

Radwaste Solutions

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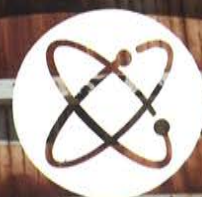
Decontamination
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The Decommissioning of Portsmouth's X-326

Demolition and disposal shifted into high gear this spring at the DOE's former uranium enrichment plant in Ohio.

In the 1950s, the U.S. Department of Energy constructed the Portsmouth Gaseous Diffusion Plant in rural southern Ohio to enrich uranium, alongside two other federally owned and managed facilities in Oak Ridge, Tenn., and Paducah, Ky. The Cold War-era plant was built as a self-sufficient industrial city with more than 400 buildings and facilities centered around three massive gaseous diffusion process buildings that could enrich the level of the uranium-235 isotope for nuclear fuel in the defense and energy sectors.

Gaseous diffusion enrichment operations ended at Portsmouth in 2001. Subsequent work has turned to environmental cleanup, waste management, and demolition of facilities and buildings that were no longer needed. It has been a methodical process, and progress has been steady but largely unnoticed, until recently when demolition and

disposal activities shifted into high gear under the DOE's Decontamination and Decommissioning contract, managed by Fluor-BWXT Portsmouth (FBP).

In June of this year, the most significant accomplishment occurred in the D&D era at Portsmouth when the first of the three huge uranium enrichment process buildings, X-326, was safely demolished. The result is 135,000 cubic yards of debris that will be disposed of at the newly constructed On-Site Waste Disposal Facility (OSWDF).

"Our goal is to place all demolition debris from the X-326 into our On-Site Waste Disposal Facility by the end of the year," said Portsmouth Site Project Director Greg Wilkett. "This requires significant project coordination across multiple disciplines and support organizations."

The massive X-326 gaseous diffusion process building (pictured below) was one of three similar large structures

Right: Prior to demolition, thousands of process components were removed from the X-326 building for shipment and disposal off-site. Photos: Fluor-BWXT Portsmouth

at the DOE's Portsmouth Site in Ohio that were used to enrich uranium. Construction of the X-326 building was completed in 1956. It measured 2,280 feet long, 552 ft wide, and 62 ft tall and contained 2,340 separation stages to enrich uranium to its highest levels. With a footprint of approximately 29 acres, the X-326 building was the smallest of the three large process buildings at Portsmouth. The uranium processing performed in the X-326 building was capable of enriching uranium product to an assay of nearly 97 percent U-235. Well over half of the enrichment stages at Portsmouth were housed in the X-326 process building.

Preparing for Demolition

Demolition of the half-mile-long X-326 building took less than 13 months, but the process of preparing the building to be torn down took nearly a decade. From 2011 to 2020, the DOE and FBP conducted a lengthy and thorough deactivation effort to identify, characterize, and remove the majority of radiological and chemical hazards.

Deactivation included more than 1 million measurements on the process piping and components to determine if the material would exceed the waste acceptance criteria (WAC) for the OSWDF. If located, the contaminated items were carefully removed and staged for further evaluation or decontamination. Deactivation also included the removal of more than 7,000 process components, which were safely shipped off-site for disposal. What remained in the building was determined to be safe for demolition and disposal into the OSWDF if it meets the regulator-approved WAC.

Finally, all utilities were safely removed from the X-326 building including electrical power, water, sewer, and alarms and the building was declared ready for demolition in late 2020.

The demolition project used lessons learned from similar projects in the DOE complex—specifically the successful demolition of the K-25 gaseous diffusion plant in Oak Ridge, Tenn. That project included five uranium enrichment process buildings similar to the X-326 building at Portsmouth.

Continued





Structural demolition of the X-326 building was completed June 10, 2022. The focus of the project has since turned to safely disposing the debris left from demolition work at a recently constructed waste facility constructed on site.



Above: The tracked Prinoth Panther T16 crawler carrier features a zero-degree turn radius and is able to adapt to irregular terrain. It traverses the X-326 demolition area daily, spraying fixative on building debris with an onboard Dust Demolisher and 2,700-gallon tank of fixative to lock down dust.

Protecting Workers, Public, and Environment

During demolition and disposal, a prominent concern is the potential spread of airborne contamination. This is controlled through a number of methods, including the following:

- Adhesive fixative was applied to the exterior and interior of the X-326 building prior to and during demolition. This substance “locks down” potential loose contamination that could be disturbed during the demolition.
- Water misters were used to suppress dust during demolition and disposal, a standard practice in industrial settings.
- Fixative was also applied to the piles of demolition debris on the ground.
- Demolition work was not conducted if wind speed reached a sustained velocity of 15 miles per hour.

To ensure that contamination controls were working, a comprehensive network of air monitors and alarms were

put in place to detect if levels of airborne radiological gases or particulates exceeded the safety levels of the Ohio Environmental Protection Agency and Ohio Department of Health. Real-time air monitors collect data and have alarms to provide a warning if elevated radiation levels are detected. Other monitors collect air-filter samples on a daily or weekly basis for laboratory analyses to detect specific particulate contamination in the air.

Monitors were located in various directions and distances from the X-326 building demolition site to provide sufficient coverage under a wide range of wind conditions. Monitoring data was discussed with the public through regular public meetings and was shared on websites and the Annual Site Environmental Report. Data collected to date have shown that dust control measures have been effective, and any detections have been far below regulatory limits.

Through a balanced approach, the highly contaminated waste from the X-326 building demolition has been

removed and is in the next stage of being shipped off-site for disposal. The remaining waste and demolition debris is placed into the 100-acre OSWDF, which began accepting waste in 2021.

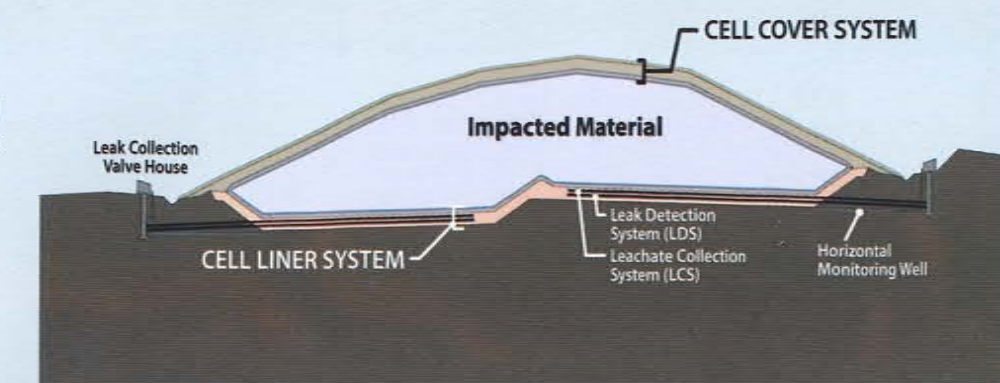
The OSWDF is an engineered disposal site with a multi-layer line and cap system designed to consolidate demolition debris and rubble into one centralized confined space that protects public health and the environment. It is constructed to meet strict state and federal environmental laws and has been proven to be safe based on similar successful operations and closed on-site disposal facilities at other DOE sites in the United States.

Located in the northeast portion of the 3,700-acre Portsmouth Site, the OSWDF is accessed by a dedicated haul road that runs directly from the X-326 building demolition site. Only trucks hauling waste to the OSWDF are permitted on the haul road. Site and public traffic are prohibited.

The entire OSWDF design includes 12 individual cells. The first three cells have been constructed and are currently accepting debris from the X-326 building, as well as engineered fill to meet the waste compaction requirements. Additional cells will be constructed as more demolition debris is generated in the future.

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The OSWDF is a specially engineered disposal site with a multilayer liner and cap system designed to consolidate demolition debris and rubble into one centralized confined space that protects public health and the environment. The final impacted material disposal area footprint will occupy about 100 acres in the northeast portion of the DOE reservation.



Debris from the demolition of the X-326 building is loaded onto a truck for disposal.

Cross-Functional Coordination

Achieving the goal of placing all X-326 building debris by the end of the calendar year requires more of everything—workers, equipment, trucks, waste capacity, and compaction soil. FBP's director of disposal integration, Frank Miller, is leading the effort to ensure that everything is done compliantly and, above all else, safely.

"This project has always been referred to as a three-legged stool with D&D, soil excavation, and On-Site Waste Disposal Facility operations," said Miller. "With any stable piece of furniture, there are bolts, pins, and glue that keep it all together. That is where ESH&Q [Environment, Safety, Health, and Quality], WAO [Waste Acceptance Organization], Engineering, Construction, Waste Management,

Nuclear Safety, and nearly every other organization plays a key role."

With debris disposal comes a need for a lot of engineered fill soil, more than twice as much soil as waste is needed. The OSWDF requires a 2.4-1 ratio of fill material to waste. To achieve this, soils are excavated from legacy groundwater plumes and old landfills on site. "With this approach, we avoid buying clean fill for the OSWDF, expedite the environmental cleanup of the site, and provide more land for future reuse," said Project Director Wilkett. "It's a win, win, win for the site."

Since the 1990s, plume contaminants, mainly industrial solvent trichloroethylene (TCE) used during plant operations, have been extracted from the ground with traditional groundwater pump-and-treat operations. It is a slow

process, however, that can be costly over time. By digging up the remaining contaminant sources and contaminated soils, the cleanup of the groundwater plumes is significantly accelerated.

Removal and consolidation of legacy environmental concerns, including groundwater plumes and old landfills, also make more land available for future community reuse and reindustrialization—a benefit for stakeholders who want to build a sustainable economic future at the site post-cleanup. The DOE has already begun the process of transferring clean parcels of land to the designated community reuse organization, the Southern Ohio Diversification Initiative (SODI). The first parcel, 80 acres, was transferred to SODI in 2018, and another 220 acres are scheduled to be transferred this year.

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The work is performed with regulatory approval under a Natural Resources Damage Act settlement and Director's Final Finding and Order authorizing excavation of five existing groundwater plumes as well as five closed waste units (i.e., landfills). Each individual waste unit or plume then needs an approved excavation work plan before excavation can be initiated, ensuring that excavation can be done safely, protectively, and compliant with all applicable or relevant and appropriate requirements. The excavated materials are then used as engineered fill in the OSWDF according to the approved WAC.

Since the first load of soil and waste was put into the cell in May 2021, more than 22,000 cubic yards of debris and 44,000 cubic yards of soil have been placed into the OSWDF. This summer, crews shifted into high gear to meet the year-end timeline. At the peak of hauling, crews were expected to move about 1,500 cubic yards of waste and 3,600 cubic yards of soil a week. That takes a lot of trucks and means sticking to a strict schedule.

"We have increased our fleet to 60 triaxle trucks in the rotation with 20 dedicated to debris and 40 to soil," said Miller. "At peak, we will be running around 400 truckloads a day: 130 will be filled with debris and 260 with soil."

Technicians verify truck shipment information going to the OSWDF.



As part of their independent oversight of the demolition and waste placement operations, the Ohio EPA and the Ohio Department of Health set up 23 air monitoring stations on and around the Portsmouth Site to provide verification of DOE air monitoring data.

Demolition debris from the X-326 building is disposed of at the Portsmouth On-Site Waste Disposal Facility. Nearly 600 employees are working at the OSWDF currently in a variety of capacities to safely dispose of the debris from the X-326 building demolition.

Adding More Staff

A project of this magnitude requires a significant workforce. So far this year, 250 new workers have been hired for a wide range of jobs. One of those is the Waste Acceptance Organization (WAO).

All demolition debris and waste must meet the strict requirements of Ohio and U.S. environmental laws before it can be placed into the OSWDF. This set of requirements, the WAC, is a strict and systematic approach for choosing the right types of waste and the right disposal methods to protect the public, environment, and wildlife.

"WAO is a compliance organization within the environmental protection organization tasked with independent oversight of compliance with the waste acceptance criteria implementation plan for wastes dispositioned to the OSWDF," said Bridget Eslinger, waste acceptance manager. "WAO provides oversight during the waste generation and handling process until the waste is disposed of in the OSWDF by the project team."

While a project of this size would seem to be the DOE's main focus at Portsmouth, it is just one of many projects taking place at the site. As crews work through the X-326 building demolition project, work is already underway preparing the next building D&D project, the X-333 building, along with the construction of three more cells at the OSWDF.

"The single reason this project will be successful this year is integration," said Miller. "The caliber of people involved from all organizations across FBP provides me the confidence that the integration will prove true." ☒

This article appears courtesy of Flour-BWXT Portsmouth.

