

EXECUTIVE SUMMARY

PURPOSE

This Annual Site Environmental Report is prepared to summarize environmental monitoring and compliance activities conducted at the U.S. Department of Energy (DOE) Portsmouth Gaseous Diffusion Plant (PORTS) for calendar year 2017. Environmental monitoring is conducted to assess the impact, if any, that site operations may have on public health and the environment. The report fulfills a requirement of DOE Order 231.1B, *Environment, Safety and Health Reporting*, for preparation of an annual summary of environmental data to characterize environmental management performance. The Annual Site Environmental Report also provides the means by which DOE demonstrates compliance with the radiation protection requirements of DOE Order 458.1, *Radiation Protection of the Public and the Environment*.

SITE AND OPERATIONS OVERVIEW

PORTS, which produced enriched uranium via the gaseous diffusion process from 1954 to 2001, is one of three uranium enrichment facilities originally built in the United States; the other two were constructed in Oak Ridge, Tennessee and Paducah, Kentucky, respectively. PORTS is located on 5.9 square miles in Pike County, Ohio. The county has approximately 28,270 residents (U.S. Census Bureau 2018).

DOE is responsible for decontamination and decommissioning (D&D) of the gaseous diffusion process buildings and associated facilities, environmental restoration, waste management, depleted uranium hexafluoride (DUF₆) conversion, and management of other non-leased facilities at PORTS. DOE contractors Fluor-BWXT Portsmouth LLC (FBP), Portsmouth Mission Alliance, LLC (PMA), Mid-America Conversion Services, LLC (MCS), and BWXT Conversion Services, LLC (BWCS) managed DOE programs at PORTS in 2017.

FBP was responsible for the following activities:

- D&D of the former gaseous diffusion process building and associated facilities;
- environmental restoration of contaminated areas;
- monitoring and reporting on environmental compliance;
- disposition of legacy radioactive waste;
- uranium management; and
- operation of the site's waste storage facilities.

PMA was responsible for the following facility support services:

- computer and telecommunications services;
- security;
- training;
- records management;
- fleet management;
- non-nuclear facility preventive and corrective maintenance;
- grounds and road maintenance;
- snow removal; and
- janitorial services.

BWCS was responsible for operations associated with the DUF₆ Conversion Facility through January 2017. On February 1, 2017 MCS assumed responsibility for the DUF₆ Conversion Facility including surveillance and maintenance of DUF₆ cylinders, and environmental compliance and monitoring activities

associated with operation of the DUF₆ Conversion Facility. DUF₆, which is a product of the uranium enrichment process, is stored in cylinders on site. The DUF₆ Conversion Facility converts DUF₆ into uranium oxide and aqueous hydrogen fluoride. The uranium oxide is made available for beneficial reuse, storage, or disposal, and the aqueous hydrogen fluoride is sold for reuse.

Centrus Energy Corp. (Centrus), formerly USEC, Inc., continues to lease facilities at PORTS that were intended for the development of a gaseous centrifuge uranium enrichment facility – the American Centrifuge Plant (ACP). The project has been shut down, and D&D of the demonstration cascade associated with the project began in 2016.

With the exception of Chapter 2, Compliance Summary; Chapter 4, Environmental Radiological Program Information; and Chapter 5, Environmental Non-Radiological Program Information, this report does not cover Centrus operations at PORTS because their operations are not subject to DOE Orders. Centrus data are included in these chapters to provide a more complete picture of the operations in place at PORTS to detect and assess potential impacts to human health and the environment resulting from PORTS activities.

ENVIRONMENTAL MONITORING AND RADIOLOGICAL DOSE SUMMARY

Extensive environmental monitoring is completed at PORTS to comply with environmental regulations, permit requirements, and DOE Orders, and assess the impact, if any, that site operations may have on public health and the environment. The *Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant* (DOE 2017b) describes the DOE environmental monitoring programs at PORTS, with the exception of groundwater monitoring. Groundwater monitoring, which also includes related surface water monitoring and residential water supply monitoring, is described in the *Integrated Groundwater Monitoring Plan for the Portsmouth Gaseous Diffusion Plant* (DOE 2017d).

Environmental monitoring includes the collection of samples of air, water, soil, sediment, and biota (vegetation, deer, fish, crops, milk, and eggs). Samples are collected at varying frequencies (weekly, monthly, quarterly, annually, or biennially). In 2017, environmental monitoring information was collected for the following programs:

- ambient air
- external radiation
- discharges to surface water
- local surface water
- sediment
- soil
- biota (vegetation, deer, fish, crops, milk, and eggs)
- groundwater.

Samples are analyzed for radionuclides, metals, and/or other chemicals that could be present in the environment due to PORTS activities, although many of these analytes also occur naturally or can be present due to human activities not related to PORTS. Over 3000 samples from these programs are collected on an annual basis.

Potential impacts on human health from radionuclides released by PORTS operations are calculated based on environmental monitoring data. This impact, if any, is calculated in terms of a dose. A dose can be caused by radionuclides released into the air and/or water, or radiation emanating directly from buildings or other objects at PORTS. PORTS complies with the following dose limits:

- The U.S. Environmental Protection Agency (U.S. EPA) has established a dose limit of 10 millirem (mrem)/year from radionuclides released to the air in Title 40 of the *Code of Federal Regulations*

(CFR), Part 61, National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart H, National Emission Standards for Emissions of Radionuclides Other Than Radon from DOE Facilities (40 CFR Part 61, Subpart H).

- The DOE has established a dose limit for members of the general public in DOE Order 458.1, which is as low as reasonably achievable¹, but no more than 100 mrem/year for the dose from radionuclides from all potential pathways of exposure including inhalation, ingestion of water and soil/sediments, consumption of food, and direct external radiation.

To aid in comparing sampling results for air and water to the 100 mrem/year dose limit, the 100 mrem/year limit is converted into a derived concentration standard (DOE 2011a). The derived concentration standard is the concentration of a radionuclide in air or water that under conditions of continuous exposure for one year by one exposure mode (ingestion of water or inhalation of air) would result in a dose of 100 mrem. A concentration of 100% of the derived concentration standard would equate to a dose at the DOE limit of 100 mrem/year.

Environmental monitoring data collected in 2017 are consistent with data collected in previous years and indicate that radionuclides, metals, and other chemicals released by PORTS operations have a minimal effect on human health and the environment. The following sections summarize the results of environmental monitoring conducted at PORTS in 2017:

Ambient air. Radionuclides in ambient air are monitored at 15 monitoring stations that are located on site, at the site perimeter, within the local area, and west of PORTS in an area not potentially impacted by PORTS operations (the background location). Samples are analyzed monthly or quarterly for radionuclides that can be associated with PORTS operations. These radionuclides are transuranics (manmade elements greater than atomic number 92 [americium-241, neptunium-237, plutonium-238, plutonium-239/240]), a fission product (technetium-99), uranium, and uranium isotopes (uranium-233/234, uranium-235/236, and uranium-238).

Uranium, uranium isotopes, neptunium-237, and technetium-99 were detected at the ambient air monitoring stations in 2017. The highest levels of each radionuclide in air were 0.08% or less of the DOE derived concentration standards (DOE 2011a). Maximum activities of detected radionuclides were located at stations A41A (Zahns Corner) and A36 (on site near the X-611 Water Treatment Plant) and are listed below (in picocurie per cubic meter [pCi/m³]):

<u>Radionuclide</u>	<u>Maximum activity (pCi/m³)</u>	<u>Location</u>	<u>Derived Concentration Standard (DCS) (DOE 2011a)</u>	<u>Percentage of DCS</u>
Neptunium-237	0.00015	A41A	0.18	0.08%
Technetium-99	0.0077	A36	920	0.0008%
Uranium-233/234	0.00025	A36	1.1	0.02%
Uranium-238	0.00017	A36	1.3	0.01%

¹ “As low as reasonably achievable” is an approach to radiation protection to manage and control releases of radioactive material to the environment, the workforce, and members of the public so that levels are as low as reasonable, taking into account societal, environmental, technical, economic, and public policy considerations. As low as reasonably achievable is not a specific release or dose limit, but a process that has the goal of optimizing control and managing release of radioactive material to the environment and doses so they are as far below the applicable limits as reasonably achievable. This approach optimizes radiation protection.

The ambient air monitoring data were used to calculate the potential worst case dose from the air pathway to a hypothetical person living at the monitoring station. This approach is unlikely to underestimate the dose because it assumes an individual resides at the location of the monitoring station breathing the air at that location for 24 hours/day, 365 days/year. The highest net dose calculation for the ambient air stations (0.00046 mrem/year) was at station A36, which is on site near the X-611 Water Treatment Plant. This net dose was calculated by subtracting the dose at the background station from the dose at the monitoring stations closer to PORTS. This hypothetical dose is well below the 10 mrem/year limit applicable to PORTS in NESHAP (40 CFR Part 61, Subpart H).

Fluoride is also monitored at 15 ambient air monitoring stations in and around PORTS. In 2017, fluoride was not detected in 88 percent of the samples collected for the ambient air monitoring program. If fluoride is not detected in a sample, the ambient concentration of fluoride is calculated assuming that fluoride is present at the detection limit. The average ambient concentration of fluoride measured in samples collected at the background station was 0.016 microgram per cubic meter ($\mu\text{g}/\text{m}^3$). Average ambient concentrations of fluoride measured at the stations around PORTS ranged from 0.0076 $\mu\text{g}/\text{m}^3$ at station A15 (east-southeast of PORTS on Loop Road) to 0.021 $\mu\text{g}/\text{m}^3$ at station A12 (east of PORTS on McCorkle Road). There is no standard for fluoride in ambient air. The data indicate that ambient concentrations of fluoride at off-site and background locations are not appreciably different from concentrations at PORTS.

Discharges to surface water. Discharges of chemicals and other parameters that measure water quality are regulated by the National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act. Water from PORTS is discharged to off-site water bodies through 11 locations called NPDES outfalls. The Ohio Environmental Protection Agency (Ohio EPA) selects the chemicals monitored at the outfalls based on the chemical characteristics of the water discharged from the outfall. Outfalls are also monitored for radionuclides. Sampling frequencies vary from weekly to quarterly.

Transuranic radionuclides were not detected in any of the samples collected from FBP NPDES external outfalls in 2017. Plutonium-239/240 was detected at 0.036 picocurie per liter (pCi/L) in one sample collected from Centrus NPDES Outfall 013. Uranium discharges from the FBP and Centrus external outfalls were estimated at 7.1 kilograms (kg). Total radioactivity (technetium-99 and isotopic uranium) released from the FBP outfalls was estimated at 0.030 curie (Ci).

Water from the NPDES outfalls is discharged to or eventually flows to the Scioto River. Data for radionuclide discharges is used to calculate a potential worst case dose to a hypothetical member of the public who is exposed to water from the Scioto River. Exposure pathways considered were ingestion of water, ingestion of fish, swimming, boating, and shoreline activities. This exposure scenario is unlikely to underestimate the dose because the Scioto River is not used for drinking water downstream of PORTS (97% of the hypothetical dose from liquid effluents is from drinking water). The dose from radionuclides released to the Scioto River in 2017 (0.0012 mrem) is significantly less than the 100 mrem/year DOE limit in DOE Order 458.1 for all radiological releases from a facility.

Discharges of chemicals and other non-radiological parameters that affect water quality are regulated by Ohio EPA in NPDES permits issued to FBP, MCS, and Centrus. In 2017, the overall FBP NPDES compliance rate with the NPDES permit was 99%. Discharge limitations at the FBP NPDES monitoring locations were exceeded on 11 occasions.

Four exceedances of a preliminary effluent limit were due to concentrations of mercury in holding pond discharges. In May through August of 2017, the average monthly concentration preliminary effluent limit for mercury was exceeded at Outfall 001 (the X-230J7 East Holding Pond). The outfall was in compliance with the preliminary effluent limit in the other eight months of 2017. The average monthly

concentration preliminary effluent limit is 12 nanograms/liter (ng/L). Average monthly concentrations at Outfall 001 ranged from 16.75 to 23.8 ng/L. FBP has initiated an investigation to identify the source of the mercury detected at Outfall 001 so that corrective measures can be implemented. The drinking water standard for mercury is 2 µg/L (2000 ng/L). The preliminary effluent limit for mercury (12 ng/L) is lower than the drinking water standard (2000 ng/L) to minimize the accumulation of mercury in biota, such as fish and birds.

Three exceedances were due to concentrations of copper at Outfall 004 in September and October of 2017. The exceedances appeared to be due to insufficient amounts of an additive used to control copper corrosion in the recirculating cooling water system during periods of biocide treatment applications. Two exceedances were due to pH measurements that were less than minimum allowable level due to temporary operational issues at Outfalls 002 and 004 that were immediately corrected. Two additional discharge limitations (E. coli and carbonaceous biochemical oxygen demand) were exceeded at Outfall 003 (X-6619 Sewage Treatment Plant) during 2017. These exceedances were corrected within 24 hours.

Ohio EPA did not issue a Notice of Violation for any of these exceedances. The overall Centrus and MCS compliance rates were 100%.

External radiation. External radiation is measured continuously with thermoluminescent dosimeters (TLDs) at five locations near the DUF₆ cylinder storage yards and 19 on-site and off-site locations (12 of the ambient air monitoring stations and seven additional on-site locations). TLDs are placed at the monitoring locations at the beginning of each quarter, remain at the monitoring location throughout the quarter, and are removed from the monitoring location at the end of the quarter and sent to the laboratory for processing. A new TLD replaces the removed device. Radiation is measured as a whole body dose (in mrem), which is the dose that a person would receive if they were continuously present at the monitored location.

The external radiation measured for the PORTS environmental monitoring program includes both external background radiation and radiation emanating PORTS activities such as storage of DUF₆ cylinders. Data from radiation monitoring at the cylinder yards are used to assess potential exposure to a representative on-site member of the public that drives on Perimeter Road. The radiological exposure to an on-site member of the general public is estimated as the time that a person drives on Perimeter Road past the cylinder yards, which is estimated at 8.7 hours per year (1 minute per trip, 2 trips per day, 5 work-days per week, and 52 weeks per year). In 2017, the average annual dose (8736 hours) recorded at the cylinder yards near Perimeter Road was 739 mrem/year. Based on these assumptions, exposure to an on-site member of the public from radiation from the cylinder yards is approximately 0.74 mrem/year.

A person living in the United States receives an average dose of approximately 311 mrem/year from natural sources of radiation (National Council on Radiation Protection [NCRP] 2009). The potential estimated dose from external radiation to a member of the public (0.74 mrem/year to a member of the public allowed to drive on Perimeter Road past the cylinder yards) is approximately 0.2% of the average yearly natural radiation exposure for a person in the United States and is significantly less than the 100 mrem/year limit to a member of the public in DOE Order 458.1 for all radiological releases from a facility.

Local surface water. Samples of surface water are collected semiannually from three on-site and eleven off-site locations upstream and downstream from PORTS at locations on the Scioto River, Little Beaver Creek, Big Beaver Creek, and Big Run Creek and background locations on local streams approximately 10 miles north, south, east, and west of PORTS. Samples are analyzed for radionuclides.

Maximum detections of technetium-99 and uranium isotopes in local surface water samples were located at off-site sampling locations RW-13 (Big Beaver Creek) and RW-7 (Little Beaver Creek) and are listed below:

<u>Radionuclide</u>	<u>Maximum activity (pCi/L)</u>	<u>Location</u>	<u>Derived Concentration Standard (DCS) (DOE 2011a)</u>	<u>Percentage of DCS</u>
Technetium-99	9.12	RW-13	44,000	0.02%
Uranium-233/234	4.72	RW-7	680	0.7%
Uranium-235/236	0.214	RW-7	720	0.03%
Uranium-238	1.02	RW-7	750	0.1%

These detected concentrations of radionuclides were 0.7% or less of the DOE derived concentration standards (DOE 2011a). This derived concentration standard is based upon direct use of the surface water as drinking water. This comparison is unlikely to underestimate the dose because surface water around PORTS is not used for drinking water.

Sediment. Samples of sediment are collected annually at 18 monitoring locations, which include the 14 locations sampled for the local surface water monitoring program (Scioto River, Little Beaver Creek, Big Beaver Creek, Big Run Creek, and background locations on local streams), three on-site NPDES outfalls on the east and west sides of PORTS, and an upstream monitoring location on Big Beaver Creek. Samples are analyzed for radionuclides, metals, and polychlorinated biphenyls (PCBs).

Neptunium-237 was detected at 0.00975 picocurie per gram (pCi/g) at Big Beaver Creek sampling location RM-13. Plutonium-239/240 was detected at 0.00961 pCi/g at the southern background monitoring location (RM-10S). Technetium-99 was detected in sediment samples collected from Big Beaver Creek at RM-13, Big Run Creek at RM-3, on-site near NPDES Outfall 001 (RM-11), and downstream locations on Little Beaver Creek (RM-7 and RM-8). The highest detection of technetium-99 (3.62 pCi/g) was at on-site location RM-11 (Little Beaver Creek at the X-230J7 East Holding Pond [NPDES Outfall 001]).

Uranium and uranium isotopes were also detected at each of the sediment sampling locations, including upstream and background sampling locations. Maximum detections of uranium and uranium isotopes in sediment samples were detected at on-site sampling locations RM-11 (Little Beaver Creek) and RM-3 (Big Run Creek) as follows.

Uranium: 4.57 micrograms per gram ($\mu\text{g/g}$) (RM-3 – duplicate sample)
 Uranium-233/234: 6.88 pCi/g (RM-11)
 Uranium-235/236: 0.291 pCi/g (RM-11)
 Uranium-238: 1.52 pCi/g (RM-3 – duplicate sample).

A dose assessment was completed based on the detections of radionuclides in sediment at the off-site sediment sampling location with the detections of radionuclides that could cause the highest dose to a member of the public (RM-7 on Little Beaver Creek). Detections of technetium-99 (3.42 pCi/g), uranium-233/234 (2.55 pCi/g), uranium-235/236 (0.128 pCi/g), and uranium-238 (0.774 pCi/g) result in a calculated dose of 0.019 mrem/year, which is well below the DOE standard of 100 mrem/year in DOE Order 458.1.

PCBs were detected in sediment samples collected from Little Beaver Creek (RM-7, RM-8, and RM-11), Big Beaver Creek (RM-13), Big Run Creek (RM-2 and RM-3), and the Scioto River (RM-1A). The highest detection of PCBs (208 micrograms per kilogram [$\mu\text{g/kg}$]) was on site in Little Beaver Creek at

the discharge from the X-230J7 Holding Pond (RM-11). None of the detections of PCBs in sediment around PORTS were above the risk-based regional screening level developed by U.S. EPA and utilized by Ohio EPA of 240 µg/kg or parts per billion (ppb) (U.S. EPA 2017).

The results of metals sampling conducted in 2017 indicate that no appreciable differences are evident in the concentrations of metals present in sediment samples taken upstream from PORTS, at background sampling locations, and downstream from PORTS.

Soil. Soil samples are collected annually at 15 locations that are co-located with the ambient air monitoring stations (on-site, fence line, off-site and background locations) and analyzed for radionuclides.

Plutonium-239/240 was detected in soil at six of the 15 ambient air monitoring stations including the background monitoring station (A37). These detections were most likely present due to atmospheric fallout from nuclear weapons testing. The detections were 0.0152 pCi/g or less, which is much less than the soil screening level for plutonium-239/240 – 3.78 pCi/g. These screening levels were calculated using the exposure assumptions in the *Methods for Conducting Human Health Risk Assessments and Risk Evaluations at the Portsmouth Gaseous Diffusion Plant* (DOE 2017e).

Uranium, uranium-233/234, uranium-235/236, and/or uranium-238 were detected in soil at each of the sampling locations. Uranium and uranium isotopes are usually detected at similar levels at all the soil sampling locations, including the background location (A37), which suggests that the uranium detected in these samples is due to naturally-occurring uranium.

A dose assessment was completed based on the detections of radionuclides in soil at the off-site ambient air station with the concentrations of radionuclides that could cause the highest dose to a member of the public (station A12, east of PORTS on McCorkle Road). Detections of uranium-233/234 (0.513 pCi/g), uranium-235/236 (0.0285 pCi/g), and uranium-238 (0.435 pCi/g) result in a calculated dose of 0.018 mrem/year, which is well below the DOE limit of 100 mrem/year in DOE Order 458.1.

Biota (vegetation, deer, fish, crops, milk, and eggs). Vegetation samples are collected annually at 15 locations that are co-located with the ambient air monitoring stations (on-site, fence line, off-site and background locations). Deer samples are collected annually or as available from deer killed on site in motor vehicle collisions. Fish are collected annually from on-site and off-site streams (Little Beaver Creek, Big Beaver Creek and the Scioto River, as available). Crops, milk, and eggs are collected annually (as available) from the local community. All samples are analyzed for radionuclides. Fish are also analyzed for PCBs.

Radionuclides were not detected in samples of deer (muscle), fish, crops, milk, and eggs collected in 2017.

Uranium, uranium-233/234, and/or uranium-238 were detected in two of the vegetation samples collected in 2017. The dose calculation for vegetation is based on the following detections of radionuclides in vegetation (primarily grass) and soil at ambient air monitoring station A12 (east of PORTS on McCorkle Road):

Vegetation

• uranium-233/234: 0.0363 pCi/g uranium-238: 0.0265 pCi/g

Soil

• uranium-233/234: 0.513 pCi/g uranium-235/236: 0.0285 pCi/g
• uranium-238: 0.435 pCi/g.

The dose assessment for a member of the public based on consumption of beef cattle that would eat grass (and soil) contaminated with these radionuclides calculated a dose of 0.00078 mrem/year, which is well below the DOE Order 458.1 limit of 100 mrem/year.

PCBs were detected in the fish samples collected from Little Beaver Creek at 241 and 290 µg/kg. PCBs were also detected in upstream and downstream Big Beaver Creek fish samples at 22 to 30.6 µg/kg. PCBs were detected in catfish collected from upstream and downstream Scioto River sampling locations at 18.5 and 20.2 µg/kg, respectively. These detections were compared to the Ohio Fish Consumption Advisory Chemical Limits provided in the *State of Ohio Cooperative Fish Tissue Monitoring Program Sport Fish Tissue Consumption Advisory Program* (Ohio EPA 2010). These limits are set for the following consumption rates: unrestricted, 1/week, 1/month, 6/year, and do not eat. The concentrations of PCBs detected in the fish caught on site in Little Beaver Creek (RW-8) are above the 1/week maximum limit (220 µg/kg) and below the 1/month maximum limit (1000 µg/kg). The concentrations of PCBs detected in fish collected from Big Beaver Creek and the Scioto River (18.5 to 30.6 µg/kg) are less than the unrestricted limit (50 µg/kg). The Ohio Department of Health advises that everyone limit consumption of sport fish caught from all waterbodies in Ohio to one meal per week, unless there is a more or less restrictive advisory (Ohio EPA 2018).

Groundwater. Groundwater contamination at PORTS is contained on site. More than 300 wells are sampled at varying frequencies to monitor corrective actions, movement of groundwater contaminants, and groundwater quality. Samples are analyzed for volatile organic compounds (VOCs), radionuclides, metals, and other parameters, specific to the contaminants present at the monitoring area. In general, concentrations of contaminants detected within the groundwater plumes at PORTS were stable or decreasing in 2017. No VOCs were detected in any of the seven off-site monitoring wells that monitor the X-749/X-120 groundwater plume near the southern boundary of PORTS. Residential water supplies near PORTS were monitored to verify that site contaminants have not migrated into off-site drinking water wells. Results of this program indicate that PORTS has not affected drinking water wells outside the site boundaries.

Dose. To demonstrate compliance with DOE Order 458.1, this Annual Site Environmental Report includes radiological dose calculations for the dose to the public from radionuclides released to the environment based on environmental monitoring data collected by DOE contractors and Centrus (discussed in the previous paragraphs). Figure 1 provides a comparison of the doses from various common radiation sources.

The maximum dose that a member of the public could receive from radiation released by PORTS in 2017 is 0.90 mrem. This maximum dose assumes that the same individual, or representative person, routinely drives on Perimeter Road past the cylinder yards, and lives in the immediate vicinity of PORTS.

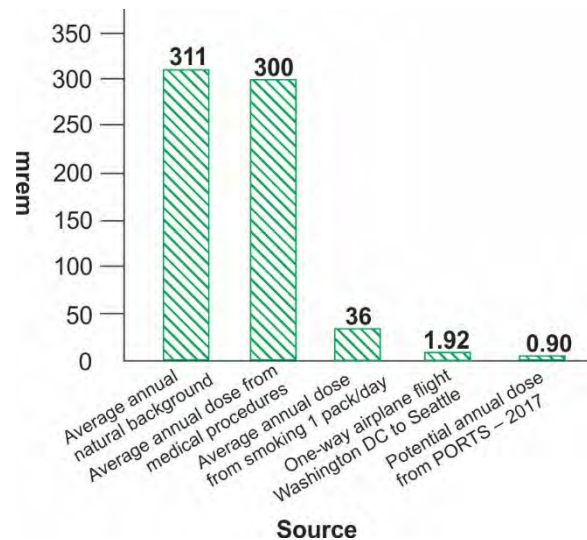


Figure 1. Comparison of dose from various common radiation sources.

The representative person is assumed to be exposed to the maximum dose calculated from each pathway. The dose is based on:

- 0.0012 mrem from radionuclides released to the Scioto River,
- 0.74 mrem from external radiation near the cylinder yards on the northwest portion of Perimeter Road (the dose to a person who works at the Ohio Valley Electric Corporation in 2017 was lower [0.22 mrem]),
- 0.038 mrem based on exposure to radionuclides detected at off-site monitoring locations in 2017 (sediment [0.019 mrem], soil [0.018 mrem], and biota [0.00078 mrem]), and
- 0.12 mrem from radionuclides released to the air (the dose calculated by the U.S. EPA model required to demonstrate compliance with the NESHAP 10 mrem/year standard [40 CFR Part 61 Subpart H]).

This dose (0.90 mrem) is significantly less than the 100 mrem/year limit set in DOE Order 458.1 for the dose to a member of the public from radionuclides from all potential pathways. The dose to a member of the public from airborne radionuclides released by PORTS (0.12 mrem) is also significantly less than the 10 mrem/year standard set by U.S. EPA in NESHAP (40 CFR Part 61 Subpart H). A person living in the United States receives an average dose of approximately 311 mrem/year from natural sources of radiation (NCRP 2009).

ENVIRONMENTAL COMPLIANCE

DOE and/or the responsible DOE contractor (FBP or MCS) have been issued permits for discharge of water to surface streams, air emission permits, and a permit for the storage of hazardous waste.

FBP and MCS are responsible for preparing a number of reports for compliance with environmental regulations. These reports may include all or a subset of the following reports (for MCS): an annual groundwater monitoring report; a biennial hazardous waste report; an annual PCB document log; an annual summary of radionuclide air emissions and the associated dose to the public from these emissions; annual or biennial reports of specified non-radiological air emissions; a monthly report of NPDES monitoring data; an annual hazardous chemical inventory; and an annual toxic chemical release inventory.

Centrus is responsible for compliance activities directly associated with the ACP including NPDES outfalls, and management of wastes generated by their current operations.

FBP received a Notice of Violation from Ohio EPA in 2018 related to the operation of PORTS drinking water system in 2017. The Notice of Violation was due to a failure to collect required water samples for *E. coli* from the PORTS drinking water system in October and November of 2017. Notices of this violation were posted throughout the plant as required by Ohio EPA. FBP has implemented procedures to track required sampling so that samples are not missed. No further actions were required.

ENVIRONMENTAL PROGRAMS

D&D, Environmental Restoration, Waste Management, and Public Awareness Programs are conducted at PORTS to protect and inform the local population, improve the quality of the environment, and comply with federal and state regulations.

D&D Program

D&D of the PORTS gaseous diffusion process buildings and associated facilities is proceeding in accordance with *The April 13, 2010 Director's Final Findings and Orders for Removal Action and Remedial Investigation and Feasibility Study and Remedial Design and Remedial Action (which includes*

the July 16, 2012 Modification thereto) (D&D DFF&O) (Ohio EPA 2012). The D&D DFF&O is a legal agreement between Ohio EPA and DOE that governs the process for D&D of the buildings/structures that are no longer in use at PORTS.

Ohio EPA concurred with the records of decision for the process buildings and waste disposition in 2015. The record of decision for the process buildings and other facilities selected controlled removal of stored waste and materials, demolition of the buildings or structures, and characterization of materials for disposal or disposition (DOE 2015c). The record of decision for waste disposition selected a combination of on-site and off-site disposal (DOE 2015d), which includes construction of an on-site waste disposal facility (OSWDF).

Implementation of the selected remedial actions began after completion of the records of decision. Activities underway in 2017 in the process buildings included disassembly and removal of equipment, removal of wastes including asbestos, PCBs, and hazardous waste, and deactivation of utilities and other systems. Initial site construction activities for the OSWDF included tree clearing, fencing, and utility installation, as well as construction of erosion and sediment controls, retention ponds for surface water runoff, and installation of office trailers.

Environmental Restoration Program

The Environmental Restoration Program was established by DOE in 1989 to identify, control, and remediate environmental contamination at PORTS. The initial assessment and investigation of PORTS under the Resource Conservation and Recovery Act (RCRA) corrective action process was completed in the 1990s. Corrective actions, also called remedial actions, are underway in each quadrant. The Environmental Restoration Program monitors and maintains five closed landfills in accordance with Ohio EPA regulations and operates four groundwater treatment facilities to treat contaminated groundwater from the on-site groundwater plumes that are contaminated with industrial solvents, including trichloroethene (TCE).

With the beginning of D&D, investigation of areas known as “deferred units” is beginning to occur. Deferred units are areas that were in or adjacent to the gaseous diffusion production and operational areas such that remedial activities would have interrupted operations, or were areas that could have become recontaminated from ongoing operations. Ohio EPA deferred investigation/remedial action of soil and groundwater associated with these units until D&D of PORTS (or until the area no longer met the requirements for deferred unit status). Chemical and/or radionuclide contaminants present in the deferred units were contained on site and were not a threat to the public. Ongoing environmental monitoring and on-site worker health and safety programs monitor the contaminants in these areas prior to D&D.

The *Deferred Units RCRA Facility Investigation/Corrective Measures Study Work Plan* was approved by Ohio EPA in 2015 (DOE 2015a). Soil and groundwater sampling in the work plan started in 2015 and was completed in 2016. The *Deferred Units RCRA Facility Investigation/Corrective Measures Study Report* (DOE 2017a) was submitted to Ohio EPA on September 27, 2017. Ohio EPA was reviewing the report at the end of 2017 and submitted draft comments to DOE in 2018.

Waste Management Program

The DOE Waste Management Program at PORTS directs the safe storage, treatment, and disposal of waste generated from D&D of facilities that are no longer in use, past plant operations, ongoing plant maintenance, and ongoing environmental restoration projects. In 2017, FBP shipped approximately 2218 tons of waste or other materials to off-site facilities for treatment, disposal, recycling, or reuse.

With the beginning of D&D at PORTS, DOE is placing increased emphasis on the evaluation of materials generated by D&D for reuse or recycling. An agreement between DOE and the Southern Ohio

Diversification Initiative (SODI) allows DOE to transfer excess equipment, clean scrap materials, and other assets to SODI. SODI first attempts to reuse the excess equipment and property within the local community. Pursuant to the agreement, if SODI is unable to place the property for reuse in the local community, SODI may sell the property. When SODI sells the property, the proceeds are used to support economic development in the southern Ohio region. In 2017, SODI received approximately 596 tons of materials from PORTS, primarily recyclable metals, recyclable oil, and reusable equipment.

Public Awareness Program

DOE provides a public Environmental Information Center to allow access to all documents used to make decisions on remedial actions being taken at PORTS. The information center is located just north of PORTS at the Ohio State University Endeavor Center (Room 207), 1862 Shyville Road, Piketon, Ohio 45661. The Information Center is open 9 a.m. to noon Monday and Tuesday, noon to 4 p.m. Wednesday and Thursday, or by appointment (call 740-289-8898). The email address is portseic@ports.pppo.gov and web site is energy.gov/pppo/portsmouth-environmental-information-center. The Environmental Information Center Online Document Repository is eic.ports.pppo.gov.

Additional information is provided by the DOE Site Office (740-897-5010) and the FBP Office of Public Affairs (740-897-2964). This Annual Site Environmental Report and other information can also be obtained from the DOE web site for PORTS at energy.gov/pppo or the FBP web site at fbportsmouth.com. PORTS Environmental Geographic Analytical Spatial Information System (PEGASIS) is designed to provide a dynamic mapping and environmental monitoring data display. The web site is <https://gisviewer.fbports.com/default.aspx>.

Public update meetings and public workshops on specific topics are also held to keep the public informed and to receive their comments and questions. Periodically, fact sheets about major projects are written for the public. Additionally, notices of document availability and public comment periods, as well as other communications on the program, are regularly distributed to the local newspaper and those on the community relations mailing list, neighbors within 2 miles of the plant, and plant employees.

The PORTS Site Specific Advisory Board, comprised of citizens from the local area, provides public input and recommendations to DOE on environmental remediation, waste management, and related issues at PORTS. Regularly scheduled meetings that are open to the public are held between DOE and the PORTS Site Specific Advisory Board. Additional information about the board can be obtained at energy.gov/pppo/ports-ssab or by calling 740-289-5249.

The PORTS Envoy Program matches employee volunteers with community stakeholders such as families living next to DOE property, community groups, and local government organizations. The envoys communicate information about PORTS D&D and other site issues to the stakeholders and are available to answer stakeholder questions about PORTS.

An educational outreach program facilitated by a DOE grant administered by Ohio University includes a project in which local high school students produce a summary of the Annual Site Environmental Report for distribution to the public. The DOE Portsmouth/Paducah Project Office web site at energy.gov/pppo provides additional information about this project.

DOE has worked with the State Historic Preservation Office, Advisory Council on Historic Preservation, Tribal Nations, and individual members of the public interested in historic preservation to determine how best to document the history associated with the gaseous diffusion process buildings and other areas that are part of D&D. The PORTS Virtual Museum (portsvirtualmuseum.org) preserves photos, video, oral histories, and other information associated with operation, remediation, and D&D of PORTS.