5. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

5.1 SUMMARY

Non-radiological environmental monitoring at PORTS includes air, water, sediment, and fish. Monitoring of non-radiological parameters is required by state and federal regulations and/or permits, but is also performed to reduce public concerns about plant operations.

Non-radiological data collected in 2017 are similar to data collected in previous years.

5.2 ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INTRODUCTION

Environmental monitoring programs at PORTS usually monitor both radiological and non-radiological constituents that could be released to the environment as a result of PORTS activities. The radiological components of each monitoring program were discussed in the previous chapter. The DOE *Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant* (DOE 2017b) specifies non-radiological monitoring requirements for ambient air, surface water, sediment, and fish. Non-radiological data are not collected for all sampling locations or all monitoring programs.

Environmental permits issued by Ohio EPA to FBP, MCS, or Centrus specify discharge limitations, monitoring requirements, and/or reporting requirements for air emissions and water discharges. Centrus data for NPDES water discharges are included in this section to provide a more complete picture of environmental monitoring at PORTS. Centrus information for discharges to water is provided for informational purposes only; DOE is not certifying the accuracy of the Centrus data.

Data from the following environmental monitoring programs are included in this chapter:

- air
- surface water
- sediment
- biota (fish).

DOE also conducts an extensive groundwater monitoring program at PORTS that includes both radiological and non-radiological constituents. Chapter 6 provides information on the groundwater monitoring program, associated surface water monitoring, and water supply monitoring.

5.3 AIR

Permitted air emission sources at PORTS emit non-radiological air pollutants. In addition, the ambient air monitoring program measures fluoride at monitoring stations within PORTS boundaries and in the surrounding area. Chapter 4, Figure 4.1 is a map of the PORTS ambient air monitoring locations.

5.3.1 Airborne Discharges

FBP is responsible for numerous air emission sources associated with the former gaseous diffusion production facilities and support facilities. These sources, which included the boilers at the X-600 Steam Plant Complex (prior to demolition in 2013), emitted more than 100 tons per year of non-radiological air pollutants specified by Ohio EPA, which caused FBP air emission sources to become a major source of air pollutants as defined in 40 CFR Part 70.

FBP is required to submit an annual report called the Ohio EPA Fee Emissions Report to report emissions of selected non-radiological air pollutants. FBP reported the following emissions of non-radiological air pollutants for 2017: 17.36 tons of particulate matter and 2.144 tons of organic compounds. Emissions for

2017 are associated with the X-627 Groundwater Treatment Facility, the X-670A Cooling Tower, X-333 Coolant System, and plant roads/parking areas.

The DUF_6 Conversion Facility emits only a small quantity of non-radiological air pollutants. Because of these small emissions, Ohio EPA requires a Fee Emissions Report only once every two years (in odd-numbered years). MCS reported less than 10 tons/year of specified non-radiological air pollutants in 2017 (the report requires reporting in increments of emissions: zero, less than 10 tons, 10-50 tons, more than 50 tons, and more than 100 tons).

U.S. EPA also requires annual reporting of greenhouse gas emissions (carbon dioxide, methane, and nitrous oxide). In 2017, FBP reported emissions of 14,695 metric tons of carbon dioxide, 0.28 metric ton of methane, and 0.028 metric ton of nitrous oxide. These emissions result from combustion of natural gas used at the X-690 Boilers.

Another potential air pollutant present at PORTS is asbestos released by D&D of plant facilities. Asbestos emissions are controlled by a system of work practices. The amount of asbestos removed and disposed is reported to Ohio EPA. In 2017, 27.2 tons of asbestos-containing materials (net weight) were shipped from PORTS.

5.3.2 Ambient Air Monitoring

In addition to the radionuclides discussed in Chapter 4, DOE ambient air monitoring stations also measure fluoride. Fluoride detected at the ambient air monitoring stations could be present due to background concentrations (fluoride occurs naturally in the environment), activities associated with the former gaseous diffusion process, and operation of the DUF_6 Conversion Facility.

In 2017, samples for fluoride were collected weekly from 15 ambient air monitoring stations in and around PORTS (see Chapter 4, Figure 4.1), including a background ambient air monitoring station (A37) located approximately 13 miles southwest of the plant.

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 background station A37 was 0.016 microgram per cubic meter ($\mu g/m^3$). Average ambient concentrations of fluoride measured at the stations around PORTS ranged from 0.0076 $\mu g/m^3$ at station A15 (east-southeast of PORTS on Loop Road) to 0.021 $\mu g/m^3$ 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.

5.4 WATER

Surface water and groundwater are monitored at PORTS. Groundwater monitoring is discussed in Chapter 6, along with surface water monitoring conducted as part of the groundwater monitoring program. Non-radiological surface water monitoring primarily consists of sampling water discharges associated with the FBP, MCS, and Centrus NPDES-permitted outfalls. PCBs are monitored in surface water downstream from the cylinder storage yards.

5.4.1 Water Discharges (NPDES Outfalls)

In 2017, DOE contractors (FBP and MCS) were responsible for 21 NPDES discharge points (outfalls) or sampling points at PORTS. Centrus was responsible for three outfalls. This section describes non-radiological discharges from these outfalls during 2017.

5.4.1.1 FBP NPDES outfalls

In 2017, FBP was responsible for 18 outfalls or sampling points. Nine outfalls discharge directly to surface water, and six outfalls discharge to another outfall before leaving the site. FBP also monitors three additional sampling points that are not discharge locations. Chapter 4, Section 4.3.5.1, provides a brief description of each FBP outfall or sampling point and provides a site diagram showing each FBP NPDES outfall/sampling point (see Chapter 4, Figure 4.2).

Ohio EPA selects the chemical parameters that must be monitored at each outfall based on the chemical characteristics of the water that flows into the outfall and sets discharge limitations for some of these parameters. For example, some of the FBP outfalls discharge water from the groundwater treatment facilities; therefore, the outfalls are monitored for selected VOCs (*trans*-1,2-dichloroethene and/or TCE) because the groundwater treatment facilities treat water contaminated with VOCs. Chemicals and water quality parameters monitored at each FBP outfall in 2017 are as follows:

- FBP NPDES Outfall 001 (X-230J7 East Holding Pond) – cadmium, chlorine, copper, dissolved solids, fluoride, mercury, oil and grease, pH, silver, suspended solids, and zinc.
- FBP NPDES Outfall 002 (X-230K South Holding Pond) – cadmium, fluoride, mercury, ammonia-nitrogen, oil and grease, pH, selenium, silver, suspended solids, and thallium.
- FBP NPDES Outfall 003 (X-6619 Sewage Treatment Plant) – acute toxicity, ammonia-nitrogen, carbonaceous biochemical oxygen demand, chlorine (May-October only), copper, E. coli (May-October only), mercury, nitrite + nitrate, oil and grease, pH, silver, thallium, suspended solids, and zinc.
- FBP NPDES Outfall 004 (Cooling Tower Blowdown) – acute toxicity, chlorine, copper, dissolved solids, mercury, oil and grease, pH, suspended solids, and zinc.
- FBP NPDES Outfall 005 (X-611B Lime Sludge Lagoon) – lead, mercury, pH, selenium, and suspended solids.
- FBP NPDES Outfall 009 (X-230L North Holding Pond) – bis(2-ethylhexyl)phthalate, copper, fluoride, mercury, oil and grease, pH, silver, suspended solids, and zinc.
- FBP NPDES Outfall 010 (X-230J5 Northwest Holding Pond) – lead, mercury, oil and grease, pH, selenium, suspended solids, and zinc.
- FBP NPDES Outfall 011 (X-230J6 Northeast Holding Pond) – cadmium, chlorine, copper, fluoride, oil and grease, pH, selenium, suspended solids, thallium, and zinc.
- FBP NPDES Outfall 015 (X-624 Groundwater Treatment Facility) – arsenic, barium, total PCBs, pH, silver, and TCE.
- FBP NPDES Outfall 602 (X-621 Coal Pile Runoff Treatment Facility) – iron, manganese, pH, and suspended solids.
- FBP NPDES Outfall 604 (X-700 Biodenitrification Facility) – copper, iron, nickel, nitrate-nitrogen, pH, and zinc.

- FBP NPDES Outfall 605 (X-705 Decontamination Microfiltration System) – ammonia-nitrogen, chromium, hexavalent chromium, copper, Kjeldahl nitrogen, nickel, nitrate-nitrogen, nitrite-nitrogen, oil and grease, pH, sulfate, suspended solids, TCE, and zinc.

- FBP NPDES Outfall 608 (X-622 Groundwater Treatment Facility) – TCE, pH, and *trans*-1,2-dichloroethene.

- FBP NPDES Outfall 610 (X-623 Groundwater Treatment Facility) – TCE, pH, and *trans*-1,2-dichloroethene.

- FBP NPDES Outfall 611 (X-627 Groundwater Treatment Facility) – pH and TCE.

The FBP NPDES Permit also identifies additional monitoring points that are not discharge points as described in the previous paragraphs. FBP NPDES Station Number 801 is a surface water background monitoring location on the Scioto River upstream from FBP NPDES Outfalls 003 and 004. Samples are collected from this monitoring point to measure toxicity to minnows and another aquatic organism, *Ceriodaphnia*.

FBP NPDES Station Number 902 is a monitoring location on Little Beaver Creek downstream from FBP NPDES Outfall 001. FBP NPDES Station Number 903 is a monitoring location on Big Run Creek downstream from FBP NPDES Outfall 002. Water temperature is the only parameter measured at each of these monitoring points.

The monitoring data detailed in the previous paragraphs are submitted to Ohio EPA in a monthly discharge monitoring report. In 2017, discharge limitations at the FBP NPDES monitoring locations were exceeded on 11 occasions (see Table 5.1).

Table 5.1 FBP NPDES exceedances in 2017

Outfall	Parameter (unit)[a]	Limit	Result	Date
001	Mercury (ng/L)	12 ng/L	18.3	May
001	Mercury (ng/L)	(maximum	23.8	June
001	Mercury (ng/L)	monthly average)	16.75	July
001	Mercury (ng/L)		19.7	August
004	Copper (µg/L)	66 µg/L	140	September 6
004	Copper (µg/L)	(maximum daily)	67	September 20
004	Copper (µg/L)		83	October 5
002	pH (SU)	6.5 SU	5.1	June 21
004	pH (SU)	(minimum daily)	6.25	March 2
003	E.coli (#/100 mL)	284/100 mL (maximum daily)	1010	June 21
003	Carbonaceous biochemical oxygen demand (kg/day)	22.7 kg/day (maximum daily loading)	23.7	May 9

[a]Units: nanogram per liter (ng/L). microgram per liter (µg/L). Standard Unit (SU). Number of organisms per 100 milliters ((#/100 mL). kilogram per day (kg/day).

The average monthly concentration preliminary effluent limit for mercury was exceeded at Outfall 001 (the X-230J7 East Holding Pond) in May through August of 2017. 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.

In September and October of 2017, the maximum daily concentration limit for copper (66 µg/L) at Outfall 004 (recirculating cooling water blowdown) was exceeded in three samples. 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. Adjustments were made to the feed system that controls the additives used in the recirculating cooling water system.

Discharge limits for pH were exceeded twice in 2017: once in June at Outfall 002 and once in March at Outfall 004. At Outfall 002, the exceedance was caused by an overfeed of citric acid from a defective feed pump in the pH neutralization control system. At Outfall 004, the exceedance was caused by a temporary overfeed of a dechlorinating chemical. Compliance was restored at both outfalls in less than two hours.

Two discharge limitations were exceeded at Outfall 003 (X-6619 Sewage Treatment Plant) during 2017. The maximum daily concentration limit for E. coli (284/100 mL) was exceeded due to a malfunction in the sewage treatment system that caused a backup of sludge in the west clarifier. The conditions that caused the exceedance were corrected within several hours. A sample collected the following day was well within the discharge limitation at 1/100 mL. The maximum daily loading limit for carbonaceous biochemical oxygen demand was exceeded due to a release of cooling water containing propylene glycol from an air compressor into the sanitary sewer system. Upon discovery, the wastewater contaminated with propylene glycol was isolated in an off-line aeration basin to be properly treated.

In 2017, the overall FBP NPDES compliance rate with the NPDES permit was 99%.

5.4.1.2 MCS NPDES outfalls

MCS is responsible for the NPDES permit for the discharge of process wastewaters from the DUF_6 Conversion Facility. The MCS NPDES permit provides monitoring requirements for two outfalls: MCS Outfall 001 and MCS Outfall 602. Chapter 4, Figure 4.2 shows the location of the MCS NPDES outfalls. Monitoring requirements for MCS Outfall 001 are only effective when process wastewater is being discharged through the outfall. No process waste water was discharged through Outfall 001 in 2017; therefore, no monitoring was required.

MCS Outfall 602 monitors the discharge of MCS process wastewater to the sanitary sewer, which flows to the X-6619 Sewage Treatment Plant that discharges through FBP NPDES Outfall 003. Process wastewater discharged from MCS Outfall 602 was monitored for pH and total flow.

The monitoring data collected in accordance with the MCS permit are submitted to Ohio EPA in a monthly discharge monitoring report. No exceedances of permit limitations at MCS Outfall 602 occurred during 2017; therefore, the overall MCS compliance rate with the NPDES permit was 100%.

5.4.1.3 Centrus NPDES outfalls

Centrus is responsible for three NPDES outfalls through which water is discharged from the site (see Chapter 4, Figure 4.2). Two outfalls discharge directly to surface water, and one outfall discharges to FBP NPDES Outfall 003 before leaving the site. Chapter 4, Section 4.3.5.2, provides a brief description

of each Centrus NPDES outfall. Chemicals and water quality parameters monitored at each Centrus outfall are as follows:

- Centrus NPDES Outfall 012 (X-2230M Southwest Holding Pond) – cadmium, chlorine, copper, iron, oil and grease, pH, selenium, silver, suspended solids, total PCBs, thallium, and TCE.

- Centrus NPDES Outfall 013 (X-2230N West Holding Pond) – antimony, arsenic, chlorine, copper, oil and grease, pH, suspended solids, thallium, total PCBs, and zinc.

- Centrus NPDES Outfall 613 (X-6002A Recirculating Hot Water Plant particle separator) – chlorine, pH, and suspended solids.

The monitoring data are submitted to Ohio EPA in a monthly discharge monitoring report. No exceedances of permit limitations at Centrus Outfalls 012, 013, and 613 occurred during 2017; therefore, the overall Centrus compliance rate with the NPDES permit was 100%.

5.4.2 Surface Water Monitoring Associated with MCS Cylinder Storage Yards

Surface water samples (filtered and unfiltered) are collected quarterly from four locations in the drainage basins downstream from the MCS X-745C, X-745E, and X-745G Cylinder Storage Yards (UDS X01, RM-8, UDS X02, and RM-10 – see Chapter 4, Figure 4.2) and analyzed for PCBs. PCBs were not detected in any of the surface water samples (filtered or unfiltered) collected during 2017. Section 5.5.2 presents the results for sediment samples collected as part of this program.

5.5 SEDIMENT

In 2017, sediment monitoring at PORTS included local streams and the Scioto River upstream and downstream from PORTS and drainage basins downstream from the MCS cylinder storage yards.

5.5.1 Local Sediment Monitoring

Sediment samples are collected annually at the same locations upstream and downstream from PORTS where local surface water samples are collected, at the NPDES outfalls on the east and west sides of PORTS, and at an upstream location on Big Beaver Creek (see Chapter 4, Figure 4.4). In 2017, samples were analyzed for 20 metals and PCBs, in addition to the radiological parameters discussed in Chapter 4.

PCBs were detected in sediment samples collected upstream and downstream from PORTS. PCBs were detected in downstream 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). PCBs were also detected in the sample collected from the upstream sampling location on the Scioto River (RM-6).

None of the detections of PCBs in sediment around PORTS were above the risk-based regional screening level for PCB-1254/1260 developed by U.S. EPA and utilized by Ohio EPA: 240 micrograms per kilogram (µg/kg) or parts per billion (ppb) (U.S. EPA 2017). The highest detection of PCBs (208 µg/kg) was on site in Little Beaver Creek at the discharge from the X-230J7 Holding Pond (RM-11).

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. Metals occur naturally in the environment. Accordingly, the metals detected in the samples most likely did not result from activities at PORTS.

5.5.2 Sediment Monitoring Associated with MCS Cylinder Storage Yards

Sediment samples are collected quarterly from four locations in the drainage basins downstream from the MCS X-745C, X-745E, and X-745G Cylinder Storage Yards (UDS X01, RM-8, UDS X02, and RM-10)

and analyzed for PCBs. These locations are on site at PORTS and not accessible to the public (see Chapter 4, Figure 4.2).

In 2017, PCBs were detected in at least one of the sediment samples collected at each location. The maximum concentration of PCBs (230 µg/kg) was detected at sampling location UDS X02. The concentrations of PCBs detected in 2017 are below the 1 ppm (1000 µg/kg) reference value set forth in the U.S. EPA Region 5 *TSCA Approval for Storage for Disposal of PCB Bulk Product (Mixed) Waste,* which applies to the storage of DUF_6 cylinders at PORTS that may have paint on the exterior of the cylinders that contains more than 50 ppm PCBs. None of the samples contained PCBs above the risk-based regional screening level for PCB-1254/1260 developed by U.S. EPA and utilized by Ohio EPA: 240 µg/kg (ppb) (U.S. EPA 2017).

Section 5.4.2 presents the results for surface water samples collected as part of this program.

5.6 BIOLOGICAL MONITORING - FISH

Fish samples are collected annually (if available) from locations on Little Beaver Creek (RW-8), Big Beaver Creek (RW-13 and RW-15), and the Scioto River (RW-1A and RW-6). In 2017, fish were caught at each of these locations. Chapter 4, Figure 4.4, shows the surface water monitoring locations where the fish were caught.

Fish samples were analyzed for PCBs, in addition to the radiological parameters discussed in Chapter 4. Fish samples collected for this program included only the fish fillet, that is, only the portion of the fish that would be eaten by a person. The fish samples collected at Little Beaver Creek (RW-8) and Big Beaver Creek (RW-13 and RW-15) were bass. The fish samples collected from the Scioto River (RW-1A and RW-6) were drum and catfish, respectively.

PCBs were detected in the bass collected from Little Beaver Creek at 241 and 290 µg/kg (regular and duplicate samples, respectively). PCBs were also detected in upstream and downstream Big Beaver Creek bass samples at 22 and 30.6 µg/kg, respectively. PCBs were detected in catfish and drum 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 concentration of PCBs detected in the fish caught on site in Little Beaver Creek (RW-8) is 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 (22 and 30.6 µg/kg) and the Scioto River (18.5 and 20.2 µg/kg) are less than the unrestricted limit (50 µg/kg).

The Ohio Sport Fish Consumption Advisory, available from Ohio EPA, Division of Surface Water, advises the public on consumption limits for sport fish caught from all water bodies in Ohio and should be consulted before eating any fish caught in Ohio waters (Ohio EPA 2018). The advisory recommends a limit of one meal per month for white bass (12 inches and over), common carp, and channel or flathead catfish caught in the Scioto River in Pike and Scioto Counties due to mercury and/or PCB contamination. 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.