



# U.S. Department of Energy

## Portsmouth Gaseous Diffusion Plant

Annual Site  
Environmental Data  
2018

June 2020



**U.S. Department of Energy  
Portsmouth Gaseous Diffusion Plant  
Annual Site Environmental Data – 2018  
Piketon, Ohio**



**U.S. Department of Energy  
DOE/PPPO/03-0933&D1**

**June 2020**

**By  
Fluor-BWXT Portsmouth LLC, under Contract DE-AC30-10CC40017**

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Date

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## ACRONYMS AND ABBREVIATIONS

#/100 mL	number per 100 mL
ACP	American Centrifuge Plant
°C	degrees Celsius
Ci	curie
cm	centimeter
DOE	U.S. Department of Energy
DUF <sub>6</sub>	depleted uranium hexafluoride
FBP	Fluor-BWXT Portsmouth LLC
°F	degrees Fahrenheit
g	gram
GPD	gallons per day
in.	inch
kg	kilogram
L	liter
m	meter
m <sup>3</sup>	cubic meter
µg	microgram
mg	milligram
MCS	Mid-America Conversion Services, LLC
MGD	million gallons per day
mrem	millirem
ND	not detected
ng	nanogram
NPDES	National Pollutant Discharge Elimination System
Ohio EPA	Ohio Environmental Protection Agency
OVEC	Ohio Valley Electric Corporation
PCB	polychlorinated biphenyl
pCi	picocurie
PK	Peter Kiewit
PORTS	Portsmouth Gaseous Diffusion Plant
SU	standard unit
TUa	acute toxicity unit
VOC	volatile organic compound

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## 1. INTRODUCTION

Environmental monitoring at the Department of Energy (DOE) Portsmouth Gaseous Diffusion Plant (PORTS) is conducted throughout the year. Monitoring demonstrates the site is a safe place to work, plant operations do not adversely affect neighboring communities, and activities comply with federal and state regulations.

This document is a compilation of the environmental monitoring data for calendar year 2018 and is intended as a tool for analysts in environmental monitoring, environmental restoration, and other related disciplines. The data in this document form the basis for the summary information in the *Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report – 2018* (DOE 2020).

The DOE has established a total public annual dose limit of 100 millirem (mrem)/year in DOE Order 458.1, *Radiation Protection of the Public and the Environment*. This annual dose limit is also subject to the concept of "as low as reasonably achievable"<sup>1</sup>. Radiological monitoring data presented in this Data Report and discussed in the *Annual Site Environmental Report for 2018* indicate that the maximum annual dose a member of the public could receive from radionuclides released by PORTS in 2018 or detected by environmental monitoring programs in 2018 is 0.92 mrem/year and is considered as low as reasonably achievable.

Other non-radiological chemicals such as polychlorinated biphenyls (PCBs), metals, and volatile organic compounds (VOCs) are also monitored. Discharges of metals and other chemicals to surface water are controlled by National Pollutant Discharge Elimination System (NPDES) permits. Emissions of non-radiological air pollutants are controlled by air emission permits issued by Ohio Environmental Protection Agency (Ohio EPA). The *Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report – 2018* (DOE 2020) provides more information about non-radiological chemicals released from PORTS or detected by PORTS monitoring programs during 2018.

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<sup>1</sup> "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.

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## 2. ENVIRONMENTAL MONITORING

This section provides environmental monitoring data collected in 2018 by DOE contractors Fluor-BWXT Portsmouth LLC (FBP) and Mid-America Conversion Services, LLC (MCS). Data collected by Centrus for NPDES outfalls associated with the American Centrifuge Plant (ACP) are also reported in this section.

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**Table 2.1. Radionuclide concentrations in FBP and Centrus  
 NPDES outfall water samples – 2018**

NPDES outfall <sup>a</sup>	Parameter <sup>b</sup>	Number of samples <sup>c</sup>	Minimum <sup>d</sup>	Maximum <sup>d</sup>	Average <sup>e</sup>
<i>FBP Outfalls</i>					
001	Americium-241	4(4)	0	< 0.012	
	Neptunium-237	4(4)	0	0	
	Plutonium-238	4(4)	0	< 0.0385	
	Plutonium-239/240	4(4)	0	< 0.0207	
	Techneium-99	12(3)	< 0.874	71.3	
	Uranium	12(3)	< 0.364	12.3	
	Uranium-233/234	12(0)	0.196	9.87	4.32
	Uranium-235/236	12(5)	< 0.0042	0.573	
002	Uranium-238	12(3)	< 0.119	4.05	
	Americium-241	4(4)	0	< 0.0124	
	Neptunium-237	4(4)	0	< 0.0194	
	Plutonium-238	4(4)	0	< 0.0542	
	Plutonium-239/240	4(4)	0	< 0.00059	
	Techneium-99	12(12)	0	< 4.84	
	Uranium	12(2)	< 0.173	1.51	
	Uranium-233/234	12(0)	0.334	1.00	0.655
003	Uranium-235/236	12(11)	< 0.0142	0.154	
	Uranium-238	12(3)	< 0.0527	0.496	
	Americium-241	4(4)	0	< 0.0074	
	Neptunium-237	4(4)	0	0	
	Plutonium-238	4(4)	< 0.00758	< 0.0521	
	Plutonium-239/240	4(4)	0	< 0.0187	
	Techneium-99	12(0)	34.9	99.7	58.6
	Uranium	12(0)	0.441	8.22	2.63
004	Uranium-233/234	12(0)	0.499	5.84	2.40
	Uranium-235/236	12(7)	< 0.012	0.327	
	Uranium-238	12(0)	0.137	2.71	0.862
	Americium-241	3(3)	< 0.000869	< 0.0301	
	Neptunium-237	3(3)	< 0.0153	< 0.0336	
	Plutonium-238	3(3)	< 0.0179	< 0.0945	
	Plutonium-239/240	3(3)	0	< 0.0299	
	Techneium-99	10(9)	0	6.01	
Uranium	10(9)	< 0.00292	0.185		
Uranium-233/234	10(10)	0	< 0.109		
Uranium-235/236	10(10)	0	< 0.0223		
Uranium-238	10(9)	0	0.0622		

**Table 2.1. Radionuclide concentrations in FBP and Centrus  
 NPDES outfall water samples – 2018 (continued)**

NPDES outfall <sup>a</sup>	Parameter <sup>b</sup>	Number of samples <sup>c</sup>	Minimum <sup>d</sup>	Maximum <sup>d</sup>	Average <sup>e</sup>
<i>FBP Outfalls</i>					
005	Americium-241	3(3)	< 0.00133	< 0.0149	
	Neptunium-237	3(3)	0	< 0.0336	
	Plutonium-238	3(3)	0	< 0.0126	
	Plutonium-239/240	3(3)	< 0.0000000897	< 0.00407	
	Techneium-99	9(9)	0	< 1.13	
	Uranium	9(8)	< 0.126	0.344	
	Uranium-233/234	9(7)	< 0.0688	0.131	
	Uranium-235/236	9(9)	0	< 0.0419	
009	Uranium-238	9(8)	< 0.0373	0.111	
	Americium-241	4(4)	0	< 0.00998	
	Neptunium-237	4(4)	0	< 0.00051	
	Plutonium-238	4(4)	0	< 0.0209	
	Plutonium-239/240	4(4)	0	< 0.0292	
	Techneium-99	12(12)	0	< 3.23	
	Uranium	12(0)	1.71	7.38	4.44
	Uranium-233/234	12(0)	0.687	3.18	1.78
010	Uranium-235/236	12(8)	< 0.0332	0.228	
	Uranium-238	12(0)	0.566	2.45	1.47
	Americium-241	4(4)	0	< 0.00513	
	Neptunium-237	4(4)	0	< 0.00503	
	Plutonium-238	4(4)	0	< 0.0654	
	Plutonium-239/240	4(4)	0	< 0.0981	
	Techneium-99	12(12)	0	< 2.18	
	Uranium	12(0)	0.518	3.34	1.96
011	Uranium-233/234	12(0)	0.353	1.56	0.973
	Uranium-235/236	12(8)	< 0.0181	0.169	
	Uranium-238	12(0)	0.171	1.11	0.646
	Americium-241	4(4)	0	< 0.0356	
	Neptunium-237	4(4)	0	< 0.0305	
	Plutonium-238	4(4)	0	< 0.0709	
	Plutonium-239/240	4(4)	0	< 0.013	
	Techneium-99	12(12)	0	< 1.79	
015	Uranium	12(0)	0.968	3.13	2.11
	Uranium-233/234	12(0)	0.582	1.45	0.990
	Uranium-235/236	12(11)	0	< 0.126	
	Uranium-238	12(0)	0.326	1.04	0.699
	Americium-241	4(4)	0	< 0.0349	
	Neptunium-237	4(4)	0	< 0.00676	
	Plutonium-238	4(4)	< 0.00769	< 0.0143	
	Plutonium-239/240	4(4)	0	< 0.0247	
015	Techneium-99	12(12)	0	< 2.08	
	Uranium	12(0)	0.59	1.77	1.16
	Uranium-233/234	12(0)	0.314	1.06	0.657
	Uranium-235/236	12(11)	0	< 0.0878	
	Uranium-238	12(0)	0.193	0.587	0.383

**Table 2.1. Radionuclide concentrations in FBP and Centrus  
 NPDES outfall water samples – 2018 (continued)**

NPDES outfall <sup>a</sup>	Parameter <sup>b</sup>	Number of samples <sup>c</sup>	Minimum <sup>d</sup>	Maximum <sup>d</sup>	Average <sup>e</sup>
<i>FBP Outfalls</i>					
608	Americium-241	4(4)	0	< 0.0218	
	Neptunium-237	4(4)	0	< 0.00405	
	Plutonium-238	4(4)	0	< 0.0199	
	Plutonium-239/240	4(4)	0	< 0.0221	
	Technetium-99	12(0)	77.5	883	215
	Uranium	12(3)	< 0.265	2.75	
	Uranium-233/234	12(3)	< 0.141	0.968	
	Uranium-235/236	12(12)	< 0.0127	< 0.0883	
610	Uranium-238	12(3)	< 0.0821	0.912	
	Americium-241	1(1)	< 0.00866		
	Neptunium-237	1(1)	0		
	Plutonium-238	1(1)	0		
	Plutonium-239/240	1(1)	< 0.00783		
	Technetium-99	1(1)	< 3.59		
	Uranium	1(0)	0.815		
	Uranium-233/234	1(0)	1.25		
611	Uranium-235/236	1(0)	0.0836		
	Uranium-238	1(0)	0.261		
	Americium-241	4(4)	0	< 0.0305	
	Neptunium-237	4(4)	0	< 0.0719	
	Plutonium-238	4(4)	< 0.0107	< 0.0325	
	Plutonium-239/240	4(4)	< 0.00453	< 0.0323	
	Technetium-99	12(0)	6.6	556	204
	Uranium	12(0)	4.62	103	16.7
<i>Centrus Outfalls</i>	Uranium-233/234	12(0)	3.26	146	21.5
	Uranium-235/236	12(0)	0.222	7.92	1.21
	Uranium-238	12(0)	1.52	33.3	5.43
	Americium-241	4(4)	< 0.027	< 0.093	
	Neptunium-237	4(3)	< 0.058	0.367	
	Plutonium-238	4(4)	< 0.045	< 0.171	
	Plutonium-239/240	4(4)	< 0.019	< 0.089	
	Technetium-99	53(53)	< 4.44	< 8.39	
012	Uranium	53(0)	0.45	1.9	1.1
	Americium-241	4(4)	< 0.027	< 0.059	
	Neptunium-237	4(3)	< 0.039	0.499	
	Plutonium-238	4(4)	< 0.044	< 0.167	
	Plutonium-239/240	4(4)	< 0.049	< 0.08	
	Technetium-99	53(53)	< 4.29	< 8.5	
	Uranium	53(0)	0.45	2.1	1.1

<sup>a</sup>FBP internal NPDES Outfalls 608, 610, and 611 discharge to NPDES Outfall 003 (X-6619 Sewage Treatment Plant).

<sup>b</sup>Uranium is reported in µg/L; all other radionuclides are reported in pCi/L.

<sup>c</sup>Number in parentheses is the number of samples that were below the detection limit.

<sup>d</sup>Minimum or maximum values reported as "0" may actually be negative results. Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out. These negative value results are reported as "0" in the table for simplicity.

<sup>e</sup>Averages were not calculated for outfalls that had greater than 15% of the results below the detection limit. For outfalls with less than 15% of the results below the detection limit, any result below the detection limit was assigned a value at the detection limit to calculate the average for the parameter.



**Table 2.2. FBP NPDES permit summary – 2018**

Effluent characteristics		Monitoring requirements		Discharge limitations	
Parameter	Units	Measurement frequency	Sampling type	Concentration/Loading <sup>a</sup>	
				Monthly	Daily
<i>FBP Outfall 001 (X-230J7 East Holding Pond)</i>					
Cadmium, total recoverable	µg/L	1/quarter	24-hr composite		
Chlorine, total residual	mg/L	1/week	Grab	0.05	0.05
Copper, total recoverable	µg/L	1/quarter	24-hr composite		
Flow rate	MGD	Daily	24-hr total		
Fluoride, total	mg/L	1/quarter	24-hr composite		
Mercury, total (low level)	ng/L	1/month	Grab	25	1700
Oil & grease	mg/L	1/week	Grab	10	15
pH	SU	1/week	Grab		6.5–9.0
Precipitation, total	in.	Daily	24-hr total		
Dissolved solids, total (Residue, total filterable)	mg/L	1/week	24-hr composite		
Silver, total recoverable	µg/L	1/month	24-hr composite		
Total suspended solids <sup>b</sup>	mg/L	1/week	24-hr composite	20	45
Zinc, total recoverable	µg/L	1/quarter	24-hr composite		
<i>FBP Outfall 002 (X-230K South Holding Pond)</i>					
Cadmium, total recoverable	µg/L	1/quarter	24-hr composite		
Flow rate	MGD	Daily	24-hr total		
Fluoride, total	mg/L	1/quarter	24-hr composite		
Mercury, total (low level)	ng/L	1/quarter	Grab		
pH	SU	1/week	Grab		6.5–9.0
Nitrogen, ammonia (NH <sub>3</sub> )	mg/L	1/month	24-hr composite		
Oil & grease	mg/L	1/week	Grab		10
Selenium, total recoverable	µg/L	1/month	24-hr composite		5.0
Silver, total recoverable	µg/L	1/quarter	24-hr composite		
Thallium, total recoverable	µg/L	1/quarter	24-hr composite		
Total suspended solids <sup>b</sup>	mg/L	1/week	24-hr composite	20	45
<i>FBP Outfall 003 (X-6619 Sewage Treatment Plant)</i>					
Acute toxicity, <i>Ceriodaphnia dubia</i>	TUa	1/quarter	24-hr composite		
Acute toxicity, <i>Pimephales promelas</i>	TUa	1/quarter	24-hr composite		
Carbonaceous biochemical oxygen demand, 5-day	mg/L	1/week	24-hr composite	10 (15.1)	15 (22.7)
Copper, total recoverable	µg/L	1/quarter	24-hr composite		
E. coli <sup>c</sup>	#/100 mL	1/week	Grab	126	284
Flow rate	MGD	Daily	24-hr total		
Mercury, total	ng/L	1/month	Grab	66 (0.000099)	1700 (0.0025)

**Table 2.2. FBP NPDES permit summary – 2018 (continued)**

Effluent characteristics		Monitoring requirements		Discharge limitations	
Parameter	Units	Measurement frequency	Sampling type	Concentration/Loading <sup>a</sup>	
				Monthly	Daily
<i>FBP Outfall 003 (X-6619 Sewage Treatment Plant)</i>					
Nitrogen, ammonia (NH <sub>3</sub> )	mg/L	1/2 weeks	24-hr composite		
Nitrite plus nitrate	mg/L	1/quarter	24-hr composite		
Oil & grease	mg/L	1/quarter	Grab		
pH	SU	3/week	Grab		6.5–9.0
Silver, total recoverable	µg/L	1/quarter	24-hr composite		
Thallium, total recoverable	µg/L	1/quarter	24-hr composite		
Total suspended solids	mg/L	1/week	24-hr composite	12 (18.2)	18 (27.3)
Zinc, total recoverable	µg/L	1/quarter	24-hr composite		
<i>FBP Outfall 004 (Cooling Tower Blowdown)</i>					
Acute toxicity, <i>Ceriodaphnia dubia</i>	TUa	1/quarter	24-hr composite		
Acute toxicity, <i>Pimephales promelas</i>	TUa	1/quarter	24-hr composite		
Chlorine, total residual	mg/L	1/week	Grab		0.05
Copper, total recoverable	µg/L	1/month	24-hr composite		66 (0.160)
Dissolved solids, total (Residue, total filterable)	mg/L	1/month	24-hr composite	3500 (8480)	4000 (9690)
Flow rate	MGD	Daily	24-hr total		
Mercury, total	ng/L	1/quarter	Grab		
Oil & grease	mg/L	1/month	Grab	15	20
pH	SU	1/month	Grab		6.5–9.0
Total suspended solids	mg/L	1/month	24-hr composite	18 (43)	27 (65)
Zinc, total recoverable	µg/L	1/quarter	24-hr composite		
<i>FBP Outfall 005 (X-611B Lime Sludge Lagoons)</i>					
Flow rate	MGD	3/week	24-hr total (estimate)		
Lead, total recoverable	µg/L	1/month	Grab		
Mercury, total	ng/L	1/month	Grab		
pH	SU	1/week	Grab		6.5–10.0
Selenium, total recoverable	µg/L	1/month	Grab		5
Total suspended solids <sup>b</sup>	mg/L	1/week	Grab	10	15
<i>FBP Outfall 009 (X-230L North Holding Pond)</i>					
Bis(2-ethylhexyl)phthalate	µg/L	1/month	Composite	8.4	1105
Copper, total recoverable	µg/L	1/month	Grab		
Flow rate	MGD	Daily	24-hr total		
Fluoride, total	mg/L	1/quarter	Grab		
Mercury, total	ng/L	1/quarter	Grab		
Oil & grease	mg/L	1/month	Grab	10	15
pH	SU	1/week	Grab		6.5–9.0

**Table 2.2. FBP NPDES permit summary – 2018 (continued)**

Effluent characteristics		Monitoring requirements		Discharge limitations	
Parameter	Units	Measurement frequency	Sampling type	Concentration/Loading <sup>a</sup>	
				Monthly	Daily
<i>FBP Outfall 009 (X-230L North Holding Pond)</i>					
Silver, total recoverable	µg/L	1/month	Grab	1.3	2.7
Total suspended solids <sup>b</sup>	mg/L	1/week	Grab	30	45
Zinc, total recoverable	µg/L	1/quarter	Grab		
<i>FBP Outfall 010 (X-230J5 Northwest Holding Pond)</i>					
Flow rate	MGD	Daily	24-hr total		
Lead, total recoverable	µg/L	1/month	24-hr composite		
Mercury, total	ng/L	1/quarter	Grab		
Oil & grease	mg/L	1/month	Grab	10	15
pH	SU	1/2 weeks	Grab		6.5–9.0
Precipitation, total	in.	Daily	24-hr total		
Selenium, total recoverable	µg/L	1/month	24-hr composite		
Total suspended solids <sup>b</sup>	mg/L	1/2 weeks	24-hr composite	30	45
Zinc, total recoverable	µg/L	1/month	24-hr composite		
<i>FBP Outfall 011 (X-230J6 Northeast Holding Pond)</i>					
Cadmium, total recoverable	µg/L	1/quarter	Grab		
Chlorine, total residual	mg/L	1/2 weeks	Grab	0.05	0.05
Copper, total recoverable	µg/L	1/month	Grab		
Flow rate	MGD	Daily	24-hr total		
Fluoride, total	mg/L	1/quarter	Grab		
Oil & grease	mg/L	1/2 weeks	Grab	10	15
pH	SU	1/2 weeks	Grab		6.5–9.0
Precipitation, total	in.	Daily	24-hr total		
Selenium, total recoverable	µg/L	1/month	Grab		5.6
Thallium, total recoverable	µg/L	1/quarter	Grab		
Total suspended solids <sup>b</sup>	mg/L	1/2 weeks	Grab	30	45
Zinc, total recoverable	µg/L	1/month	Grab		
<i>FBP Outfall 015 (X-624 Groundwater Treatment Facility)</i>					
Arsenic, total recoverable	µg/L	1/quarter	Grab		
Barium, total recoverable	µg/L	1/quarter	Grab		
Flow rate	MGD	Daily	24-hr total		
PCBs	µg/L	1/quarter	Grab		<i>d</i>
pH	SU	1/2 weeks	Grab		6.5–9.0
Silver, total recoverable	µg/L	1/month	Grab	1.3	6.8
Trichloroethene	µg/L	1/2 weeks	Grab	10	10

**Table 2.2. FBP NPDES permit summary – 2018 (continued)**

Effluent characteristics		Monitoring requirements		Discharge limitations	
Parameter	Units	Measurement frequency	Sampling type	Concentration/Loading <sup>a</sup>	
				Monthly	Daily
<i>FBP Outfall 602 (X-621 Coal Pile Runoff Treatment Facility)</i>					
Flow rate	MGD	Daily	24-hr total (estimate)		
Iron, total <sup>b</sup>	µg/L	1/2 weeks	Grab	3500	7000
Manganese, total <sup>b</sup>	µg/L	1/2 weeks	Grab	2000	4000
pH	SU	1/2 weeks	Grab		6.0–10.0
Precipitation, total	in.	Daily	24-hr total		
Total suspended solids <sup>b</sup>	mg/L	1/2 weeks	Grab	35	50
<i>FBP Outfall 604 (X-700 Bionitrification Facility)</i>					
Copper, total	µg/L	1/month	24-hr composite		
Iron, total	µg/L	1/month	24-hr composite		
Flow rate	MGD	Daily	24-hr total estimate		
Nickel, total	µg/L	1/month	24-hr composite		
Nitrogen, nitrate	mg/L	1/month	24-hr composite		
pH	SU	1/month	Grab		6.5–9.0
Zinc, total	µg/L	1/month	24-hr composite		
<i>FBP Outfall 605 (X-705 Microfiltration Treatment System)</i>					
Chromium, hexavalent	µg/L	1/month	Grab		
Chromium, total	µg/L	1/month	24-hr composite		
Copper, total	µg/L	1/month	24-hr composite		
Flow rate	MGD	Daily	24-hr total		
Nickel, total	µg/L	1/month	24-hr composite		
Nitrogen, ammonia (NH <sub>3</sub> )	mg/L	1/month	24-hr composite		
Nitrogen, nitrate	mg/L	1/month	24-hr composite		
Nitrogen, nitrite	mg/L	1/month	24-hr composite		
Nitrogen, Kjeldahl	mg/L	1/month	24-hr composite		
Oil & grease	mg/L	1/month	Grab		
pH	SU	1/month	Grab		6.5–10.0
Sulfate (SO <sub>4</sub> )	mg/L	1/month	24-hr composite		
Total suspended solids	mg/L	1/month	24-hr composite	20	30
Trichloroethene	µg/L	1/month	Grab		
Zinc, total	µg/L	1/month	24-hr composite		
<i>FBP Outfall 608 (X-622 Groundwater Treatment Facility)</i>					
Flow rate	MGD	Daily	24-hr total		
pH	SU	1/2 weeks	Grab		
<i>trans</i> -1,2-dichloroethene	µg/L	1/2 weeks	Grab	25	66
Trichloroethene	µg/L	1/2 weeks	Grab	10	10

**Table 2.2. FBP NPDES permit summary – 2018 (continued)**

Effluent characteristics		Monitoring requirements		Discharge limitations	
Parameter	Units	Measurement frequency	Sampling type	Concentration/Loading <sup>a</sup>	
				Monthly	Daily
<i>FBP Outfall 610 (X-623 Groundwater Treatment Facility)</i>					
Flow rate	MGD	Daily	24-hr total		
pH	SU	1/2 weeks	Grab		
<i>trans</i> -1,2-dichloroethene	µg/L	1/2 weeks	Grab	25	66
Trichloroethene	µg/L	1/2 weeks	Grab	10	10
<i>FBP Outfall 611 (X-627 Groundwater Treatment Facility)</i>					
Flow rate	MGD	Daily	24-hr total		
pH	SU	1/2 weeks	Grab		
Trichloroethene	µg/L	1/2 weeks	Grab	10	10
<i>FBP Monitoring Station 801 (Upstream Monitoring)</i>					
48-hr acute toxicity, <i>Ceriodaphnia dubia</i>	% affected	1/quarter	Grab		
96-hr acute toxicity, <i>Pimephales promelas</i>	% affected	1/quarter	Grab		
<i>FBP Monitoring Station 902 (Downstream Farfield Monitoring)</i>					
Water temperature	°C	2/week	24-hr maximum	27.8 <sup>c</sup>	29.4 <sup>c</sup>
<i>FBP Monitoring Station 903 (Downstream Farfield Monitoring)</i>					
Water temperature	°C	2/week	24-hr maximum	27.8 <sup>c</sup>	29.4 <sup>c</sup>

<sup>a</sup>If provided in the permit, the loading limit, in kg/day or kg/month, is provided in parentheses.

<sup>b</sup>Limitations do not apply if flow increases as a result of a precipitation or snow melt event and conditions specified in the permit are met.

<sup>c</sup>Summer only (May through October).

<sup>d</sup>No detectable PCBs.

**Table 2.3. MCS NPDES permit summary – 2018**

Effluent characteristics		Monitoring requirements		Discharge limitations	
Parameter	Units	Measurement frequency	Sampling type	Concentration	
				Monthly	Daily
<i>MCS Outfall 001<sup>a</sup></i>					
Biochemical oxygen demand, 5-day	mg/L	1/week	24-hr composite		
Chlorine, total residual	mg/L	Daily	Grab		0.05
Residue, total filterable	mg/L	1/week	24-hr composite		1500
Flow rate	GPD	Daily	24-hr total estimate		
Nitrogen, ammonia	mg/L	1/week	24-hr composite		
Oil and grease, total	mg/L	1/month	Grab		
pH	SU	Daily	Grab		6.5–9.0
Phosphorus, total	mg/L	1/week	24-hr composite		
Total suspended solids <sup>b</sup>	mg/L	1/week	24-hr composite	30	45
Water temperature	°F	Daily	Maximum	<sup>c</sup>	<sup>c</sup>
<i>MCS Outfall 602</i>					
Flow rate	GPD	Daily	24-hr total estimate		
pH	SU	Daily	Grab		

<sup>a</sup>These monitoring requirements and limits apply only when process water is being discharged through the outfall.

<sup>b</sup>Limitations do not apply if flow increases as a result of a precipitation or snow melt event and conditions specified in the permit are met.

<sup>c</sup>Maximum daily and monthly average limits vary according to month.

**Table 2.4. FBP NPDES discharge and compliance rates – 2018**

Parameter	NPDES compliance rate (%) <sup>a</sup>	Number of measurements <sup>b</sup>	Concentration (and loading if applicable)			Units
			Minimum	Maximum	Average <sup>c</sup>	
<i>Outfall 001 (X-230J7 East Holding Pond)</i>						
Cadmium, total recoverable	-	4(3)	< 0.04	0.04		µg/L
Chlorine, total residual	100	48(22)	< 0.02	0.05		mg/L
monthly average	100	12	0	0.035		mg/L
Copper, total recoverable	-	4(0)	0.84	2.2	1.4	µg/L
Flow rate	-	365	0.004	2.846	0.748	MGD
Fluoride, total	-	4(0)	0.089	0.20	0.13	mg/L
Mercury, total (low level)	100	13(0)	2.41	9.17	5.82	ng/L
monthly average <sup>d</sup>	100	12	2.445	9.17	5.94	ng/L
Oil & grease	100	48(36)	0.85	4.0		mg/L
monthly average <sup>d</sup>	100	12	0	2.1		mg/L
pH	98	49	7.32	9.25	7.98	SU
Precipitation, total	-	365	0	2.84	0.16	in.
Residue, total filterable <sup>e</sup>	-	48(0)	130	960	284	mg/L
Silver, total recoverable	-	12(10)	< 0.02	0.034		µg/L
Total suspended solids	100	48(10)	< 1.1	26		mg/L
monthly average <sup>d</sup>	100	12	1.0	17		mg/L
Zinc, total recoverable	-	4(0)	14	40	24	µg/L
<i>Outfall 002 (X-230K South Holding Pond)</i>						
Cadmium, total recoverable	-	4(4)	< 0.04	< 0.04		µg/L
Flow rate	-	365	0.004	1.859	0.728	MGD
Fluoride, total	-	4(0)	0.033	0.14	0.097	mg/L
Mercury, total (low level)	-	4(0)	1.54	6.26	3.37	ng/L
Nitrogen, ammonia (NH <sub>3</sub> )	-	12(1)	< 0.022	0.29	0.067	mg/L
Oil & grease	100	48(33)	1.05	2.9		mg/L
pH	100	48	7.32	8.47	7.97	SU
Selenium, total recoverable	100	12(11)	< 1	1		µg/L
Silver, total recoverable	-	4(4)	< 0.02	< 0.02		µg/L
Thallium, total recoverable	-	4(4)	< 0.066	< 0.066		µg/L
Total suspended solids	100	48(2)	< 1.1	33	8.2	mg/L
monthly average <sup>d</sup>	100	12	2.2	19	8.2	mg/L
<i>Outfall 003 (X-6619 Sewage Treatment Plant)</i>						
Acute toxicity, <i>Ceriodaphnia dubia</i>	-	4(2)	< 1	1		TUa
Acute toxicity, <i>Pimephales promelas</i>	-	4(2)	< 1	1		TUa
Carbonaceous biochemical oxygen demand, 5-day	100	48(35)	< 5.0	13		mg/L
monthly average <sup>d</sup>	100	12	0	7.1		mg/L
Carbonaceous biochemical oxygen demand, 5-day (loading)	98	48	0	30		kg/day
monthly average <sup>d</sup>	100	12	0	12		kg/day
Copper, total recoverable	-	5(0)	1.6	3.5	2.5	µg/L
E. coli <sup>b</sup>	100	24(11)	< 1	32.3		#/100 mL
Flow rate	-	352	0.145	0.805	0.327	MGD
Mercury, total (low level)	100	12(0)	2.07	19.3	7.34	ng/L
monthly average <sup>d</sup>	100	12	2.07	19.3	7.34	ng/L

**Table 2.4. FBP NPDES discharge and compliance rates – 2018 (continued)**

Parameter	NPDES compliance rate (%) <sup>a</sup>	Number of measurements <sup>b</sup>	Concentration (and loading if applicable)			Units
			Minimum	Maximum	Average <sup>c</sup>	
<i>Outfall 003 (X-6619 Sewage Treatment Plant)</i>						
Mercury, total (low level) (loading)	100	12	0.00000310	0.0000229	0.00000929	kg/day
monthly average <sup>d</sup>	100	12	0.00000286	0.0000226	0.00000903	kg/day
Nitrite plus nitrate (NH <sub>3</sub> )	-	5(0)	7.1	12	10.1	mg/L
Nitrogen, ammonia	-	24(10)	< 0.022	3.1		mg/L
Oil & grease	-	5(3)	< 1.9	2.3		mg/L
pH	100	203	7.02	8.86	7.65	SU
Silver, total recoverable	-	5(4)	< 0.02	0.033		µg/L
Thallium, total recoverable	-	5(4)	< 0.066	2		µg/L
Total suspended solids	100	48(9)	0.6	7.2	2.8	mg/L
monthly average <sup>d</sup>	100	12	1.2	3.7	2.3	mg/L
Total suspended solids (loading)	100	48	0	15	3.0	kg/day
monthly average <sup>d</sup>	100	12	1.7	6.8	3.8	kg/day
Zinc, total recoverable	-	5(0)	22	40	29	µg/L
<i>Outfall 004 (Cooling Tower Blowdown)</i>						
Acute toxicity, <i>Ceriodaphnia dubia</i>	-	3(3)	< 1	< 1		TUa
Acute toxicity, <i>Pimephales promelas</i>	-	3(3)	< 1	< 1		TUa
Chlorine, total residual	100	43(41)	< 0.02	0.02		mg/L
Copper, total recoverable	80	10(0)	23	140	57	µg/L
Copper, total recoverable (loading)	100	10(0)	0.0018	0.020	0.0077	kg/day
Flow rate	-	260	0.003	0.140	0.032	MGD
Mercury, total (low level)	-	3(0)	2.80	9.61	5.39	ng/L
Oil & grease	100	10(9)	< 1.7	2		mg/L
monthly average <sup>d</sup>	100	10	0	2		mg/L
pH	92	12	6.24	8.35	7.21	SU
Residue, total filterable <sup>e</sup>	100	10(0)	440	610	524	mg/L
monthly average <sup>d</sup>	100	10	440	610	524	mg/L
Residue, total filterable <sup>e</sup> (loading)	100	10	32	150	66	kg/day
monthly average <sup>d</sup>	100	10	40	88	64	kg/day
Total suspended solids	91	11(0)	2.4	31	8.2	mg/L
monthly average <sup>d</sup>	90	10	2.4	31	7.8	mg/L
Total suspended solids (loading)	100	10	0.23	2.3	0.85	kg/day
monthly average <sup>d</sup>	100	10	0.28	3.4	0.90	kg/day
Zinc, total recoverable	-	3(0)	37	58	48	µg/L
<i>Outfall 005 (X-611B Lime Sludge Lagoons)</i>						
Flow rate	-	124	0.003	9.425	1.417	MGD
Lead, total recoverable	-	9(0)	0.10	0.91	0.33	µg/L
Mercury, total (low level)	-	10(0)	1.20	5.69	2.80	ng/L
pH	100	28	7.38	9.50	8.63	SU
Selenium, total recoverable	-	9(9)	< 1	< 1		µg/L
Total suspended solids	96	27(2)	< 1.1	16	5.9	mg/L
monthly average <sup>d</sup>	100	8	2.8	9.8	5.9	mg/L



**Table 2.4. FBP NPDES discharge and compliance rates – 2018 (continued)**

Parameter	NPDES compliance rate (%) <sup>a</sup>	Number of measurements <sup>b</sup>	Concentration (and loading if applicable)			Units
			Minimum	Maximum	Average <sup>c</sup>	
<i>Outfall 009 (X-230L North Holding Pond)</i>						
Bis(2-ethylhexyl)phthalate	100	12(12)	< 0.30	< 0.74		µg/L
monthly average <sup>d</sup>	100	12	0	0		µg/L
Copper, total recoverable	-	12(1)	< 0.2	3.4	1.4	µg/L
Flow rate	-	365	0.255	2.513	1.152	MGD
Fluoride, total	-	4(0)	0.14	0.21	0.17	mg/L
Mercury, total	-	4(0)	0.59	3.40	1.61	ng/L
Oil & grease	100	12(10)	< 1.6	2.4		mg/L
monthly average <sup>d</sup>	100	12	0	2.4		mg/L
pH	100	48	7.50	8.37	7.98	SU
Silver, total recoverable	100	12(11)	< 0.02	0.027		µg/L
monthly average <sup>d</sup>	100	12	0	0.027		µg/L
Total suspended solids	100	48(5)	< 1.1	39	8.3	mg/L
monthly average <sup>d</sup>	100	12	0.40	18	8.5	mg/L
Zinc, total recoverable	-	4(0)	5.1	14	10	µg/L
<i>Outfall 010 (X-230J5 Northwest Holding Pond)</i>						
Flow rate	-	365	0.079	1.368	0.439	MGD
Lead, total recoverable	-	12(1)	< 0.1	2.1	0.58	µg/L
Mercury, total	-	4(0)	0.75	2.20	1.56	ng/L
Oil & grease	100	12(9)	< 1.6	3.6		mg/L
monthly average <sup>d</sup>	100	12	0	3.6		mg/L
pH	100	24	7.40	8.23	7.82	SU
Precipitation, total	-	365	0	2.84	0.16	in.
Selenium, total recoverable	-	12(12)	< 1	< 1		µg/L
Total suspended solids	100	24(2)	< 1.1	40	8.6	mg/L
monthly average <sup>d</sup>	100	12	2.0	26	8.6	mg/L
Zinc, total recoverable	-	12(0)	8.4	32	20	µg/L
<i>Outfall 011 (X-230J6 Northeast Holding Pond)</i>						
Cadmium, total recoverable	-	4(2)	< 0.04	0.13		µg/L
Chlorine, total residual	100	24(11)	< 0.02	0.05		mg/L
monthly average <sup>d</sup>	100	12	0	0.035		mg/L
Copper, total recoverable	-	12(0)	0.55	3.3	1.5	µg/L
Flow rate	-	365	0.002	1.368	0.070	MGD
Fluoride, total	-	4(0)	0.14	0.25	0.18	mg/L
Oil & grease	100	24(19)	< 1.6	2.4		mg/L
monthly average <sup>d</sup>	100	12	0	1.2		mg/L
pH	100	25	7.06	8.40	7.86	SU
Precipitation, total	-	365	0	2.84	0.16	in.
Selenium, total recoverable	100	12(7)	< 1.0	1.4		µg/L
Thallium, total recoverable	-	4(2)	< 0.066	0.0905		µg/L
Total suspended solids	100	24(4)	< 1.1	11		mg/L
monthly average <sup>d</sup>	100	12	0.60	8.4		mg/L
Zinc, total recoverable	-	12(0)	6.5	150	42	µg/L

**Table 2.4. FBP NPDES discharge and compliance rates – 2018 (continued)**

Parameter	NPDES compliance rate (%) <sup>a</sup>	Number of measurements <sup>b</sup>	Concentration (and loading if applicable)			Units
			Minimum	Maximum	Average <sup>c</sup>	
<i>Outfall 015 (X-624 Groundwater Treatment Facility)</i>						
Arsenic, total recoverable	-	4(4)	< 0.5	< 0.5		µg/L
Barium, total recoverable	-	4(0)	22	57	38	µg/L
Flow rate	-	301	0	0.0285	0.007	MGD
PCBs	100	4(4)	< 0.095	< 0.11		µg/L
pH	100	25	7.18	8.09	7.64	SU
Silver, total recoverable	-	12(9)	< 0.02	0.042		µg/L
Trichloroethene	100	24(13)	< 0.16	1.395		µg/L
monthly average <sup>d</sup>	100	12	0	1.05		µg/L
<i>Outfall 602 (X-621 Coal Pile Runoff Treatment Facility)</i>						
Flow rate	-	43	0.021	0.220	0.122	MGD
Iron, total	100	15(0)	35	655	213	µg/L
monthly average <sup>d</sup>	100	10	42	553	212	µg/L
Manganese, total	100	15(0)	36	590	281	µg/L
monthly average <sup>d</sup>	100	10	36	590	292	µg/L
pH	100	15	6.57	9.28	8.26	SU
Precipitation, total	-	303	0	2.9	0.17	in.
Total suspended solids	100	15(0)	6.8	26	13	mg/L
monthly average <sup>d</sup>	100	10	6.8	20	14	mg/L
<i>Outfall 604 (X-700 Biodenitrification Facility)</i>						
Copper, total	-	6(0)	0.39	1.5	1.0	µg/L
Flow rate	-	66	0.0017	0.0106	0.0104	MGD
Iron, total	-	6(0)	100	180	133	µg/L
Nickel, total	-	6(0)	0.30	0.86	0.50	µg/L
Nitrogen, nitrate	-	6(0)	16.1	53.6	36.0	mg/L
pH	100	6	7.05	8.60	8.02	SU
Zinc, total	-	6(1)	< 2	17		µg/L
<i>Outfall 605 (X-705 Microfiltration Treatment System)<sup>f</sup></i>						
<i>Outfall 608 (X-622 Groundwater Treatment Facility)</i>						
Flow rate	-	352	0.0200	0.0839	0.059	MGD
pH	-	25	7.19	8.59	7.81	SU
Trichloroethene	100	24(1)	< 0.16	2.7	1.2	µg/L
monthly average <sup>d</sup>	100	12	0.36	2.5	1.2	µg/L
1,2- <i>trans</i> -dichloroethene	100	24(24)	< 0.15	< 0.333		µg/L
monthly average <sup>d</sup>	100	12	0	0		µg/L
<i>Outfall 610 (X-623 Groundwater Treatment Facility)</i>						
Flow rate	-	1	0.00615			MGD
pH	-	1	7.21			SU
Trichloroethene	100	1(1)	< 0.333			µg/L
monthly average <sup>d</sup>	100	1	0			µg/L
1,2- <i>trans</i> -dichloroethene	100	1(1)	< 0.333			µg/L
monthly average <sup>d</sup>	100	1	0			µg/L

**Table 2.4. FBP NPDES discharge and compliance rates – 2018 (continued)**

Parameter	NPDES compliance rate (%) <sup>a</sup>	Number of measurements <sup>b</sup>	Concentration (and loading if applicable)			Units
			Minimum	Maximum	Average <sup>c</sup>	
<i>Outfall 611 (X-627 Groundwater Treatment Facility)</i>						
Flow rate	-	365	0.002	0.056	0.027	MGD
pH	-	25	7.67	8.36	8.10	SU
Trichloroethene	100	24(3)	< 0.333	8.2	1.4	µg/L
monthly average <sup>d</sup>	100	12	0	4.8	1.4	µg/L
<i>Monitoring Station 801 (Upstream Monitoring)</i>						
48-hr acute toxicity, <i>Ceriodaphnia dubia</i>	-	4(4)	0	0		% affected
96-hr acute toxicity, <i>Pimephales promelas</i>	-	4(4)	0	0		% affected
<i>Monitoring Station 902 (Downstream Farfield Monitoring)</i>						
Water temperature	100	96	0.77	29.00	15.76	°C
monthly average	100	12	3.19	26.67	15.76	°C
<i>Monitoring Station 903 (Downstream Farfield Monitoring)</i>						
Water temperature	99	96	0.27	29.88	16.01	°C
monthly average	100	12	2.56	27.01	16.01	°C

<sup>a</sup>Compliance rates are provided only for those parameters with a limit specified in the NPDES permit (many parameters require monitoring only). At all outfalls except Outfalls 003, 004, and 605, permit limitations do not apply to total suspended solids if flow increases as a result of precipitation or snow melt and conditions set in the permit are met. Sample results for total suspended solids that are elevated due to precipitation (and not subject to permit limitations) are not reported in this table, although they are included in the total number of samples reported for each outfall.

<sup>b</sup>Number in parentheses is the number of samples that were below the detection limit.

<sup>c</sup>Averages were not calculated for outfalls that had greater than 15% of the results below the detection limit. For outfalls with less than 15% of the results below the detection limit, any result below the detection limit was assumed to be zero for calculating the average for the parameter.

<sup>d</sup>To compute the monthly average, parameters that were undetected were assumed to be zero. Exceedances due to flow increases from precipitation or snow melt (see footnote a) were not included in the monthly average calculation.

<sup>e</sup>Residue (total filterable) was reported as dissolved solids in the previous version of the NPDES permit. Data collected from January through May of 2018 was reported as dissolved solids. Concentration and loading limits for this parameter did not change.

<sup>f</sup>The X-705 Microfiltration Treatment System (Outfall 605) did not operate in 2018.

**Table 2.5. MCS NPDES discharge and compliance rates – 2018**

Parameter	NPDES compliance rate (%)	Number of measurements	Result			Units
			Minimum	Maximum	Average	
		<i>Outfall 001<sup>a</sup></i>				
		<i>Outfall 602</i>				
Flow rate	-	365	466	16,547	9091	GPD
pH	100	251	6.03	8.21	7.00	SU

<sup>a</sup>This outfall was not used for process water discharges in 2018; therefore, monitoring was not required.

**Table 2.6. Centrus NPDES discharge monitoring results – 2018**

Parameter	Number of samples <sup>a</sup>	Concentration			Unit
		Minimum	Maximum	Average <sup>b</sup>	
<i>Outfall 012 (X-230M Southwest Holding Pond)</i>					
Cadmium	12(0)	0.092	0.94	0.37	µg/L
Chlorine	24(0)	0	0.05	0.03	mg/L
Copper	12(0)	0.49	2.3	1.2	µg/L
Flow rate	365	0.0368	1.701	0.316	MGD
Iron	12(0)	180	830	376	µg/L
Oil and grease	24(18)	< 1.6	4.8		mg/L
PCBs, total	1(1)	< 0.095			µg/L
pH	24	7.29	8.50	8.07	SU
Selenium	12(12)	< 1	< 1		µg/L
Silver	12(11)	< 0.02	0.028		µg/L
Suspended solids	23(0)	1.2	18	5.2	mg/L
Thallium	12(10)	< 0.066	0.2		µg/L
Trichloroethene	12(10)	< 0.16	0.22		µg/L
<i>Outfall 013 (X-230N West Holding Pond)</i>					
Antimony	12(0)	0.33	0.92	0.55	µg/L
Arsenic	12(2)	< 0.5	1.5		µg/L
Chlorine	24(0)	0	0.05	0.03	mg/L
Copper	12(0)	1.0	2.9	1.5	µg/L
Flow rate	365	0.0079	1.790	0.277	MGD
Oil and grease	24(19)	< 1.6	4.9		mg/L
PCBs, total	1(1)	< 0.098			µg/L
pH	24	7.67	8.66	8.28	SU
Suspended solids	24(1)	< 1.1	23	4.6	mg/L
Thallium	12(12)	< 0.066	< 0.066		µg/L
Zinc	12(0)	6.1	43	21	µg/L
<i>Outfall 613 (X-6002 Particulate Separator)</i>					
Chlorine	13(0)	0	0.08	0.04	mg/L
Flow rate	59	0.0003	0.022	0.0007	MGD
Suspended solids	13(5)	< 1.1	5.6		mg/L

<sup>a</sup>Number in parentheses is the number of samples that were below the detection limit.

<sup>b</sup>Averages were not calculated for outfalls that had greater than 15% of the results below the detection limit. For outfalls with less than 15% of the results below the detection limit, any result below the detection limit was assigned a value at the detection limit for calculating an average for the parameter.

**Table 2.7. Radionuclides in surface water runoff samples from FBP and MCS cylinder storage yards – 2018**

Sample location	Parameter	Unit	Number of samples <sup>a</sup>	Minimum <sup>b</sup>	Maximum	Average <sup>c</sup>
<i>FBP cylinder storage yards</i>						
X745-B1	Alpha activity	pCi/L	11(4)	< 2.03	105	
	Beta activity	pCi/L	11(1)	< 4.25	220	39.4
	Uranium	µg/L	11(0)	0.09	6.35	1.06
X745-B2	Alpha activity	pCi/L	11(4)	< 1.61	113	
	Beta activity	pCi/L	11(4)	< 1.24	98.5	
	Uranium	µg/L	11(0)	1.39	93.1	21.0
X745-B3	Alpha activity	pCi/L	11(3)	< 1.93	449	
	Beta activity	pCi/L	11(0)	5.69	345	74.8
	Uranium	µg/L	11(0)	0.086	24.4	3.38
X745-D1	Alpha activity	pCi/L	12(6)	0	35.2	
	Beta activity	pCi/L	12(5)	< 2.28	66.9	
	Uranium	µg/L	12(0)	0.269	12.8	3.17
X745-F1	Alpha activity	pCi/L	11(9)	0	291	
	Beta activity	pCi/L	11(6)	< 0.615	523	
	Uranium	µg/L	11(0)	0.105	4.99	1.52
X745-F2	Alpha activity	pCi/L	12(7)	< 1.4	181	
	Beta activity	pCi/L	12(4)	< 3.76	285	
	Uranium	µg/L	12(0)	0.843	15.8	5.83
X745-F3	Alpha activity	pCi/L	12(7)	< 0.528	146	
	Beta activity	pCi/L	12(7)	< 0.884	170	
	Uranium	µg/L	12(0)	0.193	8.87	3.45
<i>MCS cylinder storage yards</i>						
X745-C1	Alpha activity	pCi/L	12(0)	0.286	6.25	2.35
	Beta activity	pCi/L	12(0)	0.697	7.39	3.24
	Uranium	µg/L	12(1)	0	3.7	2.3
X745-C2	Alpha activity	pCi/L	12(0)	0.998	3.15	1.97
	Beta activity	pCi/L	12(0)	1.48	4.59	2.92
	Uranium	µg/L	12(0)	1.3	6.2	4.0
X745-C3	Alpha activity	pCi/L	12(0)	0.270	2.48	1.14
	Beta activity	pCi/L	12(0)	1.45	3.38	2.23
	Uranium	µg/L	12(2)	ND	2.1	
X745-C4	Alpha activity	pCi/L	12(0)	0.325	2.63	1.44
	Beta activity	pCi/L	12(0)	1.27	5.68	3.10
	Uranium	µg/L	12(0)	0.71	4.5	3.0
X745-E1	Alpha activity	pCi/L	12(0)	0.927	2.68	1.45
	Beta activity	pCi/L	12(0)	2.06	7.76	4.81
	Uranium	µg/L	12(1)	ND	1.2	0.93

**Table 2.7. Radionuclides in surface water runoff samples from FBP and MCS cylinder storage yards – 2018 (continued)**

Sample location	Parameter	Unit	Number of samples <sup>a</sup>	Minimum <sup>b</sup>	Maximum	Average <sup>c</sup>
<i>MCS cylinder storage yards (continued)</i>						
X745-G1A	Alpha activity	pCi/L	12(0)	0.854	3.22	2.16
	Beta activity	pCi/L	12(0)	1.65	5.01	2.97
	Uranium	µg/L	12(0)	1.4	2.8	2.1
X745-G2	Alpha activity	pCi/L	12(1)	0	3.37	1.58
	Beta activity	pCi/L	12(0)	1.40	5.82	3.15
	Uranium	µg/L	12(0)	0.46	2.5	1.5

<sup>a</sup>Number in parentheses is the number of samples that were below the detection limit.

<sup>b</sup>Minimum values reported as "0" may actually be negative results. Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out. These negative value results are reported as "0" in the table for simplicity. ND – not detected.

<sup>c</sup>Averages were not calculated for locations that had greater than 15% of the results below the detection limit. For locations with less than 15% of the results below the detection limit, any result below the detection limit was assigned a value at the detection limit to calculate the average for the parameter.

**Table 2.8. Drainage basin monitoring of surface water and sediment for MCS cylinder storage yards – 2018**

Location	Parameter <sup>a</sup>	First quarter <sup>b</sup>			Second quarter <sup>b</sup>		
		SW-F	SW-UF	Sed	SW-F	SW-UF	Sed
UDS X01	Total PCB	0.33U	0.35U	270	0.34U	0.35U	25J
RM-8	Total PCB	0.35U	0.35U	14U	0.35U	0.35U	12U
UDS X02	Total PCB	0.33U	0.36U	53	0.34U	0.36U	48
RM-10	Total PCB	0.34U	0.34U	13U	0.34U	0.33U	1900

  

Location	Parameter <sup>a</sup>	Third quarter <sup>b</sup>			Fourth quarter <sup>b</sup>		
		SW-F	SW-UF	Sed	SW-F	SW-UF	Sed
UDS X01	Total PCB	0.34U	0.37U	12U	0.34U	0.37U	28J
RM-8	Total PCB	0.34U	0.38U	14U	0.35U	0.35U	85
UDS X02	Total PCB	0.36U	0.36U	34J	0.33U	0.33U	270
RM-10	Total PCB	0.34U	0.36U	24J	0.33U	0.33U	17J
X-745C2	Total PCB	ns	ns	29J	ns	ns	19U
X-745E1	Total PCB	ns	ns	36J	ns	ns	32U

<sup>a</sup>Results for surface water (SW) are reported in µg/L; results for sediment (Sed) are reported in µg/kg.

<sup>b</sup>Abbreviations and data qualifiers are as follows: SW-F – filtered surface water. SW-UF – unfiltered surface water.

Sed – sediment. ns – not sampled. J – the reported value is an estimated concentration greater than or equal to the method detection limit but less than the reporting limit. U – undetected.



**Table 2.9. Ambient air monitoring program summary for radionuclides and fluoride – 2018**

Sampling Location	Parameter <sup>a</sup>	No. of measurements <sup>b</sup>	Minimum <sup>c, d</sup>	Maximum <sup>c, d</sup>	Average <sup>c, e</sup>
<i>On-site air samplers</i>					
A8	Americium-241	4(4)	0	1.0E-05	
	Fluoride	37(33)	9.1E-03	3.4E-02	
	Neptunium-237	4(4)	0	6.7E-07	
	Plutonium-238	4(4)	7.7E-07	4.1E-06	
	Plutonium-239/240	4(4)	1.9E-06	2.9E-06	
	Technetium-99	9(4)	8.2E-05	2.2E-03	
	Uranium	9(5)	2.5E-05	2.0E-04	
	Uranium-233/234	9(5)	1.0E-05	7.1E-05	
	Uranium-235/236	9(9)	0	4.2E-06	
	Uranium-238	9(5)	8.2E-06	6.7E-05	
A10	Americium-241	3(3)	8.4E-07	4.2E-06	
	Fluoride	33(28)	1.1E-02	3.3E-02	
	Neptunium-237	3(3)	0	0	
	Plutonium-238	3(3)	0	1.1E-05	
	Plutonium-239/240	3(3)	3.3E-06	8.4E-06	
	Technetium-99	10(2)	3.9E-07	9.9E-03	
	Uranium	10(4)	5.7E-05	5.0E-04	
	Uranium-233/234	10(4)	2.4E-05	1.9E-04	
	Uranium-235/236	10(10)	1.5E-06	1.2E-05	
	Uranium-238	10(4)	1.9E-05	1.7E-04	
A29	Americium-241	4(4)	1.2E-06	4.9E-06	
	Fluoride	51(46)	8.4E-03	4.0E-02	
	Neptunium-237	4(4)	0	1.7E-06	
	Plutonium-238	4(4)	1.5E-06	8.5E-06	
	Plutonium-239/240	4(4)	0	6.4E-06	
	Technetium-99	12(7)	0	1.2E-03	
	Uranium	12(8)	4.0E-05	1.8E-04	
	Uranium-233/234	12(7)	1.9E-05	5.6E-05	
	Uranium-235/236	12(12)	9.8E-07	5.3E-06	
	Uranium-238	12(8)	1.3E-05	5.9E-05	
A36	Americium-241	3(3)	4.3E-06	8.8E-06	
	Fluoride	52(45)	1.2E-02	3.9E-02	
	Neptunium-237	3(3)	0	3.6E-06	
	Plutonium-238	3(3)	7.2E-07	5.6E-06	
	Plutonium-239/240	3(3)	2.9E-06	7.4E-06	
	Technetium-99	10(2)	7.7E-05	1.8E-03	
	Uranium	10(4)	5.4E-05	4.2E-04	
	Uranium-233/234	10(4)	4.0E-05	1.6E-04	
	Uranium-235/236	10(10)	0	9.0E-06	
	Uranium-238	10(5)	1.8E-05	1.4E-04	
A40A	Fluoride	51(49)	7.1E-03	1.8E-02	

**Table 2.9. Ambient air monitoring program summary for radionuclides and fluoride – 2018 (continued)**

Sampling Location	Parameter <sup>a</sup>	No. of measurements <sup>b</sup>	Minimum <sup>c, d</sup>	Maximum <sup>c, d</sup>	Average <sup>c, e</sup>
<i>On-site air samplers</i>					
T7	Americium-241	4(4)	3.3E-06	7.0E-06	
	Neptunium-237	4(4)	0	1.3E-06	
	Plutonium-238	4(4)	0	4.4E-06	
	Plutonium-239/240	4(4)	7.0E-07	3.3E-06	
	Techneium-99	12(7)	0	1.4E-03	
	Uranium	12(7)	3.7E-05	1.9E-04	
	Uranium-233/234	12(7)	1.3E-05	5.8E-05	
	Uranium-235/236	12(12)	0	4.6E-06	
	Uranium-238	12(7)	1.2E-05	6.4E-05	
<i>Off-site air samplers</i>					
A3	Americium-241	4(4)	2.0E-06	4.6E-06	
	Fluoride	52(33)	1.0E-02	4.6E-02	
	Neptunium-237	4(4)	0	2.4E-06	
	Plutonium-238	4(4)	0	7.7E-06	
	Plutonium-239/240	4(4)	1.8E-06	8.7E-06	
	Techneium-99	12(5)	0	1.2E-03	
	Uranium	12(7)	5.0E-05	2.0E-04	
	Uranium-233/234	12(6)	2.0E-05	8.5E-05	
	Uranium-235/236	12(12)	1.5E-06	4.4E-06	
A6	Uranium-238	12(7)	1.6E-05	6.8E-05	
	Americium-241	3(3)	3.7E-06	1.0E-05	
	Fluoride	45(39)	6.8E-03	2.9E-02	
	Neptunium-237	3(3)	0	8.2E-07	
	Plutonium-238	3(3)	6.8E-07	5.5E-06	
	Plutonium-239/240	3(3)	1.8E-06	5.7E-06	
	Techneium-99	9(8)	0	4.1E-04	
	Uranium	9(5)	4.4E-07	1.1E-04	
	Uranium-233/234	9(5)	2.3E-06	4.1E-05	
A9	Uranium-235/236	9(9)	5.2E-07	4.6E-06	
	Uranium-238	9(5)	0	3.7E-05	
	Americium-241	4(4)	3.8E-06	9.7E-06	
	Fluoride	32(31)	1.3E-02	2.1E-02	
	Neptunium-237	4(4)	0	1.7E-06	
	Plutonium-238	4(4)	1.4E-06	6.9E-06	
	Plutonium-239/240	4(4)	1.4E-06	4.5E-06	
	Techneium-99	12(5)	0	6.6E-04	
	Uranium	12(8)	8.7E-07	1.9E-04	
Uranium-233/234	12(7)	7.6E-07	6.0E-05		
Uranium-235/236	12(12)	5.3E-07	6.0E-06		
Uranium-238	12(8)	0	6.2E-05		

**Table 2.9. Ambient air monitoring program summary for radionuclides and fluoride – 2018 (continued)**

Sampling Location	Parameter <sup>a</sup>	No. of measurements <sup>b</sup>	Minimum <sup>c, d</sup>	Maximum <sup>c, d</sup>	Average <sup>c, e</sup>
A12	Americium-241	4(4)	6.1E-07	6.3E-06	
	Fluoride	17(9)	1.2E-02	4.3E-02	
	Neptunium-237	4(4)	0	8.2E-07	
	Plutonium-238	4(4)	0	2.8E-06	
	Plutonium-239/240	4(4)	1.7E-06	4.4E-06	
	Techneium-99	12(6)	7.0E-05	4.2E-03	
	Uranium	12(7)	4.5E-05	2.0E-04	
	Uranium-233/234	12(7)	2.1E-05	6.4E-05	
	Uranium-235/236	12(12)	1.0E-06	5.7E-06	
	Uranium-238	12(7)	1.5E-05	6.7E-05	
A15	Americium-241	4(3)	1.2E-06	2.2E-05	
	Fluoride	37(32)	8.2E-03	2.7E-02	
	Neptunium-237	4(4)	0	7.6E-07	
	Plutonium-238	4(4)	7.9E-07	5.7E-06	
	Plutonium-239/240	4(4)	0	4.4E-06	
	Techneium-99	12(3)	4.9E-05	7.0E-04	
	Uranium	12(7)	2.5E-05	2.1E-04	
	Uranium-233/234	12(7)	1.4E-05	6.0E-05	
	Uranium-235/236	12(12)	0	5.2E-06	
	Uranium-238	12(7)	8.2E-06	6.9E-05	
A23	Americium-241	4(4)	2.0E-06	5.6E-06	
	Fluoride	31(24)	1.1E-02	2.3E-02	
	Neptunium-237	4(4)	0	1.1E-06	
	Plutonium-238	4(4)	7.0E-07	4.4E-06	
	Plutonium-239/240	4(4)	1.4E-06	6.2E-06	
	Techneium-99	12(5)	0	3.8E-03	
	Uranium	12(7)	4.1E-05	1.6E-04	
	Uranium-233/234	12(5)	2.1E-05	1.0E-04	
	Uranium-235/236	12(12)	0	4.7E-06	
	Uranium-238	12(7)	1.3E-05	5.4E-05	
A24	Americium-241	4(4)	2.0E-06	7.8E-06	
	Fluoride	43(39)	8.6E-03	2.4E-02	
	Neptunium-237	4(4)	0	7.8E-07	
	Plutonium-238	4(4)	0	7.6E-06	
	Plutonium-239/240	4(4)	1.5E-06	5.4E-06	
	Techneium-99	12(5)	0	1.1E-03	
	Uranium	12(6)	5.1E-05	1.7E-04	
	Uranium-233/234	12(5)	2.5E-05	6.3E-05	
	Uranium-235/236	12(12)	0	6.0E-06	
	Uranium-238	12(6)	1.7E-05	5.5E-05	

**Table 2.9. Ambient air monitoring program summary for radionuclides and fluoride – 2018 (continued)**

Sampling Location	Parameter <sup>a</sup>	No. of measurements <sup>b</sup>	Minimum <sup>c, d</sup>	Maximum <sup>c, d</sup>	Average <sup>c, e</sup>
A28	Americium-241	4(4)	1.6E-06	8.1E-06	
	Fluoride	47(36)	7.6E-03	4.3E-02	
	Neptunium-237	4(4)	0	1.6E-06	
	Plutonium-238	4(4)	7.4E-07	7.0E-06	
	Plutonium-239/240	4(4)	1.5E-06	8.0E-06	
	Technetium-99	12(10)	0	7.6E-04	
	Uranium	12(7)	4.7E-05	9.9E-05	
	Uranium-233/234	12(7)	1.4E-05	3.5E-05	
	Uranium-235/236	12(12)	0	4.7E-06	
A37 (background)	Uranium-238	12(7)	1.6E-05	3.3E-05	
	Americium-241	4(3)	6.5E-07	2.5E-05	
	Fluoride	25(22)	1.1E-02	5.5E-02	
	Neptunium-237	4(4)	0	1.2E-06	
	Plutonium-238	4(4)	0	1.0E-05	
	Plutonium-239/240	4(4)	1.5E-06	5.5E-06	
	Technetium-99	12(10)	0	3.7E-03	
	Uranium	12(8)	3.1E-05	1.7E-04	
	Uranium-233/234	12(8)	7.8E-06	4.8E-05	
A41A	Uranium-235/236	12(12)	0	4.2E-06	
	Uranium-238	12(8)	1.0E-05	5.7E-05	
	Americium-241	4(3)	1.3E-06	1.6E-05	
	Fluoride	37(22)	9.1E-03	3.2E-02	
	Neptunium-237	4(4)	0	2.3E-06	
	Plutonium-238	4(4)	0	6.2E-06	
	Plutonium-239/240	4(4)	2.1E-06	7.9E-06	
	Technetium-99	12(9)	2.6E-05	3.3E-04	
	Uranium	12(7)	4.0E-05	1.9E-04	
Uranium-233/234	12(7)	2.0E-05	6.3E-05		
Uranium-235/236	12(12)	0	3.9E-06		
Uranium-238	12(7)	1.3E-05	6.4E-05		

<sup>a</sup>All parameters are measured in pCi/m<sup>3</sup> with the exception of uranium and fluoride which are measured in µg/m<sup>3</sup>.

<sup>b</sup>Radiological samples for technetium-99, uranium, and uranium isotopes are analyzed monthly, samples for americium-241, neptunium-237, plutonium-238, and plutonium-239/240 are analyzed one month per quarter, and samples for fluoride are analyzed weekly. Number in parentheses is the number of samples that were below the detection limit. If the analytical result for a sample was below the detection limit, the ambient air concentration was calculated based on the value for the undetected result.

<sup>c</sup>Results are provided in scientific notation. The number and sign (+ or -) to the right of the “E” indicate the number of places to the right or left of the decimal point. For example, 3.4E-04 is 0.00034 (the decimal point moves four places to the left); 2.1E+02 is 210 (the decimal point moves two places to the right).

Ambient concentrations of uranium and uranium isotopes reported in 2018 may be slightly elevated and should be considered estimated. Uranium and uranium isotopes were detected in quality control samples associated with the ambient air samples and subsequently in unused filters obtained from the manufacturer that are placed at the ambient air stations to collect samples. The presence of uranium and uranium isotopes in the unused filters may have caused slightly elevated analytical results for uranium and uranium isotopes. Levels of these constituents in ambient air are calculated based on the analytical results and therefore may be slightly elevated as well. Reported minimum and maximum values include these estimated results.

<sup>d</sup>Values reported as “0” may actually be negative results. Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out. These negative value results are reported as “0” in the table for simplicity.

<sup>e</sup>Averages are not calculated for locations that had greater than 15% of the results below the detection limit. For locations with less than 15% of the results below the detection limit, any result below the detection limit was assigned the value of the undetected result to calculate the average for the parameter.

**Table 2.10. External radiation monitoring program (mrem) – 2018**

Location	First quarter	Second quarter	Third quarter	Fourth quarter	Cumulative annual whole body dose <sup>a</sup>
A12	19	23	21	22	85
A15	19	24	22	22	87
A23	18	24	22	21	85
A24	21	24	22	23	90
A28	18	22	19	20	79
A29	19	24	21	23	87
A3	19	24	20	20	83
A36	18	22	20	20	80
A40A	19	22	21	22	84
A6	22	25	20	23	90
A8	21	26	23	24	94
A9	19	22	22	22	85
UPOLE-1404A	17	23	20	20	80
UPOLE-518	17	22	19	19	77
UPOLE-862	28	33	30	29	120
UPOLE-874	142	176	146	141	605
UPOLE-906	16	21	17	18	72
UPOLE-933	18	21	19	20	78
X-230J2	19	24	22	22	87

<sup>a</sup>The annual occupational whole body dose limit set by Title 10 of the *Code of Federal Regulations* Part 20 is 5000 mrem.

**Table 2.11. External radiation monitoring (mrem) at locations near cylinder storage yards – 2018**

Location	First quarter	Second quarter	Third quarter	Fourth quarter	Cumulative annual whole body dose <sup>a</sup>
UPOLE-41	132	171	124	131	558
UPOLE-868	325	363	311	289	1288
UPOLE-874	160	146	142	132	580
UPOLE-882	299	293	241	262	1095
UPOLE-890	176	86	60	59	381

<sup>a</sup>The annual occupational whole body dose limit set by Title 10 of the *Code of Federal Regulations* Part 20 is 5000 mrem.

**Table 2.12. Settleable solids monitoring results – 2018**

Sampling location	Parameter <sup>a</sup>	Unit	Results <sup>b</sup>			
			First/second quarter	Third/fourth quarter		
<i>Little Beaver Creek</i>						
EDD-SW01 (FBP Outfalls 001 & 015)	Settleable solids	mg/L	4.8	4U <sup>c</sup>	4U	
	Suspended solids	mg/L	4.8J	4UJ <sup>c</sup>	4U	
FBP Outfall 005	Settleable solids	mg/L	5.2		15.2	
	Suspended solids	mg/L	19.6		22.4	
FBP Outfall 009	Settleable solids	mg/L	5.2		4U	
	Suspended solids	mg/L	5.2J		4U	
FBP Outfall 011	Settleable solids	mg/L	4U		4U	4U <sup>c</sup>
	Suspended solids	mg/L	4UJ		4U	4U <sup>c</sup>
<i>Big Run Creek</i>						
FBP Outfall 002	Settleable solids	mg/L	4U		4U	
	Suspended solids	mg/L	7.2J		6.4J	
<i>Scioto River</i>						
ACP NPDES Outfall 012	Settleable solids	mg/L	4U		4U	
	Suspended solids	mg/L	4UJ		4U	
WDD-SW03 (FBP Outfall 010 & ACP Outfall 013)	Settleable solids	mg/L	4.8		5.6	
	Suspended solids	mg/L	4.8J		5.6J	
FBP Outfall 003	Settleable solids	mg/L	4U	4U <sup>c</sup>	4U	
	Suspended solids	mg/L	4UJ	4UJ <sup>c</sup>	4U	
FBP Outfall 004	Settleable solids	mg/L	4U		4U	4U <sup>c</sup>
	Suspended solids	mg/L	4.8J		20.8	18.4 <sup>c</sup>
<i>Background locations</i>						
RW-6 (Scioto River)	Settleable solids	mg/L	5.2		38	
	Suspended solids	mg/L	16		55.2	
RW-5 (Big Beaver Creek)	Settleable solids	mg/L	5.2		4U	
	Suspended solids	mg/L	10.4		4U	
LBC-SW12 (Little Beaver Creek)	Settleable solids	mg/L	4.8		4U	
	Suspended solids	mg/L	4.8J		4U	

<sup>a</sup>Suspended solids are the solids in a water sample (such as silt or clay particles) that can be trapped by a filter. Settleable solids are a component of suspended solids defined as the particles that settle out of suspension in water within a defined time period.

<sup>b</sup>Abbreviations and data qualifiers are as follows: J – estimated. U – undetected.

<sup>c</sup>This result is for the duplicate sample collected from this location. A duplicate sample is a sample collected from the same location at the same time and using the same sampling device (if possible) as the regular sample.

**Table 2.13. Local surface water monitoring program results – 2018**

Location	Parameter <sup>a</sup>	Second quarter <sup>b,c</sup>	Fourth quarter <sup>b,c</sup>	
Scioto River RW-1A (downstream)	Americium-241	0.0551U	0.0256U	
	Neptunium-237	0U	0U	
	Plutonium-238	0.0808UJ	0.0101U	
	Plutonium-239/240	0.0505U	0.0203U	
	Technetium-99	1.61UJ	-0.055U	
	Uranium	1.51	1.26	
	Uranium-233/234	0.58	0.453	
	Uranium-235/236	0.0618U	0.0402U	
Scioto River RW-6 (upstream)	Uranium-238	0.497	0.416	
	Americium-241	0.047U	0.0197U	
	Neptunium-237	-0.00512U	0.00939U	
	Plutonium-238	0.031U	0U	
	Plutonium-239/240	0.031U	0.0175U	
	Technetium-99	4.1UJ	2.56U	
	Uranium	1.84J	1.49	
	Uranium-233/234	0.773	0.605	
Little Beaver Creek RW-7 (downstream)	Uranium-235/236	0.0607UJ	0.0415U	
	Uranium-238	0.61	0.496	
	Americium-241	0.00724U	0.0162U	0.0199U <sup>d</sup>
	Neptunium-237	0.00959U	0U	0.0174U <sup>d</sup>
	Plutonium-238	0.0191U	0U	0.00571U <sup>d</sup>
	Plutonium-239/240	0.00955U	-0.00668U	0.00572U <sup>d</sup>
	Technetium-99	7.76	4.47UJ	4.75UJ <sup>d</sup>
	Uranium	1.68J	1.72	1.85 <sup>d</sup>
RW-8 (downstream)	Uranium-233/234	1.46	2.27	2.3 <sup>d</sup>
	Uranium-235/236	0.217J	0.158	0.128 <sup>d</sup>
	Uranium-238	0.532	0.554	0.603 <sup>d</sup>
	Americium-241	0.0955U	0.0107U	
	Neptunium-237	0.0214U	0.0105U	
	Plutonium-238	0.0194U	0.0133U	
	Plutonium-239/240	0.0097U	0.00664U	
	Technetium-99	5.9UJ	1.61U	
RW-12 (upstream)	Uranium	1.88J	1.34	
	Uranium-233/234	1.57	1.49	
	Uranium-235/236	0.117UJ	0.0866UJ	
	Uranium-238	0.614	0.436	
	Americium-241	0.0378U	-0.00496U	
	Neptunium-237	0.00524U	0U	
	Plutonium-238	0.0359U	-0.0112U	
	Plutonium-239/240	0.0629U	-0.00559U	
RW-12 (upstream)	Technetium-99	3.06UJ	1.68U	
	Uranium	0.0192UJ	0.076U	
	Uranium-233/234	0.025U	0.0522UJ	
	Uranium-235/236	0.0415UJ	0.0118U	
	Uranium-238	0U	0.0237U	

**Table 2.13. Local surface water monitoring program results – 2018 (continued)**

Location	Parameter <sup>a</sup>	Second quarter <sup>b,c</sup>		Fourth quarter <sup>b,c</sup>
Big Beaver Creek RW-13 (downstream)	Americium-241	0.169		0U
	Neptunium-237	0.00512U		0.00439U
	Plutonium-238	0.042U		-0.0114U
	Plutonium-239/240	0.0526U		0.00573U
	Technetium-99	4.01UJ		2.38U
	Uranium	0.914J		1.28
	Uranium-233/234	0.797		1.88
	Uranium-235/236	0.0911UJ		0.0879UJ
RW-5 (upstream)	Uranium-238	0.293		0.415
	Americium-241	0.0394U		0.00941U
	Neptunium-237	0.0051U		0.00442U
	Plutonium-238	0.0419U		0.00562U
	Plutonium-239/240	0.105UJ		0.0225U
	Technetium-99	1.96UJ		1.46U
	Uranium	0.141UJ		0.25J
	Uranium-233/234	0.071U		0.0968J
Big Run Creek RW-2 (downstream)	Uranium-235/236	0UJ		0.00573U
	Uranium-238	0.0474U		0.083UJ
	Americium-241	0.0231UJ	0.121UJ <sup>d</sup>	0.0371U
	Neptunium-237	0.00503U	-0.00503U <sup>d</sup>	-0.00492U
	Plutonium-238	0.0582U	0.0418U <sup>d</sup>	0.0122U
	Plutonium-239/240	0.136UJ	0.0314U <sup>d</sup>	0U
	Technetium-99	2.11UJ	2.18UJ <sup>d</sup>	0.793U
	Uranium	0.0487UJ	0.0882UJ <sup>d</sup>	0.17U
RW-3 (downstream)	Uranium-233/234	0.0999U	0.0445U <sup>d</sup>	0.17
	Uranium-235/236	0.0518UJ	0UJ <sup>d</sup>	0.0242U
	Uranium-238	0.00833U	0.0296U <sup>d</sup>	0.0535U
	Americium-241	0.0652UJ		0.00498U 0.0231U <sup>d</sup>
	Neptunium-237	-0.00528U		0.00568U 0U <sup>d</sup>
	Plutonium-238	0.0762UJ		0U -0.00526U <sup>d</sup>
	Plutonium-239/240	0.0858UJ		0.0228U 0.0105U <sup>d</sup>
	Technetium-99	3.43UJ		0.759U -1.27U <sup>d</sup>
Uranium	0.802J		0.619 0.536 <sup>d</sup>	
Uranium-233/234	0.7		0.467 0.456 <sup>d</sup>	
Uranium-235/236	0.0318UJ		0.0174U 0.0362U <sup>d</sup>	
Uranium-238	0.265		0.205 0.175 <sup>d</sup>	



**Table 2.13. Local surface water monitoring program results – 2018 (continued)**

Location	Parameter <sup>a</sup>	Second quarter <sup>b,c</sup>		Fourth quarter <sup>b,c</sup>
Big Run Creek (continued)	Americium-241	0.0393U	0.0527U <sup>d</sup>	0.0307U
	Neptunium-237	-0.00504U	-0.00526U <sup>d</sup>	0.00923U
RW-33 (upstream)	Plutonium-238	0.103UJ	0.0193U <sup>d</sup>	0.00603U
	Plutonium-239/240	0.031U	0.0289U <sup>d</sup>	0.0181U
	Technetium-99	1.3UJ	0.31UJ <sup>d</sup>	-1.16U
	Uranium	0.0723UJ	0.0288UJ <sup>d</sup>	0.107U
	Uranium-233/234	0.0164U	0.0567U <sup>d</sup>	0.0459U
	Uranium-235/236	0.0509UJ	0.0101UJ <sup>d</sup>	-0.00571U
	Uranium-238	0.0164U	0.00811U <sup>d</sup>	0.0368U
Background creeks	Americium-241	0.0452U		0.00493U
RW-10N	Neptunium-237	0.00513U		0U
	Plutonium-238	0.0289U		0U
	Plutonium-239/240	0.0674U		0.0109U
	Technetium-99	0.687UJ		0.276U
	Uranium	0.228UJ		0.201U
	Uranium-233/234	0.048U		0.117
	Uranium-235/236	0.0299U		0.0117U
	Uranium-238	0.072UJ		0.0656U
RW-10S	Americium-241	0.0389U		0.0251U
	Neptunium-237	0U		0U
	Plutonium-238	0.0191U		0.0163U
	Plutonium-239/240	0.114UJ		0.0163U
	Technetium-99	3.66UJ		-0.719U
	Uranium	0.381UJ		0.125U
	Uranium-233/234	0.0732U		0.114
	Uranium-235/236	0.0404U		0.00569U
RW-10E	Uranium-238	0.122UJ		0.0412U
	Americium-241	0.0451U		0.0512U
	Neptunium-237	0U		-0.00925U
	Plutonium-238	0.0504U		0.0168U
	Plutonium-239/240	0.0706U		0.0503U
	Technetium-99	4.47UJ		-1.77U
	Uranium	0.0285U		0.089U
	Uranium-233/234	0.016U		0U
Uranium-235/236	0.00997U		0.0116U	
	Uranium-238	0.00802U		0.0281U

**Table 2.13. Local surface water monitoring program results – 2018 (continued)**

Location	Parameter <sup>a</sup>	Second quarter <sup>b,c</sup>	Fourth quarter <sup>b,c</sup>
Background creeks	Americium-241	1.86	0.00508U
	Neptunium-237	0.00487U	0U
RW-10W	Plutonium-238	0.0799UJ	-0.0057U
	Plutonium-239/240	0.17UJ	0.0285U
	Technetium-99	0.377UJ	0.605U
	Uranium	0.101U	0.116U
	Uranium-233/234	0.0243U	0.0453U
	Uranium-235/236	0.0101U	0.0169U
	Uranium-238	0.0324U	0.0363U

<sup>a</sup>Results are reported in µg/L (uranium) and pCi/L (all other parameters).

<sup>b</sup>Abbreviations and data qualifiers are as follows: U – undetected. J – the reported result is estimated.

<sup>c</sup>Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out.

<sup>d</sup>This result is for the duplicate sample collected from this location. A duplicate sample is a sample collected from the same location at the same time and using the same sampling device (if possible) as the regular sample.

**Table 2.14. Sediment monitoring program results – 2018**

Parameter	Unit	Location/results <sup>a,b</sup>			
		<i>Scioto River and outfalls that discharge to the Scioto River</i>			
		<i>RM-6 Upstream @ Piketon</i>	<i>RM-1A Downstream @ Lucasville</i>	<i>RM-9 Outfall 012</i>	<i>RM-10 Outfall 010/Outfall 013</i>
Aluminum	mg/kg	3960D	2950D	5190D	6400D
Americium-241	pCi/g	0.00372UJ	0.000967U	0.00689U	0.0105
Antimony	mg/kg	0.0698DJ	0.0731DJ	0.397DJ	0.0607DJ
Arsenic	mg/kg	8.93	7.37	150	10.8
Barium	mg/kg	44.9	30.3	108	92.2
Beryllium	mg/kg	0.235D	0.195D	0.528D	0.609D
Cadmium	mg/kg	0.272D	0.223D	1.52D	0.155D
Calcium	mg/kg	41900D	43600D	856D	1500D
Chromium	mg/kg	11.1	6.99	13.5	15.1
Copper	mg/kg	12.8	8.2	16.4	9.21
Iron	mg/kg	15500D	12300D	36200D	19600D
Lead	mg/kg	9.51	6.81	79.4	16.3
Magnesium	mg/kg	18100D	17400D	876D	980D
Manganese	mg/kg	397D	314D	1390D	856D
Mercury	mg/kg	0.0233	0.0175	0.0361	0.0348
Neptunium-237	pCi/g	0U	0.00059U	-0.00036U	0U
Nickel	mg/kg	14.7	11.5	51.9	11.8
Plutonium-238	pCi/g	0.00165U	0.002U	0U	0.000658UJ
Plutonium-239/240	pCi/g	0.00288U	0.00559UJ	0.0093J	0.0125J
PCB, total	µg/kg	61.1	52.6	19.2U	46.1
Selenium	mg/kg	0.495D	0.401D	0.494D	0.525D
Silicon	mg/kg	869D	795D	931D	798D
Silver	mg/kg	0.247U	0.245U	0.249U	0.245U
Technetium-99	pCi/g	-0.0159U	-0.0142U	-0.0161U	-0.0247U
Thallium	mg/kg	0.188D	0.149D	0.295D	0.138D
Uranium	µg/g	0.783J	0.716J	1.42J	0.702J
Uranium-233/234	pCi/g	0.215	0.202	0.446	0.272
Uranium-235/236	pCi/g	0.0169J	0.0163J	0.0235J	0.017J
Uranium-238	pCi/g	0.261	0.238	0.475	0.233
Zinc	mg/kg	56.3D	45.8D	103D	42.7D

**Table 2.14. Sediment monitoring program results – 2018 (continued)**

Parameter	Unit	Location/results <sup>a,b</sup>			
		<i>Little Beaver Creek</i>			
		<i>RM-12 Upstream</i>	<i>RM-11 X-230J7 Discharge</i>	<i>RM-8 Downstream @ Outfall 009 Discharge</i>	<i>RM-7 Downstream @ Confluence</i>
Aluminum	mg/kg	6250D	3720D	6000D	5240D
Americium-241	pCi/g	0.00236U	0.0049UJ	0.00775J	0.0047UJ
Antimony	mg/kg	0.0918DJ	0.367DUJ	0.116DJ	0.0833DJ
Arsenic	mg/kg	22.4	20.4	21.7	11.7
Barium	mg/kg	67.6	35.8	103	69.2
Beryllium	mg/kg	0.55D	0.3D	0.535D	0.482D
Cadmium	mg/kg	0.125D	0.478D	0.657D	0.433D
Calcium	mg/kg	2800D	55800D	5290D	6870D
Chromium	mg/kg	19.5	15.9	27	15.2
Copper	mg/kg	12.6	26	15.9	11.9
Iron	mg/kg	35700D	24500D	34500D	21500D
Lead	mg/kg	19.1	17.5	17.8	13.3
Magnesium	mg/kg	1550D	26000D	2650D	3920D
Manganese	mg/kg	758D	525D	859D	546D
Mercury	mg/kg	0.0279	0.436	0.113	0.0419
Neptunium-237	pCi/g	0.000892U	0.00161U	0.00832J	0.00789J
Nickel	mg/kg	16.6	21.8	29	20.5
Plutonium-238	pCi/g	0.00178U	0.00486UJ	0.00224U	0.00126UJ
Plutonium-239/240	pCi/g	0.00356UJ	0.0774	0.0242	0.00691UJ
PCB, total	µg/kg	19.2U	48.1	401	120
Selenium	mg/kg	0.417D	1.51D	0.525D	0.415D
Silicon	mg/kg	932D	846D	758D	900D
Silver	mg/kg	0.25U	0.247U	0.248U	0.248U
Technetium-99	pCi/g	-0.0463U	3.09	3.28	3.23
Thallium	mg/kg	0.0898D	0.29D	0.253D	0.155D
Uranium	µg/g	0.887J	2.53J	3.33J	1.97J
Uranium-233/234	pCi/g	0.377	4.54	4.41	2.16
Uranium-235/236	pCi/g	0.0207J	0.208J	0.222J	0.0908J
Uranium-238	pCi/g	0.295	0.819	1.08	0.646
Zinc	mg/kg	58.8D	351D	141D	74.3D

**Table 2.14. Sediment monitoring program results – 2018 (continued)**

Parameter	Unit	Location/results <sup>a,b</sup>			
		<i>Big Beaver Creek</i>			
		<i>RM-15 Upstream</i>	<i>RM-5 Confluence with Little Beaver Creek</i>	<i>RM-13 Downstream</i>	<i>RM-13 Downstream (duplicate sample)</i>
Aluminum	mg/kg	5710D	4310D	7750D	8450D
Americium-241	pCi/g	0.00297U	0.00484UJ	-0.00145U	0.00396U
Antimony	mg/kg	0.0499DJ	0.0496DUJ	0.0493DUJ	0.0514DJ
Arsenic	mg/kg	7.46	6.94	11.2	11.7
Barium	mg/kg	55.7	44.7	89.6	109
Beryllium	mg/kg	0.383D	0.305D	0.632D	0.645D
Cadmium	mg/kg	0.23D	0.247D	0.489D	0.426D
Calcium	mg/kg	6960D	6300D	3300D	3050D
Chromium	mg/kg	11.5	10.8	13.6	12.6
Copper	mg/kg	13.3	8.95	15.1	17.1
Iron	mg/kg	18800D	14600D	23100D	23400D
Lead	mg/kg	8.87	8.74	13.2	14.7
Magnesium	mg/kg	4050D	3520D	2610D	2370D
Manganese	mg/kg	623D	445D	753D	713D
Mercury	mg/kg	0.0185	0.0144	0.0322	0.0306
Neptunium-237	pCi/g	0.00188U	0U	0.000306U	0U
Nickel	mg/kg	15.4	14.3	23.3	22.7
Plutonium-238	pCi/g	0.00183U	0.00616UJ	0.00397UJ	0.00158U
Plutonium-239/240	pCi/g	0.00275U	0.00168UJ	0.00159UJ	0.00789UJ
PCB, total	µg/kg	19.7U	19.1U	82.6J	19.2UJ
Selenium	mg/kg	0.378D	0.423D	0.493D	0.602D
Silicon	mg/kg	811D	897D	951D	824D
Silver	mg/kg	0.248U	0.249U	0.243U	0.247U
Technetium-99	pCi/g	-0.0665U	-0.0417U	0.945J	0.248J
Thallium	mg/kg	0.119D	0.124D	0.219D	0.231D
Uranium	µg/g	0.787J	0.735J	1.07J	1.03J
Uranium-233/234	pCi/g	0.267	0.261	0.707J	0.408J
Uranium-235/236	pCi/g	0.0121J	0.0157J	0.0386J	0.0192J
Uranium-238	pCi/g	0.263	0.245	0.353	0.345
Zinc	mg/kg	49.4D	44.9D	77.1D	77.9D

**Table 2.14. Sediment monitoring program results – 2018 (continued)**

Parameter	Unit	Location/results <sup>a,b</sup>			
		<i>Big Run Creek</i>			<i>RM-2 Downstream @ Wakefield</i>
		<i>RM-33 Upstream</i>	<i>RM-3 Downstream</i>	<i>RM-3 Downstream (duplicate sample)</i>	
Aluminum	mg/kg	7110D	6290D	6630D	6920D
Americium-241	pCi/g	0.005UJ	0.0121	0.00251U	0.00649UJ
Antimony	mg/kg	0.166DJ	0.124DJ	0.131DJ	0.0814DJ
Arsenic	mg/kg	41.6	32.2	33.7	19.2
Barium	mg/kg	66	59.2	68	73.6
Beryllium	mg/kg	0.774D	0.545D	0.62D	0.698D
Cadmium	mg/kg	0.336D	0.214D	0.24D	0.679D
Calcium	mg/kg	1100D	15900D	13200D	3930D
Chromium	mg/kg	27.4	22.3	23.8	13.8
Copper	mg/kg	17.4	14.6	14.8	15.7
Iron	mg/kg	59800D	39900D	45200D	29400D
Lead	mg/kg	27.6	18.3	20.7	19.9
Magnesium	mg/kg	1090D	8700D	6940D	2510D
Manganese	mg/kg	1000D	831D	1060D	896D
Mercury	mg/kg	0.0291	0.0256	0.0307	0.0321
Neptunium-237	pCi/g	0U	-0.000884U	-0.00139U	0U
Nickel	mg/kg	25.8	19.5	20.6	25.9
Plutonium-238	pCi/g	0.00191UJ	0.00342UJ	0.00112UJ	0.00256UJ
Plutonium-239/240	pCi/g	0.00383UJ	0.00514UJ	0.00503UJ	0.00447UJ
PCB, total	µg/kg	18.6U	23.4	32.5	18.4U
Selenium	mg/kg	0.525D	0.521D	0.61D	0.64DJ
Silicon	mg/kg	894D	1060D	945D	1000D
Silver	mg/kg	0.249U	0.249U	0.248U	0.248U
Technetium-99	pCi/g	0.00727U	0.273J	0.0979UJ	-0.00826U
Thallium	mg/kg	0.219D	0.272D	0.295D	0.188D
Uranium	µg/g	2.2J	2.22J	2.52J	1.29J
Uranium-233/234	pCi/g	0.724	1.36	1.55	0.612
Uranium-235/236	pCi/g	0.0373J	0.085J	0.0731J	0.0361J
Uranium-238	pCi/g	0.732	0.733	0.837	0.427
Zinc	mg/kg	94.4D	74.5D	79.9D	100D

**Table 2.14. Sediment monitoring program results – 2018 (continued)**

Parameter	Unit	Location/results <sup>a,b</sup>			
		<i>Background creeks</i>			
		<i>RM-10N North background</i>	<i>RM-10S South background</i>	<i>RM-10E East background</i>	<i>RM-10W West background</i>
Aluminum	mg/kg	4980D	4440D	2380D	6210D
Americium-241	pCi/g	0.00512U	0.00123U	0.000931U	0.007UJ
Antimony	mg/kg	0.049DUJ	0.058DJ	0.049DUJ	0.309DJ
Arsenic	mg/kg	8.15	13.7	3	33.1
Barium	mg/kg	54.7	44.5	31.5	65.7
Beryllium	mg/kg	0.482D	0.437D	0.234D	0.67D
Cadmium	mg/kg	0.641D	0.0866D	0.049DU	2.04D
Calcium	mg/kg	6230D	5980D	1100D	2590D
Chromium	mg/kg	9.63	16.9	7.38	16.2
Copper	mg/kg	12.3	8.13	3.26	21.4
Iron	mg/kg	16400D	25200D	7810D	39800D
Lead	mg/kg	12.6	14	5.76	18.6
Magnesium	mg/kg	3830D	2750D	636D	1750D
Manganese	mg/kg	528D	550D	273D	860D
Mercury	mg/kg	0.0199	0.0183	0.0113	0.0316
Neptunium-237	pCi/g	0.000257U	0U	0U	0.000322U
Nickel	mg/kg	24.7	9.81	4.45	46.7
Plutonium-238	pCi/g	0.00442UJ	0U	-0.00089U	0.00108UJ
Plutonium-239/240	pCi/g	0.0304J	0.00282U	0.000891U	0.00759UJ
PCB, total	µg/kg	19.2U	19.2U	19.2U	19.2U
Selenium	mg/kg	0.447D	0.384DJ	0.2D	0.76D
Silicon	mg/kg	970D	932D	623D	950D
Silver	mg/kg	0.249U	0.245U	0.247U	0.248U
Technetium-99	pCi/g	-0.0403U	-0.0326U	-0.0787U	-0.0321U
Thallium	mg/kg	0.147D	0.0802D	0.049DU	0.435D
Uranium	µg/g	0.812J	0.745J	0.333J	2.88J
Uranium-233/234	pCi/g	0.281	0.307	0.131	0.994
Uranium-235/236	pCi/g	0.0136J	0.0122J	0.00591UJ	0.0523J
Uranium-238	pCi/g	0.271	0.249	0.111	0.961
Zinc	mg/kg	73.2D	39.1D	15.1	156D

<sup>a</sup>Abbreviations and data qualifiers are as follows: D – the result is reported from a dilution. J – the reported result is estimated. U – undetected.

<sup>b</sup>Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out.

**Table 2.15. Soil and biota (vegetation) monitoring at ambient air monitoring stations – 2018**

Parameter <sup>a</sup>	Location/results <sup>b,c</sup>			
	<i>A8 – On site at northwest boundary</i>		<i>T7 – On site near X-230L North Holding Pond</i>	
	Vegetation	Soil	Vegetation	Soil
Americium-241	0.00151U	0.00246U	0.000576U	0.00501U
Neptunium-237	-0.000517U	0U	0U	0U
Plutonium-238	-0.000558U	0U	0.000337U	-0.00049U
Plutonium-239/240	0.000559U	0.00322U	0.00135U	0.00686UJ
Technetium-99	0.0198U	-0.0849U	0.0284U	0.00878U
Uranium	0.00774U	1.32	0.00694U	0.893
Uranium-233/234	0.00207U	0.483	0.00239U	0.313
Uranium-235/236	-0.000368U	0.024	-0.000372U	0.0155
Uranium-238	0.00266U	0.438	0.00239U	0.298
	<i>A10 – On site on northwest segment of Perimeter Road</i>		<i>A29 – On site at OVEC</i>	
	Vegetation	Soil	Vegetation	Soil
Americium-241	0U	0.00356UJ	0.00146U	0.00268U
Neptunium-237	-0.000302U	-0.000454U	0.00065U	0.00107U
Plutonium-238	-0.000709U	0.00209UJ	-0.000664U	0.000562U
Plutonium-239/240	0.000709U	0.00314UJ	0.00133U	0.00788UJ
Technetium-99	0.00941U	-0.0716U	0.0277U	-0.101U
Uranium	0.0203	0.654	0.00193U	0.695
Uranium-233/234	0.00602	0.299	0.00207U	0.229
Uranium-235/236	0.00143U	0.0119	0.000368U	0.0135
Uranium-238	0.00659	0.218	0.000592U	0.231
	<i>A36 – On site at X-611 Water Treatment Plant</i>		<i>A6 – North of PORTS in Piketon</i>	
	Vegetation	Soil	Vegetation	Soil
Americium-241	-0.000598U	0.0029U	-0.000287U	0.00334U
Neptunium-237	0.000594U	-0.000389U	-0.000316U	0.000799U
Plutonium-238	0.000309U	-0.000574U	0.000688U	0U
Plutonium-239/240	0.000928U	0.0121	0.00103U	0.00934UJ
Technetium-99	0.00166U	-0.0266U	-0.0141U	-0.0897U
Uranium	0.00628U	0.614	0.0143U	0.85
Uranium-233/234	0.00257U	0.295	0.00205U	0.215
Uranium-235/236	0.000711U	0.0137	0.000728U	0.0147
Uranium-238	0.002U	0.204	0.00468U	0.283



**Table 2.15. Soil and biota (vegetation) monitoring at ambient air monitoring stations – 2018 (continued)**

Parameter <sup>a</sup>	Location/results <sup>b,c</sup>			
	<i>A24 – North of PORTS at Schuster Road</i>		<i>A41A - North of PORTS at Zahns Corner</i>	
	Vegetation	Soil	Vegetation	Soil
Americium-241	0.00258U	0.00456U	0.000862U	0.0042U
Neptunium-237	0U	0U	0U	0.000408U
Plutonium-238	-0.00065U	0U	0.000642U	0.00159U
Plutonium-239/240	0.0013U	0.00941J	0.000963U	0.0111
Technetium-99	-0.0296U	-0.0746U	0.00553U	0U
Uranium	0.00384U	0.735	0.00677U	0.912
Uranium-233/234	0.00118U	0.242	0.0025U	0.32
Uranium-235/236	0.000731U	0.0161	0.000345U	0.0137
Uranium-238	0.00118U	0.244	0.00222U	0.304
	<i>A23 – Northeastern PORTS boundary</i>		<i>A12 – Eastern PORTS boundary</i>	
	Vegetation	Soil	Vegetation	Soil
Americium-241	-0.00029U	0.00376U	0.00154U	0.00391U
Neptunium-237	0U	0U	-0.000315U	0.00218U
Plutonium-238	-0.000317U	0.00122U	0U	-0.00102U
Plutonium-239/240	0.000317U	0.0116	0.000664U	0.00461UJ
Technetium-99	-0.000553U	-0.0225U	0.0432U	0.0142U
Uranium	0.000854U	0.781	0.0129U	0.829
Uranium-233/234	0.00144U	0.267	0.00912	0.349
Uranium-235/236	0U	0.0163	0.000354U	0.0167
Uranium-238	0.000287U	0.26	0.00427U	0.276
	<i>A15 – Southeast of PORTS on Loop Road</i>		<i>A3 – Southern PORTS boundary</i>	
	Vegetation	Soil	Vegetation	Soil
Americium-241	0.000632U	0.00398U	-0.000302U	0.0084UJ
Neptunium-237	-0.000903U	0.000348U	0.000318U	0U
Plutonium-238	-0.000769U	0.000584U	-0.000673U	0.00144U
Plutonium-239/240	0.000769U	0.00409U	0.00168U	0.0134
Technetium-99	-0.0126U	-0.0733U	0.0333U	-0.0715U
Uranium	0.00204U	0.902	0.00184U	0.921
Uranium-233/234	0.000625U	0.332	0.00141U	0.356
Uranium-235/236	0.000389U	0.0138	0.00035U	0.018
Uranium-238	0.000625U	0.301	0.000563U	0.307

**Table 2.15. Soil and biota (vegetation) monitoring at ambient air monitoring stations – 2018 (continued)**

Parameter <sup>a</sup>	Location/results <sup>b,c</sup>			
	A9 – South of PORTS		A28 – Southwest of PORTS on Camp Creek Road	
	Vegetation	Soil	Vegetation	Soil
Americium-241	0.00214U	0.011	0.00058U	0.00515U
Neptunium-237	0U	0U	0U	-0.00104U
Plutonium-238	-0.000971U	0.00286U	0.000316U	0U
Plutonium-239/240	0.000972U	0.0271	0.00127U	0.0107
Technetium-99	-0.0228U	-0.0665U	-0.0631U	-0.0753U
Uranium	0.0163	0.902	0.0526	0.714
Uranium-233/234	0.00422U	0.265	0.0154	0.277
Uranium-235/236	0.000375U	0.0157	0.0018U	0.0142
Uranium-238	0.00542	0.301	0.0174	0.238
	<i>A37 – Background station near Otway</i>			
	Vegetation	Soil		
Americium-241	0.00113U	0.00491U		
Neptunium-237	0.000312U	0.000724U		
Plutonium-238	-0.000318U	-0.000463U		
Plutonium-239/240	0U	0.00788UJ		
Technetium-99	0.0393U	-0.0365U		
Uranium	0.0033U	1.23		
Uranium-233/234	0.00233U	0.449		
Uranium-235/236	-0.000362U	0.0211		
Uranium-238	0.00117U	0.41		
	<i>Duplicate vegetation samples</i>		<i>Duplicate soil samples</i>	
	A29	A41A	A12	A6
Americium-241	0.0018U	0.00118U	0.00263U	0.00269U
Neptunium-237	0U	0U	0U	0U
Plutonium-238	-0.00139U	0.000339U	0.00139U	0U
Plutonium-239/240	0.00174U	0.00136U	0.00695UJ	0.00569U
Technetium-99	0.0105U	-0.0334U	-0.0358U	-0.0187U
Uranium	0.00138U	0.00434U	0.842	0.99
Uranium-233/234	0.00133U	0.00281U	0.299	0.255
Uranium-235/236	0.000829U	0.00035U	0.0197	0.0188
Uranium-238	0.000333U	0.00141U	0.28	0.33

<sup>a</sup>All parameters are measured in pCi/g with the exception of uranium which is measured in µg/g.

<sup>b</sup>Abbreviations and data qualifiers are as follows: U – undetected. J – the reported result is estimated.

<sup>c</sup>Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out.

**Table 2.16. Biota (fish) monitoring program results – 2018**

Parameter	Unit	Location/fish/results <sup>a,b</sup>		
		<i>Scioto River (RW-1A) catfish</i>	<i>Scioto River (RW-1A) catfish (duplicate sample)</i>	<i>Scioto River (RW-6) catfish</i>
Americium-241	pCi/g	0.00117U	0.000813U	0.000393U
Neptunium-237	pCi/g	0.00125U	0U	0U
Plutonium-238	pCi/g	0.000831U	-0.000406U	-0.00042U
Plutonium-239/240	pCi/g	0.000414U	0.00283U	0.00168U
PCB, total	µg/kg	76.2	78.6J	77.9
Technetium-99	pCi/g	-0.0204U	0.011U	0.0154U
Uranium	µg/g	0.000187U	0.000201U	0.00422U
Uranium-233/234	pCi/g	0.00227U	0.00175U	0.00169U
Uranium-235/236	pCi/g	0.000404U	0.000434U	0.000421U
Uranium-238	pCi/g	0U	0U	0.00135U
		<i>Big Beaver Creek (RW-15) bass</i>	<i>Big Beaver Creek (RW-13) bass</i>	<i>Little Beaver Creek (RW-8) bass</i>
Americium-241	pCi/g	0.0032U	0.00242U	0.0016U
Neptunium-237	pCi/g	-0.000268U	-0.000536U	0U
Plutonium-238	pCi/g	0U	0U	0U
Plutonium-239/240	pCi/g	0.00306U	0.00262U	0U
PCB, total	µg/kg	5.84U	66.3	556
Technetium-99	pCi/g	0.0185U	-0.0209U	0.0152U
Uranium	µg/g	-0.000457U	0.00109U	0.00435U
Uranium-233/234	pCi/g	0.000732U	0.00122U	0.00105U
Uranium-235/236	pCi/g	0.00137U	0.000381U	0.000434U
Uranium-238	pCi/g	-0.000366U	0.000306U	0.0014U

<sup>a</sup>Abbreviations and data qualifiers are as follows: U – undetected. J – the reported result is estimated.

<sup>b</sup>Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out.

**Table 2.17. Biota (crops) monitoring program results – 2018**

Parameter	Unit	Location/crop/results <sup>a,b</sup>		
		<i>Off-site #2 corn</i>	<i>Off-site #2 cucumbers</i>	<i>Off-site #2 green peppers</i>
Americium-241	pCi/g	0U	0.000595U	0.000608U
Neptunium-237	pCi/g	0.000621U	-0.00034U	0.000297U
Plutonium-238	pCi/g	-0.000351U	0U	0.000329U
Plutonium-239/240	pCi/g	0.0014U	0.000688U	0.00165U
Technetium-99	pCi/g	-0.0575U	0.0158U	0.0157U
Uranium	µg/g	0.00194U	0.00286U	-0.000847U
Uranium-233/234	pCi/g	0.000594U	0U	0.000285U
Uranium-235/236	pCi/g	0.000369U	0.000374U	0U
Uranium-238	pCi/g	0.000594U	0.000902U	-0.000285U
		<i>Off-site #2 tomatoes</i>	<i>Off-site #5 blackberries</i>	<i>Off-site #5 hops</i>
Americium-241	pCi/g	0.0006U	0.000879U	0.000866U
Neptunium-237	pCi/g	0.000317U	-0.000258U	0.000508U
Plutonium-238	pCi/g	-0.000313U	-0.000369U	-0.000375U
Plutonium-239/240	pCi/g	0.00156U	0.000369U	0.00112U
Technetium-99	pCi/g	0.0318U	0.00789U	0.0211U
Uranium	µg/g	0.000959U	0.000000149U	0.00338U
Uranium-233/234	pCi/g	-0.00027U	0.000924U	0.0017U
Uranium-235/236	pCi/g	0.000336U	0U	0U
Uranium-238	pCi/g	0.00027U	0U	0.00114U
		<i>Off-site #5 soybeans</i>	<i>Off-site #6 cucumbers</i>	<i>Off-site #6 cucumbers (duplicate sample)</i>
Americium-241	pCi/g	0.00087U	0.00111U	0.00171U
Neptunium-237	pCi/g	0.00113U	0U	0U
Plutonium-238	pCi/g	0.000388U	0.000327U	-0.000369U
Plutonium-239/240	pCi/g	0.00233U	0.00131U	0.00148U
Technetium-99	pCi/g	0.0086U	0.0784U	0.0352U
Uranium	µg/g	0.000533U	0.000000245U	0.00113U
Uranium-233/234	pCi/g	0U	0.00152U	0.000549U
Uranium-235/236	pCi/g	-0.000727U	0U	0.000683U
Uranium-238	pCi/g	0.000292U	0U	0.000275U

**Table 2.17. Biota (crops) monitoring program results – 2018 (continued)**

Parameter	Unit	Location/crop/results <sup>a,b</sup>		
		<i>Off-site #6 pumpkin</i>	<i>Off-site #7 corn</i>	<i>Off-site #7 tomatoes</i>
Americium-241	pCi/g	0.00117U	0.00251U	0.000628U
Neptunium-237	pCi/g	0.000265U	-0.000401U	0U
Plutonium-238	pCi/g	-0.00032U	-0.000358U	0U
Plutonium-239/240	pCi/g	0.00096U	0.00179U	0.00235U
Technetium-99	pCi/g	0.0574U	-0.0223U	0.0411U
Uranium	µg/g	0.000336U	0.000496U	-0.000167U
Uranium-233/234	pCi/g	0.00263UJ	0.000862U	0.00029U
Uranium-235/236	pCi/g	0.000726U	0.00107U	-0.000361U
Uranium-238	pCi/g	0U	0U	0U
		<i>Off-site #8 cherry tomatoes</i>	<i>Off-site #8 corn</i>	<i>Off-site #8 tomatoes</i>
Americium-241	pCi/g	0.000888U	0.00147U	0.00236U
Neptunium-237	pCi/g	0U	0.000645U	0U
Plutonium-238	pCi/g	-0.000337U	-0.000336U	0.000645U
Plutonium-239/240	pCi/g	0.00202U	0.00135U	0U
Technetium-99	pCi/g	-0.0168U	0.0601U	0.0545U
Uranium	µg/g	0.00368U	0.000867U	0.00188U
Uranium-233/234	pCi/g	0.000886U	0.000874U	0.000577U
Uranium-235/236	pCi/g	0.000367U	0U	0.000359U
Uranium-238	pCi/g	0.00118U	0.000291U	0.000577U

<sup>a</sup>Abbreviations and data qualifiers are as follows: U – undetected. J – the reported result is estimated.

<sup>b</sup>Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out.

**Table 2.18. Biota (deer) monitoring program results – 2018**

Parameter	Unit	February (2/8/2018) <sup>a,b</sup>	February (2/21/2018) <sup>a,b</sup>	May 2018 <sup>a,b</sup>
<i>liver</i>				
Americium-241	pCi/g	0.00254U	0.00166U	0U
Neptunium-237	pCi/g	0.000301U	0.000333U	0.00266U
Plutonium-238	pCi/g	0.000606U	0.00355U	0.00133U
Plutonium-239/240	pCi/g	-0.000606U	0.00152U	0.00133U
Technetium-99	pCi/g	-0.142U	0.52	-0.0476U
Uranium	µg/g	0.000876U	0.000219U	0.00306UJ
Uranium-233/234	pCi/g	0.00122U	0.00038U	0.00119U
Uranium-235/236	pCi/g	0.00189U	0.000473U	0.00149UJ
Uranium-238	pCi/g	0U	0U	0.000796U
<i>muscle</i>				
Americium-241	pCi/g	0.000817U	0.00189U	0.00154U
Neptunium-237	pCi/g	0.000559U	0.000648U	0.0015U
Plutonium-238	pCi/g	0.00134U	0.00107U	0.000435U
Plutonium-239/240	pCi/g	0.00134U	0.000712U	0.00435UJ
Technetium-99	pCi/g	-0.0831U	-0.105U	0.00367U
Uranium	µg/g	0.000878U	0.00199U	0.00297UJ
Uranium-233/234	pCi/g	0U	0.000917U	0.000419U
Uranium-235/236	pCi/g	0.000308U	0.00038U	0.00104UJ
Uranium-238	pCi/g	0.000247U	0.000611U	0.000837U
<i>kidney</i>				
Americium-241	pCi/g	0.00237U	0.00197U	0.000391U
Neptunium-237	pCi/g	0.000297U	0.000814U	0.00166U
Plutonium-238	pCi/g	0.00222U	0.00221U	0.000447U
Plutonium-239/240	pCi/g	0.00127U	0.000632U	0.00179U
Technetium-99	pCi/g	-0.175U	1.5	-0.0885U
Uranium	µg/g	0.00161U	0.00196U	0.000252UJ
Uranium-233/234	pCi/g	0.000343U	0.00166U	0.000875U
Uranium-235/236	pCi/g	0.00128U	0.000687U	0.000544UJ
Uranium-238	pCi/g	0.000343U	0.000552U	0U

**Table 2.18. Biota (deer) monitoring program results – 2018 (continued)**

Parameter	Unit	June 2018 <sup>a,b</sup>	September 2018 <sup>a,b</sup>	December 2018 <sup>a,b</sup>
<i>liver</i>				
Americium-241	pCi/g	0.00162U	0.00119U	0.0019U
Neptunium-237	pCi/g	0U	0.000381U	-0.000387U
Plutonium-238	pCi/g	-0.000919U	-0.00112U	0.000401U
Plutonium-239/240	pCi/g	0.00092U	0.000746U	0.0016U
Technetium-99	pCi/g	-0.104U	-0.0349U	-0.0328U
Uranium	µg/g	0.000683UJ	0.000254U	0.00622U
Uranium-233/234	pCi/g	0.000395U	0.000442U	0.00116U
Uranium-235/236	pCi/g	0.00148UJ	0.00055U	0.000966U
Uranium-238	pCi/g	0U	0U	0.00194U
<i>muscle</i>				
Americium-241	pCi/g	0.00286U	0.00156U	0.00345U
Neptunium-237	pCi/g	0U	0.00102U	0.00184U
Plutonium-238	pCi/g	0.00328U	0.000364U	0.000421U
Plutonium-239/240	pCi/g	0.00188U	0U	0.00168U
Technetium-99	pCi/g	-0.0122U	-0.034U	-0.0754U
Uranium	µg/g	0.00133UJ	0.00262U	0.00205U
Uranium-233/234	pCi/g	0.00112U	0.00161U	0.0035U
Uranium-235/236	pCi/g	0.000466UJ	0.000499U	0.00193U
Uranium-238	pCi/g	0.000375U	0.000803U	0.000389U
<i>kidney</i>				
Americium-241	pCi/g	0.000402U	0.00111U	0.00198U
Neptunium-237	pCi/g	0U	0.000369U	0.000348U
Plutonium-238	pCi/g	0U	0U	-0.000415U
Plutonium-239/240	pCi/g	0.00048U	0U	0.00208U
Technetium-99	pCi/g	-0.0777U	-0.0367U	0.0931U
Uranium	µg/g	0.00707UJ	0.000489U	-0.000549U
Uranium-233/234	pCi/g	0.00116U	0.00424UJ	0.00238U
Uranium-235/236	pCi/g	0.00288UJ	0.00105U	-0.00119U
Uranium-238	pCi/g	0.00193U	0U	0U

<sup>a</sup>Abbreviations and data qualifiers are as follows: U – undetected. J – the reported result is estimated.

<sup>b</sup>Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out.

**Table 2.19. Biota (off-site dairy) monitoring program results – 2018**

Parameter	Unit	Milk <sup>a,b</sup>	Milk <sup>a,b</sup> (duplicate sample)	Eggs <sup>a,b</sup>
Americium-241	pCi/g	0.000305U	0.000854U	0.00168U
Neptunium-237	pCi/g	0.000587U	0.000525U	0.00418UJ
Plutonium-238	pCi/g	-0.000636U	0.000621U	0.000603U
Plutonium-239/240	pCi/g	0U	0.000622U	0.00211U
Technetium-99	pCi/g	0.0752U	0.0193U	0.0456U
Uranium	µg/g	0.00222U	0U	0.00198U
Uranium-233/234	pCi/g	0.000938U	0U	0.000279U
Uranium-235/236	pCi/g	0.000778U	0U	0.000693U
Uranium-238	pCi/g	0.000626U	0U	0.000557U

<sup>a</sup>Abbreviations and data qualifiers are as follows: U – undetected. J – the reported result is estimated.

<sup>b</sup>Because of the statistical nature of radiation detection, results for samples that have no radioactivity are often negative values because background radioactivity is subtracted out.



### 3. DOSE

This section provides summary tables of air emissions and dose assessments completed by DOE for compliance with the National Emission Standards for Hazardous Air Pollutants for airborne radionuclide emissions. The following tables are provided in this section:

- Table 3.1. Emissions (Ci/year) from DOE air emission sources – 2018
- Table 3.2. Predicted radiation doses from airborne releases at PORTS – 2018
- Table 3.3. Dose calculations for ambient air monitoring stations – 2018.

**Table 3.1. Emissions (Ci/year) from DOE air emission sources – 2018**

Radionuclide	Group 1 <sup>a</sup>	Group 2 <sup>b</sup>	Group 3 <sup>c</sup>	DUF <sub>6</sub> facility <sup>d</sup>
Americium-241	3.16E-07	-	3.42E-06	-
Neptunium-237	2.89E-06	-	1.69E-05	-
Plutonium-238	5.05E-07	-	9.21E-07	-
Plutonium-239/240	1.67E-07	-	3.49E-05	-
Technetium-99	4.88E-05	1.67E-03	7.43E-02	-
Uranium-233/234	3.96E-05	7.26E-06	6.53E-04	1.44E-06
Uranium-235	3.75E-06	2.23E-06	2.88E-05	6.57E-08
Uranium-238	4.21E-04	5.42E-06	1.80E-04	3.53E-06
Thorium-228	3.74E-08	4.28E-08	3.39E-10	-
Thorium-230	3.75E-05	4.54E-06	3.40E-10	-
Thorium-231	3.61E-06	2.23E-06	9.46E-06	2.21E-07
Thorium-232	2.29E-09	8.39E-07	2.07E-11	-
Thorium-234	4.18E-04	5.42E-06	8.01E-05	2.02E-05
Protactinium-234m	4.18E-04	5.42E-06	8.01E-05	2.02E-05
<b>Total</b>	<b>1.39E-03</b>	<b>1.70E-03</b>	<b>7.54E-02</b>	<b>4.57E-05</b>

<sup>a</sup>Group 1 consists of the X-710 Vents and X-622 Groundwater Treatment Facility.

<sup>b</sup>Group 2 consists of the X-344A Gulper Vent and X-344A Cold Trap Vent.

<sup>c</sup>Group 3 consists of the X-330 Vents, X-333 Vents, X-705 Vents, X-623 Groundwater Treatment Facility, X-624 Groundwater Treatment Facility, and X-627 Groundwater Treatment Facility.

<sup>d</sup>DUF<sub>6</sub> – depleted uranium hexafluoride.

Note: Measurements are provided in scientific notation. The number and sign (+ or -) to the right of the “E” indicate the number of places to the right or left of the decimal point. For example, 3.4E-04 is 0.00034 (the decimal point moves four places to the left); 2.1E+02 is 210 (the decimal point moves two places to the right).

**Table 3.2. Predicted radiation doses from airborne releases at PORTS – 2018**

Effective dose to:	
Maximally exposed individual (mrem/year)	0.10
Population <sup>a</sup> (person-rem/year)	2.9

<sup>a</sup>Population within 50 miles (80 kilometers) of plant site.

**Table 3.3. Dose calculations for ambient air monitoring stations – 2018**

Station	Parameter <sup>a</sup>	Dose <sup>b</sup> (mrem/year)	Total dose for station <sup>c</sup>
A3	Americium-241	1.9E-03	
	Neptunium-237	5.4E-04	
	Plutonium-238	3.5E-03	
	Plutonium-239/240	4.2E-03	
	<b>Technetium-99</b>	1.2E-02	
	<b>Uranium-233/234</b>	4.9E-03	
	Uranium-235/236	1.7E-04	(0.030)
	<b>Uranium-238</b>	3.3E-03	3.0E-02
A6	Americium-241	4.2E-03	
	Neptunium-237	1.8E-04	
	Plutonium-238	2.5E-03	
	Plutonium-239/240	2.8E-03	
	<b>Technetium-99</b>	4.2E-03	
	<b>Uranium-233/234</b>	2.4E-03	
	Uranium-235/236	1.8E-04	(0.020)
	<b>Uranium-238</b>	1.8E-03	2.0E-02
A8	Americium-241	4.1E-03	
	Neptunium-237	1.5E-04	
	Plutonium-238	1.9E-03	
	Plutonium-239/240	1.4E-03	
	<b>Technetium-99</b>	2.2E-02	
	<b>Uranium-233/234</b>	4.1E-03	
	Uranium-235/236	1.6E-04	(0.040)
	<b>Uranium-238</b>	3.3E-03	4.0E-02
A9	Americium-241	3.9E-03	
	Neptunium-237	3.8E-04	
	Plutonium-238	3.1E-03	
	Plutonium-239/240	2.2E-03	
	<b>Technetium-99</b>	6.6E-03	
	<b>Uranium-233/234</b>	3.5E-03	
	Uranium-235/236	2.3E-04	(0.020)
	<b>Uranium-238</b>	3.0E-03	2.0E-02

**Table 3.3. Dose calculations for ambient air monitoring stations – 2018 (continued)**

Station	Parameter <sup>a</sup>	Dose <sup>b</sup> (mrem/year)	Total dose for station <sup>c</sup>
A10	Americium-241	1.7E-03	
	Neptunium-237	0	
	Plutonium-238	4.7E-03	
	Plutonium-239/240	4.1E-03	
	<b>Technetium-99</b>	1.0E-01	
	<b>Uranium-233/234</b>	1.1E-02	
	Uranium-235/236	4.7E-04	(0.13)
	<b>Uranium-238</b>	8.1E-03	1.3E-01
A12	Americium-241	2.6E-03	
	Neptunium-237	1.8E-04	
	Plutonium-238	1.2E-03	
	Plutonium-239/240	2.2E-03	
	<b>Technetium-99</b>	4.3E-02	
	<b>Uranium-233/234</b>	3.8E-03	
	Uranium-235/236	2.1E-04	(0.060)
	<b>Uranium-238</b>	3.3E-03	6.0E-02
A15	<b>Americium-241</b>	1.8E-02	
	Neptunium-237	1.7E-04	
	Plutonium-238	2.6E-03	
	Plutonium-239/240	2.2E-03	
	<b>Technetium-99</b>	7.0E-03	
	<b>Uranium-233/234</b>	3.5E-03	
	Uranium-235/236	2.0E-04	(0.040)
	<b>Uranium-238</b>	3.3E-03	4.0E-02
A23	Americium-241	2.3E-03	
	Neptunium-237	2.5E-04	
	Plutonium-238	2.0E-03	
	Plutonium-239/240	3.0E-03	
	<b>Technetium-99</b>	3.8E-02	
	<b>Uranium-233/234</b>	5.9E-03	
	Uranium-235/236	1.8E-04	(0.050)
	<b>Uranium-238</b>	2.7E-03	5.0E-02
A24	Americium-241	3.2E-03	
	Neptunium-237	1.8E-04	
	Plutonium-238	3.4E-03	
	Plutonium-239/240	2.7E-03	
	<b>Technetium-99</b>	1.2E-02	
	<b>Uranium-233/234</b>	3.7E-03	
	Uranium-235/236	2.3E-04	(0.030)
	<b>Uranium-238</b>	2.7E-03	3.0E-02

**Table 3.3. Dose calculations for ambient air monitoring stations – 2018 (continued)**

Station	Parameter <sup>a</sup>	Dose <sup>b</sup> (mrem/year)	Total dose for station <sup>c</sup>
A28	Americium-241	3.3E-03	
	Neptunium-237	3.6E-04	
	Plutonium-238	3.1E-03	
	Plutonium-239/240	3.9E-03	
	<b>Technetium-99</b>	7.6E-03	
	<b>Uranium-233/234</b>	2.1E-03	
	Uranium-235/236	1.8E-04	(0.020)
	<b>Uranium-238</b>	1.6E-03	2.0E-02
A29	Americium-241	2.0E-03	
	Neptunium-237	3.8E-04	
	Plutonium-238	3.8E-03	
	Plutonium-239/240	3.1E-03	
	<b>Technetium-99</b>	1.2E-02	
	<b>Uranium-233/234</b>	3.3E-03	
	Uranium-235/236	2.0E-04	(0.030)
	<b>Uranium-238</b>	2.9E-03	3.0E-02
A36	Americium-241	3.6E-03	
	Neptunium-237	8.1E-04	
	Plutonium-238	2.5E-03	
	Plutonium-239/240	3.6E-03	
	<b>Technetium-99</b>	1.8E-02	
	<b>Uranium-233/234</b>	9.5E-03	
	Uranium-235/236	3.4E-04	(0.045)
	<b>Uranium-238</b>	6.9E-03	4.5E-02
A37	<b>Americium-241</b>	0	
	Neptunium-237	0	
	Plutonium-238	0	
	Plutonium-239/240	0	
	<b>Technetium-99</b>	0	
	<b>Uranium-233/234</b>	2.8E-03	
	Uranium-235/236	0	(0.0056)
	<b>Uranium-238</b>	2.8E-03	5.6E-03 <sup>d</sup>
A41A	<b>Americium-241</b>	1.3E-02	
	Neptunium-237	5.1E-04	
	Plutonium-238	2.8E-03	
	Plutonium-239/240	3.9E-03	
	<b>Technetium-99</b>	3.3E-03	
	<b>Uranium-233/234</b>	3.7E-03	
	Uranium-235/236	1.5E-04	(0.030)
	<b>Uranium-238</b>	3.1E-03	3.0E-02

**Table 3.3. Dose calculations for ambient air monitoring stations – 2018 (continued)**

Station	Parameter <sup>a</sup>	Dose <sup>b</sup> (mrem/year)	Total dose for station <sup>c</sup>
T7	Americium-241	2.8E-03	
	Neptunium-237	2.8E-04	
	Plutonium-238	2.0E-03	
	Plutonium-239/240	1.6E-03	
	<b>Technetium-99</b>	1.4E-02	
	<b>Uranium-233/234</b>	3.4E-03	
	Uranium-235/236	1.7E-04	(0.030)
	<b>Uranium-238</b>	3.1E-03	3.0E-02

<sup>a</sup>Parameters listed in **bold** type were detected at least once in the samples collected in 2018 (see Table 2.9).

<sup>b</sup>The dose calculation is based on the maximum detection of each parameter at each station. For parameters that were not detected, half of the highest undetected result for the parameter was used to calculate the activity of each parameter in ambient air that is the basis for the dose. Measurements are provided in scientific notation. The number and sign (+ or -) to the right of the “E” indicate the number of places to the right or left of the decimal point. For example, 3.4E-04 is 0.00034 (the decimal point moves four places to the left); 2.1E+02 is 210 (the decimal point moves two places to the right).

<sup>c</sup>The total dose is provided in scientific notation and standard numeric format (in parentheses).

<sup>d</sup>The dose is assumed to be 0 for transuranics, technetium-99, and uranium-235/236 because these radionuclides were not detected or are not typically expected to be present at this background location. This assumption is made so that in comparisons with monitoring stations nearer to PORTS, the dose associated with levels of these radionuclides at the background station is not overestimated.

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## 4. GROUNDWATER

This section summarizes analytical results for routine groundwater monitoring at PORTS in 2018 at the following locations:

- X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility
- Peter Kiewit (PK) Landfill
- Quadrant I Groundwater Investigative (5-Unit) Area
- X-749A Classified Materials Disposal Facility
- Quadrant II Groundwater Investigative (7-Unit) Area
- X-701B Former Holding Pond
- X-633 Former Recirculating Cooling Water Complex
- X-616 Former Chromium Sludge Surface Impoundments
- X-740 Former Waste Oil Handling Facility
- X-611A Former Lime Sludge Lagoons
- X-735 Landfills
- X-734 Landfills
- X-533 Former Switchyard Complex
- X-344C Former Hydrogen Fluoride Storage Building
- Surface water monitoring locations
- Exit pathway monitoring locations.

Results for radiological parameters and VOCs are reported in this section. Only those VOCs that were detected in at least one sampling event are listed in this section.

All results are included for radiological parameters, even if a specific constituent was not detected at a specific well or location during any sampling event in 2018. Sampling for radionuclides in many of the monitoring areas or wells is completed biennially (i.e., every two years in odd numbered years). Therefore, samples collected in 2018 at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility, Quadrant I Groundwater Investigative (5-Unit) Area, X-749A Classified Materials Disposal Facility, Quadrant II Groundwater Investigative (7-Unit) Area, X-735 Landfills, and X-734 Landfills were not analyzed for radionuclides. Sampling for radionuclides is not part of the monitoring programs for PK Landfill, X-633 Former Recirculating Cooling Water Complex, X-616 Former Chromium Sludge Surface Impoundments, X-740 Former Waste Oil Handling Facility, X-611A Former Lime Sludge Lagoons, X-533 Former Switchyard Complex, and X-344C Former Hydrogen Fluoride Storage Building.

Results for chromium at the X-616 Former Chromium Sludge Surface Impoundments are included in this section because chromium is a primary contaminant in this area. Results are provided for metals at the X-633 Former Recirculating Cooling Water Complex, X-611A Former Lime Sludge Lagoons, and X-533 Former Switchyard Complex because metals are the only analytical parameters for these areas.

Two VOCs, acetone and methylene chloride, were frequently detected in both environmental and blank samples (field and trip blanks) collected in 2018. Acetone and methylene chloride are common laboratory contaminants that are not typically detected in the PORTS groundwater plumes. Detections of acetone and methylene chloride can be qualified by the laboratory with a "B", which indicates that the analyte was also detected in the laboratory blank associated with the environmental sample and may be present due to laboratory contamination.

Other VOCs including 2-butanone and toluene were detected in trip and/or field blanks during 2018. These detections indicate that samples (both environmental samples and blank samples) may become contaminated with low concentrations of VOCs during other portions of the sampling process, although contamination can still occur in the laboratory. Other sources of contamination may include storage areas for sampling equipment (such as bottles and blank water), areas in which samples are collected or prepared, sample containers (such as vials for VOC samples), and storage areas after samples are collected (such as refrigerators or sample shipping containers).

The primary purpose of the groundwater data is to determine the nature and extent of contamination in groundwater and associated surface water at PORTS. Data collected in 2018 meet this purpose.

Complete groundwater monitoring results for sampling completed as required by the *Integrated Groundwater Monitoring Plan* (DOE 2017) are provided in the *2018 Groundwater Monitoring Report for the Portsmouth Gaseous Diffusion Plant* (DOE 2019). The *2018 Groundwater Monitoring Report for the Portsmouth Gaseous Diffusion Plant* also provides the following information not included in this Data Report:

- Results for special studies conducted during 2018 at the X-633 Former Recirculating Cooling Water Complex and X-630 Former Recirculating Cooling Water Complex.
- Results for duplicate samples (samples collected from the same location, at the same time, and from the same sampling device as the regular sample), which are collected at a frequency of one per 20 sampling locations per groundwater monitoring area. Duplicate samples are analyzed for the same parameters as the regular sample associated with the sampling location.

The following tables are included in this section:

- Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018
- Table 4.2. VOCs detected at the PK Landfill – 2018
- Table 4.3. VOCs detected at the Quadrant I Groundwater Investigative (5-Unit) Area – 2018
- Table 4.4. VOCs detected at the X-749A Classified Materials Disposal Facility – 2018
- Table 4.5. VOCs detected at the Quadrant II Groundwater Investigative (7-Unit) Area – 2018
- Table 4.6. VOCs detected at the X-701B Former Holding Pond – 2018
- Table 4.7. Results for radionuclides at the X-701B Former Holding Pond – 2018
- Table 4.8. Results for chromium at the X-633 Former Recirculating Cooling Water Complex – 2018
- Table 4.9. VOCs detected at the X-616 Former Chromium Sludge Surface Impoundments – 2018
- Table 4.10. Results for chromium at the X-616 Former Chromium Sludge Surface Impoundments – 2018
- Table 4.11. VOCs detected at the X-740 Former Waste Oil Handling Facility – 2018



- Table 4.12. Results for beryllium and chromium at the X-611A Former Lime Sludge Lagoons – 2018
- Table 4.13. VOCs detected at the X-735 Landfills – 2018
- Table 4.14. VOCs detected at the X-734 Landfills – 2018
- Table 4.15. Results for cadmium and nickel at the X-533 Former Switchyard Complex – 2018
- Table 4.16. VOCs detected at the X-344C Former Hydrogen Fluoride Storage Building – 2018
- Table 4.17. VOCs detected at surface water monitoring locations – 2018
- Table 4.18. Results for radionuclides at surface water monitoring locations – 2018.

Results for exit pathway monitoring locations sampled during 2018 (that are part of the monitoring programs for other areas) are provided in the tables for their respective monitoring areas as follows:

- Table 4.1: VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility (wells X749-14B, X749-44G, X749-45G, X749-64B, X749-68G, X749-96G, X749-97G and X749-98G).
- Table 4.7: Results for radionuclides at X-701B Former Holding Pond area well X701-48G (VOCs were not detected in well X701-48G in 2018).
- Tables 4.17 and 4.18: VOCs and radionuclides detected at surface water monitoring locations BRC-SW02, LBC-SW04, UND-SW02, and WDD-SW03.

The following laboratory data qualifiers are used in the tables in this section:

Data qualifier	Meaning
B	The analyte was detected in the laboratory blank sample.
D	The reported result is from a dilution.
J	The reported value is estimated.
Q	One or more quality control criteria failed.
U	Undetected

**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
PK-09G	cis-1,2-Dichloroethene	µg/L			8.5 D	
	Methylene chloride	µg/L			0.72 DJ	
	Trichloroethene	µg/L			390 D	
STSW-101G	1,1,1-Trichloroethane	µg/L		2.3		3.9
	1,1,2-Trichloroethane	µg/L		0.32 U		0.422 J
	1,1-Dichloroethane	µg/L		11		12.6
	1,1-Dichloroethene	µg/L		22		31.8 J
	1,2-Dichloroethane	µg/L		2.1		2.44
	Acetone	µg/L		2.3 J		3 U
	Chloroform	µg/L		0.63 J		1.02
	cis-1,2-Dichloroethene	µg/L		6.9		7.2
	Tetrachloroethene	µg/L		0.4 J		0.606 J
	Trichloroethene	µg/L		27		35.5
	STSW-102G	1,1,1-Trichloroethane	µg/L		3	
1,1-Dichloroethane		µg/L		37		39.2
1,1-Dichloroethene		µg/L		21		23.2 J
1,2-Dichloroethane		µg/L		12		12.4
Chloroform		µg/L		1.5		1.68
cis-1,2-Dichloroethene		µg/L		12		12.9
Trichloroethene		µg/L		92 D		99.4
WP-03G	1,1-Dichloroethane	µg/L	0.16 U	0.16 U	0.28 J	0.32 J
	1,1-Dichloroethene	µg/L	0.14 U	0.14 U	0.35 J	0.37 J
	Trichloroethene	µg/L	0.16 U	0.16 U	0.38 J	0.4 J
X120-05G	Trichloroethene	µg/L			1.8	
X120-08G	1,1,1-Trichloroethane	µg/L			2.7	
	1,1,2-Trichloroethane	µg/L			0.41 J	
	1,1-Dichloroethane	µg/L			6.7	
	1,1-Dichloroethene	µg/L			21	
	1,2-Dichloroethane	µg/L			0.68 J	
	Chloroform	µg/L			0.74 J	
	cis-1,2-Dichloroethene	µg/L			0.67 J	
X120-10G	Trichloroethene	µg/L			12	
	1,1,1-Trichloroethane	µg/L			3.7	
	1,1,2-Trichloroethane	µg/L			0.88 J	
	1,1-Dichloroethane	µg/L			14	
	1,1-Dichloroethene	µg/L			43	
	1,2-Dichloroethane	µg/L			1.1	
	Chloroform	µg/L			1.3	
X120-11G	cis-1,2-Dichloroethene	µg/L			1	
	Trichloroethene	µg/L			12	
	1,1-Dichloroethane	µg/L		0.45 J		0.76 J
	cis-1,2-Dichloroethene	µg/L		7.5 J		9.22
	trans-1,2-Dichloroethene	µg/L		0.2 J		0.3 U
X749-04G	Trichloroethene	µg/L		170 D		161
	Chloroform	µg/L			0.31 J	
	cis-1,2-Dichloroethene	µg/L			0.53 J	
	Tetrachloroethene	µg/L			0.29 J	
X749-05G	Trichloroethene	µg/L			200 D	
	1,1-Dichloroethane	µg/L			0.7 J	
	1,1-Dichloroethene	µg/L			0.38 J	

**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X749-05G	Carbon tetrachloride	µg/L			0.31 J	
	Chloroform	µg/L			0.89 J	
	cis-1,2-Dichloroethene	µg/L			1	
	Tetrachloroethene	µg/L			1.6	
	Trichloroethene	µg/L			70 D	
X749-06G	1,1,1-Trichloroethane	µg/L		23 D		18.8
	1,1,2-Trichloroethane	µg/L		2.8 D		2.51
	1,1-Dichloroethane	µg/L		130 D		105
	1,1-Dichloroethene	µg/L		120 D		83.4 J
	1,2-Dichloroethane	µg/L		2.9 D		2.48
	Acetone	µg/L		11 DJ		3 U
	Chloroform	µg/L		13 D		11.3
	cis-1,2-Dichloroethene	µg/L		35 D		35.4
	Tetrachloroethene	µg/L		12 D		12
	Trichloroethene	µg/L		480 D		410
	Vinyl chloride	µg/L		0.6 DJ		0.654 J
X749-07G	1,1,1-Trichloroethane	µg/L		9.7		9.23
	1,1-Dichloroethane	µg/L		20		15.3
	1,1-Dichloroethene	µg/L		16		17.9 J
	1,2-Dichloroethane	µg/L		11		6.39
	Acetone	µg/L		2.1 J		3 U
	Chloroform	µg/L		1.1		1.07
	cis-1,2-Dichloroethene	µg/L		5.8		5.91
	Tetrachloroethene	µg/L		0.41 J		0.495 J
	Trichloroethene	µg/L		68 D		59.8
	Vinyl chloride	µg/L		0.1 U		0.33 J
X749-08G	1,1,1-Trichloroethane	µg/L		1.4		5.12
	1,1-Dichloroethane	µg/L		0.32 J		1.21
	1,1-Dichloroethene	µg/L		1.3		5.87 J
	1,2-Dichloroethane	µg/L		0.13 U		0.248 J
	cis-1,2-Dichloroethene	µg/L		0.28 J		1.47
	Trichloroethene	µg/L		2.7		9.93
X749-09GA	1,1,1-Trichloroethane	µg/L		13		6.49
	1,1-Dichloroethane	µg/L		3		1.27
	1,1-Dichloroethene	µg/L		11		4.54 J
	1,2-Dichloroethane	µg/L		0.45 J		0.201 J
	Chloroform	µg/L		0.28 J		0.3 U
	cis-1,2-Dichloroethene	µg/L		2.6		1.19
X749-10GA	Trichloroethene	µg/L		22		10.1
	1,1-Dichloroethane	µg/L		0.51 J		1.44
	1,1-Dichloroethene	µg/L		0.97 J		3.15 J
	cis-1,2-Dichloroethene	µg/L		0.39 J		1.54
	Vinyl chloride	µg/L		0.1 U		0.566 J
X749-13G	1,1,1-Trichloroethane	µg/L		2		2.28
	1,1-Dichloroethane	µg/L		0.62 J		0.629 J
	1,1-Dichloroethene	µg/L		3.6		3.7 J
	Chloroform	µg/L		0.17 J		0.3 U
	cis-1,2-Dichloroethene	µg/L		0.7 J		0.666 J
	Trichloroethene	µg/L		6.5		6.87
X749-14B	Trichloroethene	µg/L		0.54 J		0.5 U

**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X749-20G	1,1,1-Trichloroethane	µg/L			0.34 J	
	1,1-Dichloroethane	µg/L			0.99 J	
	1,1-Dichloroethene	µg/L			0.87 J	
	cis-1,2-Dichloroethene	µg/L			1	
	Trichloroethene	µg/L			8.3 J	
X749-21G	1,1,1-Trichloroethane	µg/L		0.5 J		0.731 J
	1,1-Dichloroethene	µg/L		0.24 J		0.356 J
	Trichloroethene	µg/L		1		1.26
X749-22G	1,1,1-Trichloroethane	µg/L		0.24 J		0.302 J
	1,1-Dichloroethane	µg/L		2.9		3.74
	1,1-Dichloroethene	µg/L		3.9		5.83 J
	1,2-Dichloroethane	µg/L		0.13 U		0.167 J
	cis-1,2-Dichloroethene	µg/L		1.2		1.8
	Trichloroethene	µg/L		0.2 J		0.5 U
	Vinyl chloride	µg/L		0.1 U		0.637 J
X749-26G	1,1,1-Trichloroethane	µg/L		0.41 J		1.01
	1,1-Dichloroethane	µg/L		0.79 J		3.05
	1,1-Dichloroethene	µg/L		0.62 J		3.93 J
	1,2-Dichloroethane	µg/L		0.13 U		1.38
	cis-1,2-Dichloroethene	µg/L		0.18 J		0.802 J
	Trichloroethene	µg/L		3.1		6.6
X749-27G	1,1,1-Trichloroethane	µg/L		27		22.7
	1,1,2-Trichloroethane	µg/L		1.1		1.12
	1,1-Dichloroethane	µg/L		140 D		85.6
	1,1-Dichloroethene	µg/L		220 D		146 J
	1,2-Dichloroethane	µg/L		83 D		44.3
	Acetone	µg/L		26		3 U
	Chloroethane	µg/L		1.3 J		0.629 J
	Chloroform	µg/L		15		11.2
	cis-1,2-Dichloroethene	µg/L		31		24.5
	Methylene chloride	µg/L		0.76 J		0.345 J
	Tetrachloroethene	µg/L		1.1		2.06
	trans-1,2-Dichloroethene	µg/L		0.45 J		0.3 U
	Trichloroethene	µg/L		230 D		198
	Vinyl chloride	µg/L		0.55 J		0.307 J
	X749-28G	1,1,1-Trichloroethane	µg/L			4.3
1,1-Dichloroethane		µg/L			3.3	
1,1-Dichloroethene		µg/L			12	
Chloroform		µg/L			0.64 J	
cis-1,2-Dichloroethene		µg/L			0.69 J	
Tetrachloroethene		µg/L			0.21 J	
Trichloroethene		µg/L			34	
X749-29G	Trichloroethene	µg/L			5.5	
X749-30G	1,1-Dichloroethene	µg/L			1.2	
	Chloroform	µg/L			0.45 J	
	cis-1,2-Dichloroethene	µg/L			1.4	
X749-33G	Trichloroethene	µg/L			63 D	
	1,1,1-Trichloroethane	µg/L		11		10.3
	1,1,2-Trichloroethane	µg/L		0.97 J		0.817 J
	1,1-Dichloroethane	µg/L		39		31.7

**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X749-33G	1,1-Dichloroethene	µg/L		70 D		59.7 J
	1,2-Dichloroethane	µg/L		14		11.9
	Chloroethane	µg/L		0.41 U		0.483 J
	Chloroform	µg/L		5 J		3.75
	cis-1,2-Dichloroethene	µg/L		8.8		6.67
	Methylene chloride	µg/L		0.43 JQ		0.34 U
	Tetrachloroethene	µg/L		1.3		1.39
	Trichloroethene	µg/L		120 D		95.8
	Vinyl chloride	µg/L		0.12 J		0.15 U
X749-35G	1,1,1-Trichloroethane	µg/L			28	
	1,1-Dichloroethane	µg/L			7.5	
	1,1-Dichloroethene	µg/L			18	
	Chloroform	µg/L			0.21 J	
	cis-1,2-Dichloroethene	µg/L			5.1	
	Trichloroethene	µg/L			43	
	Vinyl chloride	µg/L			0.56 J	
X749-36G	1,1,1-Trichloroethane	µg/L			0.96 J	
	1,1-Dichloroethane	µg/L			2	
	1,1-Dichloroethene	µg/L			6.4	
	Chloroform	µg/L			0.24 J	
	cis-1,2-Dichloroethene	µg/L			0.39 J	
	Trichloroethene	µg/L			6.9	
X749-37G	1,1,1-Trichloroethane	µg/L		0.84 J		1.28
	1,1-Dichloroethane	µg/L		4.8		6.08
	1,1-Dichloroethene	µg/L		12		15.6 J
	1,2-Dichloroethane	µg/L		0.13 U		0.526 J
	Chloroform	µg/L		0.17 J		0.3 U
	cis-1,2-Dichloroethene	µg/L		2.3		2.61
	Tetrachloroethene	µg/L		0.25 J		0.3 U
	Trichloroethene	µg/L		11		15.3
X749-38G	1,1,1-Trichloroethane	µg/L		5.6		8.12
	1,1,2-Trichloroethane	µg/L		0.93 J		0.737 J
	1,1-Dichloroethane	µg/L		16		19.7
	1,1-Dichloroethene	µg/L		43		56 J
	1,2-Dichloroethane	µg/L		1.9		2.4
	Acetone	µg/L		2 J		3 U
	Chloroform	µg/L		1.4		1.65
	cis-1,2-Dichloroethene	µg/L		8.9		10.8
	Tetrachloroethene	µg/L		0.75 J		1.17
	Trichloroethene	µg/L		48		57.2
X749-40G	Chloroform	µg/L			0.4 J	
	Trichloroethene	µg/L			2.6	
X749-41G	cis-1,2-Dichloroethene	µg/L		1.7 DJ		2.6
	trans-1,2-Dichloroethene	µg/L		0.46 DJ		0.829 J
	Trichloroethene	µg/L		420 D		221 J
X749-42G	1,1,1-Trichloroethane	µg/L		0.34 J		0.321 J
	1,1-Dichloroethane	µg/L		0.68 J		0.667 J
	1,1-Dichloroethene	µg/L		2.5		2.92 J
	Trichloroethene	µg/L		3.4		4.64
X749-43G	1,1,1-Trichloroethane	µg/L			0.19 J	

**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X749-43G	1,1-Dichloroethane	µg/L			0.44 J	
	1,1-Dichloroethene	µg/L			1.2	
	Trichloroethene	µg/L			0.75 J	
X749-44G	1,1-Dichloroethane	µg/L	0.16 U	0.21 J	0.33 J	0.3 U
	1,1-Dichloroethene	µg/L	0.14 U	0.14 U	0.25 J	0.3 U
	Acetone	µg/L	2 J	1.9 U	1.9 U	3 U
	Trichloroethene	µg/L	0.18 J	0.35 J	0.54 J	0.5 U
X749-45G	1,1,1-Trichloroethane	µg/L	0.16 U	0.17 J	0.16 U	0.3 U
	1,1-Dichloroethane	µg/L	0.69 J	5.8	2.2	2.19
	1,1-Dichloroethene	µg/L	0.36 J	4.9	1.8	1.71
	1,2-Dichloroethane	µg/L	0.13 U	1.6	0.59 J	0.7 J
	cis-1,2-Dichloroethene	µg/L	0.82 J	6.5	2.5	1.93
	Trichloroethene	µg/L	1.2	16	6	5.81
X749-50B	1,1-Dichloroethane	µg/L			0.6 J	
	1,2-Dichloroethane	µg/L			0.24 J	
X749-54B	1,1-Dichloroethane	µg/L		2.3		2.56
	Trichloroethene	µg/L		2.9		12.8
	Vinyl chloride	µg/L		0.1 U		0.35 J
X749-64B	Acetone	µg/L			2.4 J	
	Trichloroethene	µg/L			0.45 J	
X749-67G	1,1,1-Trichloroethane	µg/L	5.1	2.6	4.6	5.01
	1,1,2-Trichloroethane	µg/L	0.38 J	0.38 J	0.4 J	0.322 J
	1,1-Dichloroethane	µg/L	58 D	35	54	60 J
	1,1-Dichloroethene	µg/L	42	32	43	43 J
	1,2-Dichloroethane	µg/L	22	10	17	17.4
	Acetone	µg/L	1.9 U	2.1 J	3.2 J	3 U
	Chloroethane	µg/L	0.61 J	0.57 J	0.52 J	0.571 J
	Chloroform	µg/L	3.1	1.8	2.6	2.61
	cis-1,2-Dichloroethene	µg/L	33	24	30	28.1 J
	Methylene chloride	µg/L	0.32 U	0.32 U	0.32 J	0.34 U
	trans-1,2-Dichloroethene	µg/L	0.25 J	0.19 J	0.3 J	0.317 J
	Trichloroethene	µg/L	150 D	110 D	160 D	141
	Vinyl chloride	µg/L	0.19 J	0.21 J	0.21 J	0.247 J
	X749-97G	1,1-Dichloroethane	µg/L	0.16 U	1.5	0.29 J
1,1-Dichloroethene		µg/L	0.14 U	0.6 J	0.14 U	0.3 U
1,2-Dichloroethane		µg/L	0.13 U	0.38 J	0.13 U	0.15 U
cis-1,2-Dichloroethene		µg/L	0.15 U	1.1	0.15 U	0.3 U
Trichloroethene		µg/L	0.16 U	2.7	0.75 J	0.5 U
X749-102G	1,1-Dichloroethane	µg/L	0.16 U	0.5 J	0.71 J	0.811 J
	1,1-Dichloroethene	µg/L	0.14 U	0.62 J	0.98 J	1.17
	cis-1,2-Dichloroethene	µg/L	0.15 U	0.15 U	0.15 J	0.3 U
	Trichloroethene	µg/L	0.16 U	0.69 J	1	1.18
X749-103G	1,1-Dichloroethane	µg/L	0.16 U	0.34 J	0.6 J	0.66 J
	1,1-Dichloroethene	µg/L	0.14 U	0.49 J	1.1	1.17 J
	Acetone	µg/L	4.4 J	1.9 U	1.9 U	3 U
	cis-1,2-Dichloroethene	µg/L	0.15 U	0.15 U	0.16 J	0.3 U
	Trichloroethene	µg/L	0.16 U	0.47 J	0.98 J	0.985 J
X749-106G	1,1,1-Trichloroethane	µg/L		8.7		8.71
	1,1,2-Trichloroethane	µg/L		0.97 J		0.887 J
	1,1-Dichloroethane	µg/L		17		16.9 J

**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X749-106G	1,1-Dichloroethene	µg/L		51		54.7 J
	1,2-Dichloroethane	µg/L		1.7		1.54
	Acetone	µg/L		6.8 J		3 U
	Chloroform	µg/L		1.5		1.48
	cis-1,2-Dichloroethene	µg/L		2.7		3.13 J
	Tetrachloroethene	µg/L		0.62 J		0.728 J
	Trichloroethene	µg/L		36		38.9
X749-107G	1,1,1-Trichloroethane	µg/L		9.8		9.13
	1,1,2-Trichloroethane	µg/L		1.1		0.977 J
	1,1-Dichloroethane	µg/L		20		19 J
	1,1-Dichloroethene	µg/L		60 D		50
	1,2-Dichloroethane	µg/L		1.6		1.77
	Acetone	µg/L		4.2 J		3 U
	Chloroform	µg/L		1.9		1.75
X749-108G	cis-1,2-Dichloroethene	µg/L		3.8		3.39 J
	Tetrachloroethene	µg/L		0.78 J		0.774 J
	Trichloroethene	µg/L		49		46.3
	1,1,1-Trichloroethane	µg/L		22		22.3
	1,1,2-Trichloroethane	µg/L		1.5		1.38
	1,1-Dichloroethane	µg/L		26		23.8
	1,1-Dichloroethene	µg/L		73 D		61.1
X749-109G	1,2-Dichloroethane	µg/L		2.2		2.13
	Acetone	µg/L		6.7 J		3 U
	Chloroform	µg/L		2.8		2.48
	cis-1,2-Dichloroethene	µg/L		4.5		4.32
	Tetrachloroethene	µg/L		1.1		1.34
	Trichloroethene	µg/L		65 D		59.8
	Vinyl chloride	µg/L		0.1 J		0.15 U
X749-110G	1,1,1-Trichloroethane	µg/L		1.3		0.602 J
	1,1-Dichloroethane	µg/L		6.5		2.3
	1,1-Dichloroethene	µg/L		9.5		4.09 J
	1,2-Dichloroethane	µg/L		1.4		0.15 U
	Acetone	µg/L		2.2 J		3 U
	Chloroform	µg/L		0.41 J		0.3 U
	cis-1,2-Dichloroethene	µg/L		3.8		1.36
X749-113G	Trichloroethene	µg/L		13		5.99
	1,1,1-Trichloroethane	µg/L		2.2		1.06
	1,1-Dichloroethane	µg/L		3.3		2.87
	1,1-Dichloroethene	µg/L		8.3		5.72 J
	1,2-Dichloroethane	µg/L		0.98 J		0.913 J
	Chloroform	µg/L		0.38 J		0.3 U
	cis-1,2-Dichloroethene	µg/L		3.8		3.95
X749-113G	Trichloroethene	µg/L		16		15.8
	1,1,1-Trichloroethane	µg/L		11		10.6
	1,1-Dichloroethane	µg/L		15		14.3
	1,1-Dichloroethene	µg/L		24		26.1 J
	1,2-Dichloroethane	µg/L		8.6		6.68
	Chloroform	µg/L		1.6		1.54
	cis-1,2-Dichloroethene	µg/L		2.1		2.21
Tetrachloroethene	µg/L		0.31 J		0.332 J	

**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X749-113G	Trichloroethene	µg/L		39		38.5
X749-114G	cis-1,2-Dichloroethene	µg/L			1.2	
X749-115G	Trichloroethene	µg/L			0.27 J	
	Chloroform	µg/L			0.22 J	
X749-117G	cis-1,2-Dichloroethene	µg/L			8.4	
	Trichloroethene	µg/L			240 D	
	4-Methyl-2-pentanone	µg/L			3.7 J	
	Acetone	µg/L			13	
X749-118G	Chloroform	µg/L			1.5	
	cis-1,2-Dichloroethene	µg/L			0.29 J	
	Tetrachloroethene	µg/L			0.55 J	
	Trichloroethene	µg/L			55	
	1,1-Dichloroethane	µg/L			1	
	1,1-Dichloroethene	µg/L			0.31 J	
	2-Butanone	µg/L			2.1 J	
	4-Methyl-2-pentanone	µg/L			18	
	Acetone	µg/L			24	
	Chloroform	µg/L			0.24 J	
X749-119G	cis-1,2-Dichloroethene	µg/L			10	
	Tetrachloroethene	µg/L			1.3	
	Trichloroethene	µg/L			58	
X749-120G	Chloroform	µg/L			1.1	
	cis-1,2-Dichloroethene	µg/L			0.37 J	
	Trichloroethene	µg/L			11	
X749-121G	1,1,1-Trichloroethane	µg/L			530 D	
	1,1,2-Trichloroethane	µg/L			78 D	
	1,1-Dichloroethane	µg/L			4800 D	
	1,1-Dichloroethene	µg/L			2200 D	
	1,2-Dichloroethane	µg/L			83 D	
	Chloroform	µg/L			270 D	
	cis-1,2-Dichloroethene	µg/L			1300 D	
	Methylene chloride	µg/L			74 D	
	Tetrachloroethene	µg/L			240 D	
	trans-1,2-Dichloroethene	µg/L			4.8 DJ	
X749-122G	Trichloroethene	µg/L			7100 D	
	Vinyl chloride	µg/L			29 D	
	1,1,1-Trichloroethane	µg/L			39 J	
	1,1,2-Trichloroethane	µg/L			1.3	
	1,1-Dichloroethane	µg/L			13	
	1,1-Dichloroethene	µg/L			200 D	
	1,2-Dichloroethane	µg/L			1.7	
	Chloroethane	µg/L			3.8	
	Chloroform	µg/L			1.1	
	cis-1,2-Dichloroethene	µg/L			8.4	
X749-122G	Tetrachloroethene	µg/L			0.24 J	
	Trichloroethene	µg/L			53 D	
	Vinyl chloride	µg/L			1	
	1,1,1-Trichloroethane	µg/L			270 D	
	1,1,2-Trichloroethane	µg/L			2.5 DJ	
	1,1-Dichloroethane	µg/L			70 D	



**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter	
X749-122G	1,1-Dichloroethene	µg/L			240 D		
	Benzene	µg/L			4.1 D		
	Chloroform	µg/L			2.7 DJ		
	cis-1,2-Dichloroethene	µg/L			44 D		
	trans-1,2-Dichloroethene	µg/L			0.78 DJ		
	Trichloroethene	µg/L			780 D		
	Vinyl chloride	µg/L			2.1 DJ		
X749-PZ02G	Acetone	µg/L		3.8 J		3 U	
	Trichloroethene	µg/L		0.25 J		0.5 U	
X749-PZ04G	1,1,1-Trichloroethane	µg/L	0.16 U	0.18 J	0.16 U	0.3 U	
	1,1-Dichloroethane	µg/L	0.37 J	3.6	4.9	4.43	
	1,1-Dichloroethene	µg/L	0.14 U	1.9	2.7	2.54	
	1,2-Dichloroethane	µg/L	0.13 U	0.94 J	1.3	1.15	
	cis-1,2-Dichloroethene	µg/L	0.15 U	1.5	1.5	1.38	
	Trichloroethene	µg/L	0.78 J	8.4	10	9.02	
X749-PZ05G	Trichloroethene	µg/L	0.16 U	0.16 U	0.26 J	0.5 U	
X749-PZ06G	1,1,1-Trichloroethane	µg/L		6.4		7.76	
	1,1,2-Trichloroethane	µg/L		0.86 J		0.839 J	
	1,1-Dichloroethane	µg/L		17		19.8 J	
	1,1-Dichloroethene	µg/L		53 J		56.2	
	1,2-Dichloroethane	µg/L		1.4		1.7	
	Acetone	µg/L		3.1 J		3 U	
	Chloroform	µg/L		1.5		1.68	
	cis-1,2-Dichloroethene	µg/L		2.7		3.17 J	
	Tetrachloroethene	µg/L		0.3 J		0.437 J	
	Trichloroethene	µg/L		36 J		43.9	
	X749-PZ07G	Trichloroethene	µg/L			0.56 J	
	X749-PZ10G	1,1,1-Trichloroethane	µg/L		6.4 D		6.4
		1,1,2-Trichloroethane	µg/L		0.64 U		0.332 J
		1,1-Dichloroethane	µg/L		0.54 DJ		0.577 J
1,1-Dichloroethene		µg/L		87 D		91.6 J	
1,2-Dichloroethane		µg/L		0.26 U		0.479 J	
Acetone		µg/L		62 D		13.2	
Chloroform		µg/L		23 D		22.2	
cis-1,2-Dichloroethene		µg/L		0.5 DJ		0.519 J	
Trichloroethene		µg/L		360 D		383	
X749-WPW		1,1,1-Trichloroethane	µg/L		61 D		74.1
		1,1,2-Trichloroethane	µg/L		3.2 U		2.77
		1,1-Dichloroethane	µg/L		59 D		62.6
		1,1-Dichloroethene	µg/L		180 D		293 J
		1,2-Dichloroethane	µg/L		7.1 DJ		4.03
	1,4-Dichlorobenzene	µg/L		1.6 U		0.428 J	
	Benzene	µg/L		3.9 DJ		3.43	
	Chlorobenzene	µg/L		1.7 U		0.733 J	
	Chloroethane	µg/L		4.1 U		1.82	
	Chloroform	µg/L		3.6 DJ		2.14	
	cis-1,2-Dichloroethene	µg/L		1200 D		1590	
	Tetrachloroethene	µg/L		2 U		1.66	
	trans-1,2-Dichloroethene	µg/L		1.9 DJ		4.08 J	
	Trichloroethene	µg/L		37 D		755	

**Table 4.1. VOCs detected at the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X749-WPW	Vinyl chloride	µg/L		7.8 DJ		18.3

**Table 4.2 VOCs detected at the PK Landfill – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
PK-10G	Trichloroethene	µg/L		0.52 J		0.633 J
PK-14G	Acetone	µg/L		17		3 U
PK-15B	Vinyl chloride	µg/L		0.5 J		0.15 U
PK-16G	cis-1,2-Dichloroethene	µg/L		0.74 J		0.3 U
PK-17B	1,1-Dichloroethane	µg/L		3.4		1.73
	1,1-Dichloroethene	µg/L		0.56 J		0.308 J
	Acetone	µg/L		1.9 U		3.18 BJ
	Benzene	µg/L		0.3 J		0.3 U
	Chlorobenzene	µg/L		0.92 J		1.15
	cis-1,2-Dichloroethene	µg/L		49 J		27.9
	trans-1,2-Dichloroethene	µg/L		1.8		0.9 J
	Trichloroethene	µg/L		1.1		0.5 U
	Vinyl chloride	µg/L		19		7.34
PK-19B	1,1-Dichloroethane	µg/L		0.36 J		0.533 J
	Chloroethane	µg/L		1.6 J		1.45
PK-21B	1,1-Dichloroethane	µg/L		110 D		113
	1,1-Dichloroethene	µg/L		0.98 J		1.09 J
	1,2-Dichloroethane	µg/L		0.52 J		0.551 J
	Benzene	µg/L		0.59 J		0.729 J
	cis-1,2-Dichloroethene	µg/L		8.2		10.5
	Trichloroethene	µg/L		0.24 J		0.5 U
	Vinyl chloride	µg/L		12		8.99
PK-PL6	1,1,1-Trichloroethane	µg/L	0.39 J	1.6	1.7	0.344 J
	1,1-Dichloroethane	µg/L	0.71 J	5.4	6.1	0.813 J
	1,1-Dichloroethene	µg/L	0.21 J	1.1	1.4	0.3 U
	Acetone	µg/L	1.9 U	1.9 U	3 J	3 U
	cis-1,2-Dichloroethene	µg/L	0.62 J	1.5	1.4	0.597 J
	Trichloroethene	µg/L	0.25 J	1.5	1.5	0.5 U
	Vinyl chloride	µg/L	0.1 U	0.12 J	0.33 J	0.15 U
PK-PL6A	1,1,1-Trichloroethane	µg/L	1.2	3.5	2.6	0.79 J
	1,1-Dichloroethane	µg/L	2.1	9.5	8	1.53
	1,1-Dichloroethene	µg/L	0.7 J	2.3	1.9	0.43 J
	cis-1,2-Dichloroethene	µg/L	0.87 J	1.9	1.6	0.718 J
	Trichloroethene	µg/L	0.73 J	3	2.3	0.793 J
	Vinyl chloride	µg/L	0.16 J	0.22 J	0.53 J	0.15 U

**Table 4.3. VOCs detected at the Quadrant I Groundwater Investigative (5-Unit) Area – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter	
X230K-14G	cis-1,2-Dichloroethene	µg/L			0.35 J		
	Trichloroethene	µg/L			3.4		
X230K-15G	cis-1,2-Dichloroethene	µg/L			0.23 J		
	Trichloroethene	µg/L			1.2		
X231A-01G	1,1-Dichloroethane	µg/L			1		
	Benzene	µg/L			0.18 J		
	cis-1,2-Dichloroethene	µg/L			0.38 J		
X231A-02G	Trichloroethene	µg/L			2.3		
	1,1,1-Trichloroethane	µg/L			3.4		
	1,1,2-Trichloroethane	µg/L			0.83 J		
	1,1-Dichloroethane	µg/L			6.3		
	1,1-Dichloroethene	µg/L			53		
	Benzene	µg/L			0.28 J		
	Chloroform	µg/L			1.2		
	cis-1,2-Dichloroethene	µg/L			8.9		
	Tetrachloroethene	µg/L			0.6 J		
	trans-1,2-Dichloroethene	µg/L			0.34 J		
	Trichloroethene	µg/L			180 D		
	X231A-04G	1,1-Dichloroethene	µg/L			0.54 J	
		Chloroform	µg/L			0.25 J	
		cis-1,2-Dichloroethene	µg/L			2.4	
Trichloroethene		µg/L			17		
X231B-02G	Trichlorofluoromethane	µg/L			0.4 J		
	1,1-Dichloroethene	µg/L	1.5 DJ		2.9		
	Chloroform	µg/L	0.74 DJ		0.79 J		
	cis-1,2-Dichloroethene	µg/L	25 D		13		
	Tetrachloroethene	µg/L	0.4 U		0.21 J		
	trans-1,2-Dichloroethene	µg/L	0.7 DJ		0.79 J		
	Trichloroethene	µg/L	370 D		250 D		
X231B-03G	Vinyl chloride	µg/L	0.2 U		0.23 J		
	1,1,1-Trichloroethane	µg/L	2.4		2.7		
	1,1,2-Trichloroethane	µg/L	0.67 J		0.76 J		
	1,1-Dichloroethane	µg/L	2.6		3.3		
	1,1-Dichloroethene	µg/L	90 D		87 D		
	1,2-Dichloroethane	µg/L	0.33 J		0.13 U		
	Acetone	µg/L	4.9 J		1.9 U		
	Benzene	µg/L	0.16 U		0.23 J		
	Chloroform	µg/L	0.45 J		0.5 J		
	cis-1,2-Dichloroethene	µg/L	6.7		6.5		
	Tetrachloroethene	µg/L	0.29 J		0.4 J		
	trans-1,2-Dichloroethene	µg/L	0.3 J		0.45 J		
	Trichloroethene	µg/L	140 D		130 D		
	X231B-06G	1,1,1-Trichloroethane	µg/L	13		0.65 J	
1,1-Dichloroethane		µg/L	12		0.87 J		
1,1-Dichloroethene		µg/L	24		3.5		
Acetone		µg/L	3.6 J		1.9 U		
Chloroform		µg/L	0.33 J		0.2 J		
cis-1,2-Dichloroethene		µg/L	0.53 J		0.2 J		
Tetrachloroethene		µg/L	0.25 J		0.2 U		
Trichloroethene		µg/L	14		7.5		

**Table 4.3. VOCs detected at the Quadrant I Groundwater Investigative (5-Unit) Area – 2018  
 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X231B-06G	Trichlorofluoromethane	µg/L	0.53 J		0.29 U	
X231B-12G	1,1,1-Trichloroethane	µg/L			1.1	
	1,1-Dichloroethane	µg/L			0.18 J	
	1,1-Dichloroethene	µg/L			6.1	
	Trichloroethene	µg/L			2.5	
X231B-14G	Trichlorofluoromethane	µg/L			0.29 J	
	1,1,1-Trichloroethane	µg/L			1.2	
	1,1-Dichloroethane	µg/L			1.3	
	1,1-Dichloroethene	µg/L			22	
	Chloroform	µg/L			0.95 J	
X231B-15G	cis-1,2-Dichloroethene	µg/L			5.5	
	Trichloroethene	µg/L			94 D	
	1,1-Dichloroethene	µg/L			0.36 J	
	Chloroform	µg/L			0.54 J	
X231B-16G	cis-1,2-Dichloroethene	µg/L			0.15 J	
	Trichloroethene	µg/L			0.75 J	
	1,1,1-Trichloroethane	µg/L			0.4 J	
X231B-20G	1,1-Dichloroethane	µg/L			0.2 J	
	1,1-Dichloroethene	µg/L			2	
	Chloroform	µg/L			1.1	
	Trichloroethene	µg/L			0.37 J	
	1,1-Dichloroethene	µg/L			4.9	
X231B-23G	Chloroform	µg/L			1	
	cis-1,2-Dichloroethene	µg/L			0.32 J	
	Trichloroethene	µg/L			36	
	Trichlorofluoromethane	µg/L			0.44 J	
	1,1,1-Trichloroethane	µg/L			0.23 J	
X231B-32B	1,1-Dichloroethene	µg/L			1.4	
	Toluene	µg/L			0.2 J	
	Trichloroethene	µg/L			1.3	
	Trichloroethene	µg/L			0.28 J	
X231B-36G	Acetone	µg/L			5.1 DJ	
	Chloroform	µg/L			1.1 DJ	
	cis-1,2-Dichloroethene	µg/L			0.82 DJ	
	Trichloroethene	µg/L			690 D	
X231B-37G	1,1-Dichloroethane	µg/L			0.93 J	
	1,1-Dichloroethene	µg/L			1.1	
	Benzene	µg/L			0.17 J	
	cis-1,2-Dichloroethene	µg/L			7.6	
	trans-1,2-Dichloroethene	µg/L			0.64 J	
	Trichloroethene	µg/L			7.6	
	Vinyl chloride	µg/L			0.77 J	
X326-09G	1,1-Dichloroethene	µg/L	290 D		320 D	
	Chloroform	µg/L	390 D		310 D	
	cis-1,2-Dichloroethene	µg/L	310 D		240 D	
	Trichloroethene	µg/L	36000 D		30000 D	
	Vinyl chloride	µg/L	17 DJ		16 DJ	
X326-10G	1,1-Dichloroethene	µg/L			10	
	cis-1,2-Dichloroethene	µg/L			0.71 J	
	Trichloroethene	µg/L			9	

**Table 4.3. VOCs detected at the Quadrant I Groundwater Investigative (5-Unit) Area – 2018  
 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X626-07G	1,1,1-Trichloroethane	µg/L	5.3 D		4.5 D	
	1,1,2-Trichloroethane	µg/L	3.8 DJ		3.1 DJ	
	1,1-Dichloroethane	µg/L	2.9 D		3.2 DJ	
	1,1-Dichloroethene	µg/L	470 D		440 D	
	1,2-Dichloroethane	µg/L	1.5 DJ		0.52 U	
	Benzene	µg/L	1.2 DJ		1.1 DJ	
	Chloroform	µg/L	0.73 DJ		0.86 DJ	
	cis-1,2-Dichloroethene	µg/L	0.96 DJ		1.9 DJ	
	Trichloroethene	µg/L	420 D		860 D	
X760-03G	Acetone	µg/L			2.7 J	
	cis-1,2-Dichloroethene	µg/L			0.75 J	
	Trichloroethene	µg/L			120 D	
X760-07G	1,1-Dichloroethene	µg/L			0.39 DJ	
	Acetone	µg/L			3.9 DJ	
	Chloroform	µg/L			0.35 DJ	
	cis-1,2-Dichloroethene	µg/L			7.9 D	
	Trichloroethene	µg/L			320 D	
	Vinyl chloride	µg/L			0.27 DJ	
X770-17GA	Acetone	µg/L	2.7 J		3.8 U	
	cis-1,2-Dichloroethene	µg/L	1.1		1.2 DJ	
	Trichloroethene	µg/L	390 D		420 D	

**Table 4.4 VOCs detected at the X-749A Classified Materials Disposal Facility – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X749A-03G	Acetone	µg/L		2.2 J		
X749A-04G	Acetone	µg/L		2.8 J		
X749A-12G	1,1-Dichloroethane	µg/L		0.26 J		
	cis-1,2-Dichloroethene	µg/L		5.2		
	Trichloroethene	µg/L		4.7		
X749A-14G	Acetone	µg/L		3.3 J		
X749A-17G	1,1-Dichloroethene	µg/L		0.42 J		
X749A-18G	Trichloroethene	µg/L		2.3		
X749A-19G	cis-1,2-Dichloroethene	µg/L		3.8		
	Trichloroethene	µg/L		7.8		

**Table 4.5. VOCs detected at the Quadrant II Groundwater Investigative (7-Unit) Area – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X700-02G	1,1,1-Trichloroethane	µg/L	3.4 DJ			
	1,1-Dichloroethane	µg/L	13 D			
	1,1-Dichloroethene	µg/L	120 D			
	Acetone	µg/L	92 DJ			
	cis-1,2-Dichloroethene	µg/L	1900 D			
	trans-1,2-Dichloroethene	µg/L	4.1 DJ			
	Trichloroethene	µg/L	4100 D			
	Vinyl chloride	µg/L	100 D			
X700-04G	1,1-Dichloroethane	µg/L	3.4 DJ			
	1,1-Dichloroethene	µg/L	23 D			
	Chloroethane	µg/L	43 D			
	cis-1,2-Dichloroethene	µg/L	5900 D			
	Methylene chloride	µg/L	8.1 DJ			
	trans-1,2-Dichloroethene	µg/L	14 DJ			
	Trichloroethene	µg/L	620 D			
	Vinyl chloride	µg/L	6900 D			
X700-05G	1,1,2-Trichloroethane	µg/L	83 DJ			
	1,1-Dichloroethene	µg/L	68 DJ			
	cis-1,2-Dichloroethene	µg/L	26000 D			
	Trichloroethene	µg/L	110000 D			
	Vinyl chloride	µg/L	700 D			
X700-06G	Trichloroethene	µg/L	3300000 D			
X701-26G	Chloroform	µg/L	0.26 J		0.3 J	
	Tetrachloroethene	µg/L	1.3		1.4	
	Trichloroethene	µg/L	2.6		0.41 J	
X701-27G	1,1,1-Trichloroethane	µg/L	0.85 J		0.73 J	
	1,1-Dichloroethane	µg/L	0.53 J		0.43 J	
	1,1-Dichloroethene	µg/L	1.3		1.2	
	cis-1,2-Dichloroethene	µg/L	4.9		6.1	
	trans-1,2-Dichloroethene	µg/L	0.18 J		0.22 J	
	Trichloroethene	µg/L	15		20	
X701-69G	1,1-Dichloroethene	µg/L	1 DJ			
	cis-1,2-Dichloroethene	µg/L	210 D			
	Tetrachloroethene	µg/L	0.48 DJ			
	trans-1,2-Dichloroethene	µg/L	5 D			
	Trichloroethene	µg/L	700 D			
X705-02G	1,1-Dichloroethene	µg/L	0.3 J			
	cis-1,2-Dichloroethene	µg/L	0.49 J			
	Trichloroethene	µg/L	27 J			
X705-03G	1,1-Dichloroethane	µg/L	1.3			
	1,1-Dichloroethene	µg/L	8.9			
	cis-1,2-Dichloroethene	µg/L	9.3			
	Tetrachloroethene	µg/L	1.1			
	trans-1,2-Dichloroethene	µg/L	0.37 J			
X705-04G	Trichloroethene	µg/L	110 D			
	1,1-Dichloroethane	µg/L	0.22 J			
	1,1-Dichloroethene	µg/L	0.67 J			
	Bromodichloromethane	µg/L	0.29 J			
	Carbon tetrachloride	µg/L	9.3			
	Chloroform	µg/L	150 D			



**Table 4.5. VOCs detected at the Quadrant II Groundwater Investigative (7-Unit) Area – 2018  
 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X705-04G	Tetrachloroethene	µg/L	1.8			
	Trichloroethene	µg/L	35			
X720-01G	1,1,1-Trichloroethane	µg/L	3.9 DJ			
	1,1-Dichloroethane	µg/L	4.1 DJ			
	1,1-Dichloroethene	µg/L	33 D			
	cis-1,2-Dichloroethene	µg/L	580 DJ			
	Methylene chloride	µg/L	8.1 DJ			
	Trichloroethene	µg/L	6100 D			
	Vinyl chloride	µg/L	33 D			
X720-08G	1,1-Dichloroethene	µg/L	57 D			
	cis-1,2-Dichloroethene	µg/L	18 DJ			
	Methylene chloride	µg/L	8.5 DJ			
	Tetrachloroethene	µg/L	19 DJ			
X720-09G	Trichloroethene	µg/L	6700 D			
	1,1,1-Trichloroethane	µg/L	2300 D			
	1,1-Dichloroethene	µg/L	10000 D			
	cis-1,2-Dichloroethene	µg/L	4500 D			
	Methylene chloride	µg/L	430 DJ			
	Tetrachloroethene	µg/L	620 DJ			
	Toluene	µg/L	790 DJ			
Trichloroethene	µg/L	410000 D				
Vinyl chloride	µg/L	200 DJ				

**Table 4.6. VOCs detected at the X-701B Former Holding Pond – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
LBC-PZ03G	1,1-Dichloroethene	µg/L	0.14 U		0.2 J	
	Acetone	µg/L	5.4 J		1.9 U	
	cis-1,2-Dichloroethene	µg/L	54		180 D	
	trans-1,2-Dichloroethene	µg/L	0.43 J		1.3	
	Trichloroethene	µg/L	20		36 J	
LBC-PZ06G	Acetone	µg/L	3.1 J		1.9 U	
	Trichloroethene	µg/L	0.7 J		0.16 U	
X230J7-01GA	1,1,2-Trichloroethane	µg/L	0.36 J		0.32 U	
	1,1-Dichloroethene	µg/L	0.3 J		0.26 J	
	Acetone	µg/L	2.7 J		1.9 U	
	Chloroform	µg/L	0.23 J		0.16 J	
	cis-1,2-Dichloroethene	µg/L	1.1		1.4	
	Tetrachloroethene	µg/L	0.2 U		0.25 J	
X230J7-02GA	Trichloroethene	µg/L	330 D		350 D	
	1,1-Dichloroethene	µg/L	0.18 J		0.21 J	
	Acetone	µg/L	2.7 J		1.9 U	
	Chloroform	µg/L	0.23 J		0.2 J	
	cis-1,2-Dichloroethene	µg/L	13		17	
	Tetrachloroethene	µg/L	0.3 J		0.39 J	
	trans-1,2-Dichloroethene	µg/L	0.23 J		0.4 J	
X230J7-03GA	Trichloroethene	µg/L	290 D		340 D	
	Vinyl chloride	µg/L	0.37 J		1.1	
	1,1,2,2-Tetrachloroethane	µg/L	0.8 U		0.24 J	
	1,1,2-Trichloroethane	µg/L	1.5 DJ		0.81 J	
	1,1-Dichloroethene	µg/L	0.86 DJ		0.52 J	
	cis-1,2-Dichloroethene	µg/L	150 DJ		140 J	
	Tetrachloroethene	µg/L	1.5 DJ		0.86 J	
	trans-1,2-Dichloroethene	µg/L	4.2 D		4.2	
X237-EPW	Trichloroethene	µg/L	1300 D		89 D	
	Vinyl chloride	µg/L	2.4 DJ		6.6	
	1,1,2,2-Tetrachloroethane	µg/L			37 DJ	
	1,1,2-Trichloroethane	µg/L			19 DJ	
	1,1-Dichloroethene	µg/L			29 DJ	
	cis-1,2-Dichloroethene	µg/L			9700 D	
	Tetrachloroethene	µg/L			9.3 DJ	
	trans-1,2-Dichloroethene	µg/L			48 D	
X237-WPW	Trichloroethene	µg/L			5400 D	
	Vinyl chloride	µg/L			20 DJ	
	1,1,2,2-Tetrachloroethane	µg/L			97 DJ	
	1,1,2-Trichloroethane	µg/L			66 DJ	
	1,1-Dichloroethene	µg/L			14 DJ	
	cis-1,2-Dichloroethene	µg/L			3200 D	
	Tetrachloroethene	µg/L			67 DJ	
X701-01G	trans-1,2-Dichloroethene	µg/L			55 DJ	
	Trichloroethene	µg/L			38000 D	
	Vinyl chloride	µg/L			320 D	
	1,1-Dichloroethene	µg/L	0.79 J		2	
	cis-1,2-Dichloroethene	µg/L	32		48	
	trans-1,2-Dichloroethene	µg/L	0.91 J		2	
Trichloroethene	µg/L	190 D		260 D		

**Table 4.6. VOCs detected at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-01G	Vinyl chloride	µg/L	0.28 J		0.86 JQ	
X701-02G	1,1-Dichloroethene	µg/L	0.26 J		0.23 J	
	cis-1,2-Dichloroethene	µg/L	2.9		2.9	
	Trichloroethene	µg/L	10		10	
X701-06G	1,1-Dichloroethane	µg/L	0.51 DJ		0.63 J	
	1,1-Dichloroethene	µg/L	4.1 D		5.5	
	Chloroform	µg/L	0.33 DJ		0.32 J	
	cis-1,2-Dichloroethene	µg/L	19 D		27	
	trans-1,2-Dichloroethene	µg/L	0.58 DJ		0.81 J	
	Trichloroethene	µg/L	170 D		200 D	
	Vinyl chloride	µg/L	0.43 DJ		0.84 J	
X701-15G	1,1-Dichloroethene	µg/L	0.14 U		1.8 DJ	
	cis-1,2-Dichloroethene	µg/L	100 D		1200 D	
	trans-1,2-Dichloroethene	µg/L	2.5		9.1 DJ	
	Trichloroethene	µg/L	2.8		11 D	
X701-19G	Trichloroethene	µg/L	0.16 U		0.29 J	
X701-20G	1,1,2,2-Tetrachloroethane	µg/L	140 DJ		130 DJ	
	cis-1,2-Dichloroethene	µg/L	800 D		800 D	
	Tetrachloroethene	µg/L	120 DJ		120 DJ	
	trans-1,2-Dichloroethene	µg/L	61 DJ		66 DJ	
	Trichloroethene	µg/L	51000 D		49000 D	
X701-21G	1,1,1-Trichloroethane	µg/L	0.16 U		3.5 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	0.41 J		11 D	
	1,1-Dichloroethane	µg/L	0.18 J		1.6 U	
	1,1-Dichloroethene	µg/L	0.26 J		1.4 U	
	1,2-Dichlorobenzene	µg/L	0.35 J		1.3 U	
	Chloroform	µg/L	0.16 J		1.6 U	
	cis-1,2-Dichloroethene	µg/L	47		180 D	
	Tetrachloroethene	µg/L	0.32 J		5.4 DJ	
	trans-1,2-Dichloroethene	µg/L	0.87 J		19 D	
	Trichloroethene	µg/L	93 D		2000 D	
	Vinyl chloride	µg/L	2.9		7.4 DJ	
X701-23G	cis-1,2-Dichloroethene	µg/L			0.57 J	
	Trichloroethene	µg/L			7.1	
X701-24G	cis-1,2-Dichloroethene	µg/L	210 D		350 D	
	trans-1,2-Dichloroethene	µg/L	6 U		2.9 DJ	
	Trichloroethene	µg/L	2500 D		1500 D	
	Vinyl chloride	µg/L	4 U		4 DJ	
X701-30G	Trichloroethene	µg/L	4.9		3.6	
	Trichlorofluoromethane	µg/L	0.81 J		0.58 JQ	
X701-31G	Toluene	µg/L			0.2 J	
	Trichloroethene	µg/L			0.2 J	
X701-42G	1,1,1-Trichloroethane	µg/L			0.3 J	
	1,1,2,2-Tetrachloroethane	µg/L			0.65 J	
	1,1,2-Trichloroethane	µg/L			0.36 J	
	1,1-Dichloroethane	µg/L			0.39 J	
	1,1-Dichloroethene	µg/L			0.69 J	
	1,2-Dichlorobenzene	µg/L			0.32 J	
	Chloroform	µg/L			0.17 J	
	cis-1,2-Dichloroethene	µg/L			78 D	

**Table 4.6. VOCs detected at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-42G	Tetrachloroethene	µg/L			0.73 J	
	trans-1,2-Dichloroethene	µg/L			3	
	Trichloroethene	µg/L			250 D	
	Vinyl chloride	µg/L			8	
X701-61B	Acetone	µg/L			20	
	m,p-Xylenes	µg/L			2.1	
X701-66G	1,1-Dichloroethene	µg/L	2.8 U		3.5 DJ	
	Chloroform	µg/L	3.2 U		1.9 DJ	
	cis-1,2-Dichloroethene	µg/L	180 D		210 DJ	
	Tetrachloroethene	µg/L	4.4 DJ		5.1 DJ	
	trans-1,2-Dichloroethene	µg/L	3 U		3.5 DJ	
	Trichloroethene	µg/L	2800 D		2800 D	
X701-77G	Vinyl chloride	µg/L	8.2 DJ		13 D	
	1,1-Dichloroethene	µg/L			2.4 DJ	
	cis-1,2-Dichloroethene	µg/L			44 D	
	Tetrachloroethene	µg/L			7.4 DJ	
	trans-1,2-Dichloroethene	µg/L			1.8 DJ	
X701-79G	Trichloroethene	µg/L			2700 D	
	cis-1,2-Dichloroethene	µg/L			4.9 D	
X701-127G	Trichloroethene	µg/L			330 D	
	1,1,2,2-Tetrachloroethane	µg/L	61 DJ		80 U	
	cis-1,2-Dichloroethene	µg/L	760 D		660 D	
X701-128G	Trichloroethene	µg/L	41000 D		39000 D	
	cis-1,2-Dichloroethene	µg/L	310 D		250 D	
	Tetrachloroethene	µg/L	40 U		30 DJ	
X701-130G	Trichloroethene	µg/L	24000 D		20000 D	
	cis-1,2-Dichloroethene	µg/L			360 DJ	
X701-141G	Trichloroethene	µg/L			130000 D	
	1,1,2-Trichloroethane	µg/L			0.34 J	
	1,1-Dichloroethene	µg/L			0.19 J	
	cis-1,2-Dichloroethene	µg/L			3.7	
	Tetrachloroethene	µg/L			0.2 J	
X701-142G	Trichloroethene	µg/L			250 D	
	1,1,2,2-Tetrachloroethane	µg/L	5 DJ		4 U	
	1,1,2-Trichloroethane	µg/L	12 DJ		13 DJ	
	1,1-Dichloroethene	µg/L	8.8 DJ		7.5 DJ	
	cis-1,2-Dichloroethene	µg/L	4800 D		4400 D	
	trans-1,2-Dichloroethene	µg/L	36 D		35 D	
	Trichloroethene	µg/L	5200 D		5600 D	
X701-143G	Vinyl chloride	µg/L	22 D		57 D	
	1,1-Dichloroethene	µg/L	0.14 U		1.8 DJ	
	Acetone	µg/L	2.8 J		19 U	
	cis-1,2-Dichloroethene	µg/L	54		1300 D	
	trans-1,2-Dichloroethene	µg/L	1.1		14 D	
	Trichloroethene	µg/L	54		41 D	
X701-144G	Vinyl chloride	µg/L	0.1 U		33 D	
	1,1-Dichloroethene	µg/L	0.27 J			
	cis-1,2-Dichloroethene	µg/L	150 D			
	trans-1,2-Dichloroethene	µg/L	1.3			
	Trichloroethene	µg/L	1.8			

**Table 4.6. VOCs detected at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-144G	Vinyl chloride	µg/L	49			
X701-BW2G	1,1-Dichloroethene	µg/L			83 DJ	
	Chloroform	µg/L			290 DJ	
	cis-1,2-Dichloroethene	µg/L			490 D	
X701-BW3G	Trichloroethene	µg/L			56000 D	
	1,1-Dichloroethane	µg/L			0.32 J	
	1,1-Dichloroethene	µg/L			0.93 J	
	cis-1,2-Dichloroethene	µg/L			58 J	
	trans-1,2-Dichloroethene	µg/L			0.36 J	
X701-BW4G	Trichloroethene	µg/L			66 D	
	Vinyl chloride	µg/L			8.9	
	cis-1,2-Dichloroethene	µg/L	2.1		9.1	
	trans-1,2-Dichloroethene	µg/L	0.15 U		0.95 J	
X701-EW121G	Trichloroethene	µg/L	1.1		1.5	
	Vinyl chloride	µg/L	0.1 U		0.74 J	
	1,1,2,2-Tetrachloroethane	µg/L	140 DJ		87 DJ	
	1,1,2-Trichloroethane	µg/L	72 DJ		64 U	
	cis-1,2-Dichloroethene	µg/L	630 D		520 D	
X701-EW122G	Tetrachloroethene	µg/L	130 DJ		110 DJ	
	trans-1,2-Dichloroethene	µg/L	71 DJ		64 DJ	
	Trichloroethene	µg/L	62000 D		49000 D	
	1,1,1-Trichloroethane	µg/L	24 DJ		39 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	170 D		210 D	
	1,1,2-Trichloroethane	µg/L	32 DJ		64 U	
X701-IRMPZ03G	cis-1,2-Dichloroethene	µg/L	380 D		460 D	
	Tetrachloroethene	µg/L	190 D		240 D	
	trans-1,2-Dichloroethene	µg/L	56 DJ		77 DJ	
	Trichloroethene	µg/L	38000 D		49000 D	
	1,1,2-Trichloroethane	µg/L	1.1 DJ		1.8 DJ	
	1,1-Dichloroethene	µg/L	0.53 DJ		1.5 DJ	
	Acetone	µg/L	3.8 U		17 DJ	
	Chloroform	µg/L	0.42 DJ		0.64 U	
X701-IRMPZ05G	cis-1,2-Dichloroethene	µg/L	200 D		660 D	
	trans-1,2-Dichloroethene	µg/L	3.7 D		22 D	
	Trichloroethene	µg/L	370 D		1000 DQ	
	Vinyl chloride	µg/L	0.2 U		2 DJ	
X701-IRMPZ06G	cis-1,2-Dichloroethene	µg/L	230 DJ			
	trans-1,2-Dichloroethene	µg/L	1.4 DJ			
	Trichloroethene	µg/L	630 D			
X701-IRMPZ07G	Vinyl chloride	µg/L	1.2 DJ			
	1,1-Dichloroethene	µg/L	0.14 U		0.4 DJ	
	cis-1,2-Dichloroethene	µg/L	92 D		370 D	
	trans-1,2-Dichloroethene	µg/L	3.4		17 D	
	Trichloroethene	µg/L	28		46 D	
X701-IRMPZ08G	Vinyl chloride	µg/L	0.92 J		6.6 D	
	cis-1,2-Dichloroethene	µg/L	4900 D			
	Trichloroethene	µg/L	53000 D			
X701-IRMPZ08G	Vinyl chloride	µg/L	460 D			
	cis-1,2-Dichloroethene	µg/L	51		45 J	
	trans-1,2-Dichloroethene	µg/L	0.35 J		0.38 J	

**Table 4.6. VOCs detected at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-IRMPZ08G	Trichloroethene	µg/L	130 D		54 D	
X701-TC01G	1,1,1-Trichloroethane	µg/L	30 DJ		23 D	
	1,1,2,2-Tetrachloroethane	µg/L	8 U		4 DJ	
	1,1-Dichloroethene	µg/L	10 DJ		11 DJ	
	Chloromethane	µg/L	12 U		10 DJ	
	cis-1,2-Dichloroethene	µg/L	2400 D		2400 D	
	Tetrachloroethene	µg/L	12 DJ		7.8 DJ	
	trans-1,2-Dichloroethene	µg/L	59 D		50 D	
	Trichloroethene	µg/L	5100 D		4100 D	
	Vinyl chloride	µg/L	47 D		41 D	
X701-TC03G	1,1,1-Trichloroethane	µg/L	94 DJ		75 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	120 DJ		73 DJ	
	Chloromethane	µg/L	71 DJ		59 DJ	
	cis-1,2-Dichloroethene	µg/L	7300 D		5500 D	
	Tetrachloroethene	µg/L	52 DJ		44 DJ	
	trans-1,2-Dichloroethene	µg/L	660 D		560 D	
	Trichloroethene	µg/L	33000 D		25000 D	
	Vinyl chloride	µg/L	47 DJ		57 DJ	
X701-TC05G	1,1,1-Trichloroethane	µg/L	64 DJ		77 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	150 D		85 DJ	
	Acetone	µg/L	190 U		250 DJ	
	Chloromethane	µg/L	76 DJ		76 DJ	
	cis-1,2-Dichloroethene	µg/L	2100 D		2300 D	
	Tetrachloroethene	µg/L	33 DJ		25 DJ	
	trans-1,2-Dichloroethene	µg/L	340 D		390 D	
	Trichloroethene	µg/L	22000 D		11000 D	
X701-TC10G	1,1,1-Trichloroethane	µg/L	6.4 U		11 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	9.9 DJ		8 U	
	1,1-Dichloroethene	µg/L	13 DJ		16 DJ	
	cis-1,2-Dichloroethene	µg/L	1100 D		1200 DJ	
	Tetrachloroethene	µg/L	17 DJ		18 DJ	
	trans-1,2-Dichloroethene	µg/L	35 DJ		28 DJ	
	Trichloroethene	µg/L	7700 D		11000 D	
	Vinyl chloride	µg/L	35 DJ		32 DJ	
X701-TC17G	1,1,1-Trichloroethane	µg/L	31 DJ		23 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	20 U		20 DJ	
	4-Methyl-2-pentanone	µg/L	100 U		150 DJ	
	Acetone	µg/L	190 U		460 D	
	Chloroform	µg/L	21 DJ		18 DJ	
	Chloromethane	µg/L	30 U		71 DJ	
	cis-1,2-Dichloroethene	µg/L	240 D		130 D	
	Tetrachloroethene	µg/L	42 DJ		37 DJ	
	trans-1,2-Dichloroethene	µg/L	19 DJ		11 DJ	
	Trichloroethene	µg/L	17000 D		9000 D	
X701-TC22G	1,1,1-Trichloroethane	µg/L	46 DJ		82 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	62 DJ		50 DJ	
	cis-1,2-Dichloroethene	µg/L	850 D		600 D	
	Tetrachloroethene	µg/L	200 DJ		360 D	
	trans-1,2-Dichloroethene	µg/L	94 DJ		64 DJ	
	Trichloroethene	µg/L	44000 D		80000 D	

**Table 4.6. VOCs detected at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-TC28G	1,1,1-Trichloroethane	µg/L	140 DJ		160 U	
	1,1,2,2-Tetrachloroethane	µg/L	150 DJ		200 U	
	Acetone	µg/L	2000 DJ		1900 U	
	cis-1,2-Dichloroethene	µg/L	360 DJ		260 DJ	
	Tetrachloroethene	µg/L	770 D		750 DJ	
	Trichloroethene	µg/L	140000 D		150000 D	
X701-TC48G	1,1,1-Trichloroethane	µg/L	5.3 DJ		5.9 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	11 D		16 DJ	
	1,1,2-Trichloroethane	µg/L	3.5 DJ		14 DJ	
	2-Butanone	µg/L	90 D		37 U	
	Acetone	µg/L	610 DJ		630 D	
	Benzene	µg/L	2 DJ		3.2 U	
	Bromomethane	µg/L	2.2 DJ		4.2 U	
	Chloroform	µg/L	5.3 DJ		4.6 DJ	
	Chloromethane	µg/L	48 D		42 D	
	cis-1,2-Dichloroethene	µg/L	33 D		60 D	
	Tetrachloroethene	µg/L	12 D		26 D	
	trans-1,2-Dichloroethene	µg/L	5.8 DJ		9.9 DJ	
	Trichloroethene	µg/L	1800 D		4800 D	
	X701-TC54G	1,1,1-Trichloroethane	µg/L	110 DJ		94 DJ
1,1,2,2-Tetrachloroethane		µg/L	740 D		730 D	
1,1,2-Trichloroethane		µg/L	130 U		64 DJ	
Acetone		µg/L	760 U		400 DJ	
cis-1,2-Dichloroethene		µg/L	300 DJ		270 D	
Tetrachloroethene		µg/L	470 D		330 D	
trans-1,2-Dichloroethene		µg/L	60 U		42 DJ	
Trichloroethene		µg/L	110000 D		78000 D	
X701-TC61G	1,1,1-Trichloroethane	µg/L	110 DJ		120 DJ	
	1,1,2,2-Tetrachloroethane	µg/L	630 D		520 D	
	cis-1,2-Dichloroethene	µg/L	940 D		890 D	
	Tetrachloroethene	µg/L	470 D		470 D	
	trans-1,2-Dichloroethene	µg/L	130 DJ		140 DJ	
	Trichloroethene	µg/L	140000 DJ		130000 D	
X701-TC67G	1,1,1-Trichloroethane	µg/L	8.8 DJ		16 U	
	1,1,2,2-Tetrachloroethane	µg/L	14 DJ		20 U	
	1,1-Dichloroethene	µg/L	6.2 DJ		14 U	
	cis-1,2-Dichloroethene	µg/L	170 D		160 D	
	Tetrachloroethene	µg/L	48 D		41 DJ	
	trans-1,2-Dichloroethene	µg/L	9.8 DJ		15 U	
	Trichloroethene	µg/L	12000 D		11000 D	
X744G-02G	cis-1,2-Dichloroethene	µg/L	1.7		1.7	
	Trichloroethene	µg/L	30 J		26	
	Trichlorofluoromethane	µg/L	2.2 J		3.8 Q	
X744G-03G	Acetone	µg/L	5.1 J		1.9 QU	
	cis-1,2-Dichloroethene	µg/L	0.89 J		0.68 J	
	Trichloroethene	µg/L	9.4		7.5	

**Table 4.7. Results for radionuclides at the X-701B Former Holding Pond – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
LBC-PZ03G	Technetium-99	pCi/L	0.0109 U			
	Uranium	µg/L	0.0499 U			
	Uranium-233/234	pCi/L	0.0632 U			
	Uranium-235/236	pCi/L	0.0272 U			
	Uranium-238	pCi/L	0.0125 U			
LBC-PZ06G	Technetium-99	pCi/L	0.759 U			
	Uranium	µg/L	0.469			
	Uranium-233/234	pCi/L	0.206			
	Uranium-235/236	pCi/L	0.0547 U			
	Uranium-238	pCi/L	0.149			
X230J7-01GA	Technetium-99	pCi/L	10.4			
	Uranium	µg/L	0.329			
	Uranium-233/234	pCi/L	0.114			
	Uranium-235/236	pCi/L	0.0126 U			
	Uranium-238	pCi/L	0.109			
X230J7-02GA	Technetium-99	pCi/L	145			
	Uranium	µg/L	0.177			
	Uranium-233/234	pCi/L	0.0905			
	Uranium-235/236	pCi/L	0.00709 U			
	Uranium-238	pCi/L	0.0583 U			
X230J7-03GA	Americium-241	pCi/L	-0.0054 U			
	Neptunium-237	pCi/L	0.0217 U			
	Plutonium-238	pCi/L	0.0208 U			
	Plutonium-239/240	pCi/L	0.015 U			
	Technetium-99	pCi/L	113			
	Uranium	µg/L	0.443			
	Uranium-233/234	pCi/L	0.146			
	Uranium-235/236	pCi/L	0.02 U			
X230J7-04GA	Uranium-238	pCi/L	0.146			
	Technetium-99	pCi/L			1.48 U	
	Uranium	µg/L			0.122	
	Uranium-233/234	pCi/L			0.0808 U	
	Uranium-235/236	pCi/L			0 U	
X701-01G	Uranium-238	pCi/L			0.0411 U	
	Technetium-99	pCi/L	-0.649 U			
	Uranium	µg/L	8.08			
	Uranium-233/234	pCi/L	4.31			
	Uranium-235/236	pCi/L	0.145			
X701-02G	Uranium-238	pCi/L	2.69			
	Technetium-99	pCi/L	4.27 U			
	Uranium	µg/L	0.532 J			
	Uranium-233/234	pCi/L	0.392			
	Uranium-235/236	pCi/L	0.0274 UJ			
X701-06G	Uranium-238	pCi/L	0.175 J			
	Technetium-99	pCi/L	28.5			
	Uranium	µg/L	2.2 J			
	Uranium-233/234	pCi/L	1.42			
	Uranium-235/236	pCi/L	0.0499 UJ			
X701-15G	Uranium-238	pCi/L	0.732			
	Technetium-99	pCi/L	-1.29 U			



**Table 4.7. Results for radionuclides at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-15G	Uranium	µg/L	0.212 UJ			
	Uranium-233/234	pCi/L	0.0792 UJ			
	Uranium-235/236	pCi/L	0.00834 U			
	Uranium-238	pCi/L	0.07 UJ			
X701-16G	Technetium-99	pCi/L	4.58 U			
	Uranium	µg/L	0.0145 U			
	Uranium-233/234	pCi/L	0.0683 U			
	Uranium-235/236	pCi/L	0.0112 U			
X701-18G	Uranium-238	pCi/L	0.00314 U			
	Technetium-99	pCi/L			-1.09 U	
	Uranium	µg/L			0.102 UJ	
	Uranium-233/234	pCi/L			0.00839 U	
X701-19G	Uranium-235/236	pCi/L			0.0187 U	
	Uranium-238	pCi/L			0.0312 U	
	Technetium-99	pCi/L	0.0283 U			
	Uranium	µg/L	0.0456 U			
X701-20G	Uranium-233/234	pCi/L	0.0203 U			
	Uranium-235/236	pCi/L	-0.00348 U			
	Uranium-238	pCi/L	0.0159 U			
	Americium-241	pCi/L	0.00162 U		0.0149 U	
X701-21G	Neptunium-237	pCi/L	-0.00676 U		1.48 J	
	Plutonium-238	pCi/L	-0.004 U		0.0218 U	
	Plutonium-239/240	pCi/L	0.0122 U		-0.00485 U	
	Technetium-99	pCi/L	281		264	
	Uranium	µg/L	0.29 UJ		0.441 J	
	Uranium-233/234	pCi/L	0.0995 UJ		0.161 UJ	
	Uranium-235/236	pCi/L	-0.00249 UJ		0.0189 U	
	Uranium-238	pCi/L	0.0978 J		0.145 J	
X701-23G	Technetium-99	pCi/L	412			
	Uranium	µg/L	0.686 J			
	Uranium-233/234	pCi/L	0.346			
	Uranium-235/236	pCi/L	0.0154 UJ			
X701-24G	Uranium-238	pCi/L	0.228 J			
	Technetium-99	pCi/L			21.5	
	Uranium	µg/L			0.0942 UJ	
	Uranium-233/234	pCi/L			0.0458 U	
X701-25G	Uranium-235/236	pCi/L			0.0229 U	
	Uranium-238	pCi/L			0.0281 U	
	Americium-241	pCi/L	0.0154 U			
	Neptunium-237	pCi/L	-0.0142 U			
X701-25G	Plutonium-238	pCi/L	0.0159 U			
	Plutonium-239/240	pCi/L	0.178 UJ			
	Technetium-99	pCi/L	5.16 UJ			
	Uranium	µg/L	0.467 J			
	Uranium-233/234	pCi/L	0.277 J			
	Uranium-235/236	pCi/L	0.0232 UJ			
	Uranium-238	pCi/L	0.153 J			
	Technetium-99	pCi/L	1.78 U			
X701-25G	Uranium	µg/L	0.234			
	Uranium-233/234	pCi/L	0.184			

**Table 4.7. Results for radionuclides at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-25G	Uranium-235/236	pCi/L	0.0245 U			
	Uranium-238	pCi/L	0.0748 U			
X701-30G	Technetium-99	pCi/L	7.33			
	Uranium	µg/L	0.314			
	Uranium-233/234	pCi/L	0.207			
	Uranium-235/236	pCi/L	-0.00292 U			
	Uranium-238	pCi/L	0.106 U			
X701-31G	Technetium-99	pCi/L			2.26 U	
	Uranium	µg/L			0.193 UJ	
	Uranium-233/234	pCi/L			0.127 UJ	
	Uranium-235/236	pCi/L			0.0179 U	
	Uranium-238	pCi/L			0.0621 U	
X701-38G	Technetium-99	pCi/L			65.6	
	Uranium	µg/L			0.125	
	Uranium-233/234	pCi/L			0.0438 U	
	Uranium-235/236	pCi/L			0.0035 U	
	Uranium-238	pCi/L			0.0416 U	
X701-42G	Technetium-99	pCi/L			326	
	Uranium	µg/L			0.339	
	Uranium-233/234	pCi/L			0.113 U	
	Uranium-235/236	pCi/L			0.00374 U	
	Uranium-238	pCi/L			0.113 U	
X701-48G	Americium-241	pCi/L			0.00419 U	
	Neptunium-237	pCi/L			0.369 UJ	
	Plutonium-238	pCi/L			0.00198 U	
	Plutonium-239/240	pCi/L			-0.015 U	
	Technetium-99	pCi/L			-1.85 U	
	Uranium	µg/L			0.0606 UJ	
	Uranium-233/234	pCi/L			0.0677 UJ	
	Uranium-235/236	pCi/L			0.000708 U	
	Uranium-238	pCi/L			0.0203 U	
X701-58B	Technetium-99	pCi/L			0.627 U	
	Uranium	µg/L			0.193	
	Uranium-233/234	pCi/L			0.275	
	Uranium-235/236	pCi/L			0.00493 U	
	Uranium-238	pCi/L			0.0641 U	
X701-61B	Technetium-99	pCi/L			-0.44 U	
	Uranium	µg/L			0.128	
	Uranium-233/234	pCi/L			0.166	
	Uranium-235/236	pCi/L			0.0113 U	
	Uranium-238	pCi/L			0.0411 U	
X701-66G	Americium-241	pCi/L	-0.0013 U		0.0203 U	
	Neptunium-237	pCi/L	-0.0358 U		0.127 UJ	
	Plutonium-238	pCi/L	0.0194 U		0.0238 U	
	Plutonium-239/240	pCi/L	0.0227 U		-0.00473 U	
	Technetium-99	pCi/L	167		173	
	Uranium	µg/L	0.414 J		0.425 J	
	Uranium-233/234	pCi/L	0.225		0.158 J	
	Uranium-235/236	pCi/L	0.0136 UJ		0.00883 U	
	Uranium-238	pCi/L	0.137 J		0.142 J	

**Table 4.7. Results for radionuclides at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-77G	Technetium-99	pCi/L			25.8	
	Uranium	µg/L			0.121	
	Uranium-233/234	pCi/L			0.134	
	Uranium-235/236	pCi/L			0.00725 U	
	Uranium-238	pCi/L			0.0396 U	
X701-79G	Technetium-99	pCi/L			41.3	
	Uranium	µg/L			-0.00256 U	
	Uranium-233/234	pCi/L			0.0305 U	
	Uranium-235/236	pCi/L			-0.000744 U	
	Uranium-238	pCi/L			-0.000745 U	
X701-127G	Americium-241	pCi/L	-0.0078 U		-0.000746 U	
	Neptunium-237	pCi/L	-0.00744 U		0.249 UJ	
	Plutonium-238	pCi/L	0.0248 U		0.0127 U	
	Plutonium-239/240	pCi/L	0.00535 U		-0.00435 U	
	Technetium-99	pCi/L	114		132	
	Uranium	µg/L	0.199 UJ		0.0898 UJ	
	Uranium-233/234	pCi/L	0.0907 UJ		0.117 UJ	
	Uranium-235/236	pCi/L	0.0112 UJ		0.0116 U	
	Uranium-238	pCi/L	0.0652 UJ		0.0284 U	
X701-128G	Americium-241	pCi/L	-0.00271 U			
	Neptunium-237	pCi/L	0.029 UJ			
	Plutonium-238	pCi/L	0.0162 UJ			
	Plutonium-239/240	pCi/L	0.0197 U			
	Technetium-99	pCi/L	57.4			
	Uranium	µg/L	0.229 UJ			
	Uranium-233/234	pCi/L	0.124 UJ			
	Uranium-235/236	pCi/L	0.0184 UJ			
	Uranium-238	pCi/L	0.0742 J			
X701-130G	Technetium-99	pCi/L			1030	
	Uranium	µg/L			4.61	
	Uranium-233/234	pCi/L			7.01	
	Uranium-235/236	pCi/L			0.369	
	Uranium-238	pCi/L			1.49	
X701-BW1G	Technetium-99	pCi/L			59.2	
	Uranium	µg/L			0.113	
	Uranium-233/234	pCi/L			0.067 U	
	Uranium-235/236	pCi/L			-0.00772 U	
	Uranium-238	pCi/L			0.039 U	
X701-BW2G	Technetium-99	pCi/L			1350	
	Uranium	µg/L			0.0586 UJ	
	Uranium-233/234	pCi/L			0.0663 U	
	Uranium-235/236	pCi/L			0.00246 U	
	Uranium-238	pCi/L			0.0193 U	
X701-BW3G	Technetium-99	pCi/L			-2.08 U	
	Uranium	µg/L			0.0103 U	
	Uranium-233/234	pCi/L			0.0899 U	
	Uranium-235/236	pCi/L			0.00759 U	
	Uranium-238	pCi/L			0.00228 U	
X701-BW4G	Technetium-99	pCi/L	133			
	Uranium	µg/L	0.0709 U			

**Table 4.7. Results for radionuclides at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-BW4G	Uranium-233/234	pCi/L	0.0537 U			
	Uranium-235/236	pCi/L	-0.00356 U			
X701-EW121G	Uranium-238	pCi/L	0.0244 U			
	Technetium-99	pCi/L	152		127	
	Uranium	µg/L	0.399 J		0.286	
	Uranium-233/234	pCi/L	0.136 J		0.128 U	
	Uranium-235/236	pCi/L	0.0105 U		0.0195 U	
X701-EW122G	Uranium-238	pCi/L	0.132 J		0.093 U	
	Technetium-99	pCi/L	370		350	
	Uranium	µg/L	0.622 J		0.625	
	Uranium-233/234	pCi/L	0.253		0.29	
	Uranium-235/236	pCi/L	0.0204 U		0.0188 U	
X701-IRMPZ06G	Uranium-238	pCi/L	0.206 J		0.207	
	Technetium-99	pCi/L	2.48 U			
	Uranium	µg/L	1.54			
	Uranium-233/234	pCi/L	0.654			
	Uranium-235/236	pCi/L	0.0444 U			
X701-TC01G	Uranium-238	pCi/L	0.512			
	Americium-241	pCi/L	0.00312 U		0.000539 U	
	Neptunium-237	pCi/L	0.0344 U		0.195 UJ	
	Plutonium-238	pCi/L	0.0105 U		-0.00587 U	
	Plutonium-239/240	pCi/L	0.000916 U		-0.0236 U	
	Technetium-99	pCi/L	148		143	
	Uranium	µg/L	13.3		10.6	
	Uranium-233/234	pCi/L	8.87		7.13	
	Uranium-235/236	pCi/L	0.361		0.348	
X701-TC03G	Uranium-238	pCi/L	4.43		3.52	
	Americium-241	pCi/L	-0.00663 U		0.0357 U	
	Neptunium-237	pCi/L	0.0259 U		0.187 UJ	
	Plutonium-238	pCi/L	0.00976 U		-0.0198 U	
	Plutonium-239/240	pCi/L	0.0238 U		0.00119 U	
	Technetium-99	pCi/L	596		584	
	Uranium	µg/L	4.92		4.52 J	
	Uranium-233/234	pCi/L	1.66		1.56	
	Uranium-235/236	pCi/L	0.0729		0.0474 UJ	
X701-TC05G	Uranium-238	pCi/L	1.64		1.51	
	Americium-241	pCi/L	-0.021 UJ		0.0161 U	
	Neptunium-237	pCi/L	0.0432 U		0.284 UJ	
	Plutonium-238	pCi/L	0.0167 U		-0.00936 U	
	Plutonium-239/240	pCi/L	0.0105 U		-0.0123 U	
	Technetium-99	pCi/L	722		603	
	Uranium	µg/L	23.6 J		24.4	
	Uranium-233/234	pCi/L	9.18		9.28	
	Uranium-235/236	pCi/L	0.436 J		0.55	
X701-TC10G	Uranium-238	pCi/L	7.85		8.11	
	Americium-241	pCi/L	0.00473 U		0.0234 U	
	Neptunium-237	pCi/L	0 U		0.356 UJ	
	Plutonium-238	pCi/L	0.0793 UJ		-0.0307 U	
	Plutonium-239/240	pCi/L	0.254		0.00403 U	
	Technetium-99	pCi/L	152		134	

**Table 4.7. Results for radionuclides at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-TC10G	Uranium	µg/L	4.18 J		1.77 J	
	Uranium-233/234	pCi/L	1.65		0.683	
	Uranium-235/236	pCi/L	0.063 UJ		0.0179 UJ	
	Uranium-238	pCi/L	1.4		0.593	
X701-TC17G	Americium-241	pCi/L	-0.00472 U		0.00703 U	
	Neptunium-237	pCi/L	0 U		0.33 UJ	
	Plutonium-238	pCi/L	0.019 U		0.0148 U	
	Plutonium-239/240	pCi/L	0.0104 U		0.00401 U	
	Technetium-99	pCi/L	285		295	
	Uranium	µg/L	20.5		42.9	
	Uranium-233/234	pCi/L	7.5		16.4	
	Uranium-235/236	pCi/L	0.334		0.771	
X701-TC22G	Uranium-238	pCi/L	6.83		14.3	
	Americium-241	pCi/L	-0.00074 U		0.0136 UJ	
	Neptunium-237	pCi/L	-0.0494 U		0.139 UJ	
	Plutonium-238	pCi/L	-0.00046 U		0.0047 U	
	Plutonium-239/240	pCi/L	0.0115 U		0.00841 U	
	Technetium-99	pCi/L	254		244	
	Uranium	µg/L	1.67		1.14 J	
	Uranium-233/234	pCi/L	0.662		0.504	
X701-TC28G	Uranium-235/236	pCi/L	0.0286 U		0.0152 U	
	Uranium-238	pCi/L	0.555		0.38	
	Americium-241	pCi/L	0.000649 U		0.0183 U	
	Neptunium-237	pCi/L	-0.00694 U		0.0577 U	
	Plutonium-238	pCi/L	-0.00059 U		-0.0136 U	
	Plutonium-239/240	pCi/L	0.0094 U		-0.0225 U	
	Technetium-99	pCi/L	239		316	
	Uranium	µg/L	17.2		13.8 J	
X701-TC48G	Uranium-233/234	pCi/L	6.64		6.07	
	Uranium-235/236	pCi/L	0.241		0.206 J	
	Uranium-238	pCi/L	5.74		4.61	
	Americium-241	pCi/L	-0.0101 U		-0.000704 U	
	Neptunium-237	pCi/L	0.0215 U		0.157 UJ	
	Plutonium-238	pCi/L	0.00339 U		-0.00735 U	
	Plutonium-239/240	pCi/L	0.088 UJ		-0.0251 U	
	Technetium-99	pCi/L	315		365	
X701-TC54G	Uranium	µg/L	66.9		57.4	
	Uranium-233/234	pCi/L	24.2		20.2	
	Uranium-235/236	pCi/L	1.05		0.851	
	Uranium-238	pCi/L	22.3		19.2	
	Americium-241	pCi/L	-0.0121 U		0.0144 U	
	Neptunium-237	pCi/L	-0.0223 U		0.357 UJ	
	Plutonium-238	pCi/L	0.00522 U		0.0358 U	
	Plutonium-239/240	pCi/L	0.00856 U		-0.0202 U	
X701-TC61G	Technetium-99	pCi/L	345		329	
	Uranium	µg/L	2.65 J		1.72 J	
	Uranium-233/234	pCi/L	0.817		0.692	
	Uranium-235/236	pCi/L	0.0502 UJ		0.0322 UJ	
	Uranium-238	pCi/L	0.881		0.574	
	Americium-241	pCi/L	0.0604 UJ		0.026 U	

**Table 4.7. Results for radionuclides at the X-701B Former Holding Pond – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X701-TC61G	Neptunium-237	pCi/L	0.0672 U		0.116 UJ	
	Plutonium-238	pCi/L	0.0111 U		0.0631 U	
	Plutonium-239/240	pCi/L	0.218		0.00198 U	
	Technetium-99	pCi/L	386		317	
	Uranium	µg/L	1.35 J		0.946 J	
	Uranium-233/234	pCi/L	0.457		0.343	
	Uranium-235/236	pCi/L	0.0151 UJ		0.0103 U	
	Uranium-238	pCi/L	0.452		0.316	
X701-TC67G	Americium-241	pCi/L	0.00287 U		0.0179 U	
	Neptunium-237	pCi/L	-0.0348 U		-0.0248 U	
	Plutonium-238	pCi/L	0.0178 U		-0.00252 U	
	Plutonium-239/240	pCi/L	0.074 UJ		-0.0154 U	
	Technetium-99	pCi/L	130		91.6	
	Uranium	µg/L	0.624 J		0.39 UJ	
	Uranium-233/234	pCi/L	0.242		0.164 UJ	
	Uranium-235/236	pCi/L	0.00906 U		0.0276 UJ	
Uranium-238	pCi/L	0.208 J		0.127 J		

**Table 4.8. Results for chromium at the X-633 Former Recirculating Cooling Water Complex – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X633-07G	Chromium	µg/L		1700		560 J
X633-PZ04G	Chromium	µg/L		68 J		62

**Table 4.9. VOCs detected at the X-616 Former Chromium Sludge Surface Impoundments – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X616-05G	Trichlorofluoromethane	µg/L	0.35 J			
X616-09G	1,1,1-Trichloroethane	µg/L	2.3		3.5	
	1,1-Dichloroethane	µg/L	2.8		3.6	
	1,1-Dichloroethene	µg/L	26 J		42	
	cis-1,2-Dichloroethene	µg/L	2.5		3.5	
	Trichloroethene	µg/L	20 J		30	
X616-13G	Trichlorofluoromethane	µg/L	0.36 J		1.1 J	
	1,1,1-Trichloroethane	µg/L	3.6		3.9	
	1,1-Dichloroethane	µg/L	1.2		1.2	
	1,1-Dichloroethene	µg/L	30		36	
	cis-1,2-Dichloroethene	µg/L	0.62 J		0.73 J	
X616-14G	Trichloroethene	µg/L	19		21	
	Trichlorofluoromethane	µg/L	9.4		11	
	1,1,1-Trichloroethane	µg/L	1.4		1.2	
	1,1-Dichloroethane	µg/L	0.37 J		0.39 J	
	1,1-Dichloroethene	µg/L	9.3		11 J	
X616-16G	Trichloroethene	µg/L	3.2		3.3 J	
	Trichlorofluoromethane	µg/L	1 J		1.2 J	
	1,1,1-Trichloroethane	µg/L	0.16 J			
	1,1-Dichloroethane	µg/L	0.27 J			
	1,1-Dichloroethene	µg/L	2.2			
X616-20B	cis-1,2-Dichloroethene	µg/L	0.81 J			
	Trichloroethene	µg/L	3.5			
	1,1,1-Trichloroethane	µg/L	0.46 J		0.69 J	
	1,1-Dichloroethane	µg/L	0.81 J		0.99 J	
	1,1-Dichloroethene	µg/L	6.7		13	
X616-25G	cis-1,2-Dichloroethene	µg/L	0.57 J		0.89 J	
	Methylene chloride	µg/L	0.32 U		0.43 J	
	Trichloroethene	µg/L	19 J		24	
	1,1-Dichloroethane	µg/L	0.16 U		0.21 J	
	cis-1,2-Dichloroethene	µg/L	0.15 U		0.53 J	
X616-28B	Trichloroethene	µg/L	0.95 J		1.3	
	1,1,1-Trichloroethane	µg/L	0.45 J			
	1,1-Dichloroethene	µg/L	0.17 J			



**Table 4.10. Results for chromium at the X-616 Former Chromium Sludge Surface  
Impoundments – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X616-05G	Chromium	µg/L	970 J			

**Table 4.11. VOCs detected at the X-740 Former Waste Oil Handling Facility – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter	
X740-02G	1,1,1-Trichloroethane	µg/L		1.9			
	1,1-Dichloroethane	µg/L		2.1			
	1,1-Dichloroethene	µg/L		3.5			
	Trichloroethene	µg/L		5.7			
X740-03G	1,1-Dichloroethane	µg/L		3.5 D			
	1,1-Dichloroethene	µg/L		72 D			
	1,2-Dichloroethane	µg/L		6.4 D			
	Chloroethane	µg/L		6.3 D			
	cis-1,2-Dichloroethene	µg/L		480 D			
	Toluene	µg/L		0.43 DJ			
	trans-1,2-Dichloroethene	µg/L		0.9 DJ			
	Trichloroethene	µg/L		5.3 D			
	Vinyl chloride	µg/L		9.7 D			
	X740-08G	1,1,1-Trichloroethane	µg/L		0.7 J		
		1,1-Dichloroethane	µg/L		13		
1,1-Dichloroethene		µg/L		1.5			
cis-1,2-Dichloroethene		µg/L		17			
trans-1,2-Dichloroethene		µg/L		4.9			
Trichloroethene		µg/L		9			
X740-09B	1,1,1-Trichloroethane	µg/L		4.5 D			
	1,1-Dichloroethane	µg/L		15 D			
	1,1-Dichloroethene	µg/L		200 D			
	1,2-Dichloroethane	µg/L		34 D			
	cis-1,2-Dichloroethene	µg/L		1000 D			
	Tetrachloroethene	µg/L		7.5 D			
	trans-1,2-Dichloroethene	µg/L		2 DJ			
	Trichloroethene	µg/L		320 D			
X740-10G	Vinyl chloride	µg/L		2.9 DJ			
	1,1,1-Trichloroethane	µg/L		0.16 J			
	1,1-Dichloroethane	µg/L		1.3			
	1,1-Dichloroethene	µg/L		8.3			
	1,2-Dichloroethane	µg/L		1.6			
	cis-1,2-Dichloroethene	µg/L		47			
	Tetrachloroethene	µg/L		0.55 J			
	Trichloroethene	µg/L		26			
X740-11G	Vinyl chloride	µg/L		0.12 J			
	1,1,1-Trichloroethane	µg/L		0.75 J			
	1,1-Dichloroethane	µg/L		0.45 J			
	1,1-Dichloroethene	µg/L		6.3			
	1,2-Dichloroethane	µg/L		1.6			
	Chloroform	µg/L		0.2 J			
X740-14B	Trichloroethene	µg/L		25			
	1,1-Dichloroethene	µg/L		0.84 J			
	Trichloroethene	µg/L		3.9			
X740-18G	1,1-Dichloroethane	µg/L		0.36 J			
	1,2-Dichloroethane	µg/L		0.49 J			
	Chloroethane	µg/L		0.51 J			
	cis-1,2-Dichloroethene	µg/L		10			
	Toluene	µg/L		0.17 J			
	trans-1,2-Dichloroethene	µg/L		0.22 J			

**Table 4.11. VOCs detected at the X-740 Former Waste Oil Handling Facility – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X740-18G	Vinyl chloride	µg/L		1.3		
X740-19G	1,1-Dichloroethene	µg/L		0.96 J		
	1,2-Dichloroethane	µg/L		0.4 J		
	cis-1,2-Dichloroethene	µg/L		7.1		
	Tetrachloroethene	µg/L		0.35 J		
	Trichloroethene	µg/L		5.8		
X740-20G	1,1-Dichloroethene	µg/L		0.23 J		
	1,2-Dichloroethane	µg/L		0.17 J		
	cis-1,2-Dichloroethene	µg/L		1.9		
	Trichloroethene	µg/L		2.1		
X740-21G	1,1-Dichloroethene	µg/L		0.18 J		
	cis-1,2-Dichloroethene	µg/L		0.37 J		
	Trichloroethene	µg/L		3		
X740-22G	1,1,1-Trichloroethane	µg/L		0.73 J		
	1,1-Dichloroethane	µg/L		0.93 J		
	1,1-Dichloroethene	µg/L		8.8		
	1,2-Dichloroethane	µg/L		2.3		
	cis-1,2-Dichloroethene	µg/L		14		
	Tetrachloroethene	µg/L		1.2		
X740-PZ10G	Trichloroethene	µg/L		64 D		
	1,1-Dichloroethane	µg/L		0.17 J		
X740-PZ12G	Trichloroethene	µg/L		3.5		
	1,1,1-Trichloroethane	µg/L		1		
	1,1-Dichloroethane	µg/L		0.6 J		
	1,1-Dichloroethene	µg/L		3.9		
	1,2-Dichloroethane	µg/L		2		
	Chloroform	µg/L		0.23 J		
	cis-1,2-Dichloroethene	µg/L		0.2 J		
	Tetrachloroethene	µg/L		0.55 J		
X740-PZ14G	Trichloroethene	µg/L		46		
	1,1,1-Trichloroethane	µg/L		0.92 J		
	1,1-Dichloroethane	µg/L		0.73 J		
	1,1-Dichloroethene	µg/L		9.9		
	1,2-Dichloroethane	µg/L		2.4		
	Chloroform	µg/L		0.25 J		
	cis-1,2-Dichloroethene	µg/L		1.5		
X740-PZ17G	Tetrachloroethene	µg/L		0.87 J		
	Trichloroethene	µg/L		71 D		
	1,1,1-Trichloroethane	µg/L		0.53 J		
	1,1-Dichloroethane	µg/L		0.27 J		
	1,1-Dichloroethene	µg/L		2.7		
	1,2-Dichloroethane	µg/L		1.1		
	Trichloroethene	µg/L		15		

**Table 4.12. Results for beryllium and chromium at the X-611A Former Lime Sludge Lagoons – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
F-07G	Beryllium	µg/L	0.72 J		0.47 J	
	Chromium	µg/L	19		23	
F-08B	Beryllium	µg/L	0.08 U		0.08 U	
	Chromium	µg/L	0.5 U		0.5 U	
X611-01B	Beryllium	µg/L	0.08 U		0.08 U	
	Chromium	µg/L	0.53 J		1 J	
X611-02BA	Beryllium	µg/L	0.08 U		0.08 U	
	Chromium	µg/L	0.5 U		0.5 U	
X611-03G	Beryllium	µg/L	0.08 U		0.08 U	
	Chromium	µg/L	1.3 J		0.5 U	
X611-04BA	Beryllium	µg/L	0.34 J		0.6 J	
	Chromium	µg/L	0.5 U		0.5 U	

**Table 4.13. VOCs detected at the X-735 Landfills – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X735-20B	Methylene chloride	µg/L		1.4 JQ		

**Table 4.14. VOCs detected at the X-734 Landfills – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X734-01G	Carbon disulfide	µg/L		0.46 J		0.45 U
X734-04G	Methylene chloride	µg/L		0.32 U		0.45 J
X734-05B	Benzene	µg/L		0.31 J		0.76 J
	Toluene	µg/L		0.17 JU		0.21 J
X734-16G	Acetone	µg/L		1.9 U		4.5 J
	Carbon disulfide	µg/L		2.3		0.45 U
X734-23G	cis-1,2-Dichloroethene	µg/L		5.8		5.6
	trans-1,2-Dichloroethene	µg/L		0.37 J		0.25 J
	Vinyl chloride	µg/L		1.5		0.9 J

**Table 4.15. Results for cadmium and nickel at the X-533 Former Switchyard Complex – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
F-03G	Cadmium	µg/L		52		47 J
	Nickel	µg/L		550		480 J
TCP-01G	Cadmium	µg/L		12		11
	Nickel	µg/L		150 J		130
X533-03G	Cadmium	µg/L		30		31
	Nickel	µg/L		370		410

**Table 4.16. VOCs detected at the X-344C Former Hydrogen Fluoride Storage Building – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
X344C-01G	Acetone	µg/L	2.9 J			
	cis-1,2-Dichloroethene	µg/L	2.2			
	trans-1,2-Dichloroethene	µg/L	0.18 J			
	Trichloroethene	µg/L	0.51 J			



**Table 4.17. VOCs detected at surface water monitoring locations – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
BRC-SW01	Acetone	µg/L	4.2 J	7 UJ	10	4.3 J
	Bromodichloromethane	µg/L	0.17 U	0.17 J	0.17 U	0.17 U
	Chloroform	µg/L	0.16 U	0.47 J	0.16 J	0.16 U
	Dibromochloromethane	µg/L	0.17 U	0.17 U	0.19 J	0.17 U
	Methylene chloride	µg/L	0.34 J	0.32 U	0.32 U	0.32 U
BRC-SW02	Acetone	µg/L	66	39 UJ	4.1 J	1.9 U
BRC-SW05	Acetone	µg/L	3.6 J	1.9 U	3.9 J	1.9 U
	Methylene chloride	µg/L	0.39 J	0.32 U	0.32 U	0.32 U
EDD-SW01	1,1,2-Trichloroethane	µg/L	0.32 U	0.32 U	0.27 U	0.408 J
	1,1-Dichloroethene	µg/L	0.14 U	0.14 U	0.23 U	0.757 J
Samples for LBC-SW01 inadvertently collected from a location upstream from the identified location. Data provided for information only.	Acetone	µg/L	3 J	1.9 U	6.1 J	3 U
	Bromodichloromethane	µg/L	0.22 J	0.25 J	1.3	0.3 U
	Bromoform	µg/L	0.19 U	0.19 U	0.47 J	0.3 U
	Chloroform	µg/L	0.48 J	0.37 J	1.3	0.3 U
	cis-1,2-Dichloroethene	µg/L	3.3	2.2	2.1	208
	Dibromochloromethane	µg/L	0.17 U	0.22 J	1.4	0.3 U
	Methylene chloride	µg/L	0.38 J	0.32 U	0.32 U	0.34 U
	trans-1,2-Dichloroethene	µg/L	0.15 U	0.15 U	0.15 U	1.25 J
	Trichloroethene	µg/L	9.4	6.4	1.5	79.6
	Vinyl chloride	µg/L	0.1 U	0.1 U	0.1 U	0.224 J
<del>LBC-SW01</del>	Acetone	µg/L	2.8 J	1.9 JU	3.5 J	3 U
	Methylene chloride	µg/L	0.36 J	0.32 U	0.32 U	0.34 U
LBC-SW02	Acetone	µg/L	3.7 J	1.9 U	2.9 J	3 U
	Bromodichloromethane	µg/L	0.17 U	0.17 U	0.4 J	0.3 U
	Chloroform	µg/L	0.16 U	0.16 U	0.37 J	0.3 U
	cis-1,2-Dichloroethene	µg/L	1.6	0.79 J	2.5	6.93
	Dibromochloromethane	µg/L	0.17 U	0.17 U	0.53 J	0.3 U
LBC-SW03	Trichloroethene	µg/L	5.3	2.4	1.3	2.78
	Acetone	µg/L	6 J	1.9 U	1.9 U	3 U
	cis-1,2-Dichloroethene	µg/L	0.46 J	0.24 J	0.15 U	0.96 J
	Methylene chloride	µg/L	0.49 J	0.32 U	0.32 U	0.34 U
LBC-SW04	Trichloroethene	µg/L	1.3	0.72 J	0.16 U	0.5 U
	Acetone	µg/L	2.7 J	1.9 U	1.9 U	3 U
	Methylene chloride	µg/L	0.54 J	0.32 U	0.32 U	0.34 U
NHP-SW01	Trichloroethene	µg/L	0.2 J	0.19 J	0.16 QU	0.5 U
	Acetone	µg/L	3.2 J	1.9 U	1.9 U	3 U
	Methylene chloride	µg/L	0.41 J	0.32 U	0.32 U	0.34 U
UND-SW01	1,1-Dichloroethene	µg/L	0.29 J	0.14 U	0.23 U	0.3 U
	cis-1,2-Dichloroethene	µg/L	0.23 J	0.15 U	0.15 U	0.316 J
	Trichloroethene	µg/L	3.6	0.76 J	0.95 J	2.06
UND-SW02	Acetone	µg/L	2.1 J	2.9 UJ	1.9 U	3 U
WDD-SW01	Acetone	µg/L	2.5 J	3.6 UJ	1.9 U	3 U
	Chloroform	µg/L	0.16 U	0.16 U	0.19 J	0.3 U
	Methylene chloride	µg/L	0.38 J	0.32 U	0.32 U	0.34 U
WDD-SW02	Chloroform	µg/L	0.16 U	0.16 U	0.31 J	0.3 U
	Dibromochloromethane	µg/L	0.17 U	0.17 U	0.38 J	0.3 U
WDD-SW03	Acetone	µg/L	2.4 J	1.9 U	1.9 U	3 U
	Chloroform	µg/L	0.16 U	0.35 J	0.41 J	0.408 J
	Dibromochloromethane	µg/L	0.17 U	0.17 U	0.38 JQ	0.3 U

**Table 4.18. Results for radionuclides at surface water monitoring locations – 2018**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
BRC-SW01	Americium-241	pCi/L		0.0157 U		0.008869 U
	Neptunium-237	pCi/L		0.0248 U		-0.00821 U
	Plutonium-238	pCi/L		0.0232 U		0.02455 U
	Plutonium-239/240	pCi/L		-0.0075 U		0.008184 U
	Technetium-99	pCi/L	1.26 U	0.982 U	2.23 U	1.81 U
	Uranium	µg/L	1.32 J	3.2 J	4.04	0.187 U
	Uranium-233/234	pCi/L	0.926	3.42	2.51	0.2696
	Uranium-235/236	pCi/L	0.0378 UJ	0.156 J	0.135 U	0.008526 U
BRC-SW02	Uranium-238	pCi/L	0.436	1.05	1.34	0.06209 U
	Americium-241	pCi/L		0.0129 U		-0.00772 U
	Neptunium-237	pCi/L		0.00918 U		0 U
	Plutonium-238	pCi/L		-0.025 U		0.02257 U
	Plutonium-239/240	pCi/L		0.00768 U		0 U
	Technetium-99	pCi/L	1.56 U	-0.369 U	1.01 U	0.226 U
	Uranium	µg/L	2.91 J	0.499 UJ	0.294	0.377 U
	Uranium-233/234	pCi/L	2	0.413	0.332	0.5045
BRC-SW05	Uranium-235/236	pCi/L	0.0816 UJ	0.0314 U	0.024 U	0.008644 U
	Uranium-238	pCi/L	0.966	0.163 J	0.0951 U	0.1259 U
	Americium-241	pCi/L		0.0126 U		0 U
	Neptunium-237	pCi/L		-0.005 U		0.008044 U
	Plutonium-238	pCi/L		0.0476 U		0.03209 U
	Plutonium-239/240	pCi/L		-0.0178 U		0.008022 U
	Technetium-99	pCi/L	0.509 U	-1.87 U	0.362 U	0.187 U
	Uranium	µg/L	0.827 J	0.927 J	0.372	0.4581 U
EDD-SW01	Uranium-233/234	pCi/L	0.585	0.599	0.368	0.4819
	Uranium-235/236	pCi/L	0.032 UJ	0.0686 UJ	0.0147 U	0.03552 U
	Uranium-238	pCi/L	0.273	0.301	0.123	0.1508
	Americium-241	pCi/L		0.00052 U		0.04094 U
	Neptunium-237	pCi/L		0.0526 U		0 U
	Plutonium-238	pCi/L		0.0209 U		7.34E-06 U
	Plutonium-239/240	pCi/L		0.00844 U		0.0147 U
	Technetium-99	pCi/L	106	104	14.1	10.1
LBC-SW01	Uranium	µg/L	5.97 J	6.41	1.81	2.975 J
	Uranium-233/234	pCi/L	10.6	11.7	2.72	3.764
	Uranium-235/236	pCi/L	0.423 J	0.481	0.163 U	0.1524 UJ
	Uranium-238	pCi/L	1.94	2.08	0.582	0.986
	Americium-241	pCi/L		0.0181 U		0 U
	Neptunium-237	pCi/L		0.0382 U		-0.03435 U
	Plutonium-238	pCi/L		0.00107 U		0.01372 U
	Plutonium-239/240	pCi/L		0.00313 U		6.85E-06 U
LBC-SW02	Technetium-99	pCi/L	-0.22 U	-0.472 U	-1.09 U	0.427 U
	Uranium	µg/L	0.0379 UJ	0.109	0.108 U	0.05864 U
	Uranium-233/234	pCi/L	0.0857 U	0.0945 U	0.113 U	0.03411 U
	Uranium-235/236	pCi/L	0.00626 UJ	0.00538 U	0.0206 U	-0.0084 U
	Uranium-238	pCi/L	0.0117 U	0.0357 U	0.0332 U	0.02042 U
	Americium-241	pCi/L		0.00288 U		0 U
	Neptunium-237	pCi/L		-0.0044 U		0.01511 U
	Plutonium-238	pCi/L		-0.0185 U		0.02261 U
LBC-SW02	Plutonium-239/240	pCi/L		-0.0102 U		7.53E-06 U
	Technetium-99	pCi/L	16.7	8.52	11.5	6.5

**Table 4.18. Results for radionuclides at surface water monitoring locations – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
LBC-SW02	Uranium	µg/L	0.917 J	0.299	0.617	1.297
	Uranium-233/234	pCi/L	1.62	0.697	1.33	1.817
	Uranium-235/236	pCi/L	0.0996 UJ	0.0278 U	0.0544 U	0.07473 U
	Uranium-238	pCi/L	0.292	0.0962	0.199	0.4291
LBC-SW03	Americium-241	pCi/L		0.00725 U		0 U
	Neptunium-237	pCi/L		-0.0072 U		-0.02376 U
	Plutonium-238	pCi/L		-0.0094 U		0.01582 U
	Plutonium-239/240	pCi/L		-0.0151 U		0.007916 U
	Technetium-99	pCi/L	14.3	4.2 U	4.87 U	4.04 UJ
	Uranium	µg/L	1.03 J	0.612	0.845	0.7972 J
	Uranium-233/234	pCi/L	1.28	0.619	0.962	0.9992
	Uranium-235/236	pCi/L	0.0195 UJ	0.0359 U	0.0398 U	0.04081 UJ
	Uranium-238	pCi/L	0.343	0.2	0.278	0.2641
LBC-SW04	Americium-241	pCi/L		0.00193 U		-0.0082 U
	Neptunium-237	pCi/L		0.0153 U		-0.00789 U
	Plutonium-238	pCi/L		0.0037 U		0.01576 U
	Plutonium-239/240	pCi/L		0.00098 U		0.01577 U
	Technetium-99	pCi/L	11.9	2.47 U	4.9 U	2.03 U
	Uranium	µg/L	1.04 J	0.631	1.07	1.326 J
	Uranium-233/234	pCi/L	1.53	0.742	0.89	1.171
	Uranium-235/236	pCi/L	0.0617 UJ	0.0568 U	0.0251 U	0.03904 UJ
	Uranium-238	pCi/L	0.341	0.203	0.355	0.4421
NHP-SW01	Americium-241	pCi/L		-0.0046 U		-0.0153 U
	Neptunium-237	pCi/L		-0.0085 U		0 U
	Plutonium-238	pCi/L		0.0488 U		0.02817 UJ
	Plutonium-239/240	pCi/L		0.00926 U		0.0141 U
	Technetium-99	pCi/L	-0.543 U	-1.94 U	0.236 U	1.24 U
	Uranium	µg/L	5.91 J	5.13	4.55	3.895 J
	Uranium-233/234	pCi/L	2.23	2.44	1.99	1.588
	Uranium-235/236	pCi/L	0.0878 UJ	0.0948	0.0667 U	0.06835 UJ
	Uranium-238	pCi/L	1.97	1.71	1.52	1.303
UND-SW01	Americium-241	pCi/L		0.0325 U		0.008418 U
	Neptunium-237	pCi/L		-0.0077 U		-0.00854 U
	Plutonium-238	pCi/L		0.0537 U		0.008535 U
	Plutonium-239/240	pCi/L		-0.0098 U		0.01705 U
	Technetium-99	pCi/L	-0.108 U	-0.449 U	-0.999 U	-2.04 U
	Uranium	µg/L	2.26 J	0.958 J	1.97	1.55
	Uranium-233/234	pCi/L	0.952	0.507	0.795	0.7336
	Uranium-235/236	pCi/L	0.0282 UJ	0.00909 U	0.0314 U	0.01547 U
	Uranium-238	pCi/L	0.756	0.32	0.658	0.5194
UND-SW02	Americium-241	pCi/L		0.00232 U		0.008556 U
	Neptunium-237	pCi/L		-0.0043 U		-0.00732 U
	Plutonium-238	pCi/L		-0.019 U		0.007324 U
	Plutonium-239/240	pCi/L		-0.0151 U		-0.02927 U
	Technetium-99	pCi/L	-0.588 U	-0.687 U	1.67 U	-1.35 U
	Uranium	µg/L	1.3 J	0.659 J	0.997	1.508
	Uranium-233/234	pCi/L	0.67	0.309	0.465	0.6142
	Uranium-235/236	pCi/L	0.0254 UJ	0.0195 U	0.0491 U	0.01667 U
	Uranium-238	pCi/L	0.434	0.218 J	0.327	0.5051
WDD-SW01	Americium-241	pCi/L		0.0296 U		0.01695 U

**Table 4.18. Results for radionuclides at surface water monitoring locations – 2018 (continued)**

Sampling Location	Parameter	Unit	First quarter	Second quarter	Third quarter	Fourth quarter
WDD-SW01	Neptunium-237	pCi/L		-0.0294 U		0.02623 UJ
	Plutonium-238	pCi/L		0.01 U		0.008728 U
	Plutonium-239/240	pCi/L		0.0115 U		-0.00870 U
	Technetium-99	pCi/L	-0.376 U	-0.623 U	2.2 U	-0.256 U
	Uranium	µg/L	2.11 J	1.11	3.39	2.122
	Uranium-233/234	pCi/L	1.4	0.699	1.34	1.013
	Uranium-235/236	pCi/L	0.0397 UJ	0.0346 U	0.116 U	0.0557 U
	Uranium-238	pCi/L	0.701	0.369	1.12	0.708
WDD-SW02	Americium-241	pCi/L		-0.0020 U		0.00871 U
	Neptunium-237	pCi/L		-0.0045 U		2.22E-05 U
	Plutonium-238	pCi/L		-0.0196 U		0.02218 UJ
	Plutonium-239/240	pCi/L		-0.0127 U		-0.00738 U
	Technetium-99	pCi/L	0.0423 U	-2.41 U	4.55 U	-0.658 U
	Uranium	µg/L	2.77 J	1.62	3.42	1.259
	Uranium-233/234	pCi/L	1.65	1.25	1.57	0.8852
	Uranium-235/236	pCi/L	0.0952 UJ	0.0256 U	0.0793 U	0.03928 UJ
WDD-SW03	Uranium-238	pCi/L	0.916	0.542	1.14	0.4195
	Americium-241	pCi/L		-0.0131 U		0.007755 U
	Neptunium-237	pCi/L		0.0183 U		0 U
	Plutonium-238	pCi/L		-0.0045 U		0.02082 UJ
	Plutonium-239/240	pCi/L		-0.0204 U		0.00694 U
	Technetium-99	pCi/L	1.33 U	-0.0665 U	2.55 U	0.868 U
	Uranium	µg/L	2.56 J	1.24	2.47	2.191 J
	Uranium-233/234	pCi/L	1.19	0.802	1.21	1.046
Uranium-235/236	pCi/L	0.111 UJ	0.0391 U	0.0889 U	0.05266 UJ	
Uranium-238	pCi/L	0.842	0.41	0.815	0.7313	

## 5. REFERENCES

- 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.
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