



Independent Assessment of Work Planning and Control for Deactivation and Demolition Work at the Portsmouth Site

March 2022

Office of Enterprise Assessments
U.S. Department of Energy

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Acronyms

BZA	Breathing Zone Air Sampler
CAS	Contractor Assurance System
CFR	Code of Federal Regulations
CWP	Construction Work Package Process
DEAR	Department of Energy Acquisition Regulation
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
E-TAS	Enterprise Technical Assistance Services
FBP	Fluor-BWXT Portsmouth, LLC
FBP WP&C	FBP Work Planning and Control Process
FR	Facility Representative
GW	General Work
HCA	High Contamination Area
HCIC	Hazard and Control Identification Checklist
IH	Industrial Hygiene
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
JS	Job-specific
MTS	Management Tracking System
NEC	National Electric Code
NFPA	National Fire Protection Association
OFI	Opportunity for Improvement
OSHA	Occupational Safety and Health Administration
OSWDF	Onsite Waste Disposal Facility
PPE	Personal Protective Equipment
PPPO	Portsmouth/Paducah Project Office
RCT	Radiological Control Technician
RWP	Radiological Work Permit
TQP	Technical Qualification Program
WP&C	Work Planning and Control
WSHP	Worker Safety and Health Program

INDEPENDENT ASSESSMENT OF WORK PLANNING AND CONTROL FOR DEACTIVATION AND DEMOLITION WORK AT THE PORTSMOUTH SITE

Executive Summary

The U.S. Department of Energy's Office of Enterprise Assessments (EA) conducted an independent assessment of work planning and control (WP&C) at the Portsmouth Site (formerly Portsmouth Gaseous Diffusion Plant) in September and October 2021. This assessment focused on the Fluor-BWXT Portsmouth, LLC (FBP) WP&C processes for deactivation and demolition work, elements of the FBP electrical safety program and contractor assurance system, and the Portsmouth/Paducah Project Office (PPPO) oversight processes for WP&C. The assessment did not include the Portsmouth DUF-6 facility.

EA identified the following strengths:

- FBP has established an adequate integrated WP&C process that generally meets the fundamental expectations of the Department's integrated safety management requirements.
- The FBP electrical safety program and the electrical utility safety program effectively integrate applicable electrical safety requirements and are effectively implemented for electrical maintenance work on de-energized electrical equipment.
- PPPO has a comprehensive and integrated process for Federal line oversight of WP&C.

EA also identified four findings and several deficiencies summarized below:

- FBP's implementation of its job hazard analysis process and procedure does not ensure adequate tailoring of all non-radiological hazards and controls to specific work activities, resulting in some missed hazards and controls during the performance of work and thereby possibly posing unnecessary safety risks to workers. (Finding)
- FBP has not implemented a comprehensive industrial hygiene exposure assessment/health hazard assessment program to ensure that workplace exposures are maintained below regulatory limits. (Finding)
- FBP's radiological control organization did not ensure proper implementation of radiological contamination surveys (personnel, area boundaries, and equipment) and proper use of breathing zone air samplers during observed work. These concerns, if left uncorrected, could potentially result in the spread of contamination onsite beyond the posted radiological area boundaries, and affect the accuracy of air samples used for workers' internal dose assignment, respectively. (Deficiencies)
- PPPO has not conducted Facility Representative (FR) staffing analysis, quarterly FR performance indicators consistent with DOE-STD-1063, and triennial self-assessments of the FR program. Without the required information, the Office of Environmental Management would not have an accurate evaluation of the FR program. (Finding)
- PPPO has not implemented a formal continuous training program for FRs in the technical qualification program, has not periodically requalified FRs, and has not conducted periodic self-assessments of the effectiveness of the technical qualification program, which could result in inconsistent or inadequate oversight of contractor performance. (Finding)
- PPPO has not identified site-specific training for support service contractor personnel performing safety oversight of site operational activities, which could result in inconsistent or inadequate oversight of contractor performance. (Deficiency)

In summary, FBP has a WP&C framework that is generally well documented with program plans and detailed implementing procedures. However, EA observed weaknesses in the areas of hazard analyses,

industrial hygiene hazard assessments, radiological contamination control, and breathing zone air sampling. PPO has a comprehensive and integrated process for oversight, but EA observed program weaknesses in the implementation of a continuous training program and in tracking and assessing technical qualifications and FR programs. Until the concerns identified in this report are addressed or effective mitigations are put in place, workplace hazards may not be identified and addressed to sufficiently protect workers' safety and health during D&D work at the Portsmouth Site. As a follow-up to the findings and deficiencies identified in this assessment, EA plans to reassess the WP&C programs at the Portsmouth Site in a future assessment.

INDEPENDENT ASSESSMENT OF WORK PLANNING AND CONTROL FOR DEACTIVATION AND DEMOLITION WORK AT THE PORTSMOUTH SITE

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Worker Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of work planning and control (WP&C) for deactivation and demolition work in process buildings at the Portsmouth Site (formerly Portsmouth Gaseous Diffusion Plant), which is managed by Fluor-BWXT Portsmouth, LLC (FBP). This assessment did not include operations at the DUF6 Facility at the Portsmouth Site. Planning calls and document collection began in July 2021, and the assessment was conducted on site September 20-23 and October 4-7, 2021.

Consistent with the *Plan for the Independent Assessment of Deactivation & Demolition Work Planning and Control at the Portsmouth Gaseous Diffusion Plant, August 2021*, this assessment evaluated the effectiveness of the implementation of the integrated safety management (ISM) core functions (define the scope of work, identify and analyze hazards, identify and implement controls, perform work safely within controls, and provide feedback and make improvements) for activity-level work involving deactivation and demolition efforts. This assessment also evaluated elements of the electrical safety program, the contractor assurance system (CAS), and Federal oversight of WP&C provided by the Portsmouth/Paducah Project Office (PPPO).

The decontamination and decommissioning program at the Portsmouth Site involve deactivation, demolition, and disposal of approximately 415 facilities. These facilities include three gaseous diffusion process buildings that housed the process equipment, along with support facilities such as electrical switchyards, cooling towers, cleaning and decontamination facilities, water and wastewater treatment plants, maintenance and laboratory facilities, and storage and office buildings.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which is implemented through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms “best practices, deficiencies, findings, and opportunities for improvement (OFIs)” as defined in DOE Order 227.1A.

As identified in the assessment plan, this assessment considered objectives and criteria from DOE Guide 226.1-2A, *Federal Line Management Oversight of Department of Energy Nuclear Facilities*, appendix D, *Activity Level Work Planning and Control Criterion Review and Approach Documents with Lines of Inquiry*. EA used elements of Criteria and Review Approach Document (CRAD) EA-30-07, Rev. 0, *Federal Line Management Oversight Processes*, to collect and analyze data on PPPO oversight activities related to WP&C. EA also used objectives and criteria from EA CRAD 32-03, Rev. 1, *Industrial Hygiene Program*.

EA observed the planning and implementation of work activities in two primary areas, deactivation and demolition of gaseous diffusion plant process buildings, and electrical safety. EA examined key activity-level work control documents, such as WP&C plans and procedures, job hazard analyses (JHAs), work orders, manuals, analyses, and policies. EA also interviewed key personnel responsible for developing and executing the associated programs, observed 26 onsite work activities, and walked down relevant portions of specific facilities, including the X-326 demolition site, the X-740 Ground Water Plume

Remediation project, and the Onsite Waste Disposal Facility (OSWDF) operating waste cells and unloading ramp. The observed onsite work activities consisted of 13 broad-scope deactivation work activities and 13 electrical maintenance work activities.

Appendix A lists the members of the assessment team, the Quality Review Board, and management responsible for this assessment.

There were no findings from previous assessments for follow-up addressed during this assessment.

3.0 RESULTS

The objective of this assessment was to verify that FBP manages and performs work in accordance with a documented safety management system that defines the scope of work, identifies and analyzes hazards associated with the work, develops and implements hazard controls, performs work within controls, and provides feedback on the adequacy of controls and continues to improve safety management, all in accordance with the DOE requirements for an integrated safety management system (ISMS) as defined in 48 CFR 970.5223-1(C), *Integration of environment, safety, and health into work planning and execution*, and DOE Policy 450.4A, *Integrated Safety Management Policy*.

This section provides assessment results in the areas of WP&C institutional programs, WP&C implementation, electrical safety, the CAS, and PPPO oversight.

3.1 Work Planning and Control Institutional Programs

The objective of this portion of the assessment was to verify that FBP has established WP&C processes to enable the safe performance of work in the areas of WP&C, supporting programs, and the JHA process.

Work Planning and Control Processes

FBP has established adequate WP&C processes that meet the expectations of DOE's ISM requirements with some exceptions, identified later in section 3.1. The site's overall integrated work planning and control process consists of two separate WP&C processes used to plan and perform work: (1) the FBP WP&C process and (2) the Construction Work Package (CWP) process. Both processes are supported by other processes, such as the JHA process. All FBP organizations and groups use the FBP WP&C process, except for work identified in the Project Labor Agreement, which uses the CWP process and applies to five organizational divisions: Portsmouth Construction, Demolition, Soil Excavation, Projects, and OSWDF Operations. FBP adequately ensures that the WP&C processes are flowed down to the lowest subcontractor task level through standard subcontract document clause J-13, *Flow Down of Fluor-BWXT Worker Health and Safety Program*.

Supporting Programs

Both WP&C processes are supported by formal radiation protection and industrial hygiene (IH) programs. The radiation protection program includes an extensive document hierarchy that includes program plans, technical basis documents, and implementing procedures, which flow down radiological requirements to the working level. The IH program has an effective approach to respiratory protection, which is used extensively to control radiological and IH hazards. The FBP IH program is characterized by several effective processes, including respirator inventory control, maintenance, and repair; fit testing; controlled issuance of respirators to qualified employees; and a well-organized and effectively managed respirator facility. Additionally, IH technicians and professional staff were well integrated into the observed work activities and proactive in identification of IH hazards.

While the FBP IH program is generally effective in many areas, it does not include a comprehensive IH exposure assessment and health hazard assessment program, contrary to 10 CFR 851.21, *Hazard Identification and Assessment*, sections (a)(1), (a)(2), and appendix A6(a), and FBP-OS-PDD-001, *FBP Worker Safety and Health Program* (WSHP), section 6.6.2. (See **Finding F-FBP-1** and **OFI-FBP-1**.) 10 CFR 851.21 requires contractors to establish procedures to document the assessment of chemical, physical, and biological hazards through recognized exposure assessment methodologies. Consistent with 10 CFR 851 appendix A6(a), FBP WSHP, section 6.6.2 requires contractors to perform initial or baseline surveys of all work areas whenever a potential hazard is identified and based on the initial survey, to perform a health hazard assessment to evaluate and document employee exposures to chemical, physical, and biological agents and ergonomic stressors.

Further, FBP industrial hygienists perform selective monitoring of potential IH exposure hazards in response to exposure hazards identified in the JHA or from workplace observations, in accordance with their professional training and FBP-IH-PRO-00024, *Industrial Hygiene Sampling*. However, FBP-IH-PRO-00024 does not provide instructions to perform either initial or baseline surveys and periodic resurveys, or qualitative and quantitative evaluation of identified hazards that would constitute an exposure assessment or health hazard assessment; the latter includes the designation of similar exposure groups, frequency of exposure, assessment of the toxicity of the hazard, and other factors typically included in an exposure or health hazard assessment. (See **Finding F-FBP-1** and **OFI-FBP-1**.) EA observed examples of this weakness, as discussed in section 3.2 of this report. Consequently, workers may be exposed to hazards that have not been sufficiently analyzed.

Job Hazard Analysis

FBP-IH-PRO-00022, *Job Hazard Analysis*, identifies two types of JHAs: general work (GW) and job-specific (JS), which apply to both the FBP WP&C and CWP processes. FBP-IH-PRO-00022 references a sitewide general JHA, FBP-JHA-13-1647, *General Work (GW) Job Hazard Analysis*, that FBP developed to address and control common hazardous activities performed by workers across the site. This GW JHA is referenced in FBP-IH-PRO-00022 as a source document for JHA authors to use during hazard screenings that are required for all newly planned work. Per the JHA procedure, JHA authors for all new work activities under the FBP WPC or CWP processes assume that the GW JHA is adequate for all hazards listed in the GW JHA unless they determine that any of the hazards meet the criteria as “unique” and/or “substantial”. This determination is made by completing form FBP-IH-PRO-00022-F02, *Hazard and Control Identification Checklist (HCIC)*. The FBP process provides a generally effective approach with one exception, discussed below.

The JHA process adequately addresses most hazards, general and specific. However, contrary to DOE Acquisition Regulation (DEAR) 970.5223-1, (b)(6), FBP-IH-PRO-00022 does not ensure adequate tailoring of needed controls to specific work activities. This shortcoming results in some needed controls that may be missed hazards during work, possibly posing unnecessary risks to worker safety and health. (See **Finding F-FBP-2**.) FBP-IH-PRO-00022 states as a sub bullet, “common hazardous activities performed by workers are addressed in the site’s General Work JHA (FBP-JHA-13-1647).” Both FBP-PRO-00022 and the GW JHA state: “The GW JHA contains hazards that are neither unique nor substantial.” This second statement is incorrect for some hazards, such as noise and general chemical use, which require professional evaluation (e.g., monitoring, sampling) to determine the magnitude and possible need for job-specific controls. The following two hazard examples are from the GW JHA:

- “Hand and power tools-noise with potential to exceed 85 dBA,”
- “Work involving the use of chemicals,”

These types of hazards are not required to be included in the JS JHA for the work. Also, there is no other formal process to ensure that the required professional evaluations are conducted and that any resulting controls are identified, documented, included in applicable work control documents, and conveyed to workers during pre-job briefings. Section 3.2 of this report describes several examples in which noise and chemical hazards were not properly and effectively addressed and controlled by the GW JHA.

Work Planning and Control Institutional Program Conclusions

FBP's WP&C framework is generally well documented with program plans and detailed implementing procedures, as required by 48 CFR 970.52231(c) and DOE Policy 450.4A. The FBP WP&C and CWP processes rely extensively on FBP's comprehensive environment, safety, and health programs to control radiological, IH, and safety hazards. However, two findings were identified in the areas of IH exposure/health hazard assessments and job hazard analyses.

3.2 Work Planning and Control Implementation

The objective of this portion of the assessment was to assess FBP and subcontractor implementation of the WP&C institutional programs for deactivation and demolition, and work activities through the core functions of ISM. Results are reported according to the following ISM core functions: defining the scope of work, identifying and analyzing hazards, developing and implementing hazard controls, and performing work within controls.

Defining the Scope of Work

The scope for all observed work was well defined in work documents prepared under both the FBP WP&C and CWP processes. Work scopes in reviewed activity-level work control documents developed under both the FBP WP&C and CWP processes were sufficiently detailed to permit effective analysis of hazards and specification of appropriate controls.

Identifying and Analyzing Hazards

For the observed work, the HCICs, in combination with a JS and/or GW JHA, provided a comprehensive mechanism for identifying hazards in a specific project or scope of work. For example:

- Hazards for the X-740 Ground Water Plume Remediation project were identified and sufficiently documented in the JS JHA.
- The project to install liner material at the OSWDF was well analyzed, and controls were in place for ergonomic hazards, physical hazards from fusing operations, and environmental heat and cold stress hazards.

However, during several work observations, some non-radiological hazards were present that were not adequately analyzed and/or controlled in the GW JHA or addressed in a JS JHA. (See **Finding F-FBP-2.**) For example:

- Observed transite (asbestos-cement product) removal work performed at Building X-326 by an FBP subcontractor did not include any noise monitoring for the noise hazard associated with operation of a reciprocating saw. The JHA author identified the noise hazard associated with the use of reciprocating saws and determined that the JS JHA did not need to address it because the GW JHA was sufficient. However, the GW JHA does not identify specific noise controls (e.g., hearing protection, entry into a hearing conservation program) and requires only that a noise evaluation be performed if noise levels are above 85 dBA. In response to EA's request for the

sound level survey, FBP industrial hygienists monitored the noise levels, which were well above 85 dBA (i.e., 104.7 dBA).

- Observed work using an FBP WP&C work instruction at Building X-333 (Work Control Document 2101083-02 for gasket sampling of asbestos containing material in ductwork) created noise hazards from duct cutting that were improperly determined to be adequately addressed by the GW JHA. At the start of the job, workers and the supervisor noticed high noise levels and contacted IH for an evaluation, which confirmed high noise levels that required hearing protection and a large, posted boundary around the work area to prevent co-located individuals from entering the high noise area. However, the HCIC was not updated as required by FBP-IH-PRO-00022 to reflect that the noise hazard was not adequately addressed in the GW JHA. This change also did not result in the required revision to the JS JHA to include the high noise hazard and needed controls. Consequently, the noise hazard was not addressed in the Level 4 work instruction, as required by FBP-WPC-PRO-00004, *Planning Work*.
- Hazards and controls for the X-740 Ground Water Plume Remediation project “Chemical/Combustible/Flammable/Petroleum Storage Tank Systems” are not adequately defined for this work in either the JHA or the work instructions. The HCIC determined that the GW JHA adequately addressed the potential hazards for this activity. However, the GW JHA identifies this hazardous activity/potential hazard as “not applicable,” so neither the GW JHA nor the JS JHA identifies any hazards or the required controls.

Developing and Implementing Hazard Controls

Hazard controls were generally well developed and adequately implemented during observed work, including FBP’s accommodation of workers’ requests for supplementary personal protective equipment (PPE), specificity of radiological controls in radiological work permits (RWPs), and IH hazard controls in JHAs.

FBP has accommodated workers’ requests for supplementary PPE, even when such PPE exceeds the requirements imposed by the hazard. This was evident during transite siding removal work at Building X-326, where workers stated they were allowed to opt for a higher level of protection using powered air purifying respirators (PAPRs) than is required for the work, to improve comfort levels. These workers also stated that they can request and receive a change of respiratory equipment at any time during its issuance cycle. In response to the transient odors sometimes detected in the transite removal process, management changed from particulate cartridges on these respirators to combination cartridges to reduce any potential exposures. Management has also altered the panel removal process to increase general ventilation and fresh air flow into Building X-326 and reduce potential exposures.

FBP RWPs governing the work observed during the assessment were adequate with two exceptions: one discussed below in this paragraph, and the other discussed below under Performing Work Within Controls. All RWPs for observed work were task-based and specific to unique work evolutions and included appropriate radiological controls consistent with procedural requirements. Each RWP also provided a documented linkage to all related FBP WP&C and CWP work packages. Interviewed radiological supervisors and technicians were knowledgeable of field work activities, tasks, and RWP requirements, and radiological control technician (RCT) support during work was appropriate. Required radiological surveys and air sampling were performed and documented appropriately. However, contrary to FBP-RP-PRO-0054, *Conduct of Radiological Operations*, sections 6.3.5 and 6.3.7, RWPs covering work at Building X-326 demolition and OSWDF did not require workers exiting high contamination areas to perform a whole-body frisk with the portable survey meters after doffing their PPE and before leaving the boundary control station, even though they had to walk through clean areas to get to the automated whole body counting equipment, which was at distant central locations. (See **Deficiency D-**

FBP-1.) The RWPs required only a hand and foot frisk with the portable equipment, so the workers walked up to one quarter mile depending on work location, through clean areas to the whole-body counter, potentially spreading contamination to clean areas onsite.

The FBP GW JHA and the JS JHAs provide detailed IH hazard controls, such as for the incidental airborne chemical releases at Building X-326. However, as discussed in section 3.1 of this report, several observed work activities included potential workplace contaminants that were not sufficiently assessed through appropriate workplace monitoring to ensure proper control of worker exposures to chemical, physical, and biological workplace hazards as required by 10 CFR 851.21. (See **Finding F-FBP-1** and **OFI-FBP-1**). The following are examples of observed work activities that lacked a specific documented health hazard or exposure assessment, or examples of inappropriate workplace monitoring or undefined hazard controls:

- Health hazard assessments, exposure assessments, and initial and baseline surveys for work activities observed at the X-740 Ground Water Plume Remediation project and the Building X-326 demolition were neither performed nor documented as required by section 6.6.2 of the FBP WSHP.
- For work at the X-740 Ground Water Plume Remediation project and Building X-326 demolition, there is no IH health hazard assessment identifying the contaminant(s) to be sampled, similar exposure groups, method of sampling/monitoring to be performed (if applicable), action levels for those contaminants, frequency and location of sampling/monitoring, actions to be taken if an action level is reached, and the recommended hazard controls.
- Although an air monitoring plan was developed for the Building X-326 demolition project, the plan is not a health hazard assessment and lacks the specific attributes of a health hazard assessment defined in the previous bullet. Neither an air monitoring plan nor a health hazard assessment was developed for the X-740 Ground Water Plume Remediation project.
- At the X-740 Ground Water Plume Remediation project, recorded breathing zone exposures and time weighted average exposures to airborne particulate contaminants during the mixing of Calciment are performed only via direct reading instruments (i.e., TSI DataRAM). This method of personal sampling, when not accompanied by air sampling by way of a sampling pump and a sample collection device placed in the worker's breathing zone, is contrary to the requirements of FBP-IH-PRO-00024, section 8.1, and the good practices contained in Occupational Safety and Health Administration (OSHA) air sampling protocols documented in section II, chapter 1 of the OSHA Technical Manual, *Personal Sampling for Air Contaminants*.
- IH hazard controls are typically developed and documented in health hazard assessments and subsequently inserted into JHAs and work procedures. However, since no health hazard assessments have been developed, IH hazard controls for some health hazards have not been established and documented. Therefore, the JHA hazard controls lack specificity, as reflected in such statements as "Contact IH for PPE guidance" or "Contact IH in order to identify the proper controls and PPE."
- Because of the lack of exposure and health hazard assessments, the IH technicians interviewed by EA provided conflicting and incorrect information about the contaminants for which they were monitoring. For example, the IH technicians and the IH personnel assigned to the project cited different contaminant action levels for trichloroethylene and dust at the X-740 ground water plume remediation site.

Performing Work Within Controls

Observed pre-job briefings adequately addressed the identified work scope, tasks, and hazard controls contained in the respective work package and/or JS JHA. Pre-job briefings were interactive and inclusive, and they used information to supplement work package information, such as the daily safety sheet, pre-job briefing checklist, and/or safety task assignment form. These supplemental documents served as a ready reference and provided an effective mechanism to inform workers of any applicable lessons learned or recent Portsmouth Site events/incidents applicable to the planned activities. Additionally, RWP briefings were provided and included appropriate information regarding the expected workplace conditions, including required PPE, limiting radiological conditions, and alarm response.

The observed work was performed without incident and within defined work controls, with three exceptions discussed below. Work at Building X-326, OSWDF, and X-740 ground water plume remediation project involving the use of multiple heavy equipment vehicles demonstrated appropriate operations, including effective worker/heavy equipment interface controls. Workers and equipment operators were careful to avoid incidents by using spotters, separation distances, and barricades. These safety controls were also reinforced daily by supervision. However, EA identified the following radiological weaknesses:

- Contrary to FBP-RP-PRO-00054, section 6.2, RCTs did not perform routine boundary verification surveys to demonstrate that there had been no spread of contamination beyond posted radiological boundaries during and after associated work at the Building X-326 demolition site and at the OSWDF loading ramp. (See **Deficiency D-FBP-2** and **OFI-FBP-2**.) At the Building X-326 demolition site, material was observed falling from the loader bucket while loading the trucks transporting contaminated material from the high contamination area (HCA) to the contamination area. The constant movement of contaminated debris within the demolition zone results in the potential for windblown deposition of radioactive material beyond the contamination area boundaries. Additionally, offloading trucks transporting contaminated material from the OSWDF to the disposal cell also has the potential for airborne resuspension and deposition of contamination.
- Contrary to FBP-RP-PRO-00054, section 6.4, RCTs at the OSWDF ramp did not perform quantitative item/equipment exit (technical smear) release surveys of the rear tires and mud flaps of dump trucks that repeatedly contacted HCA ramp surfaces before allowing the trucks to proceed to the release survey station located in a clean area at the bottom of the ramp. Only qualitative large-area wipe samples were taken, and field counted. When backing up for proper positioning to offload material into the cell, each truck made partial entry across the HCA boundary to offload waste material but did not undergo the required release surveys before exiting the HCA. During this process, RCT PPE only consisted of booties and gloves, but their personal clothing (pants and short-sleeved shirts that exposed the forearms) was observed touching the rear tires when they bent to collect the large-area wipe samples. (See **Deficiency D-FBP-1** and **Deficiency D-FBP-2**.)
- Contrary to FBP-RP-PRO-00007, *Air Sampling Operations*, section 8.4.14, OSWDF RCTs did not ensure that heavy equipment operators were appropriately using breathing zone air samplers (BZAs) to collect a representative sample of the air they were breathing. (See **Deficiency D-FBP-3**.) These workers were observed carrying BZAs into the HCA and placing them in the cabs of their heavy equipment instead of wearing them within 30 centimeters of the head (the defined breathing zone). This practice was also incorrectly authorized by Task 6 of the RWP (Heavy Equipment Operations), because it conflicts with requirements of FBP-RP-PRO-00007 for placement of BZAs. Further, during their work, workers were observed exiting their vehicles without the samplers while conducting vehicle inspection, maintenance, or other material

movement, thereby further reducing the effectiveness of such sampling. Consequently, the samples are not representative of the breathing zone, limiting the accuracy of the results, which are used as the basis for workers' internal dose assignment instead of bioassays.

Work Planning and Control Implementation Conclusions

The scope for all observed work was well defined in work documents prepared under the FBP WP&C and CWP processes. The use of the HCIC, in combination with a JS and/or GW JHA, generally provides a useful mechanism for identifying hazards in a specific project or scope of work. Hazard controls were generally well developed and adequately implemented during observed work. The observed pre-job briefings were adequate, and the observed work was performed without incident and within defined work controls. However, weaknesses were identified in the areas of hazard analyses, IH hazard assessments, radiological contamination control, and breathing zone air sampling.

3.3 Electrical Safety

The objective of this portion of the assessment was to verify the adequacy of the FBP electrical safety programs, arc flash and electrical shock hazard warnings, and electrical safety implementation during work performance.

The FBP electrical safety program (FBP-OS-PRD-00001, *Electrical Safety*) and the electrical utility safety program (FBP-OS-PRD-00003, *Electrical Utility Safety Program*) effectively integrate the requirements of 10 CFR 851, including National Electrical Code (NEC), section 110.26, *Spaces About Electrical Equipment*; OSHA 29 CFR 1910.303(g)(1), *Space about electric equipment*; and National Fire Protection Association (NFPA) 70E-2018, *Standard for Electrical Safety in the Workplace*, section 110.1, *Electrical Safety Program*. Additionally, FBP-OS-PRO-00068, *Instructions for Lockout-Tagout*, adequately addresses the requirements of NFPA 70E-2018, article 120, *Establishing an Electrically Safe Work Condition*. To coordinate electrical safety, FBP has effectively established an electrical safety committee that is well-staffed with subject matter experts and designated authorities having jurisdiction who are qualified in all aspects of electrical safety.

All observed electrical equipment arc flash and electrical shock warnings are appropriately communicated to workers. The observed 208-volt (and greater) three-phase electrical panels, disconnect switches, motor control centers, and switchgear either have current arc flash and shock warning labels installed or the electrical hazards are documented in the work package on a job-specific electrical task risk assessment form, as required by NFPA 70E-2018, section 130.5(H) *Equipment Labeling*. These labels and forms provide appropriate warnings and guidance to maintenance and operations personnel. The warnings and guidance identify the potential arc flash hazard and describe the arc flash boundary; identify potential shock hazards and describe the shock hazard boundaries; and identify the required PPE for anyone working on or operating equipment within the arc flash boundary or electrical shock limited and restricted approach boundaries of exposed energized electrical conductors or circuit parts.

The observed work performance demonstrated effective implementation of the FBP electrical safety program. During 13 observed electrical work activities on de-energized electrical equipment, qualified electrical maintenance personnel performed the work safely, appropriate to the risk associated with electrical hazards, and in accordance with the requirements of the electrical safety program or the electrical utility safety program. The electrical maintenance personnel also appropriately verified that previously applied energy control lockout/tagout was properly installed and provided the required protection in compliance with lockout/tagout requirements. Additionally, all electrical maintenance personnel donned appropriate PPE for shock and arc flash hazards and implemented safe work practices, including zero energy checks (instrument verification that a circuit is de-energized prior to work). However, contrary to electrical safety requirements, EA observed that the working space around many

electrical panels and disconnect switches was insufficient and that access was encumbered by such items as furniture, storage items, and toolboxes. (See **Deficiency D-FBP-4.**) OSHA, NFPA 70E, and the NEC require adequate working space for safe access for operation and maintenance of circuit breakers and disconnect switches, particularly in emergency situations when the power must be disconnected rapidly.

Electrical Safety Conclusions

The FBP electrical safety program and electrical utility safety program effectively integrate the requisite electrical safety requirements. All observed electrical equipment arc flash and electrical shock warnings are appropriately communicated to workers. The FBP electrical safety program and electrical utility safety program are effectively implemented for electrical maintenance work activities performed on de-energized electrical equipment. However, less than the required working space is provided around many installed electrical panels and disconnect switches.

3.4 Contractor Assurance System

The objective of this portion of the assessment was to ensure that FBP has established a CAS to identify and manage WP&C issues and associated corrective actions, plan and conduct associated assessments, and analyze CAS results to provide feedback on the adequacy of work controls to enable continued improvement of safety management.

FBP has developed and implemented FBP-QP-PDD-00005, *Portsmouth Gaseous Diffusion Plant Contractor Assurance System Description*, which was appropriately reviewed and approved by PPPO. The FBP CAS organization implements a comprehensive performance assurance system that includes issues management, assessment planning, data collection, and periodic reports that track and trend performance.

FBP procedure FBP-QP-PRO-00020, *Problem Reporting and Issues Management*, provides an effective system for identifying issues, analyzing issue causes, developing corrective actions, tracking action completion, and conducting appropriate effectiveness reviews. FBP's formally chartered Corrective Action Review Board, consisting of senior site managers, reviews and approves causal analyses, corrective action plans, and effectiveness reviews; its effectiveness is demonstrated by three adverse/significant problem reports, eight corrective actions, and two effectiveness reviews prepared since 2019. FBP also implements an informal Problem Report Screening Committee, often including participation of union safety representatives, that reviews problem reports and provides useful input to the performance assurance organization. As demonstrated by 26 recent problem reports, the performance assurance organization effectively reviews problem reports, including those submitted by safety working groups and subcontractors; determines DOE Occurrence Reporting and Processing System reportability; assigns trend codes, ownership, and severity levels; and enters them into the issues tracking system. A weekly report of closure actions for problem reports is sent to "identifiers and submitters" of the reports and is shared at pre-job briefings and post-job reviews and safety working group meetings.

FBP assessment planning is systematic and appropriately encompasses required assessments as demonstrated by 10 management assessments and eight independent assessments. These assessments adequately address areas of concern, based on programmatic internal risk assessments and on topics identified as weaknesses by external third-party assessments. FBP responded to a 2019 parent company external assessment by developing a CAS improvement plan that enhanced the quality and self-critical nature of subsequent management and independent assessments.

FBP adequately collects CAS feedback information from problem reports, assessments, and incidents. Feedback data is tracked through various metrics and reports, which senior management reviews for follow-up or additional actions. Use of this feedback information demonstrates the qualities of a learning

organization. Although FBP tracks and trends performance metrics related to injuries, illnesses, incidents, and issues, the performance assurance organization has not identified a specific set of metrics for monitoring WP&C performance. (See **OFI-FBP-3.**)

FBP maintains an effective lessons-learned program that gathers lessons learned from multiple sources including the DOE Lessons Learned database, the DOE OPEX Share website, and locally developed lessons learned. Lessons learned are screened into three categories (not applicable, beneficial, and applicable requiring further evaluation) and are distributed for information purposes. For lessons learned judged to be beneficial or applicable, problem reports are appropriately generated, requiring additional actions and tracking. Although implementation of lessons learned into work control procedures is reviewed in some management assessments, the lessons-learned organization does not perform periodic independent assessments to determine how well beneficial/applicable lessons learned are implemented in work control documents across the site. (See **OFI-FBP-4.**)

Contractor Assurance System Conclusions

FBP has effectively developed and implemented a DOE-approved CAS that provides an adequate system for identifying problems, analyzing causes, developing corrective actions, monitoring completion activities, and conducting appropriate effectiveness reviews. Management and independent assessments provide useful information to enhance contract performance. FBP's collection, monitoring, and analysis of performance feedback information helps management focus on needed improvements. An FBP parent company external assessment conducted in 2019 resulted in FBP developing a CAS improvement plan that improved the quality and self-critical nature of subsequent FBP assessments. FBP's implementation of performance assurance processes demonstrate the qualities of a learning organization. However, FBP has not identified a specific set of metrics for use in monitoring WP&C performance. Also, the lessons-learned organization does not perform periodic independent assessments to determine how well lessons learned are implemented in work control documents across the site.

3.5 Portsmouth/Paducah Project Office Oversight

The objective of this portion of the assessment was to verify the adequacy of the PPPO WP&C oversight process for overseeing and evaluating the Portsmouth Site operations managed by FBP and the implementation of specific PPPO programs, including assessments and operational awareness activities; issues management; and performance assurance analysis.

PPPO oversees operations at the Paducah and Portsmouth sites and has procedures that provide an effective overall approach to oversight by establishing the functions, responsibilities, authorities, and processes for conducting safety oversight. Enterprise Technical Assistance Services (E-TAS) is contracted to provide technical support services to PPPO, including supporting the implementation of PPPO oversight programs and procedures to maintain operational oversight, and providing feedback and recommendations. PPPO-M-413.1-1, *Management Plan*, contains the safety and health requirements necessary for achieving ISM objectives and establishes functional responsibilities and authorities for the execution of authorized work. PPPO-M-226.1-2, *Oversight Program Plans*, adequately describes the roles and responsibilities of oversight personnel, oversight methods, and annual assessment schedules. PPPO-M-414.1-7G, *Quality Assurance Program Plan*, adequately establishes processes for maintaining an effective quality assurance program that supports compliance with applicable regulations and DOE orders and requirements. PPPO personnel leading oversight activities are certified Nuclear Quality Assurance (NQA)-1 lead auditors.

PPPO performs biannual ISMS effectiveness reviews, uses the results of reviews to create a biannual written declaration of the status and effectiveness of ISM implementation within the field office and the contractor organization, and submits this declaration to the DOE Office of Environmental Management

(EM). The *Fiscal Year 2020 ISMS Effectiveness Review Declaration* concisely summarizes performance-based insights from established, ongoing field element oversight processes and the quality assurance program.

The PPPO oversight procedures reviewed by EA were past their revision cycle and have not been reviewed to incorporate current DOE requirements. For example, PPPO-M-426.1-0, *Technical Qualification Program Plan*, has not been revised to incorporate new requirements from DOE Order 426.1B, *DOE Federal Technical Capabilities*. Additionally, PPPO has not implemented a formal continuous training program that includes 80 hours of continuous training in a 5-year cycle and 5-year requalification process for oversight personnel; monitoring of technical qualification program (TQP) qualification progress; and conduct of a self-assessment of its TQP. These items are required by PPPO-M-426.1-0, sections 6.1 and 8.8.1; PPPO-2691323, *Facility Representative Program Plan*, sections 7.1 and 7.2; and DOE Order 426.1B, sections 4f(4) and 5.b(3)(e). (See **Finding F-PPPO-1.**) Weaknesses in the program resulted in Facility Representatives (FRs) not being qualified and requalified in a timely manner.

Internal management assessments performed in September 2021 on the current qualification status of the DOE PPPO FR candidates identified one finding, namely that FR candidates did not complete full qualification in a reasonable amount of time. During interviews, FRs stated that they are understaffed and do not maintain an appropriate level of oversight on low or medium-level hazard category facilities. PPPO has not conducted the FR staffing analysis, analysis of quarterly FR performance indicators consistent with DOE-STD-1063, and triennial self-assessments of its FR program as required by PPPO-2691323, sections 4.1.1, 5.1.1, and 5.7.4; and DOE-STD-1063-2017, *Facility Representatives*, sections 4.2.4, 5.1, 5.7.1, and 5.7.2. (See **Finding F-PPPO-2.**) PPPO has not established an optimal FR staffing level to maintain effective oversight, and without the required information, EM would not have an accurate assessment of the FR program.

PPPO has not identified site-specific training for support service contractor personnel performing safety oversight of site operational activities, contrary to PPPO-M-226.1-2, *Oversight Program Plan*, section 5.4.2.6. (See **Deficiency D-PPPO-1.**) E-TAS oversight personnel receive specific safety training (i.e., Radiation Worker, Respirator, and Hazardous Waste Operations and Emergency Response – HAZWOPER) required by its contract, but E-TAS has not implemented a safety training program for its personnel performing oversight. Although E-TAS oversees contractor activities that include many potential industrial safety hazards covered under 10 CFR 851 *Worker Safety and Health Program* and the OSHA general industry and construction standards, E-TAS personnel have not received an appropriate level of safety training in such areas as crane operations, rigging, heavy equipment, hazard communication, and excavation hazards. Consequently, support service contractor personnel may not be adequately trained for the safety hazards the workers are exposed to.

The Integrated Assessment and Surveillance Schedule for FBP, developed by PPPO quality assurance personnel with input from FRs and system safety oversight engineers, identifies eight key focus areas that are assessed to ensure that work is performed safely. The COVID-19 pandemic impacted the scheduled assessments and surveillances, resulting in cancellation or postponement of some activities. EA reviewed 22 oversight reports, including reports of assessments and surveillances, Portsmouth Site Weekly Reports, E-TAS Field Service Reports, and E-TAS Field Observation Reports, and determined that they were detailed and adequately characterized performance.

In general, PPPO adequately identifies and manages issues resulting from oversight activities. From September 2019 through August 2021, PPPO documented 1,219 issues from oversight activities, not including the “management by walking around” reviews in the Management Tracking System (MTS) issues management database. These issues were effectively communicated to PPPO management and FBP, and they were tracked and closed by PPPO. Eighteen issues remain open, all from oversight

activities between August and October 2021. Most of the identified observations were facility safety-related non-compliance issues. PPPO does not use the data from MTS for trending and analysis and for scheduling targeted assessments and surveillances to increase the effectiveness of oversight. (See **OFI-PPPO-1**.)

Portsmouth/Paducah Project Office Oversight Conclusions

PPPO has a comprehensive, integrated process for Federal line oversight of WP&C. PPPO conducts adequate assessments and surveillances, operational awareness activities, and performance assurance analyses and effectively communicates issues from oversight activities to FBP. Although PPPO has adequate oversight procedures to ensure effective oversight, the procedures have not been updated at the required frequency, and do not reflect some current DOE requirements. PPPO has not conducted the FR staffing analysis to establish an optimal level to maintain effective oversight. PPPO has not implemented a continuous training program, monitored and tracked TQP qualifications, conducted self-assessments of the TQP, or developed site-specific safety training requirements for support service personnel supporting the Federal oversight program.

4.0 BEST PRACTICES

There were no best practices identified as part of this assessment.

5.0 FINDINGS

Findings are deficiencies that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. DOE line management and/or contractor organizations must develop and implement corrective action plans for findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*, to manage corrective actions and track them to completion.

Fluor-BWXT Portsmouth, LLC

Finding F-FBP-1: FBP has not developed a comprehensive IH exposure assessment/health hazard assessment program. (10 CFR 851.21, sections (a)(1) and (a)(2), and appendix A6 (a); FBP-OS-PDD-001, FBP WSHP, section 6.6.2)

Finding F-FBP-2: FBP JHA procedure FBP-IH-PRO-00022 does not ensure adequate tailoring of all needed controls to specific work activities. (DEAR 970.5223-1, (b)(6))

Portsmouth/Paducah Project Office

Finding F-PPPO-1: PPPO has not implemented a formal continuous training program for personnel in the TQP, periodically requalified TQP qualified personnel, or conducted periodic self-assessment of the TQP for effectiveness. (PPPO-M-426.1-0, sections 6.1 and 8.8.1; PPPO-2691323, sections 7.1 and 7.2; DOE Order 426.1B, sections 4f(4) and 5.b(3)(e))

Finding F-PPPO-2: PPPO has not conducted FR staffing analysis, analysis of quarterly FR performance indicators consistent with DOE-STD-1063, or triennial self-assessments of the FR program. (PPPO-2691323, sections 4.1.1, 5.1.1, and 5.7.4; DOE-STD-1063-2017, sections 4.2.4, 5.1, 5.7.1, and 5.7.2)

6.0 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.

Fluor-BWXT Portsmouth, LLC

Deficiency D-FBP-1: FBP did not specify a requirement in RWPs governing work at X-326 and OSWDF for workers to perform (and workers did not perform) the required whole-body surveys with portable survey meters after exiting contamination areas, resulting in the potential spread of contamination while traversing clean areas to locations where automated whole-body counting equipment was available. (FBP-RP-PRO-00054, sections 6.3.5 and 6.3.7)

Deficiency D-FBP-2: FBP has not performed sufficient quantitative radiological contamination surveys during work with the potential to spread contamination at X-326 and OSWDF. (FBP-RP-PRO-00054, sections 6.2 and 6.4)

Deficiency D-FBP-3: FBP RCTs and heavy equipment operators did not ensure proper placement of BZAs as required to ensure samples that were representative of air breathed by the workers, and the RWP incorrectly authorized the observed practices, contrary to breathing zone air sampling requirements. (FBP-RP-PRO-00007, section 8.4.14)

Deficiency D-FBP-4: FBP does not maintain the required safe working space around electrical equipment. (NEC-2017, section 110.26; OSHA 29 CFR 1910.303(g); and NFPA 70E-2018 sections 205.5 and 205.9)

Portsmouth/Paducah Project Office

Deficiency D-PPPO-1: PPPO has not identified site-specific training for support service contractor personnel performing safety oversight of site operational activities. (PPPO-M-226.1-2, section 5.4.2.6)

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified four OFIs for FBP and one for PPPO to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in assessment reports, they may also address other conditions observed during the assessment process. These OFIs are offered only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

Fluor-BWXT Portsmouth, LLC

OFI-FBP-1: Consider developing qualitative and quantitative health hazard and/or exposure assessment programs and procedures based on the guidance provided in the American Industrial Hygiene Association publication, *A Strategy for Assessing and Managing Occupational Exposures*. Examples of exposure assessment or health hazard assessment processes developed by using this publication include (1) the *Exposure Assessment Process Map* and related exposure assessment procedures developed by the Oak

Ridge National Laboratory, and (2) the *Worker Exposure Assessment* program (P101-32) developed at Los Alamos National Laboratory

OFI-FBP-2: Consider specifying daily routine sampling frequencies for radiological contamination boundary verification surveys at Building X-326 and the OSWDF ramp. The effectiveness of boundary surveys for dirt and paved concrete surfaces prevalent at these locations could be improved by also considering installation of a network of smooth metal horizontal surfaces (deposition plates) at strategic locations at Building X-326 and OSWDF. These could be surveyed one or more times per work shift to supplement the continuous air monitors, with the intention of detecting any gradual buildup of windblown or other spread of contamination to these surfaces, similar to deposition plate systems that have been and are being used at other open-air demolition sites, such as at the Hanford Plutonium Finishing Plant and West Valley Vitrification Facility and Main Plant Process Building.

OFI-FBP-3: Consider identifying a specific set of metrics for monitoring WP&C performance. Candidates for such metrics include trending problem report issues that have been assigned an associated ISMS core function and guiding principle. The process for assigning such core functions and guiding principles by Four Rivers Nuclear Partnership, LLC (Paducah) may provide a useful example. In addition, review of WP&C-related metrics developed by Lawrence Livermore National Laboratory WP&C program management may be useful.

OFI-FBP-4: Consider conducting periodic independent assessments to determine how well beneficial/applicable lessons learned are implemented in work control documents across the site. Similar assessments conducted by the lessons-learned coordinator at Four Rivers Nuclear Partnership, LLC (Paducah) may provide a useful example.

Portsmouth/Paducah Project Office

OFI-PPPO-1: Consider analyzing and trending MTS data for repeat non-compliance occurrences, with the intention of scheduling targeted assessments and surveillances to increase the effectiveness of oversight.

Appendix A Supplemental Information

Dates of Assessment

Onsite Assessment: September 20-23 and October 4-7, 2021

Office of Enterprise Assessments Management

John E. Dupuy, Director, Office of Enterprise Assessments
William F. West, Deputy Director, Office of Enterprise Assessments
Kevin G. Kilp, Director, Office of Environment, Safety and Health Assessments
David A. Young, Deputy Director, Office of Environment, Safety and Health Assessments
Kevin M. Witt, Director, Office of Nuclear Safety and Environmental Assessments
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Jack E. Winston, Director, Office of Emergency Management Assessments
Joseph J. Waring, Director, Office of Nuclear Engineering and Safety Basis Assessments

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