

*Summary of the U.S. Department
of Energy Portsmouth Annual Site
Environmental Report (ASER) for 2019*



Message from the U.S. Department of Energy

The U.S. Department of Energy (DOE) conducts environmental monitoring at the Portsmouth Gaseous Diffusion Plant Site (PORTS) on an ongoing basis. Each year, the information collected is presented in a data volume and a comprehensive publication entitled the Annual Site Environmental Report (ASER). This year, students at Western High School (WHS), located in Pike County, Ohio, reviewed the most recent ASER, participated in educational outreach efforts to learn about PORTS, and then helped to develop this summary report. Both the ASER and this summary report are important as they allow DOE to clearly and concisely explain our environmental monitoring programs to our many stakeholders. The information presented in this summary shows that the PORTS site near Piketon, Ohio, is operated in an environmentally safe manner. The work at DOE facilities is highly detailed and technically complex, but DOE is committed to performing each of these activities safely. DOE's first priority is to protect the well-being of our workers, the surrounding communities and the environment. DOE would like to offer its sincerest appreciation to the students and faculty leader at WHS who worked on this summary document. DOE congratulates each of you for your effort, enthusiasm, and willingness to support this project.

DOE hopes you enjoy reading the *PORTS 2019 Annual Site Environmental Report Summary*.

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Western High School Student Recognition 2021-2022

The students of Mr. Andrew Delotell's class at Western High School worked in collaboration with Ohio University's Voinovich School of Leadership and Public Service to produce this ASER Summary report. The Voinovich School thanks the students for their hard work. Their effort in this public service is much appreciated and worthy of special recognition. The 10 high school students who participated in the preparation of this ASER Summary report are listed below.

Lily Chandler
Ethan Gedeon

Jagger Grooms
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Piper Martin
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Photo Credit: Charles R. Love, Public Relations Specialist, Enterprise Technical Assistance Services, Inc. (ETAS), Contractor to the U.S. Department of Energy

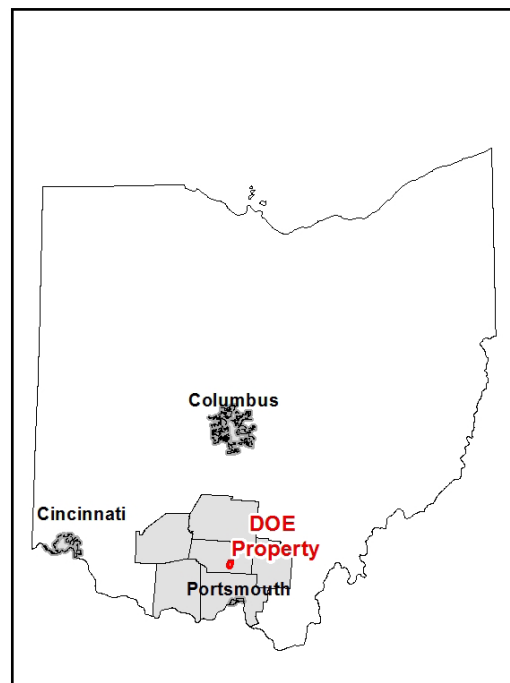
Plant Site History

In 1952, the United States Atomic Energy Commission (AEC) expanded the nation's atomic energy program due to needs and demands of the Cold War. As a part of the expansion a new, roughly \$2 billion, gaseous diffusion plant was constructed to increase the production capacity of uranium-235 (U-235). A 5.8 square mile site was chosen for The Portsmouth Gaseous Diffusion Plant (PORTS) in Pike County Ohio, near the towns of Piketon, Beaver, and Waverly. Located ~2 miles west of the Scioto River, this site allowed easy access to a water source to meet the needs of the plant, as well as a sufficient labor force from the nearby towns.

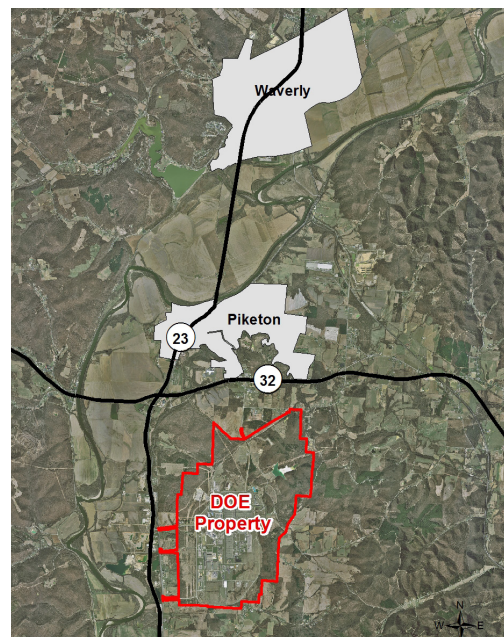
Construction of the plant began on November 18, 1952 and included a total of 25 miles of road, 22 miles of railroad track, 500,000 cubic yards of concrete, approximately 100,000 tons of structural steel, 600 miles of piping, and 1,000 miles of copper tubing. A water pumping station with a capacity of 40 million gallons/day was built to supply the plant with water to dissipate the large amounts of heat produced during the gaseous diffusion process. Power for the plant was generated by the Ohio Valley Electric Corporation (OVEC) and required the largest oil circuit breakers ever used in the United States. Construction of the site took four years but finished six months ahead of schedule and was completed nearly fifty million dollars under budget. The facility was fully operational by 1956.

The PORTS plant enriched uranium for nuclear defense operations during the Cold War. The PORTS plant produced very highly enriched (VHE) uranium with an assay of 97.65% U-235.

In the 1960s, production of VHE uranium ceased and the plant transitioned to enriching uranium at a lower assay for use in nuclear reactors, powering ships, submarines, and commercial use. By the 1990s, the PORTS plant was producing low-enriched uranium for use primarily in nuclear power plants both domestically and abroad. In 2001, the PORTS plant entered "Cold-Standby" status where operations could be resumed in 18-24 months if needed. In 2006, the plant transitioned to "Cold Shutdown" status and began preparations of decontamination and decommission. Decommissioning efforts are currently ongoing at the site as of this writing.



Map: Matt Trainer, Voinovich School of Leadership and Public Service



Map: Matt Trainer, Voinovich School of Leadership and Public Service

Today, environmental monitoring is conducted at PORTS to assess the impact, if any, that site activities may have on public health and the environment. Each year, an Annual Site Environmental Report (ASER) is prepared to summarize environmental monitoring and compliance activities conducted at the site. An important facet of the ASER is transparency with the community about site activities. The report fulfills a requirement of DOE Order 231.1B, Environment, Safety and Health Reporting, for characterizing environmental management performance. The ASER demonstrates compliance with the radiation protection requirements of DOE Order 458.1, Radiation Protection of the Public and the Environment.

“If the community has the opportunity to read a report like ASER, I’m hoping the facts and extensive radiological testing will put them at ease”

- Piper Martin, WHS Student



A PORTS employee is calibrating an air monitoring station

References

- *Portsmouth Gaseous Diffusion Plant Virtual Museum*, Fluor-BWXT Portsmouth for DOE, 24 May 2022, retrieved from <https://www.portsvirtualmuseum.org/>
- DOE 2020. U.S. Department of Energy Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report-2019, Piketon, Ohio, DOE/PPPO/03-0989&D1, U.S. Department of Energy, Piketon, OH, December.

Public Engagement

In order to foster credibility and openness between PORTS officials and local community members, elected officials, business, media, and the public at-large a comprehensive Public Engagement and Community Relations Program was created. The public are given opportunities to become involved in decisions that affect the PORTS site. The PORTS version of the PPPO Environmental Geographic Analytical Spatial Information System (PEGASIS) allows the user to obtain PORTS off-site environmental monitoring data and display it on a local map that shows the locations the data were collected to keep the public informed.

Eight local area citizens comprise the PORTS Site Specific Advisory Board (SSAB). They provide recommendations and public input to DOE and regularly administer scheduled meetings between DOE and the PORTS SSAB that are open to the public. To further enable the public to be involved there is also a website to visit and a phone number to call with any questions or concerns. Details can be found at <https://www.energy.gov/pppo/ports-ssab/portsmouth-site-specific-advisory-board>

Regular public meetings and public workshops on specific topics are also held to keep the public informed and to provide additional opportunities for comments and questions. Notices of document availability and public comment periods, as well as other communications on specific programming, are regularly distributed to local newspapers and to a community relations mailing list, neighbors within 2 miles of the plant, and plant employees. The PORTS Envoy Program is yet another way the public can be engaged with the site. This program will match employee volunteers with people living next to the DOE property, local government organizations and community groups, allowing them to communicate information about site activities and issues to stakeholders.

“It is important that as many people from the community as possible be involved in PORTS site activities as a way to bridge a connection between the PORTS site and the general public. This connection allows transparency and could build trusts between the two entities”

*- Scotti Jordan, Lily Chandler,
Tessa Risner, WHS Students*

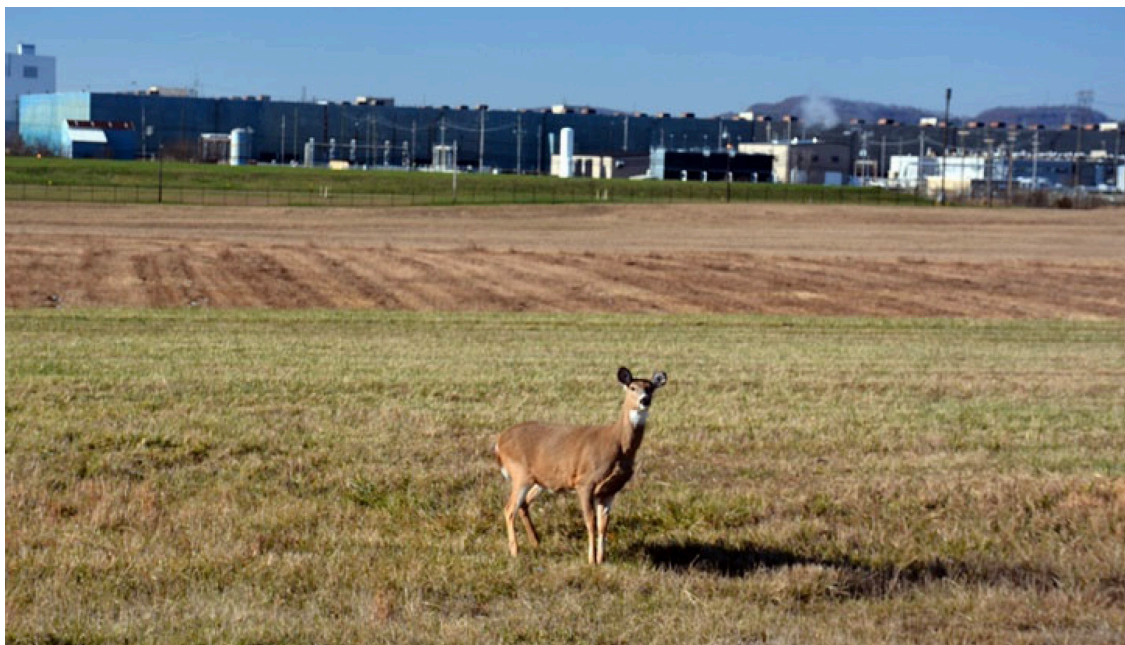
A public Environmental Information Center is also maintained by DOE to provide public access to documents used to inform decisions on environmental remediation actions being taken at PORTS. The Information Center is located just north of the site at the Ohio State University Endeavor Center (Room 207), 1862 Shyville Road, Piketon, Ohio 45661, and additional information is available to the public at <https://www.energy.gov/pppo/portsmouth-environmental-information-center>. There is also an online document repository associated with the Environmental Information Center which is available at <https://eic.ports.pppo.gov/>. Other information, including the Annual Site Environmental Report, is available to the public on the DOE PPPO web site at <https://www.energy.gov/pppo/portsmouthpaducah-project-office> or the Fluor-BWXT Portsmouth web site at <https://www.fbportsmouth.com/>

This document was produced as part of an educational outreach program sponsored by a DOE grant administered by Ohio University in which local high school students learn about PORTS and develop their own summary of the ASER for distribution to the public. This project includes classroom experiments, guest presentations, demonstrations, and field trips.

The DOE PPPO web site at <https://www.energy.gov/pppo/portsmouthpaducah-project-office> provides additional information about this outreach project.

References

- DOE 2020. U.S. Department of Energy Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report-2019, Piketon, Ohio, DOE/PPPO/03-0932&D1, U.S. Department of Energy, Piketon, OH, December.
- Portsmouth Site Specific Advisory Board, DOE, 24 May 2022, retrieved from <https://www.energy.gov/pppo/ports-ssab/portsmouth-site-specific-advisory-board>
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- Portsmouth Environmental Information Center Online Repository, DOE, 24 May 2022, retrieved from <https://eic.ports.pppo.gov/>
- Portsmouth/Paducah Project Office, DOE, 24 May 2022, retrieved from <https://www.energy.gov/pppo/portsmouthpaducah-project-office>
- Fluor-BWXT Portsmouth LLC, 24 May 2022, retrieved from <https://www.fbportsmouth.com/>



Wildlife near the Plant's security fence facing west towards the former X-326 Process Building

Environmental Sustainability

DOE is committed to efforts to reduce potential environmental risks, costs, wastes, and future liability at PORTS by integrating environmental sustainability principals into its activities. The DOE creates balanced and holistic goals in its Environmental Sustainability Program, taking into account the challenges around planning, budgeting, measuring, and improving PORTS overall performance. This program includes efforts to pollution mitigation, waste minimization, affirmative procurement, sustainable design, and energy and water efficiency. The broad sustainability objectives of DOE programs and operations at PORTS include:

- eliminating, minimizing, or recycling wastes that would otherwise require storage, treatment, disposal, or long-term monitoring and surveillance
- minimizing the use of toxic chemicals and associated environmental releases that would otherwise require control, treatment, monitoring, and reporting
- maximizing the use (procurement) of recycled-content materials and environmentally preferable products and services, thereby minimizing the economic and environmental impacts of managing
- reducing the life-cycle cost of managing property at PORTS
- working toward releasing facility property for beneficial land reuse to reduce the environmental footprint while fostering re-industrialization and revitalization for the region

“The DOE has developed and found a well-defined strategy for setting, updating, and successfully achieving the goals and targets, in conjunction with DOE pollution prevention goals”

*- Cheyenne Seymour,
WHS Student*

DOE has continued energy reduction programs at PORTS that are focused on greenhouse gas emission reductions and environmental sustainability metrics such as energy and water efficiency, waste and pollution prevention, and electronics stewardship. The following accomplishments are of note in 2019:

- a decrease of 76.2% in greenhouse gas emissions versus the 2008 baseline emissions
- a decrease in water consumption of 24% versus 2018
- approximately 61.4% of nonhazardous waste was recycled
- approximately 38.7% of construction and demolition materials were recycled

The Annual Site Environmental Report (ASER) provides important information needed by site managers and DOE Headquarters to assess field environmental program performance, site-wide environmental monitoring and surveillance effectiveness, and confirm compliance with environmental standards and requirements. ASERs are also important for communicating DOE’s environmental protection performance to stakeholders and members of the public living near or around a DOE site. By participating in the ASER summary outreach program, students have gained increased awareness of the various environmental sustainability efforts at PORTS.

References

- DOE 2020. U.S. Department of Energy Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report-2019, Piketon, Ohio, DOE/PPPO/03-0932&D1, U.S. Department of Energy, Piketon, OH, December.
- DOE 2019. Fiscal Year 2020 Site Sustainability Plan for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio, DOE/PPPO/03-0967&D1, U.S. Department of Energy, Piketon, OH, December



Rainbow at Portsmouth

Non-Radiological Program

Non-radiological Environmental Monitoring Program at PORTS refers to monitoring of non-radiological parameters including air, water, sediment, and fish. The monitoring of parameters is required by state and federal regulations and/or permits but is also performed in an effort to maintain transparency and alleviate public concerns about PORTS site operations. The DOE *Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant* (DOE 2017) specifies non-radiological monitoring requirements for ambient air, surface water, sediment, and fish. Non-radiological data collection results in 2019 are similar to previous years.

The DOE ambient air monitoring program measures fluoride emissions associated with former gaseous diffusion operations. Fluoride detected at the ambient air monitoring stations can be present due to background concentrations (fluoride occurs naturally in the environment), activities associated with the former gaseous diffusion process, and the operation of the DUF₆ Conversion Facility. In 2019, samples for fluoride were collected weekly from 15 ambient air monitoring stations in and around PORTS; fluoride was not detected in 50 percent of the samples collected. The determined concentrations of fluoride were found to be within ambient background concentrations measured in the United States (there is no national standard).

Surface water and groundwater are monitored at PORTS. The Ohio EPA selects parameters to be monitored at each of the water discharge sites, known as outfalls, based on the federal National Pollution Discharge Elimination Systems (NPDES) program initiated from the Clean Water Act in 1972.

In 2019, two DOE contractors (FBP and MCS) were responsible for monitoring 20 NPDES outfalls while Centrus was responsible for monitoring an additional three locations, all results were reported monthly to the OEPA. Throughout 2019, all non-radiological surface and groundwater monitoring results were found in 98% to 100% compliance relative to the specific parameters and limitations set.

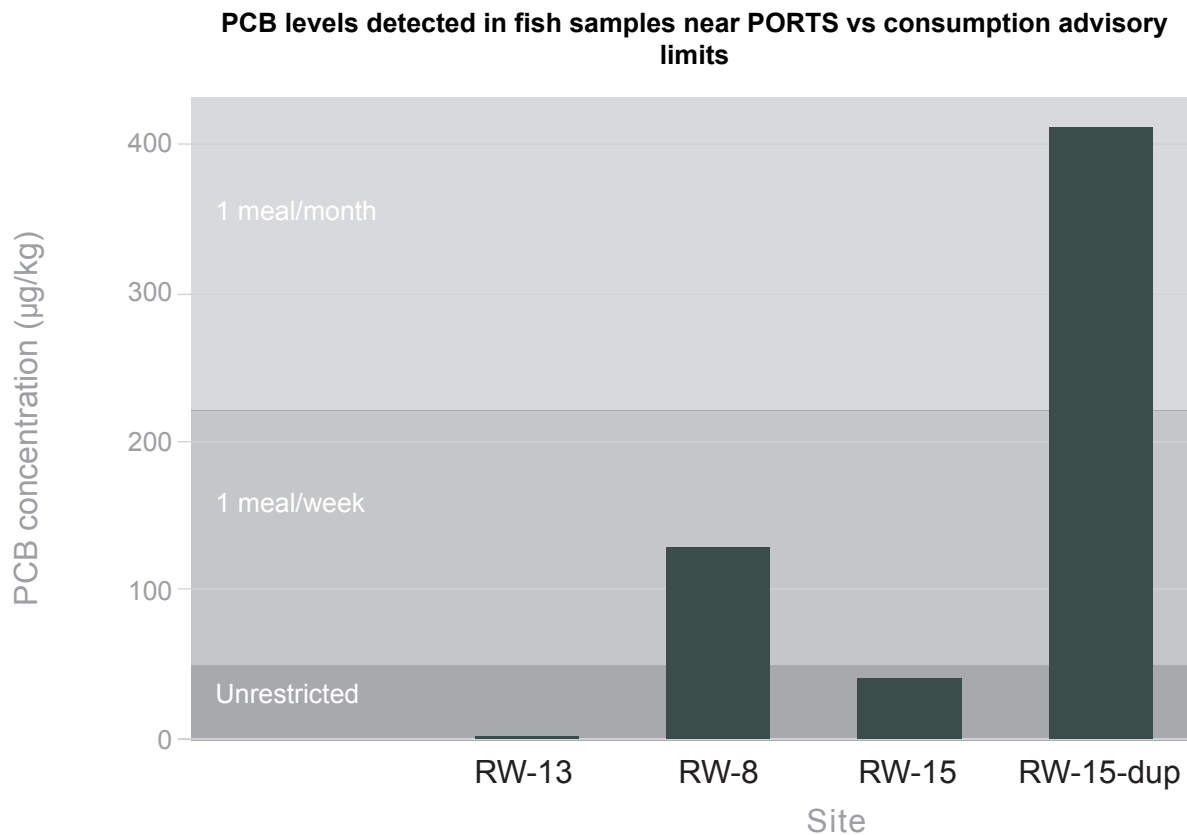
“It is important for us to learn about non-radiological contamination because it affects all parts of our environment; air, water, sediment, and even the fish we may eat. We need to be aware of the pollutants that could be affecting us, especially living so close to the PORTS site.”

*-Xavier Wilt & Laney Yoakum,
WHS Students*

Sediment samples were collected at the same locations where surface water samples were collected. In 2019 samples were collected and analyzed for 20 different polychlorinated biphenyls (PCBs) and metals. PCBs were detected at 3 on-site (PORTS facility) locations and at one off-site sampling location on Little Beaver Creek. PCB concentrations at the on-site sampling locations ranged from 71.6 to 380 µg/kg, while concentrations at the off-site sampling location (Little Beaver Creek) were 33.1 µg/kg. The regional screening level for PCBs has been established at 240 µg/kg (U.S. EPA 2019). The off-site sample did not exceed the regional screening level.

The results also indicated no differences in the concentrations of metals present in sediment samples taken upstream from PORTS compared with samples taken downstream from the site. Because metals occur naturally in the environment, it is unlikely that the metals detected in the samples resulted from activities at PORTS.

Fish samples were also collected and tested for the presence of PCBs in the portion of the fish that would be eaten by a person (fillets). In 2019 fish were collected in Big Beaver Creek (RW-15, RW-13) and Little Beaver Creek (RW-8), but not the Scioto River. PCBs were detected in fish collected from both creeks, at 2 of the 3 sampling locations, including a duplicate sample at RW-15. The determined levels 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) which are set for the following consumption rates: unrestricted, 1/week, 1/month, and do not eat.



References

- DOE 2020. U.S. Department of Energy Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report-2018, Piketon, Ohio, DOE/PPPO/03-0932&D1, U.S. Department of Energy, Piketon, OH, December.
- DOE 2017. Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio, DOE/PPPO/03-0009&D5, U.S. Department of Energy, Piketon, OH, April.
- Agency for Toxic Substances and Disease Registry 2003. Toxicological Profile for Fluorides, Hydrogen Fluoride, and Fluorine, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, <https://www.atsdr.cdc.gov/ToxProfiles/tp11.pdf> (accessed 26 May 2022).
- U.S. EPA 2019. Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=1) April 2019, Screening level for PCB-1254/PCB-1260 in residential soil, <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables> (accessed 26 May 2022).
- Ohio EPA 2010. State of Ohio Cooperative Fish Tissue Monitoring Program Sport Fish Tissue Consumption Advisory Program, State of Ohio, Columbus, OH, October.



Environmental sample testing lesson plan in Western High School classroom

Environmental Radiological Program

Environmental monitoring at PORTS includes assessing the potential impacts to human health and the environment from radionuclides (unstable chemical elements) released by current and historical activities at PORTS. The human health impact can be measured by what is called, a dose. A radiological dose is a concentration of energy absorbed in human tissue and can be caused by radionuclides being released into air/water, or due to radiation emanating directly from buildings or other objects at PORTS. It is estimated that a person living in the United States receives an average annual dose of approximately 311 mrem/year from natural sources of radiation (National Council on Radiation Protection [NCRP] 2009).

There are several different focuses of the environmental radiological monitoring programs at PORTS which include ambient (outside) air, external radiation, surface water, sediment, soil, vegetation, and biota (deer, fish, crops, milk, and eggs). Radionuclides were not detected in samples of residential drinking water, deer, fish, crops, or dairy products in 2019.

The Environmental Radiological Program monitored external radiation at areas near the depleted uranium hexafluoride (DUF₆) cylinder storage locations at PORTS. Additionally, surface water, sediment, soil, and vegetation were also tested for radiological contamination.

Surface water results showed an annual dose of 0.0011 mrem/year. Soil and Sediment results showed an annual dose of 0.022/0.023 mrem/year, respectively. Finally, vegetation, primarily grass, results showed annual dose of 0.00096 mrem/year. All radiation levels were found to be well below the 100 mrem/year limit for all radiological releases from a DOE facility (DOE Order 458.1).

“We, as students, learned a lot from ASER regarding the site’s environmental radiological monitoring program...We have also learned that the PORTS site has been thoroughly tested and determined to be safe. We are reassured that the PORTS site is not contaminated with substantial amounts of radiation and that it can be used for future use.”

*Ethan Gedeon & Jagger Grooms,
WHS students*

The 2019 Environmental Radiological Monitoring Program at PORTS determined that the maximum annual dose a member of the public could receive from radiation released from the facility was 0.95 mrem/year. The annual dose was calculated from individual exposure from each possible pathway. The table below summarizes the dose information determined from 2019 monitoring data:

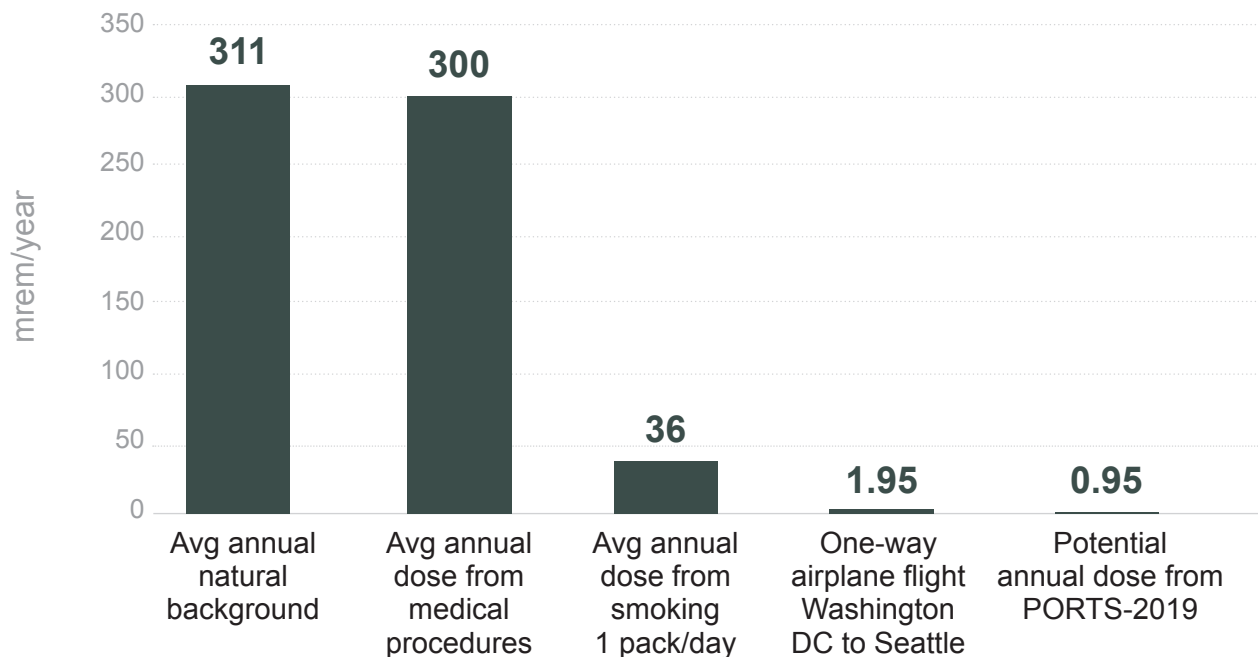
Summary of potential annual doses to the public from PORTS in 2019

Source of dose	Dose (mrem/year)
Airborne radionuclides (off-site individual)	0.16 ^a
Radionuclides released to the Scioto River	0.0011
External radiation near cylinder yards (northwest portion of Perimeter Rd)	0.74
Radionuclides detected by environmental monitoring programs	0.046
Total	0.95^b

^a10 mrem/year is U.S. EPA limit for airborne radionuclides.

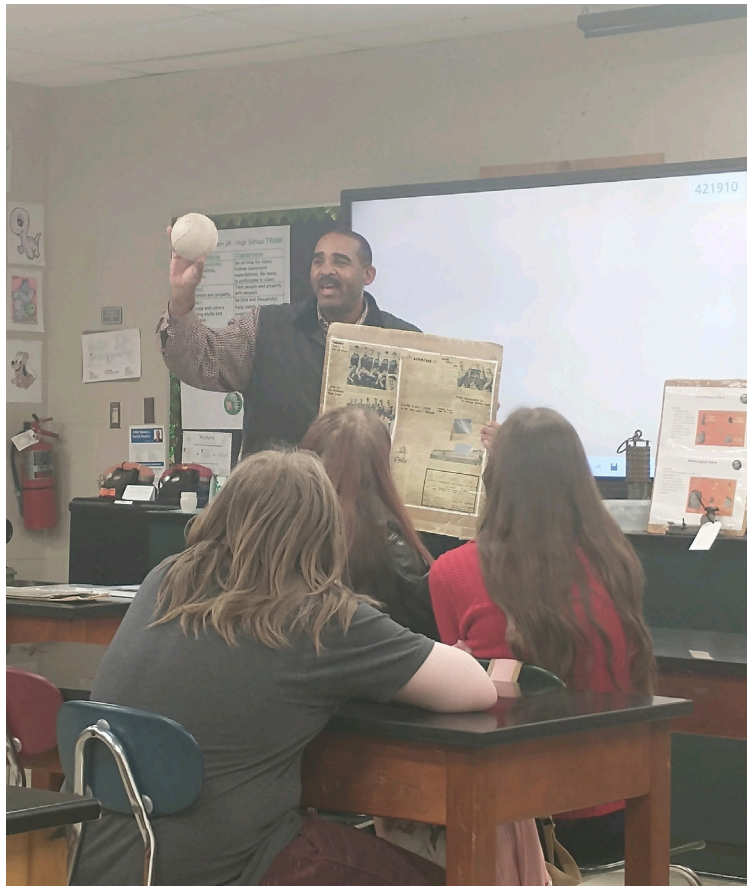
^b100 mrem/year is the DOE limit for all potential pathways.

Summary of potential annual doses to the public from PORTS compared with other sources



References

- DOE 2020. U.S. Department of Energy Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report-2019, Piketon, Ohio, DOE/PPPO/03-0932&D1, U.S. Department of Energy, Piketon, OH, December.
- National Council on Radiation Protection 2009. Ionizing Radiation Exposure of the Population of the United States, NCRP Report No. 160, National Council on Radiation Protection and Measurements, Bethesda, MD.



Lessons on Portsmouth site in Western High School classroom

Groundwater Program

Groundwater monitoring at PORTS was initiated in the 1980s and an Integrated Groundwater Monitoring Plan was developed in 1999 as a way to improve all monitoring requirements and annual reporting. Monitoring is conducted in response to state and federal regulations, Ohio EPA legal agreements, and DOE Orders. There are more than 400 groundwater monitoring wells used to track the flow of groundwater and to identify and measure contaminants. The PORTS groundwater monitoring program also includes on-site surface water monitoring and water supply monitoring.

Samples of water are collected from groundwater monitoring wells and analyzed to determine levels of contaminants and naturally occurring compounds. Monitoring wells are also used to obtain other information about groundwater. The rate and direction of groundwater flow can be estimated by measuring the groundwater elevation at multiple wells, which is then used to predict the movement of contaminants in the groundwater and mitigate or remediate contamination.

“What I have learned from this report is that the PORTS site takes testing seriously when testing groundwater. The amount of testing that PORTS does helps them make sure that the groundwater isn’t contaminated or if it is contaminated that the levels of contamination are either safe or not.”

*Wesley Satterfield, WHS
Student*

Private residential drinking water sources are monitored in accordance with the requirements of the September 1989 Consent Decree between the State of Ohio and DOE and the *Integrated Groundwater Monitoring Plan* (DOE 2017c) to determine whether PORTS has had any impact on the quality of the private residential drinking water sources. Four residential drinking water sources participated in the program in 2019, as well as the water supply for PORTS itself. In general, concentrations of most contaminants detected within the groundwater were found to be stable or decreasing during 2019, although a few contaminants increased at specific site locations. Four groundwater treatment facilities are located at PORTS. In 2019, approximately 32.7 million gallons of groundwater were treated at PORTS Groundwater Treatment Facilities, with approximately 13.4 gallons of the contaminant trichloroethane (TCE) estimated to have been removed from the treated water. The treated water is then discharged through an outlet that dumps into nearby waterways, known as an outfall. All treated water to be discharged must meet the standards set by the federal EPA through a permitting program known as the National Pollutants Discharge Elimination Systems (NPDES), including the water that is discharged from all PORTS facilities.

References

- DOE 2020. U.S. Department of Energy Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report-2019, Piketon, Ohio, DOE/PPPO/03-0932&D1, U.S. Department of Energy, Piketon, OH, December.
- DOE 2017. Integrated Groundwater Monitoring Plan for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio, DOE/PPPO/03-0032&D10, U.S. Department of Energy, Piketon, OH, August.

Conclusions

The PORTS facility is a large, complex, industrial site that once played a role in ensuring our nation's security. It has unique historical significance being one of only three uranium enrichment plants used for national security and the commercial sector. The PORTS workforce have provided an invaluable service to our nation and its people. Since 2011, it has been the mission of the DOE and those involved with the D&D of the facility to safeguard the people of this region from any potential dangers presented by facility operations. Furthermore, the DOE is working toward releasing facility property for beneficial land reuse to reduce the environmental footprint while fostering re-industrialization and revitalization for the region.

The processes of D&D, monitoring, and remediation are huge tasks that require the hard work of many. From the laborers, the local environmentalists, the state and federal EPA, to the DOE agency, we thank everyone for their hard work and dedication. This summary emanates from the environmental monitoring activities at PORTS for calendar year 2019. The following are some of the highlights of 2019:

- D&D of PORTS continues through the disassembly and removal of equipment, removal of wastes including asbestos, PCBs, and hazardous waste, and deactivation of utilities and other systems.
- SODI received approximately 416 tons of materials from PORTS, primarily recyclable metals, recyclable oil, and reusable equipment.
- Environmental monitoring data collected in 2019 are consistent with data collected in previous years and indicated that radionuclides, metals, and other chemicals released by PORTS operations have a minimal effect on human health and the environment.
- More than 10,000 samples of air, water, soil, sediment, vegetation, fish and wildlife, and external radiation were collected and analyzed on and around the PORTS facility in 2019.

The continuous environmental monitoring of the PORTS operations helps the DOE calculate potential impacts to human health and environmental degradation for the region. The maximum annual dose that a member of the public could receive from radiation released by PORTS in 2019 is 0.95 mrem, equaling less than 1% of the 100 mrem/year limit set by DOE for all potential pathways. The dose to a member of the public from airborne radionuclides released by PORTS in 2019 is 0.16 mrem, significantly less than the 10 mrem/year standard. Concentrations of contaminants detected within the groundwater plumes at PORTS were stable or decreasing in 2019, while concentrations of groundwater metals were increasing in a few areas and will continue to be closely monitored. PORTS operations has not affected the safety of drinking water outside the site boundaries. Finally, surface water and sediment samples, from the nearby waterways to the site facility, showed either no contamination or levels below DOE standards.

The DOE is committed to reducing environmental impacts from site operations through stewardship and sustainability by integrating sustainable practices into PORTS activities such as eliminating the amount of waste generated, minimizing the use of toxic chemicals, and maximizing the use of recycled materials. Each year a report of Environmental Management Systems goals is submitted to DOE Headquarters. In 2019, PORTS stewardship scorecard was green, indicating environmental and sustainable standards were met.

Definitions

Ambient air – the atmosphere around people, plants and structures. Ambient air usually means outdoor air (as opposed to indoor air)

Biota – animal and plant life characterizing a given region

Compliance – fulfillment of applicable regulations or requirements of a plan or schedule ordered or approved by a government authority

Concentration – the amount of a substance contained in a unit volume or mass of a sample

Contaminant – any substance that enters a system (the environment, food, the human body, etc.) where it is not normally found, include substances that spoil food, pollute the environment, or cause other adverse effects

Decontamination and decommissioning – removing equipment, demolishing buildings, disposing of wastes and investigating potential contamination in areas of PORTS that are no longer part of current operations

Dose – energy imparted to matter by ionizing radiation; unit of absorbed dose is the rad, equal to 0.01 joule per kilogram

Absorbed dose – the quantity of ionizing radiation energy absorbed by an organ divided by the organ's mass; expressed in units of rad (or gray) (1 rad = 0.01 gray)

Effective dose – sum of the doses received by all organs or tissues of the body after each one has been multiplied by the appropriate weighting factor

Collective dose/collective effective dose – the sums of the doses of all individuals in an exposed population expressed in units of person-rem, also known as “population dose”

Duplicate sample – sample collected from the same location, time, and device as the regular sample

Effluent – a liquid or gaseous waste discharge to the environment

External radiation – the exposure to ionizing radiation when the radiation source is located outside the body

Gaseous diffusion – technology used to produce enriched uranium by forcing gases through a porous barrier

Groundwater – any water found below the land surface

Ionizing radiation – radiation that has enough energy to remove electrons from substances that it passes through, forming ions

Isotope – form of an element having the same number of protons but differing numbers of neutrons in their nuclei

mrem – the dose that is one-thousandth of a rem

Monitoring – process whereby the quantity and quality of factors that can affect the environment or human health are measured periodically to regulate and control potential impacts

Outfall – the point of conveyance (e.g., drain or pipe) of wastewater or other effluents into a ditch, pond, or river

PPPO- Portsmouth/Paducah Project Office- manages the DOE cleanup efforts at two gaseous diffusion plant site

Person-rem – a unit of measure for the collective dose to a population group. For example, a dose of 1 rem to 10 individuals results in a collective dose of 10 person-rem

Polychlorinated biphenyls (PCBs) – man-made chemicals that range from oily liquids to waxy solids. PCBs were used in hundreds of industrial and commercial applications due to their chemical properties until production in the United States ceased in 1977. PCBs have been demonstrated to cause a variety of adverse health effects in animals and possibly cause cancer and other adverse effects in humans

Radioactivity – the spontaneous emission of radiation, generally alpha or beta particles or gamma rays, from the nucleus of an unstable isotope

Radionuclide – radioactive nuclide capable of spontaneous transformation into other nuclides by changing its nuclear configuration or energy level; accomplished by the emission of photons or particles

Release – any discharge to the environment. “Environment” is broadly defined as any water, land, or ambient air

Rem – unit of radiation dose that reflects the ability of different types of radiation to damage human tissues and the susceptibility of different tissues to the damage

Remediate – correction or cleanup of a contaminated site

Surface water – all water on the surface of the earth, as distinguished from groundwater

Volatile Organic Compounds (VOCs) – organic (carbon-containing) compounds that evaporate readily at room temperature. These compounds are present in solvents, degreasers, paint, thinners and fuels. Due to a number of factors including widespread industrial use, they are commonly found as contaminants in soil and groundwater. VOCs found at PORTS include TCE, vinyl chloride, benzene and dichloroethenes.

Acronyms & Abbreviations

ASER	Annual Site Environmental Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DUF ₆	depleted uranium hexafluoride
FBP	Fluor-BWXT Portsmouth LLC
LLC	Limited Liability Company
µg/kg	microgram per kilogram (equivalent to part per billion)
µg/L	microgram per liter (equivalent to part per billion)
MCS	Mid-American Conversion Services, LLC
mrem	millirem
Ohio EPA	Ohio Environmental Protection Agency
PEGASIS	PPPO Environmental Geographic Analytical Spatial Information System
PCB	polychlorinated biphenyl
WHS	Western High School
PORTS	Portsmouth Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
SODI	Southern Ohio Diversification Initiative
TCE	trichloroethene
TLD	thermoluminescent dosimeters
U.S. EPA	U.S. Environmental Protection Agency
VOCs	Volatile Organic Compounds

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