceptance criteria and that no prohibited items are accidentally introduced into waste streams. Defense in depth is intended to reduce the likelihood of a non-compliant waste package by implementing a diverse defensive control strategy, so that if one layer of defense turns out to be inadequate, another layer of defense will prevent a non-compliance. In this figure, the generator is the point of origin of any waste stream. As waste progresses through the process, it can be accumulated and stored at various locations. Along the way, the waste is characterized and verified to be appropriate for the approved waste stream. Once finally packaged, the waste is certified to have met all requirements and is shipped to its final disposal site.

