

west virginia department of environmental protection

Division of Water and Waste Management 601 57th Street SE Charleston, WV 25304 Phone: 304-926-0495/Fax: 304-926-0463 Harold D. Ward, Cabinet Secretary dep.wv.gov

December 22, 2023

Heidi Suhoski The Chemours Co, LLC 8480 Dupont Road Washington, WV 26181

> RE: WV/NPDES Permit Application No. WV0117986, Wood County

Dear Sir or Madam:

Your forms for WV/NPDES Individual Permit have been found to be complete.

For your information, the public notice period prescribed in Title 47, Series 10, Section 12.1.b of the West Virginia Legislative Rules issued pursuant to Chapter 22, Article 11 commences on the 29th day of December, 2023 in the *Parkersburg News*.

Within twenty (20) days after publication of the public notice, you are required to send to the Office a certificate of publication. This should be sent to:

Director, Division of Water and Waste Management, DEP Permitting Section 601 57th Street, SE Charleston, WV 25304-2345 Attention: Lori Devereux

Enclosed are copies of your draft permit, any required fact sheet and the public notice. If you have any questions, please do not hesitate to contact this office at 304-926-0495.

Sincerely,

Lori Devereux NPDES Team

Enclosures

Promoting a healthy environment.

STATE OF WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF WATER AND WASTE MANAGEMENT

PUBLIC NOTICE

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION'S, PUBLIC INFORMATION OFFICE, 601 57TH STREET, CHARLESTON SE, WEST VIRGINIA 25304-2345 TELEPHONE: (304) 926-0440.

APPLICATION FOR A WEST VIRGINIA NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WATER POLLUTION CONTROL PERMIT

Public Notice No.: L-113-23

Public Notice Date: December 29, 2023

Paper: *Parkersburg News*

The following has applied for a WV NPDES Water Pollution Control Permit for this facility or activity:

Appl. No.:	WV0117986
Applicant:	THE CHEMOURS COMPANY FC, LLC 8480 DUPONT RD WASHINGTON, WV 26181

Location:	WASHINGTON, WOO	D COUNTY	
Latitude:	39:16:11	Longitude:	81:40:35

Receiving Stream:

Ohio River

Activity:

To acquire, construct, install, operate and maintain wastewater treatment disposal systems for the direct discharge of process wastewater and non-contact cooling water from Outlet 008 to the Ohio River at Milepoint 190.8. Wastewater treatment shall consist of three (3) granulated activated carbon beds in series, a nitrate treatment system, pH neutralization, and dechlorination. An antidegradation review has been conducted and Tier 2 and Tier 1 protection are afforded fro the uses specified in 47 CSR 2, Section 6.

Business conducted:

Production of fluorocarbon polymers.

Implementation:

NA

On the basis of review of the application, the "Water Pollution Control Act (Chapter 22, Article 11-8(a))," and the "West Virginia Legislative Rules," the State of West Virginia will act on the above application.

Any interested person may submit written comments on the draft permit and may request a public hearing by addressing such to the Director of the Division of Water and Waste Management within 30 days of the date of the public notice. Such comments or requests should be addressed to:

Director, Division of Water and Waste Management, DEP ATTN: Lori Devereux, Permitting Section 601 57th Street SE Charleston, WV 25304-2345

The public comment period begins December 29, 2023 and ends January 28, 2024.

Comments received within this period will be considered prior to acting on the permit application. Correspondence should include the name, address and the telephone number of the writer and a concise statement of the nature of the issues raised. The Director shall hold a public hearing whenever a finding is made, on the basis of requests, that there is a significant degree of public interest on issues relevant to the Draft Permit(s). Interested persons may contact the public information office to obtain further information.

The application, draft permit and any required fact sheet may be inspected, by appointment, at the Division of Water and Waste Management Public Information Office, at 601 57th Street SE, Charleston, WV 25304-2345, between 8:00 a.m. and 4:00 p.m. on business days.



STATE OF WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION **DIVISION OF WATER AND WASTE MANAGEMENT** 601 57TH STREET SE CHARLESTON, WV 25304-2345

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WATER POLLUTION CONTROL PERMIT

NPDES PERMIT NO.: WV0117986 SUBJECT: Industrial Waste

ISSUE DATE: EFFECTIVE DATE : EXPIRATION DATE: SUPERSEDES: N/A

LOCATION: WASHINGTON (City)

Wood

(County)

Middle Ohio River 2 (Drainage Basin)

See the next page for a list of Outlets.

TO WHOM IT MAY CONCERN:

This is to certify that:

THE CHEMOURS COMPANY FC, LLC 8480 DUPONT RD WASHINGTON, WV 26181

is hereby granted a West Virginia NPDES Water Pollution Control Permit to:

acquire, construct, install, operate and maintain wastewater treatment disposal systems for the direct discharge of process wastewater and non-contact cooling water from Outlet 008 to the Ohio River at Milepoint 190.8. Wastewater treatment shall consist of three (3) granulated activated carbon beds in series, a nitrate treatment system, pH neutralization, and dechlorination.

This permit is subject to the following terms and conditions :

The information submitted on and with WV/NPDES Permit Application No. WV0117986 submitted the 18th day of August 2023 and additional information submitted the 1st day of November 2023 are all hereby made terms and conditions of this Permit with like effect as if all such permit application information were set forth herein and with other conditions set forth in Sections A, B, C, D, and Appendix A.

The validity of this permit is contingent upon the payment of the applicable annual permit fee, as required by Chapter 22, Article 11, Section 10 of the Code of West Virginia.

Page No. : 2 of 36

Permit No. : WV0117986

Inspectable Unit	Latitude	Longitude	Receiving Stream	Dist. to Stream Mouth (in Mile)	Milepost
008	39°16'11"	81°40'36"	OHIO RV	N/A	190.8
108	39°16'13"	81°40'31"	OHIO RV	N/A	N/A
208	39°16'13"	81°40'30"	OHIO RV	N/A	N/A

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 008 (Cooling Water, Process Water)

Such discharges shall be limi	Such discharges shall be limited and monitored by the permittee as specified below:										
Effluent			Disc		Measurement	Sample					
<u>Characteristic</u>	Qua	<u>ntity</u>	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type		
50050 - (Flow,in Conduit or thru plant)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	mgd	Continuous	measured		
(Year Round) (ML-1) (RF-A)					Avg. Monthly	Max. Daily					
00400 - (pH)	N/A	N/A	N/A	6	N/A	9	S.U.	1/daily	Grab		
(Year Round) (ML-1) (RF-A)				Inst. Min.		Inst. Max.					
00610 - (Ammonia Nitrogen)	N/A	N/A	N/A	N/A	18.8	37.6	mg/l	1/month	24 hr Composite		
(Year Round) (ML-1) (RF-A)					Avg. Monthly	Max. Daily					
00620 - (Nitrogen Nitrate)	13.4	27	Lbs/Day	N/A	3.91	7.88	mg/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
00615 - (Nitrogen Nitrite)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	mg/l	1/quarter	24 hr Composite		
(Year Round) (ML-1) (RF-B)					Avg. Monthly	Max. Daily					
50060 - (Chlorine, Total Residual)	N/A	N/A	N/A	N/A	0.028	0.057	mg/l	1/week	Grab		
(Year Round) (ML-1) (RF-A)					Avg. Monthly	Max. Daily					
01119 - (Copper, Total Recoverable)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	mg/l	1/quarter	24 hr Composite		
(Year Round) (ML-1) (RF-B)					Avg. Monthly	Max. Daily					
00980 - (Iron, Total Recoverable)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	mg/l	1/quarter	24 hr Composite		
(Year Round) (ML-1) (RF-B)					Avg. Monthly	Max. Daily					

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Outlet 008 - Sampling shall occur after the effluents from Internal Outlets 108 and 208 have combined and after dechlorination but prior to combining with the discharge from Outlet 005 in WV/NPDES Permit No. WV0001279.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 3 of 36 Permit No.: WV0117986

Permit Limits

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Such discharges shall be limite	Such discharges shall be limited and monitored by the permittee as specified below:											
<u>Effluent</u>			Disc	charge Limita	<u>tions</u>			Measurement	Sample			
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	<u>Frequency</u>	<u>Type</u>			
00951 - (Fluoride, Total)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	mg/l	1/quarter	24 hr Composite			
(Year Round) (ML-1) (RF-B)					Avg. Monthly	Max. Daily						
61425 - (Acute Tox - Ceriodaphnia Dut	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	TUa	1/quarter	24 hr Composite			
(Year Round) (ML-1) (RF-B)					Avg. Monthly	Max. Daily						
61427 - (Acute Toxicity - Pimephales)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	TUa	1/quarter	24 hr Composite			
(Year Round) (ML-1) (RF-B)					Avg. Monthly	Max. Daily						
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	DEG.F	1/month	Insitu			
(Year Round) (ML-7) (RF-A)					Avg. Monthly	Max. Daily						
		Ohio	River Tempera	ature. Refer f	to Section C.20.							
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	54.5	63.1	DEG.F	1/week	Insitu			
(January 1-31) (ML-1) (RF-A)					Avg. Monthly	Max. Daily						
		Efflue	nt Temperatur	re. Refer to S	Section C.20.							
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	56.8	65.7	DEG.F	1/week	Insitu			
(February 1-28) (ML-1) (RF-A)					Avg. Monthly	Max. Daily						
		Efflue	ent Temperatur	re. Refer to S	Section C.20.							
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	68.7	79.5	DEG.F	1/week	Insitu			
(March 1-31) (ML-1) (RF-A)					Avg. Monthly	Max. Daily						
		Efflue	ent Temperatur	re. Refer to S	Section C.20.							
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	82	94.9	DEG.F	1/week	Insitu			
(April 1-30) (ML-1) (RF-A)					Avg. Monthly	Max. Daily						
		Efflue	nt Temperatur	e. Refer to S	Section C.20.							

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Outlet 008 - Sampling shall occur after the effluents from Internal Outlets 108 and 208 have combined and after dechlorination but prior to combining with the discharge from Outlet 005 in WV/NPDES Permit No. WV0001279.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 4 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 008 (Cooling Water, Process Water)

Such discharges shall be lim	ited and mon			Monitoring Reg	uirements				
Effluent			Disch	narge Limita	tions			Measurement	Sample
<u>Characteristic</u>	Qua	<u>intity</u>	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	108.8	126	DEG.F	1/week	Insitu
(May 1-31) (ML-1) (RF-A)					Avg. Monthly	Max. Daily			
		Efflue	ent Temperature	. Refer to S	Section C.20.				
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	138.1	159.9	DEG.F	1/week	Insitu
(June 1-30) (ML-1) (RF-A)					Avg. Monthly	Max. Daily			
		Efflue	ent Temperature	. Refer to S	Section C.20.				
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	110.9	128.3	DEG.F	1/week	Insitu
(July 1-31) (ML-1) (RF-A)					Avg. Monthly	Max. Daily			
		Efflue	ent Temperature	. Refer to S	Section C.20.				
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	104.9	121.5	DEG.F	1/week	Insitu
(August 1-31) (ML-1) (RF-A)					Avg. Monthly	Max. Daily			
		Efflue	ent Temperature	. Refer to S	Section C.20.				
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	111.3	128.9	DEG.F	1/week	Insitu
(September 1-30) (ML-1) (RF-A)					Avg. Monthly	Max. Daily			
		Efflue	ent Temperature	. Refer to S	Section C.20.				
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	94.9	109.9	DEG.F	1/week	Insitu
(October 1-31) (ML-1) (RF-A)					Avg. Monthly	Max. Daily			
		Efflue	ent Temperature	. Refer to S	Section C.20.				
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	105.5	122.1	DEG.F	1/week	Insitu
(November 1-30) (ML-1) (RF-A)					Avg. Monthly	Max. Daily			
		Efflue	ent Temperature	. Refer to S	Section C.20.				
00011 - (Temperature, F)	N/A	N/A	N/A	N/A	72.2	83.6	DEG.F	1/week	Insitu
(December 1-31) (ML-1) (RF-A)					Avg. Monthly	Max. Daily			
		Efflue	nt Temperature	. Refer to S	Section C.20.				

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Outlet 008 - Sampling shall occur after the effluents from Internal Outlets 108 and 208 have combined and after dechlorination but prior to combining with the discharge from Outlet 005 in WV/NPDES Permit No. WV0001279.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 5 of 36 Permit No.: WV0117986

A.008 DISCHARGE LIMITATIONS AND MONITORING REQUIREMENTS: Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 008 (Cooling Water, Process Water)

Such discharges shall be limi	Monitoring Requirements								
Effluent			Disch	harge Limita	ations			Measurement	Sample
<u>Characteristic</u>	<u>Qua</u>	<u>ntity</u>	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type
51641 - (NEtFOSE)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51525 - (Perfluorooctanesulfonamide)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51522 - (Perfluorobutanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51623 - (Perfluoropentanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51624 - (Perfluorohexanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51625 - (Perfluoroheptanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51626 - (Perfluorononanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51627 - (Perfluorodecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Outlet 008 - Sampling shall occur after the effluents from Internal Outlets 108 and 208 have combined and after dechlorination but prior to combining with the discharge from Outlet 005 in WV/NPDES Permit No. WV0001279.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 6 of 36 Permit No.: WV0117986 During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 008 (Cooling Water, Process Water)

Such discharges shall be lim	Monitoring Requirements								
Effluent			Disch	harge Limita	tions			Measurement	Sample
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type
51629 - (Perfluorododecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51642 - (NMeFOSE)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51521 - (Perfluorooctanoic acid)	0.000554	0.00114	Lbs/Day	N/A	0.162	0.333	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51628 - (Perfluoroundecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51630 - (Perfluorotridecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51631 - (Perfluorotetradecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51643 - (NEtFOSAA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51644 - (NMeFOSAA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Outlet 008 - Sampling shall occur after the effluents from Internal Outlets 108 and 208 have combined and after dechlorination but prior to combining with the discharge from Outlet 005 in WV/NPDES Permit No. WV0001279.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 7 of 36 Permit No.: WV0117986

A.008 DISCHARGE LIMITATIONS AND MONITORING REQUIREMENTS: Permit Limits

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Such discharges shall be limit	Monitoring Requirements								
<u>Effluent</u>			Disch		Measurement	Sample			
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Туре
52602 - (Perfluorobutanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52603 - (Perfluorodecanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52604 - (Perfluoroheptanesulfonic acid	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52605 - (Perfluorohexanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52606 - (Perfluorooctanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52607 - (4:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52608 - (6:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52609 - (8:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Outlet 008 - Sampling shall occur after the effluents from Internal Outlets 108 and 208 have combined and after dechlorination but prior to combining with the discharge from Outlet 005 in WV/NPDES Permit No. WV0001279.

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Page No.: 8 of 36 Permit No.: WV0117986

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Such discharges shall be limit		Monitoring R	equirements						
<u>Effluent</u>			Disch	narge Limita	tions			Measurement	Sample
<u>Characteristic</u>	Qua	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type
52610 - (Perfluoropentanesulfonic acid	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52611 - (Perfluorononanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52612 - (HFPO-DA)	0.000126	0.000224	Lbs/Day	N/A	0.0368	0.0653	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52626 - (NFDHA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52629 - (PFEESA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52632 - (Perfluorododecanesulfonic ac	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52636 - (ADONA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52641 - (NMeFOSA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Outlet 008 - Sampling shall occur after the effluents from Internal Outlets 108 and 208 have combined and after dechlorination but prior to combining with the discharge from Outlet 005 in WV/NPDES Permit No. WV0001279.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 9 of 36 Permit No.: WV0117986 During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 008 (Cooling Water, Process Water)

Such discharges shall be l	Monitoring Requirements								
<u>Effluent</u>			Discl	harge Limita	ations			Measurement	Sample
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type
52642 - (NEtFOSA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF001 - (3:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF002 - (PFMPA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF003 - (9CI-PF3ONS)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF004 - (11CI-PF3OUdS)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF005 - (7:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF006 - (PFMBA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF007 - (5:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Outlet 008 - Sampling shall occur after the effluents from Internal Outlets 108 and 208 have combined and after dechlorination but prior to combining with the discharge from Outlet 005 in WV/NPDES Permit No. WV0001279.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 10 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be lim	Such discharges shall be limited and monitored by the permittee as specified below:										
<u>Effluent</u>			Disc	harge Limita	<u>tions</u>			Measurement	Sample		
<u>Characteristic</u>	Qua	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type		
50050 - (Flow,in Conduit or thru plant)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	mgd	Continuous	measured		
(Year Round) (ML-1) (RF-A)					Avg. Monthly	Max. Daily					
00310 - (BOD, 5-Day 20 Deg.C)	21	56	Lbs/Day	N/A	Rpt Only	Rpt Only	mg/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
00530 - (Total Suspended Solids)	40	130	Lbs/Day	N/A	Rpt Only	Rpt Only	mg/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
00400 - (pH)	N/A	N/A	N/A	6	N/A	9	S.U.	1/daily	Grab		
(Year Round) (ML-1) (RF-A)				Inst. Min.		Inst. Max.					
00620 - (Nitrogen Nitrate)	13.4	27	Lbs/Day	N/A	Rpt Only	Rpt Only	mg/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
01119 - (Copper, Total Recoverable)	1.258	2.932	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
01114 - (Lead, Total Recoverable)	0.278	0.598	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
01094 - (Zinc, Total Recoverable)	0.911	2.264	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 11 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be lim		Monitoring Requirements							
Effluent			Disc	harge Limita	tions			Measurement	Sample
<u>Characteristic</u>	<u>Qua</u>	<u>ntity</u>	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>
01074 - (Nickel, Total Recoverable)	1.466	3.452	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34423 - (Methylene Chloride)	0.031	0.147	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
39175 - (Vinyl Chloride)	0.084	0.149	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
39180 - (Trichloroethylene)	0.023	0.06	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
39700 - (Hexachlorobenzene)	0.17	0.689	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34030 - (Benzene)	0.049	0.116	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34571 - (1,4-Dichlorobenzene)	0.123	0.33	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34591 - (2-Nitrophenol)	0.056	0.2	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 12 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be I		Monitoring Requirements							
Effluent			Disc	harge Limita	<u>tions</u>			Measurement	Sample
<u>Characteristic</u>	Quar	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>
34616 - (2,4-Dinitrophenol)	1.047	3.722	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34646 - (4-Nitrophenol)	0.141	0.5	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34657 - (4,6-Dinitro-o-cresol)	0.068	0.24	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34469 - (Pyrene)	0.017	0.042	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34475 - (Tetrachloroethylene)	0.045	0.142	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34496 - (1,1 Dichloroethane)	0.019	0.051	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34501 - (1,1-Dichloroethylene)	0.019	0.052	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34526 - (Benzo (A) Anthracene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 13 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be lim		Monitoring Requirements							
Effluent			Disc	harge Limita	tions			Measurement	Sample
<u>Characteristic</u>	Qua	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type
34536 - (1,2-Dichlorobenzene)	0.17	0.689	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34546 - (1,2-Trans-Dichloroethylene)	0.022	0.057	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34551 - (1,2,4-Trichlorobenzene)	0.17	0.689	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34561 - (1,3-Dichloropropene)	0.17	0.689	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34566 - (1,3-Dichlorobenzene)	0.123	0.33	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34320 - (Chrysene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34336 - (Diethyl Phthalate)	0.04	0.098	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34341 - (Dimethyl Phthalate)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 14 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be lim		Monitoring Requirements							
Effluent			Disc	harge Limita	<u>tions</u>			Measurement	Sample
<u>Characteristic</u>	<u>Quar</u>	<u>ntity</u>	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>
34376 - (Fluoranthene)	0.019	0.047	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34381 - (Fluorene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34396 - (Hexachloroethane)	0.17	0.689	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34418 - (Methyl Chloride)	0.095	0.256	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34447 - (Nitrobenzene)	1.94	5.553	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34461 - (Phenanthrene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34200 - (Acenaphthylene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34205 - (Acenaphthene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 15 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be lir		Monitoring Requirements							
Effluent			Disc	harge Limita	tions			Measurement	Sample
<u>Characteristic</u>	Qua	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Туре
34215 - (Acrylonitrile)	0.082	0.201	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34220 - (Anthracene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34230 - (Benzo (B) Fluoranthene)	0.017	0.042	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34242 - (Benzo (K) Fluoranthene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34247 - (Benzo (A) Pyrene)	0.017	0.042	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34301 - (Chlorobenzene)	0.123	0.33	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34506 - (1,1,1-Trichloroethane)	0.019	0.051	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34511 - (1,1,2-Trichloroethane)	0.028	0.11	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 16 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be lim		Monitoring Requirements							
<u>Effluent</u>			Disc	harge Limita	tions			Measurement	Sample
<u>Characteristic</u>	Qua	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>
34541 - (1,2-Dichloropropane)	0.17	0.689	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34606 - (2,4-Dimethylphenol)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
39110 - (Di-n-butyl Phthalate)	0.017	0.037	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
32103 - (1,2-Dichloroethane)	0.156	0.498	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34694 - (Phenol, Single Compound)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
85811 - (Chloroethane)	0.095	0.256	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34010 - (Toluene)	0.024	0.064	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
37371 - (Ethyl Benzene)	0.123	0.33	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 17 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be limi		Monitoring Requirements							
<u>Effluent</u>			Disc	harge Limita	tions			Measurement	Sample
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>
00720 - (Cyanide, Total)	0.364	1.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34696 - (Naphthalene)	0.016	0.041	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
39100 - (BIS(2-Ethylhexyl) Phthalate)	0.082	0.224	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
32102 - (Carbon Tetrachloride)	0.123	0.33	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
01118 - (Chromium, Total Recoverable)	0.963	2.403	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
32106 - (Chloroform)	0.096	0.282	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	Grab
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
34391 - (Hexachlorobutadiene)	0.123	0.33	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/month	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
51641 - (NEtFOSE)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 18 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be limi		Monitoring Requirements							
<u>Effluent</u>			Disch	harge Limita	<u>itions</u>			Measurement	Sample
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>
51525 - (Perfluorooctanesulfonamide)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51522 - (Perfluorobutanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51623 - (Perfluoropentanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51624 - (Perfluorohexanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51625 - (Perfluoroheptanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51626 - (Perfluorononanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51627 - (Perfluorodecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51629 - (Perfluorododecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 19 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be limi		Monitoring Requirements							
<u>Effluent</u>			Disch	narge Limita	tions			Measurement	Sample
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type
51642 - (NMeFOSE)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51521 - (Perfluorooctanoic acid)	3.0E-6	4.0E-6	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51628 - (Perfluoroundecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51630 - (Perfluorotridecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51631 - (Perfluorotetradecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51643 - (NEtFOSAA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
51644 - (NMeFOSAA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52602 - (Perfluorobutanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 20 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be limit		Monitoring Requirements							
Effluent			Disch	narge Limita	<u>tions</u>			Measurement	Sample
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	Type
52603 - (Perfluorodecanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52604 - (Perfluoroheptanesulfonic acid	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52605 - (Perfluorohexanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52606 - (Perfluorooctanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52607 - (4:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52608 - (6:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52609 - (8:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52610 - (Perfluoropentanesulfonic acid	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 21 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be limit		Monitoring Requirements							
<u>Effluent</u>			Discl	harge Limita	<u>itions</u>			Measurement	Sample
<u>Characteristic</u>	Qua	<u>intity</u>	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>
52611 - (Perfluorononanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52612 - (HFPO-DA)	0.000284	0.000655	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52626 - (NFDHA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52629 - (PFEESA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52632 - (Perfluorododecanesulfonic ac	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52636 - (ADONA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52641 - (NMeFOSA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
52642 - (NEtFOSA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 22 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 108 (Process Water)

Such discharges shall be lir		Monitoring Requirements							
<u>Effluent</u>			<u>Disch</u>	narge Limita	<u>tions</u>			Measurement	Sample
<u>Characteristic</u>	Qua	ntity	<u>Units</u>		Other Units		<u>Units</u>	<u>Frequency</u>	<u>Type</u>
PF001 - (3:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF002 - (PFMPA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF003 - (9CI-PF3ONS)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF004 - (11CI-PF3OUdS)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF005 - (7:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF006 - (PFMBA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			
		Refer	to Section D.						
PF007 - (5:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily			

Refer to Section D.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Internal Outlet 108 - Sampling shall occur after treatment from: the three GAC beds in series, the nitrate treatment system, and pH neutralization, but prior to combining with the wastewater from Internal Outlet 208.

This discharge shall comply with Appendix A - I MANAGEMENT CONDITIONS I - 12.

Page No.: 23 of 36 Permit No.: WV0117986

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 208 (Noncontact Cooling Water)

Such discharges shall be limited and monitored by the permittee as specified below:									Monitoring Requirements	
Effluent			Disch		Measurement	Sample				
Characteristic	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>	
50050 - (Flow,in Conduit or thru plant)	N/A	N/A	N/A	N/A	Rpt Only	Rpt Only	mgd	Continuous	measured	
(Year Round) (ML-1) (RF-A)					Avg. Monthly	Max. Daily				
51641 - (NEtFOSE)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refe	r to Section D.							
51525 - (Perfluorooctanesulfonamide)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refe	r to Section D.							
51522 - (Perfluorobutanoic acid)	Rpt Only	Rpt Only	Lbs/Month	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refe	r to Section D.							
51623 - (Perfluoropentanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refe	r to Section D.							
51624 - (Perfluorohexanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refe	r to Section D.							
51625 - (Perfluoroheptanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refe	r to Section D.							
51626 - (Perfluorononanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				

Refer to Section D.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Internal Outlet 208 - Sampling shall occur from the effluent of all NCCW prior to combining with the wastewater from Internal Outlet 108.

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 208 (Noncontact Cooling Water)

Such discharges shall be limited and monitored by the permittee as specified below:									Monitoring Requirements	
<u>Effluent</u>	Discharge Limitations							Measurement	Sample	
Characteristic	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>	
51627 - (Perfluorodecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
51629 - (Perfluorododecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
51642 - (NMeFOSE)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
51521 - (Perfluorooctanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
51628 - (Perfluoroundecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
51630 - (Perfluorotridecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
51631 - (Perfluorotetradecanoic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
51643 - (NEtFOSAA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				

Refer to Section D.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Internal Outlet 208 - Sampling shall occur from the effluent of all NCCW prior to combining with the wastewater from Internal Outlet 108.

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 208 (Noncontact Cooling Water)

Such discharges shall be limited and monitored by the permittee as specified below:									Monitoring Requirements		
Effluent	Discharge Limitations							Measurement	Sample		
Characteristic	<u>Quai</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>		
51644 - (NMeFOSAA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
Refer to Section D.											
52602 - (Perfluorobutanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
52603 - (Perfluorodecanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
52604 - (Perfluoroheptanesulfonic acid	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
52605 - (Perfluorohexanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
52606 - (Perfluorooctanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
52607 - (4:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
52608 - (6:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					

Refer to Section D.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Internal Outlet 208 - Sampling shall occur from the effluent of all NCCW prior to combining with the wastewater from Internal Outlet 108.

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 208 (Noncontact Cooling Water)

Such discharges shall be limited and monitored by the permittee as specified below:									Monitoring Requirements	
<u>Effluent</u>			Disch		Measurement	Sample				
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>	
52609 - (8:2 Fluorotelomersulfonic acic	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
52610 - (Perfluoropentanesulfonic acid	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
52611 - (Perfluorononanesulfonic acid)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
52612 - (HFPO-DA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
52626 - (NFDHA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
52629 - (PFEESA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
52632 - (Perfluorododecanesulfonic ac	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							
52636 - (ADONA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Internal Outlet 208 - Sampling shall occur from the effluent of all NCCW prior to combining with the wastewater from Internal Outlet 108.

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 208 (Noncontact Cooling Water)

Such discharges shall be limited and monitored by the permittee as specified below:									Monitoring Requirements		
Effluent	Discharge Limitations							Measurement	Sample		
Characteristic	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	<u>Frequency</u>	<u>Type</u>		
52641 - (NMeFOSA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
52642 - (NEtFOSA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
PF001 - (3:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
PF002 - (PFMPA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
PF003 - (9CI-PF3ONS)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
PF004 - (11CI-PF3OUdS)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
PF005 - (7:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Refer	to Section D.								
PF006 - (PFMBA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite		
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily					
		Defe									

Refer to Section D.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Internal Outlet 208 - Sampling shall occur from the effluent of all NCCW prior to combining with the wastewater from Internal Outlet 108.

Permit Limits

During the period beginning effective date of permit and lasting through midnight expiration date of permit the permittee is authorized to discharge from Outlet Number(s) 208 (Noncontact Cooling Water)

Such discharges shall b	Monitoring Requirements									
Effluent Discharge Limitations						Measurement	<u>Sample</u>			
<u>Characteristic</u>	<u>Qua</u>	ntity	<u>Units</u>		Other Units		<u>Units</u>	Frequency	<u>Type</u>	
PF007 - (5:3 FTCA)	Rpt Only	Rpt Only	Lbs/Day	N/A	Rpt Only	Rpt Only	ug/l	1/week	24 hr Composite	
(Year Round) (ML-1) (RF-A)	Avg. Monthly	Max. Daily			Avg. Monthly	Max. Daily				
		Refer	to Section D.							

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Internal Outlet 208 - Sampling shall occur from the effluent of all NCCW prior to combining with the wastewater from Internal Outlet 108.

Page No.: 30 of 36 Permit No.: WV0117986

B. SCHEDULE OF COMPLIANCE

- The permitee shall achieve compliance with the provisions for waste treatment and the monitoring requirements specified in the permit in accordance with the following schedule : Effective date of permit.
- 2. Reports of compliance or non-compliance with, and progress reports on interim and final requirements contained in the above compliance schedule, if any, shall be postmarked no later than 14 days following each schedule date.

Section C - Other Requirements

- 1. The permittee shall practice good housekeeping including maintaining the facility grounds. There shall be no scattered parts, equipment, debris, etc. Any and all drums shall be either stored in a covered area or kept upon pallets and properly sealed.
- 2. The issuance of this permit shall not relieve the permittee of the obligation to comply with any other federal, state or local laws. Compliance with this permit does not relieve the permittee from the obligation of Section 311 of the Clean Water Act. This permit does not authorize spills of hazardous substances/wastes from any permitted outlet into waters of the State. Such incidents are to be reported in accordance with Sections IV.1 and IV.2 of Appendix A of this permit.
- 3. Upon review of information submitted under terms and conditions of this permit, the permit may be modified to require additional effluent limitations/monitoring requirements and/or improved best management practices.
- 4. The permittee shall notify the Division of Water and Waste Management immediately when it becomes aware of any migration of any pollutant from any unpermitted source (such as contaminated groundwater and/or storm water) into surface waters of the State. Notification is not required for any condition or activity that the Agency has already permitted or taken an enforcement action upon unless said permit or action taken by the agency did not consider the pollutant.
- 5. Without prior approval from the agency, the permittee shall not accept and treat wastewater from any other facility.
- 6. The permittee shall submit each month according to the enclosed format, a Discharge Monitoring Report (DMR) indicating in terms of concentration and/or quantities the values of the constituents listed in Section A analytically determined to be in the plant effluent(s). Additional information pertaining to effluent monitoring and reporting can be found in Section III of Appendix A.
- 7. The required DMRs shall be received by the agency no later than 25 days following the end of the reporting period in accordance with the following requirements. The agency is now requiring the permittee to utilize our electronic discharge monitoring report (eDMR) system which is now mandatory. The permittee is not required to submit hard copies of the DMRs to the addresses listed below when using eDMR. Special circumstances may result in the agency granting an exemption to eDMR and are considered on case by case basis. If the permittee was exempted by the agency from using the eDMR system, then the permittee is required to send hard copies to the addresses below. The permittee may contact the agency for more information about the eDMR system and potential exemptions from using it. Regardless, in accordance with Appendix A, Section III.6 of this permit, the permittee shall maintain copies of DMRs (either hard copies or electronic copies) at the plant site and the DMRs shall be made readily available upon request for DEP personnel.

a	Director	U. S. Environmental Protection Agency
u.	Division of Water and Waste Management	Region III, Water Protection Division
	601 57th Street, SE	NPDES Enforcement Branch (3WP42)
	Charleston, West Virginia 25304	1650 Arch Street
	Attn: Permitting Program	Philadelphia, PA 19103
	Department of Environmental Protection	
	Environmental Enforcement	
	76 Conservation Way	
	Parkersburg, WV 26104	

- 8. The permittee shall not use alternate DMRs without prior approval from this Agency.
- 9. For any noncompliance reports to be submitted in writing by this permit, a copy shall also be forwarded to the EPA at the location specified under Section C.7.a of this permit.
- 10. The Groundwater Protection Plan (GPP) shall be implemented and maintained at the plant site and shall be available for inspection by the Division of Water and Waste Management personnel.
- 11. This permit only authorizes the discharge of process wastewater and non-contact cooling via Outlet 008 from the manufacture of 40 CFR 414 Subpart D OCPSF products. This permit does not authorize the discharge of stormwater via Outlet 008. The permittee must modify this permit prior to discharging or accepting from offsite any process wastewater from the manufacturing of any other products at the facility.

Section C - Other Requirements

- 12. If any portion of the Permittee's discharge that is identified as being subject to Federal Effluent Guideline(s) and the new or revised requirements of the Federal Effluent Guideline(s) are not currently in this permit, the Director may reopen or reissue this permit to incorporate additional, more stringent requirements or limitations.
- 13. Prior to disposing of any solids generated from any treatment system, the permittee shall submit a letter of acceptance from the disposal facility to this Division. This does not apply to any normal solid wastes (trash/refuse) generated by the standard operation of the facility. However, those normal solid wastes shall be disposed of in a manner consistent with any, and all, appropriate laws and regulations. Additionally, this does not apply to any disposal methods identified in the permit application.
- 14. Any "not detected (ND)" results by the permittee must be "ND" at the method detection limit (MDL) for the test method used for that parameter and must be reported as less than the MDL used. The permittee may not report the result as zero, "ND", or report the result as less than a minimum level (ML), reporting limit (RL), or practical quantitation limit (PQL).

When averaging values of analytical results for DMR reporting purposes for monthly averages, the permittee should use actual analytical results when these results are greater than or equal to the MDL and should use zero (0) when these results are less than the MDL. If all analytical results are non-detect at the MDL (<MDL), then the permittee should use the actual MDL in the calculation for averaging and report the result as less than the average calculation.

15. Total Residual Chlorine (TRC) self-monitoring and compliance evaluations shall be performed as follows:

- a. The permittee shall use EPA-approved (or accepted) analytical methods that are sensitive enough to determine compliance with calculated permit effluent limitations. Examples of acceptable methods that meet the method detection limit (MDL) requirements are:
 HACH ULR Chlorine Residual DPD Colormetric Method 10014 (Published MDL of 2 ug/l) HACH Chlorine Amperometric Back Titration Method 10025 (Published MDL of 6 ug/l).
- b. The calculated permit effluent limitations for TRC in most current circumstances are not quantifiable using EPA approved (or accepted) analytical methods. An interim minimum level (IML) is calculated when a method-specified minimum level does not exist. The IML is approximately equal to 3.18 times the lab-specified MDL. Based upon current knowledge and technology, the Division has determined that an interim minimum level of 100 ug/l shall be used as the compliance evaluation level for TRC.
- c. Matrix interference precludes most of the State's certified WWTP laboratories from achieving the published MDL as specified and also precludes the Division from determining compliance with the calculated permit effluent limitations for TRC. Based upon data collected concerning lab-specific MDLs by the Division from a number of the State's certified WWTP laboratories, it has been determined that a WV-specified reporting level for TRC should be established at 32 ug/l.
- d. When actual analytical results are greater than or equal to 32 ug/l, the permittee shall report these actual analytical results on the Discharge Monitoring Report (DMR). The permittee shall report "less than (<) 32 ug/l" on the DMR when results are less than the WV-specified MDL.
- e. When calculating averages of analytical result values, the permittee shall use the actual analytical result when these results are greater than or equal to 32 ug/l. Additionally, when calculating averages of analytical result values, the permittee shall use zero (0) when the actual analytical result obtained is less than 32 ug/l.
- 16. Effluent monitoring for the following pollutants shall be conducted using the most sensitive methods and detection levels commercially available and economically feasible. The following methods are to be used unless the permittee desires to use an EPA Approved Test Method with a listed lower method detection level. Regardless, it is recognized that detection levels can vary from analysis to analysis and that non-detect results at a different MDL for the specified test method would not constitute a permit violation.

Section C - Other Requirements

EPA Test Method	Method Detection Level (ug/l)
200.8	0.5
200.8	0.6
200.8	1.8
200.8	1.8
200.8	1.8
624.1	variable
625.1	variable
	EPA Test Method 200.8 200.8 200.8 200.8 200.8 200.8 624.1 625.1

17. In incidences where a specific test method is not defined, the permittee shall utilize an EPA approved method with a method detection limit (MDL) sensitive enough to confirm compliance with the permit effluent limit for that parameter. If a MDL is not sensitive enough to confirm compliance, the most sensitive approved method must be used. If a more sensitive EPA approved method becomes available, that method shall be used. Should the current and/or new method not be sensitive enough to confirm compliance with the permitted effluent limit, analytical results reported as "not detected" at the MDL of the most sensitive method available will be deemed compliant for purposes of permit compliance. Results shall be reported on the Discharge Monitoring Reports as a numeric value less than the MDL.

18. The permittee shall perform acute effluent toxicity testing in accordance with the following.

- a. The acute effluent toxicity testing prescribed, herein, shall be 48-hour static acute toxicity tests utilizing Pimephales Promelas fathead minnow and Ceriodaphnia Dubia as the test species.
- b. The acute toxicity testing shall be performed on a semiannual basis. The first acute toxicity testing shall be carried out within six (6) months from the effective date of the permit for Outlet No. 001. There shall be a minimum of three (3) months between required sampling events.
- c. 24-hour flow weighted composite samples of the effluent, as prescribed in Section A, shall be collected for testing.
- d. The dilution water should be a representative sample of the receiving water and should be obtained from a point as close as possible to but upstream or outside of the zone influenced by the effluent. If dilution water from the receiving stream is not suitable, some other uncontaminated, well-aerated surface or groundwater or commercially available media or reconstituted laboratory water can be used.
- e. Testing and reporting of the result shall be performed in accordance with 40 CFR 136 and must be submitted with the Discharge Monitoring Report (DMR) for the month following the completion of each test. LC50 shall be converted into Acute Toxic Units (TUa) using the following formula:

TUa = 100/LC50For example, if LC50 is 100%, then TUa = 100/100 = 1.

- i) When the effluent demonstrates no toxicity at 100% effluent (no organisms die), the permittee may report zero (0) TUa.
- An effluent that causes some mortality but less than %50 mortality at %100 effluent on a species is still deemed to have some toxicity. As such, the permittee shall not report zero (0) in this case, but shall report the result as less than one (1) TUa.
- iii) When averaging values of analytical results for DMR reporting purposes for monthly averages, the permittee shall use actual toxicity results when these results are greater than or equal to one (1) TUa and shall use zero (0) when these results are less than one (1) TUa. If all analytical results are less than one (1) TUa, then the permittee shall report the average monthly result as less than one (1) TUa.
Section C - Other Requirements

18. f. If acute effluent toxicity testing results exceed a level of 1 TUa, the permittee shall immediately resample and retest the effluent. This resampling shall be performed within 30 days of the permittee obtaining the initial sampling result showing the exceedance of 1.0 TUa prescribed herein. Copies of the retesting results shall be provided to the Director immediately, or as soon as practicable, upon completion of the retest.

If the retest is less than 1 TUa, acute effluent toxicity testing shall continue in accordance with the requirements, as prescribed herein. However, if the retest again exceeds 1 TUa, the Director shall impose further requirements, as may be necessary, in order to address acute effluent toxicity.

- g. The Director may impose further requirements should the acute effluent toxicity testing results demonstrate toxicity.
- 19. In order to reassess the mixing zones at the next permit issuance for Outlet 008, the permittee will be required to assess the background water quality in the Ohio River during the last two years of this permit in accordance with the following.
 - a. Background water quality data shall be collected at a location upstream of the discharge for which a mixing zone is being requested and downstream of any discharges that are upstream of the discharge for which a mixing zone is being requested.
 - b. A minimum of ten sample results shall be collected for temperature, pH, hardness, total suspended solids, and any other pollutant for which a mixing zone will be requested for each respective discharge outfall. Analytical test methods used shall be in accordance with Sections C and D of this permit. Samples shall be collected during different calendar months.
 - c. Width and depth (river bottom samples shall be included) integrated samples shall be collected.
 - d. Background water quality data must be completed for each pollutant for which a mixing zone is being requested.
- 20. The upstream temperatures and discharge temperatures required by Section A.008 of this permit shall be collected concurrently. Concurrently shall be defined as no more than two hours between monitoring collected at the upstream location in the Ohio River and the respective discharge.

The permittee may, in lieu of sampling at an upstream location, collect a temperature measurement from the facilities water intake so long as the water intake remains representative of the temperatures observed at the upstream temperature location (i.e. above Outlet 008).

Section D - PFAS Requirements

- 1. Monitoring for PFAS (Per- And Polyfluoroalkyl Substances) compounds as required by Sections A.008, A.108, and A.208 of this permit shall be sampled using the latest version of EPA Method 1633.
- 2. The following table is provided for reference for the PFAS compound chemical names, EPA ICIS parameter codes, and their associated abbreviations and CAS numbers. It is recommended that the permittee supply this information to its laboratory to ensure the proper compounds are monitored.

ICIS	Chemical	Chemical	CAS
Code	Name	Abbreviation	Number
51521	Perfluorooctanoic acid	PFOA	335-67-1
51522	Perfluorobutanoic acid	PFBA	375-22-4
51525	Perfluorooctanesulfonamide	PFOSA	754-91-6
51623	Perfluoropentanoic acid	PFPeA	2706-90-3
51624	Perfluorohexanoic acid	PFHxA	307-24-4
51625	Perfluoroheptanoic acid	PFHpA	375-85-9
51626	Perfluorononanoic acid	PFNA	375-95-1
51627	Perfluorodecanoic acid	PFDA	335-76-2
51628	Perfluoroundecanoic acid	PFUnA	2058-94-8
51629	Perfluorododecanoic acid	PFDoA	307-55-1
51630	Perfluorotridecanoic acid	PFTrDA	72629-94-8
51631	Perfluorotetradecanoic acid	PFTeA	376-06-7
51641	N-Ethylperfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2
51642	N-Methylperfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7
51643	N-Ethylperfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
51644	N-Methylperfluorooctanesulfonamidoacetic acid	NMefosaa	2355-31-9
52602	Perfluorobutanesulfonic acid	PFBS	375-73-5
52603	Perfluorodecanesulfonic acid	PFDS	335-77-3
52604	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
52605	Perfluorohexanesulfonic acid	PFHxS	355-46-4
52606	Perfluorooctanesulfonic acid	PFOS	1763-23-1
52607	4:2 Fluorotelomersulfonic acid	4:2 FTS	757124-72-4
52608	6:2 Fluorotelomersulfonic acid	6:2 FTS	27619-97-2
52609	8:2 Fluorotelomersulfonic acid	8:2 FTS	39108-34-4
52610	Perfluoropentanesulfonic acid	PFPeS	2706-91-4
52611	Perfluorononanesulfonic acid	PFNS	68259-12-1
52612	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
52626	Perfluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
52629	Perfluoroethoxyethanesulfonic acid	PFEESA	113507-82-7
52632	Perfluorododecanesulfonic acid	PFDoS	79780-39-5
52636	4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
52641	N-Methylperfluorooctanesulfonamide	NMeFOSA	31506-32-8
52642	N-Ethylperfluorooctanesulfonamide	NEtFOSA	4151-50-2
PF001	3-Perfluoropropyl propanoic acid	3:3 FTCA	356-02-5
PF002	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
PF003	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9C1-PF3ONS	756426-58-1
PF004	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11C1-PF30Uds	763051-92-9
PF005	3-Perfluoroheptyl propanoic acid	7:3 FTCA	812-70-4
PF006	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
PF007	2H,2H,3H,3H-Perfluorooctanoic acid	5:3 FTCA	914637-49-3

Appendix A

I. MANAGEMENT CONDITIONS:

1. Duty to Comply a)

- The permittee must comply with all conditions of this permit. Permit noncompliance constitutes a violation of the CWA and State Act and is grounds for enforcement action; for permit modification, revocation and reissuance, suspension or revocation; or for denial of a permit renewal application.
- b) The permittee shall comply with all effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

2. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for a new permit at least 180 days prior to expiration of the permit.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment.

4. Permit Actions

This permit may be modified, revoked and reissued, suspended, or revoked for cause. The filing of a request by the permittee for permit modification, revocation and reissuance, or revocation, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

5. Property Rights

This permit does not convey any property rights of any sort or any exclusive privilege.

6. Signatory Requirements

All applications, reports, or information submitted to the Director shall be signed and certified as required in Title 47, Series 10, Section 4.6 of the West Virginia Legislative Rules.

7. Transfers

This permit is not transferrable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary.

8. Duty to Provide Information

The permittee shall furnish to the Director, within a reasonable specified time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, suspending, or revoking this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

9. Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

10. Inspection and Entry

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

- a) Enter upon the permittee's premises in which an effluent source or activity is located, or where records must be kept under the conditions of this permit;
- b) Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit;
- c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- d) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the State Act, any substances or parameters at any location.

11. Permit Modification

This permit may be modified, suspended, or revoked in whole or in part during its term in accordance with the provisions of Chapter 22-11-12 of the Code of West Virginia.

12. Water Quality

This discharge shall not cause or materially contribute to: distinctly visible floating or settable solids, suspended solids, scum, foam or oily slicks; deposits or sludge bank on the bottom; odors in the vicinity of the waters; taste or odor that would adversely affect the designated uses of the affected waters; distinctly visible color which may impair or interfere with the designated uses of the affected waters; and shall not cause a fish or mussel kill. The limitations and conditions in this permit for the discharges identified in this permit are limitations and conditions that are necessary to meet applicable West Virginia water quality standards, Requirements Governing Water Quality Standards 47 CSR 2.

13. Outlet Markers

A permanent marker at the establishment shall be posted in accordance with Title 47, Series 11, Section 9 of the West Virginia Legislative Rules.

- 14. Liabilities
 - a) Any person who violates a permit condition implementing sections 301, 302, 306, 307, 308, 318, or 405 of the Clean Water Act is subject to a civil penalty not to exceed \$25,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing sections 301, 302, 306, 307, 308 or 405 of the Clean Water Act is subject to a fine of not less than \$2,500 nor more than \$25,000 per day of violation, or by imprisonment for not more than 1 year, or both.
 - b) Any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 2 years, or by both.
 - c) Any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 2 years, or by both.
 - d) Nothing in I.14 a), b), and c) shall be construed to limit or prohibit any other authority the Director may have under the State Water Pollution Control Act, Chapter 22, Article 11.

II. OPERATION AND MAINTENANCE:

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls, and appropriate quality assurance procedures. Unless otherwise required by Federal or State law, this provision requires the operation of back-up auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of the permit. For domestic waste treatment facilities, waste treatment operators as classified by the WV Bureau of Public Health Laws, W. Va. Code Chapter 16-1, will be required except that in circumstances where the domestic waste treatment facility is receiving any type of industrial waste, the Director may require a more highly skilled operator.

2. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

3. Bypass

a)

c)

d)

- Definitions
 - (1) "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility; and
 - (2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
- b) Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of II.3.c) and II.3.d) of this permit.
 - If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten (10) days before the date of the bypass;
 - (2) If the permittee does not know in advance of the need for bypass, notice shall be submitted as required in IV.2.b) of this permit. Prohibition of bypass
 - (1) Bypass is permitted only under the following conditions, and the Director may take enforcement action against a permittee for a bypass, unless;
 - (A) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
 - (B) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and
 - (C) The permittee submitted notices as required under II.3.c) of this permit.
 - (2) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed in II.3.d.(1) of this permit.

4. Upset

- a) Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.
- b) Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitation if the requirements of II.4.c) are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
- c) Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
 - (1) An upset occurred and that the permittee can identify the cause(s) of the upset;
 - (2) The permitted facility was at the time being properly operated;
 - (3) The permittee submitted notice of the upset as required in IV.2.b) of this permit.
 - (4) The permittee complied with any remedial measures required under I.3. of this permit.
 - Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Removed Substances

d)

Where removed substances are not otherwise covered by the terms and conditions of this permit or other existing permit by the Director, any solids, sludges, filter backwash or other pollutants (removed in the course of treatment or control of wastewaters) and which are intended for disposal within the State, shall be disposed of only in a manner and at a site subject to the approval by the Director. If such substances are intended for disposal outside the State or for reuse, i.e., as a material used for making another product, which in turn has another use, the permittee shall notify the Director in writing of the proposed disposal or use of such substances, the identity of the prospective disposer or users, and the intended place of disposal or use, as appropriate.

1. Representative Sampling

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

2. Reporting

- a) Permittee shall submit, according to the enclosed format, a Discharge Monitoring Report (DMR) indicating in terms of concentration, and/or quantities, the values of the constituents listed in Part A analytically determined to be in the plant effluent(s). DMR submissions shall be made in accordance with the terms contained in Section C of this permit.
- b) Enter reported average and maximum values under "Quantity" and "Concentration" in the units specified for each parameter, as appropriate.
- c) Specify the number of analyzed samples that exceed the allowable permit conditions in the columns labeled "N.E." (i.e., number exceeding).
- d) Specify frequency of analysis for each parameter as number of analyses/specified period (e.g., 3/month is equivalent to 3 analyses performed every calendar month). If continuous, enter "Cont.". The frequency listed on format is the minimum required.

3. Test Procedures

Samples shall be taken, preserved and analyzed in accordance with the latest edition of 40 CFR Part 136, unless other test procedures have been specified elsewhere in this permit.

4. Recording of Results

For each measurement or sample taken pursuant to the permit, the permittee shall record the following information.

- a) The date, exact place, and time of sampling or measurement;
- b) The date(s) analyses were performed;
- c) The individual(s) who performed the sampling or measurement;
- d) The individual(s) who performed the analyses; if a commercial laboratory is used, the name and address of the laboratory;
- e) The analytical techniques or methods used, and
- f) The results of such analyses. Information not required by the DMR form is not to be submitted to this agency, but is to be retained as required in III.6.

5. Additional Monitoring by Permittee

If the permittee monitors any pollutant at any monitoring point specified in this permit more frequently than required by this permit, using approved test procedures or others as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report Form. Such increased frequency shall also be indicated. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in the permit.

6. Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for the permit, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

7. Definitions

- a) "Daily discharge" means the discharge of a pollutant measured during a calendar day or within any specified period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the average measurement of the pollutant over the day.
- b) "Average monthly discharge limitation" means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
- c) "Maximum daily discharge limitation" means the highest allowable daily discharge.
- d) "Composite Sample" is a combination of individual samples obtained at regular intervals over a time period. Either the volume of each individual sample is proportional to discharge flow rates or the sampling interval (for constant volume samples) is proportional to the flow rates over the time period used to produce the composite. The maximum time period between individual samples shall be two hours.
- e) "Grab Sample" is an individual sample collected in less than 15 minutes.
- f) "is" = immersion stabilization a calibrated device is immersed in the effluent stream until the reading is stabilized.
- g) The "daily average temperature" means the arithmetic average of temperature measurements made on an hourly basis, or the mean value plot of the record of a continuous automated temperature recording instrument, either during a calendar month, or during the operating month if flows are of shorter duration.
- h) The "daily maximum temperature" means the highest arithmetic average of the temperatures observed for any two (2) consecutive hours during a 24 hour day, or during the operating day if flows are of shorter duration.
- i) The "monthly average fecal coliform" bacteria is the geometric average of all samples collected during the month.
- "Measured Flow" means any method of liquid volume measurement, the accuracy of which has been previously demonstrated in engineering practice, or which a relationship to absolute volume has been obtained.
- k) "Estimate" means to be based on a technical evaluation of the sources contributing to the discharge including, but not limited to pump capabilities, water meters and batch discharge volumes.
- "Non-contact cooling water" means the water that is contained in a leak-free system, i.e., no contact with any gas, liquid, or solid other than the container for transport; the water shall have no net poundage addition of any pollutant over intake water levels, exclusive of approved antifouling agents.

1. Reporting Spills and Accidental Discharges

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties established pursuant to Title 47, Series 11, Section 2 of the West Virginia Legislative Rules promulgated pursuant to Chapter 22, Article 11. Attached is a copy of the West Virginia Spill Alert System for use in complying with Title 47, Series 11, Section 2 of the Legislative rules as they pertain to the reporting of spills and accidental discharges.

2. Immediate Reporting

- a) The permittee shall report any noncompliance which may endanger health or the environment immediately after becoming aware of the circumstances by using the Agency's designated spill alert telephone number. A written submission shall be provided within five (5) days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
- b) The following shall also be reported immediately:
 - (1) Any unanticipated bypass which exceeds any effluent limitation in the permit;
 - (2) Any upset which exceeds any effluent limitation in the permit; and
 - (3) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit shall be reported immediately. This list shall include any toxic pollutant or hazardous substance, or any pollutant specifically identified as the method to control a toxic pollutant or hazardous substance.
- c) The Director may waive the written report on a case-by-case basis if the oral report has been received in accordance with the above.
- d) Compliance with the requirements of IV.2 of this section, shall not relieve a person of compliance with Title 47, Series 11, Section 2.

3. Reporting Requirements

a)

- Planned changes. The permittee shall give notice to the Director of any planned physical alterations or additions to the permitted facility which may affect the nature or quantity of the discharge. Notice is required when:
 - (1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in Section 13.7.b of Series 10, Title 47; or
 - (2) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under IV.2 of this section.
- b) Anticipated noncompliance. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- c) In addition to the above reporting requirements, all existing manufacturing, commercial, and silvicultural discharges must notify the Director in writing as soon as they know or have reason to believe:
 - (1) That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, or any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
 - (A) One hundred micrograms per liter (100 ug/l);
 - (B) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitro phenol; and for 2-methyl 4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
 - (C) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with Section 4.4.b.9 of Series10, Title 47.
 - (D) The level established by the Director in accordance with Section 6.3.g of Series 10, Title 47;
 - (2) That any activity has occurred or will occur which would result in any discharge (on a non-routine or infrequent basis) of a toxic which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
 - (A) Five hundred micrograms per liter (500 ug/l);
 - (B) One milligram per liter (1 mg/l) for antimony;
 - (C) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with Section 4.4.b.7 of Series 10, Title 47;
 - (D) The level established by the Director in accordance with Section 6.3.g of Series 10, Title 47.
 - (3) That they have begun or expect to begin to use or manufacture as an intermediate or final product or by-product of any toxic pollutant which was not reported in the permit application under Section 4.4.b.9 of Series 10, Title 47 and which will result in the discharge on a routine or frequent basis of that toxic pollutant at levels which exceed five times the detection limit for that pollutant under approved analytical procedure.
 - (4) That they have begun or expect to begin to use or manufacture as an intermediate or final product or by-product of any toxic pollutant which was not reported in the permit application under Section 4.4.b.9 of Series 10, Title 47 and which will result in the discharge on a non-routine or infrequent basis of that toxic pollutant at levels which exceed ten times the detection limit for that pollutant under approved analytical procedure.

4. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under the above paragraphs at the time monitoring reports are submitted. The reports shall contain the information listed in IV.2.a). Should other applicable noncompliance reporting be required, these terms and conditions will be found in Section C of this permit.

Permit Limits

FACILITY NAME: (The Chemours Company FC, LLC) THE CHEMOURS COMPANY F(CERTIFIED LABORATORY NAME: LOCATION OF FACILITY: WASHINGTON; Wood County CERTIFIED LABORATORY ADDRESS: PERMIT NO.: WV0117986 800 WASTELOAD FOR THE MONTH OF: INDIVIDUAL PERFORMING ANALYSIS: Quantity Other Units Measurement Sample Parameter N.E. Frequency Туре Units N.E. CEL* Units 50050 (ML-1) RF-A Reported Continuous Flow, in Conduit or thru plant N/A N/A Rpt Only Rpt Only N/A mgd N/A measured Permit Limits Year Round Avg. Monthly Max. Daily 00400 (ML-1) RF-A Reported pН N/A N/A S.U. 1/daily Grab N/A 6 9 N/A Permit Limits Year Round Inst. Min. Inst. Max. 00610 (ML-1) RF-A Reported 24 hr Ammonia Nitrogen N/A N/A N/A 18.8 37.6 N/A lma/l 1/month Permit Limits Composite Year Round Avg. Monthly Max. Daily 00620 (ML-1) RF-A Reported Lbs/Dav 24 hr Nitrogen Nitrate N/A 3.91 7.88 N/A 1/week 13.4 27 mg/l Permit Limits Composite Max. Daily Year Round Avg. Monthly Avg. Monthly Max. Daily 00615 (ML-1) RF-B Reported Nitrogen Nitrite N/A 1/quarter 24 hr N/A N/A N/A Rpt Only Rpt Only lma/l Permit Limits Composite Year Round Avg. Monthly Max. Daily 50060 (ML-1) RF-A Reported Chlorine. Total Residual N/A 0.1 mg/l Grab N/A N/A 0.028 0.057 1/week Permit Limits Year Round Avg. Monthly Max. Daily

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed
	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly	Signature of Principal Executive Officer or
Title of Officer	responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant	
	penalties for submitting faise information including the possibility of a fine and imprisonment for knowing violations.	

Permit Limits

FACILITY NAME: (The Chemours Company FC, LLC) THE CHEMOURS COMPANY F(CERTIFIED LABORATORY NAME: LOCATION OF FACILITY: WASHINGTON; Wood County CERTIFIED LABORATORY ADDRESS: PERMIT NO.: WV0117986 800 WASTELOAD FOR THE MONTH OF: INDIVIDUAL PERFORMING ANALYSIS: Quantity Other Units Measurement Sample Parameter N.E. Frequency Туре Units N.E. CEL* Units 01119 (ML-1) RF-B Reported 24 hr Copper, Total Recoverable N/A N/A Rpt Only N/A mg/l 1/quarter N/A Rpt Only Permit Limits Composite Year Round Avg. Monthly Max. Daily 00980 (ML-1) RF-B Reported N/A 1/quarter 24 hr Iron, Total Recoverable N/A N/A Rpt Only N/A mg/l Rpt Only Permit Limits Composite Max. Daily Year Round Avg. Monthly 00951 (ML-1) RF-B Reported 24 hr Fluoride. Total N/A N/A N/A Rpt Only Rpt Only N/A lma/l 1/quarter Permit Limits Composite Year Round Avg. Monthly Max. Daily 61425 (ML-1) RF-B Reported 24 hr Acute Tox - Ceriodaphnia Dubia N/A TUa 1/quarter N/A N/A N/A Rpt Only Rpt Only Permit Limits Composite Year Round Avg. Monthly Max. Daily 61427 (ML-1) RF-B Reported Acute Toxicity - Pimephales N/A TUa 1/quarter 24 hr N/A N/A N/A Rpt Only Rpt Only Permit Limits Composite Year Round Avg. Monthly Max. Daily 00011 (ML-7) RF-A Reported DEG.F Temperature, F N/A N/A N/A N/A Rpt Only Rpt Only 1/month Insitu Permit Limits Year Round Avg. Monthly Max. Daily

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my	Signature of Principal Executive Officer or Authorized Agent
	knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	

Permit Limits

FACILITY NAME: <u>(The</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	Chemours Cor Y: <u>WASHING</u> 986 MONTH OF:	Y FI CERTIF CERTIF Individ	CERTIFIED LABORATORY NAME:										
			Quantity				Ot	her Units				Measurement	Sample
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре
00011 (ML-1) RF-A	Reported												
Temperature, F January 1-31	Permit Limits	N/A	N/A			N/A	54.5 Avg. Monthly	63.1 Max. Daily	N/A	DEG.F		1/week	Insitu
00011 (ML-1) RF-A	Reported												
Temperature, F February 1-28	Permit Limits	N/A	N/A			N/A	56.8 Avg. Monthly	65.7 Max. Daily	N/A	DEG.F		1/week	Insitu
00011 (ML-1) RF-A	Reported												
Temperature, F March 1-31	Permit Limits	N/A	N/A			N/A	68.7 Avg. Monthly	79.5 Max. Daily	N/A	DEG.F		1/week	Insitu
00011 (ML-1) RF-A	Reported												
Temperature, F April 1-30	Permit Limits	N/A	N/A			N/A	82 Avg. Monthly	94.9 Max. Daily	N/A	DEG.F		1/week	Insitu
00011 (ML-1) RF-A	Reported												
Temperature, F May 1-31	Permit Limits	N/A	N/A			N/A	108.8 Avg. Monthly	126 Max. Daily	N/A	DEG.F		1/week	Insitu
00011 (ML-1) RF-A	Reported												
Temperature, F June 1-30	Permit Limits	N/A	N/A			N/A	138.1 Avg. Monthly	159.9 Max. Daily	N/A	DEG.F		1/week	Insitu

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: (The Chemours Company FC, LLC) THE CHEMOURS COMPANY F(LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 008 008							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS:								
WASTELOAD FOR THE	MONTH OF:														
Parameter			Quantity	Units	N.E.		Ot	her Units	CEL*	Units	N.E.	Measurement Frequency	Sample Type		
00011 (ML-1) RF-A	Reported														
Temperature, F July 1-31	Permit Limits	N/A	N/A			N/A	110.9 Avg. Monthly	128.3 Max. Daily	N/A	DEG.F		1/week	Insitu		
00011 (ML-1) RF-A	Reported														
Temperature, F August 1-31	Permit Limits	N/A	N/A			N/A	104.9 Avg. Monthly	121.5 Max. Daily	N/A	DEG.F		1/week	Insitu		
00011 (ML-1) RF-A	Reported														
Temperature, F September 1-30	Permit Limits	N/A	N/A			N/A	111.3 Avg. Monthly	128.9 Max. Daily	N/A	DEG.F		1/week	Insitu		
00011 (ML-1) RF-A	Reported														
Temperature, F October 1-31	Permit Limits	N/A	N/A			N/A	94.9 Avg. Monthly	109.9 Max. Daily	N/A	DEG.F		1/week	Insitu		
00011 (ML-1) RF-A	Reported														
Temperature, F November 1-30	Permit Limits	N/A	N/A			N/A	105.5 Avg. Monthly	122.1 Max. Daily	N/A	DEG.F		1/week	Insitu		
00011 (ML-1) RF-A	Reported														
D0011 (ML-1) RF-A F Temperature, F December 1-31	Permit Limits	N/A	N/A			N/A	72.2 Avg. Monthly	83.6 Max. Daily	N/A	DEG.F		1/week	Insitu		

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed
	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my	Signature of Principal Executive Officer or Authorized Agent
	knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	

Permit Limits

FACILITY NAME: (The Chemours Company FC, LLC) THE CHEMOURS COMPANY FC LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 WASTELOAD FOR THE MONTH OF: 008							CERTIFIED LABORATORY NAME:								
		Quantity					Ot	her Units				Magguramont	Sampla		
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре		
51641 (ML-1) RF-A	Reported														
NEtFOSE Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51525 (ML-1) RF-A	Reported														
Perfluorooctanesulfonamide Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51522 (ML-1) RF-A	Reported														
Perfluorobutanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51623 (ML-1) RF-A	Reported										İ				
Perfluoropentanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51624 (ML-1) RF-A	Reported														
51624 (ML-1) KF-A Perfluorohexanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51625 (ML-1) RF-A	Reported														
Perfluoroheptanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief true, accurate and complete Low sweet that there are significant	Signature of Principal Executive Officer or Authorized Agent
	penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	

Permit Limits

FACILITY NAME: (The Chemours Company FC, LLC) THE CHEMOURS COMPANY F(LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 WASTELOAD FOR THE MONTH OF: 008							CERTIFIED LABORATORY NAME:CERTIFIED LABORATORY ADDRESS:							
			Quantity				Ot	her Units		-		Measurement	Sample	
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре	
51626 (ML-1) RF-A	Reported													
Perfluorononanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
51627 (ML-1) RF-A	Reported													
Perfluorodecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
51629 (ML-1) RF-A	Reported													
Perfluorododecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
51642 (ML-1) RF-A	Reported													
NMeFOSE Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
51521 (ML-1) RF-A	Reported													
91921 (ML-1) KF-A Perfluorooctanoic acid Year Round	Permit Limits	0.000554 Avg. Monthly	0.00114 Max. Daily	Lbs/Day		N/A	0.162 Avg. Monthly	0.333 Max. Daily	N/A	ug/l		1/week	24 hr Composite	
51628 (ML-1) RF-A	Reported													
Perfluoroundecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	

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Permit Limits

FACILITY NAME: (The Chemours Company FC, LLC) THE CHEMOURS COMPANY F(LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 WASTELOAD FOR THE MONTH OF: 008							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:							
			Quantity				Ot		Measurement	Sample				
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре	
51630 (ML-1) RF-A	Reported													
Perfluorotridecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
51631 (ML-1) RF-A	Reported													
Perfluorotetradecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
51643 (ML-1) RF-A	Reported			Lbs/Day						ug/l				
NEtFOSAA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily			N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A			1/week	24 hr Composite	
51644 (ML-1) RF-A	Reported													
NMeFOSAA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day	y	N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52602 (ML-1) RF-A	Reported													
52002 (ML-1) KF-A Perfluorobutanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52603 (ML-1) RF-A	Reported													
52603 (ML-1) RF-A Perfluorodecanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	

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			Quantity				Other Units Measurement					Sample	
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре
52604 (ML-1) RF-A	Reported												
Perfluoroheptanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52605 (ML-1) RF-A	Reported												
Perfluorohexanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52606 (ML-1) RF-A	Reported												
Perfluorooctanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52607 (ML-1) RF-A	Reported												
4:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52608 (ML-1) RF-A	Reported												
6:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52609 (ML-1) RF-A	Reported												
8:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite

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			Quantity				Other Units Measurement					Sample	
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре
52610 (ML-1) RF-A	Reported												
Perfluoropentanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52611 (ML-1) RF-A	Reported												
Perfluorononanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52612 (ML-1) RF-A	Reported												
HFPO-DA Year Round	Permit Limits	0.000126 Avg. Monthly	0.000224 Max. Daily	Lbs/Day		N/A	0.0368 Avg. Monthly	0.0653 Max. Daily	N/A	ug/l		1/week	24 hr Composite
52626 (ML-1) RF-A	Reported												
NFDHA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52629 (ML-1) RF-A	Reported												
PFEESA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
52632 (ML-1) RF-A	Reported												
Perfluorododecanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite

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FACILITY NAME: (The Chemours Company FC, LLC) THE CHEMOURS COMPANY F(LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 WASTELOAD FOR THE MONTH OF: 008						<u>Y F(</u> CERTI CERTI INDIVI	CERTIFIED LABORATORY NAME:CERTIFIED LABORATORY ADDRESS:							
			Quantity				Ot	her Units				Magguramont	Sampla	
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре	
52636 (ML-1) RF-A	Reported													
ADONA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52641 (ML-1) RF-A	Reported													
NMeFOSA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52642 (ML-1) RF-A	Reported													
NEtFOSA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
PF001 (ML-1) RF-A	Reported													
3:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
PF002 (ML-1) RF-A	Reported													
PFMPA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
PF003 (ML-1) RF-A	Reported													
9CI-PF3ONS Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	

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Permit Limits

FACILITY NAME: <u>(The (</u>	Chemours Cor Y: WASHING	<u>Y FI</u> CERTI											
PERMIT NO.: WV01179	986		00	8									
WASTELOAD FOR THE	MONTH OF:			DUAL PERFOR	MING ANALYS	IS:							
			Quantity				Ot	her Units				Measurement	Sample
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре
PF004 (ML-1) RF-A	Reported												
11CI-PF3OUdS Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
PF005 (ML-1) RF-A	Reported												
7:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
PF006 (ML-1) RF-A	Reported												
PFMBA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite
PF007 (ML-1) RF-A	Reported												
5:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite

* CEL	= Compliance I	Evaluation Level
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Permit Limits

FACILITY NAME: (Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 WASTELOAD FOR THE MONTH OF:							CERTIFIED LABORATORY NAME:						
			Quantity		-		Ot	her Units	-	_		Measurement	Sample
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре
50050 (ML-1) RF-A	Reported												
Flow,in Conduit or thru plant Year Round	Permit Limits	N/A	N/A			N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	mgd		Continuous	measured
00310 (ML-1) RF-A	Reported												
BOD, 5-Day 20 Deg.C Year Round	Permit Limits	21 Avg. Monthly	56 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	mg/l		1/week	24 hr Composite
00530 (ML-1) RF-A	Reported												
Total Suspended Solids Year Round	Permit Limits	40 Avg. Monthly	130 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	mg/l		1/week	24 hr Composite
00400 (ML-1) RF-A	Reported												
pH Year Round	Permit Limits	N/A	N/A			6 Inst. Min.	N/A	9 Inst. Max.	N/A	S.U.		1/daily	Grab
00620 (ML-1) RF-A	Reported												
Nitrogen Nitrate Year Round	Permit Limits	13.4 Avg. Monthly	27 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	mg/l		1/week	24 hr Composite
01119 (ML-1) RF-A	Reported												
Copper, Total Recoverable Year Round	Permit Limits	1.258 Avg. Monthly	2.932 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite

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Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	ACILITY NAME: <u>(Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC</u> OCATION OF FACILITY: <u>WASHINGTON; Wood County</u> PERMIT NO.: <u>WV0117986</u> VASTELOAD FOR THE MONTH OF: Quantity						CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity				Other Units					Measurement	Sample		
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре		
01114 (ML-1) RF-A	Reported														
Lead, Total Recoverable Year Round	Permit Limits	0.278 Avg. Monthly	0.598 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
01094 (ML-1) RF-A	Reported														
Zinc, Total Recoverable Year Round	Permit Limits	0.911 Avg. Monthly	2.264 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
01074 (ML-1) RF-A	Reported														
Nickel, Total Recoverable Year Round	Permit Limits	1.466 Avg. Monthly	3.452 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34423 (ML-1) RF-A	Reported														
Methylene Chloride Year Round	Permit Limits	0.031 Avg. Monthly	0.147 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		
39175 (ML-1) RF-A	Reported														
Vinyl Chloride Year Round	Permit Limits	0.084 Avg. Monthly	0.149 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		
39180 (ML-1) RF-A	Reported														
Trichloroethylene Year Round	Permit Limits	0.023 Avg. Monthly	0.06 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		

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	imprisonment for knowing violations.	

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	FACILITY NAME: (Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC _OCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity				Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
39700 (ML-1) RF-A	Reported															
Hexachlorobenzene Year Round	Permit Limits	0.17 Avg. Monthly	0.689 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34030 (ML-1) RF-A	Reported															
Benzene Year Round	Permit Limits	0.049 Avg. Monthly	0.116 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			
34571 (ML-1) RF-A	Reported															
1,4-Dichlorobenzene Year Round	Permit Limits	0.123 Avg. Monthly	0.33 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34591 (ML-1) RF-A	Reported															
2-Nitrophenol Year Round	Permit Limits	0.056 Avg. Monthly	0.2 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34616 (ML-1) RF-A	Reported															
2,4-Dinitrophenol Year Round	Permit Limits	1.047 Avg. Monthly	3.722 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34646 (ML-1) RF-A	Reported															
4-Nitrophenol Year Round	Permit Limits	0.141 Avg. Monthly	0.5 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			

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			Quantity		•		Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
34657 (ML-1) RF-A	Reported															
4,6-Dinitro-o-cresol Year Round	Permit Limits	0.068 Avg. Monthly	0.24 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34469 (ML-1) RF-A	Reported															
Pyrene Year Round	Permit Limits	0.017 Avg. Monthly	0.042 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34475 (ML-1) RF-A	Reported															
Tetrachloroethylene Year Round	Permit Limits	0.045 Avg. Monthly	0.142 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			
34496 (ML-1) RF-A	Reported															
1,1 Dichloroethane Year Round	Permit Limits	0.019 Avg. Monthly	0.051 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			
34501 (ML-1) RF-A	Reported															
1,1-Dichloroethylene Year Round	Permit Limits	0.019 Avg. Monthly	0.052 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			
34526 (ML-1) RF-A	Reported															
Benzo (A) Anthracene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC</u> LOCATION OF FACILITY: <u>WASHINGTON; Wood County</u> PERMIT NO : W//0117986 108							CERTIFIED LABORATORY NAME:									
PERMIT NO.: WV0117	986		<u>10</u>	8												
			Quantity													
Parameter				Units	N.E.			01		CEL*	Units	N.E.	Measurement Frequency	Sample Type		
34536 (ML-1) RF-A	Reported															
1,2-Dichlorobenzene Year Round	Permit Limits	0.17 Avg. Monthly	0.689 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Month	/ ily	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34546 (ML-1) RF-A	Reported															
1,2-Trans-Dichloroethylene Year Round	Permit Limits	0.022 Avg. Monthly	0.057 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Month	/ nly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		
34551 (ML-1) RF-A	Reported															
1,2,4-Trichlorobenzene Year Round	Permit Limits	0.17 Avg. Monthly	0.689 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Month	/ nly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34561 (ML-1) RF-A	Reported															
1,3-Dichloropropene Year Round	Permit Limits	0.17 Avg. Monthly	0.689 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Month	/ nly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		
34566 (ML-1) RF-A	Reported															
1,3-Dichlorobenzene Year Round	Permit Limits	0.123 Avg. Monthly	0.33 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Month	/ ily	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34320 (ML-1) RF-A	Reported															
Chrysene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Month	/ ily	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		

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Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	FACILITY NAME: (Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC OCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 NASTELOAD FOR THE MONTH OF:							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:							
			Quantity				Other Units					Measurement	Sample		
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре		
34336 (ML-1) RF-A	Reported														
Diethyl Phthalate Year Round	Permit Limits	0.04 Avg. Monthly	0.098 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34341 (ML-1) RF-A	Reported														
Dimethyl Phthalate Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34376 (ML-1) RF-A	Reported														
Fluoranthene Year Round	Permit Limits	0.019 Avg. Monthly	0.047 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34381 (ML-1) RF-A	Reported														
Fluorene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34396 (ML-1) RF-A	Reported														
Hexachloroethane Year Round	Permit Limits	0.17 Avg. Monthly	0.689 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34418 (ML-1) RF-A	Reported														
Methyl Chloride Year Round	Permit Limits	0.095 Avg. Monthly	0.256 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		

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			Quantity				Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
34447 (ML-1) RF-A	Reported															
Nitrobenzene Year Round	Permit Limits	1.94 Avg. Monthly	5.553 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34461 (ML-1) RF-A	Reported															
Phenanthrene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34200 (ML-1) RF-A	Reported															
Acenaphthylene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34205 (ML-1) RF-A	Reported															
Acenaphthene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34215 (ML-1) RF-A	Reported															
Acrylonitrile Year Round	Permit Limits	0.082 Avg. Monthly	0.201 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			
34220 (ML-1) RF-A	Reported															
Anthracene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			

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		Quantity					Other Units					Measurement	Sample		
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре		
34230 (ML-1) RF-A	Reported														
Benzo (B) Fluoranthene Year Round	Permit Limits	0.017 Avg. Monthly	0.042 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34242 (ML-1) RF-A	Reported														
Benzo (K) Fluoranthene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34247 (ML-1) RF-A	Reported														
Benzo (A) Pyrene Year Round	Permit Limits	0.017 Avg. Monthly	0.042 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
34301 (ML-1) RF-A	Reported														
Chlorobenzene Year Round	Permit Limits	0.123 Avg. Monthly	0.33 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		
34506 (ML-1) RF-A	Reported														
1,1,1-Trichloroethane Year Round	Permit Limits	0.019 Avg. Monthly	0.051 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		
34511 (ML-1) RF-A	Reported														
1,1,2-Trichloroethane Year Round	Permit Limits	0.028 Avg. Monthly	0.11 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		

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			Quantity				Other Units					Moosuromont	Sampla		
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре		
34541 (ML-1) RF-A	Reported														
1,2-Dichloropropane Year Round	Permit Limits	0.17 Avg. Monthly	0.689 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		
34606 (ML-1) RF-A	Reported														
2,4-Dimethylphenol Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
39110 (ML-1) RF-A	Reported														
Di-n-butyl Phthalate Year Round	Permit Limits	0.017 Avg. Monthly	0.037 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
32103 (ML-1) RF-A	Reported														
1,2-Dichloroethane Year Round	Permit Limits	0.156 Avg. Monthly	0.498 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		
34694 (ML-1) RF-A	Reported														
Phenol, Single Compound Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite		
85811 (ML-1) RF-A	Reported														
Chloroethane Year Round	Permit Limits	0.095 Avg. Monthly	0.256 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab		

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			Quantity				Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
34010 (ML-1) RF-A	Reported															
Toluene Year Round	Permit Limits	0.024 Avg. Monthly	0.064 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			
37371 (ML-1) RF-A	Reported															
Ethyl Benzene Year Round	Permit Limits	0.123 Avg. Monthly	0.33 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			
00720 (ML-1) RF-A	Reported															
Cyanide, Total Year Round	Permit Limits	0.364 Avg. Monthly	1.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
34696 (ML-1) RF-A	Reported															
Naphthalene Year Round	Permit Limits	0.016 Avg. Monthly	0.041 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
39100 (ML-1) RF-A	Reported															
BIS(2-Ethylhexyl) Phthalate Year Round	Permit Limits	0.082 Avg. Monthly	0.224 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
32102 (ML-1) RF-A	Reported															
Carbon Tetrachloride Year Round	Permit Limits	0.123 Avg. Monthly	0.33 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			

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			Quantity				Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
01118 (ML-1) RF-A	Reported															
Chromium, Total Recoverable Year Round	Permit Limits	0.963 Avg. Monthly	2.403 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
32106 (ML-1) RF-A	Reported															
Chloroform Year Round	Permit Limits	0.096 Avg. Monthly	0.282 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	Grab			
34391 (ML-1) RF-A	Reported		1													
Hexachlorobutadiene Year Round	Permit Limits	0.123 Avg. Monthly	0.33 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/month	24 hr Composite			
51641 (ML-1) RF-A	Reported															
NEtFOSE Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51525 (ML-1) RF-A	Reported															
Perfluorooctanesulfonamide Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51522 (ML-1) RF-A	Reported															
Perfluorobutanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

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			Quantity				Other Units					Magguramont	Sampla			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
51623 (ML-1) RF-A	Reported															
Perfluoropentanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51624 (ML-1) RF-A	Reported															
Perfluorohexanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51625 (ML-1) RF-A	Reported															
Perfluoroheptanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51626 (ML-1) RF-A	Reported															
Perfluorononanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51627 (ML-1) RF-A	Reported															
Perfluorodecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51629 (ML-1) RF-A	Reported															
Perfluorododecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

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			Quantity													
Parameter			Quantity	Units	N.E.				CEL*	Units	N.E.	Measurement Frequency	Sample Type			
51642 (ML-1) RF-A	Reported															
NMeFOSE Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51521 (ML-1) RF-A	Reported															
Perfluorooctanoic acid Year Round	Permit Limits	3.0E-6 Avg. Monthly	4.0E-6 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51628 (ML-1) RF-A	Reported															
Perfluoroundecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51630 (ML-1) RF-A	Reported															
Perfluorotridecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51631 (ML-1) RF-A	Reported															
Perfluorotetradecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51643 (ML-1) RF-A	Reported															
NEtFOSAA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTEL OAD FOR THE	FACILITY NAME: (Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 MASTELOAD FOR THE MONTH OF: 108							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity													
Parameter			Quantity	Units	N.E.				CEL*	Units	N.E.	Measurement Frequency	Sample Type			
51644 (ML-1) RF-A	Reported															
NMeFOSAA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52602 (ML-1) RF-A	Reported															
Perfluorobutanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52603 (ML-1) RF-A	Reported															
Perfluorodecanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52604 (ML-1) RF-A	Reported															
Perfluoroheptanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52605 (ML-1) RF-A	Reported															
Perfluorohexanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52606 (ML-1) RF-A	Reported															
Perfluorooctanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed
	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my	Signature of Principal Executive Officer or Authorized Agent
	knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	ACILITY NAME: <u>(Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC</u> OCATION OF FACILITY: <u>WASHINGTON; Wood County</u> PERMIT NO.: <u>WV0117986</u> VASTELOAD FOR THE MONTH OF: Quantity							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity	-	_		Ot	her Units				Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
52607 (ML-1) RF-A	Reported															
4:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52608 (ML-1) RF-A	Reported															
6:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52609 (ML-1) RF-A	Reported		1													
8:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day	Lbs/Day	N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52610 (ML-1) RF-A	Reported															
Perfluoropentanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52611 (ML-1) RF-A	Reported															
Perfluorononanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52612 (ML-1) RF-A	Reported															
HFPO-DA Year Round	Permit Limits	0.000284 Avg. Monthly	0.000655 Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	FACILITY NAME: (Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 108 WASTELOAD FOR THE MONTH OF:							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity				Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
52626 (ML-1) RF-A	Reported															
NFDHA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52629 (ML-1) RF-A	Reported															
PFEESA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52632 (ML-1) RF-A	Reported															
Perfluorododecanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52636 (ML-1) RF-A	Reported															
ADONA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52641 (ML-1) RF-A	Reported															
NMeFOSA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
52642 (ML-1) RF-A	Reported															
NEtFOSA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	FACILITY NAME: (Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC LOCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986 WASTELOAD FOR THE MONTH OF:							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity				Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
PF001 (ML-1) RF-A	Reported															
3:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
PF002 (ML-1) RF-A	Reported															
PFMPA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
PF003 (ML-1) RF-A	Reported															
9CI-PF3ONS Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
PF004 (ML-1) RF-A	Reported															
11CI-PF3OUdS Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
PF005 (ML-1) RF-A	Reported															
7:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
PF006 (ML-1) RF-A	Reported															
PFMBA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Internal Outlet 108) THE CHEMOURS COMPANY FC, LLC</u> LOCATION OF FACILITY: <u>WASHINGTON; Wood County</u> PERMIT NO : WV0117986 108						CERTI	CERTIFIED LABORATORY NAME:							
PERMIT NO.: WV0117986 108 WASTELOAD FOR THE MONTH OF: 108 108														
							JUAL PERFUR	MING ANALYS	15					
			Quantity				Other Units Measurement					Measurement	Sample	
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре	
PF007 (ML-1) RF-A	Reported													
5:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and	Signature of Principal Executive Officer or Authorized Agent
	imprisonment for knowing violations.	

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	FACILITY NAME: (Internal Outlet 208) THE CHEMOURS COMPANY FC, LLC _OCATION OF FACILITY: WASHINGTON; Wood County PERMIT NO.: WV0117986							CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity				Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
50050 (ML-1) RF-A	Reported															
Flow,in Conduit or thru plant Year Round	Permit Limits	N/A	N/A			N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	mgd		Continuous	measured			
51641 (ML-1) RF-A	Reported															
NEtFOSE Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51525 (ML-1) RF-A	Reported															
Perfluorooctanesulfonamide Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51522 (ML-1) RF-A	Reported						1									
Perfluorobutanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Month		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51623 (ML-1) RF-A	Reported															
Perfluoropentanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51624 (ML-1) RF-A	Reported															
Perfluorohexanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or
Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u>	ACILITY NAME: <u>(Internal Outlet 208) THE CHEMOURS COMPANY FC, LLC</u> DCATION OF FACILITY: <u>WASHINGTON; Wood County</u> ERMIT NO.: <u>WV0117986</u> <u>208</u> ASTEL OAD FOR THE MONTH OF:							CERTIFIED LABORATORY NAME:CERTIFIED LABORATORY ADDRESS:								
WASTELOAD FOR THE	MONTH OF:					INDIVI	INDIVIDUAL PERFORMING ANALYSIS:									
			Quantity				Other Units					Measurement	Sample			
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре			
51625 (ML-1) RF-A	Reported															
Perfluoroheptanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51626 (ML-1) RF-A	Reported															
Perfluorononanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51627 (ML-1) RF-A	Reported															
Perfluorodecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51629 (ML-1) RF-A	Reported							1								
Perfluorododecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51642 (ML-1) RF-A	Reported															
NMeFOSE Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			
51521 (ML-1) RF-A	Reported															
Perfluorooctanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite			

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	ACILITY NAME: <u>(Internal Outlet 208) THE CHEMOURS COMPANY FC, LLC</u> DCATION OF FACILITY: <u>WASHINGTON; Wood County</u> ERMIT NO.: <u>WV0117986</u> ASTELOAD FOR THE MONTH OF:						CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
	1		Quantity				Other Units								
Parameter				Units	N.E.				CEL*	Units	N.E.	Measurement Frequency	Sample Type		
51628 (ML-1) RF-A	Reported														
Perfluoroundecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51630 (ML-1) RF-A	Reported														
Perfluorotridecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51631 (ML-1) RF-A	Reported														
Perfluorotetradecanoic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51643 (ML-1) RF-A	Reported														
NEtFOSAA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
51644 (ML-1) RF-A	Reported														
NMeFOSAA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
52602 (ML-1) RF-A	Reported														
Perfluorobutanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	ACILITY NAME: <u>(Internal Outlet 208) THE CHEMOURS COMPANY FC, LLC</u> OCATION OF FACILITY: <u>WASHINGTON; Wood County</u> PERMIT NO.: <u>WV0117986</u> 208 VASTELOAD FOR THE MONTH OF:						CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity				Other Units						Comula		
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Sample Type		
52603 (ML-1) RF-A	Reported														
Perfluorodecanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
52604 (ML-1) RF-A	Reported														
Perfluoroheptanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
52605 (ML-1) RF-A	Reported														
Perfluorohexanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
52606 (ML-1) RF-A	Reported														
Perfluorooctanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
52607 (ML-1) RF-A	Reported														
4:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
52608 (ML-1) RF-A	Reported														
6:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	ACILITY NAME: <u>(Internal Outlet 208) THE CHEMOURS COMPANY FC, LLC</u> OCATION OF FACILITY: <u>WASHINGTON; Wood County</u> PERMIT NO.: <u>WV0117986</u> 208 VASTELOAD FOR THE MONTH OF:						CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS: INDIVIDUAL PERFORMING ANALYSIS:							
			Quantity				Other Units					Measurement	Sample	
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре	
52609 (ML-1) RF-A	Reported													
8:2 Fluorotelomersulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52610 (ML-1) RF-A	Reported													
Perfluoropentanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52611 (ML-1) RF-A	Reported													
Perfluorononanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52612 (ML-1) RF-A	Reported						1							
HFPO-DA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52626 (ML-1) RF-A	Reported													
NFDHA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52629 (ML-1) RF-A	Reported													
PFEESA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: <u>(Inter</u> LOCATION OF FACILIT PERMIT NO.: <u>WV0117</u> WASTELOAD FOR THE	ACILITY NAME: <u>(Internal Outlet 208) THE CHEMOURS COMPANY FC, LLC</u> OCATION OF FACILITY: <u>WASHINGTON; Wood County</u> PERMIT NO.: <u>WV0117986</u> 208 VASTELOAD FOR THE MONTH OF:						CERTIFIED LABORATORY NAME: CERTIFIED LABORATORY ADDRESS: INDIVIDUAL PERFORMING ANALYSIS:							
		Quantity					Other Units					Measurement	Sample	
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Туре	
52632 (ML-1) RF-A	Reported													
Perfluorododecanesulfonic acid Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52636 (ML-1) RF-A	Reported													
ADONA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52641 (ML-1) RF-A	Reported													
NMeFOSA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
52642 (ML-1) RF-A	Reported													
NEtFOSA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
PF001 (ML-1) RF-A	Reported													
3:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	
PF002 (ML-1) RF-A	Reported													
PFMPA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite	

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed	
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and imprisonment for knowing violations.	Signature of Princ Authorized Agent	ipal Executive Officer or

Permit Limits

FACILITY NAME: (Inter	nal Outlet 208) THE CHEMO		IY FC, LLC	;	CERTI									
	92 <u>WASHING</u> 086		20	8		CERTI	-IED LABORAT	ORY ADDRES	S:						
WASTELOAD FOR THE	MONTH OF:		20	0			INDIVIDUAL PERFORMING ANALYSIS:								
			Quantity				Ot								
Parameter				Units	N.E.				CEL*	Units	N.E.	Frequency	Sample Type		
PF003 (ML-1) RF-A	Reported														
9CI-PF3ONS Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
PF004 (ML-1) RF-A	Reported														
11CI-PF3OUdS Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
PF005 (ML-1) RF-A	Reported														
7:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
PF006 (ML-1) RF-A	Reported									ĺ					
PFMBA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		
PF007 (ML-1) RF-A	Reported														
5:3 FTCA Year Round	Permit Limits	Rpt Only Avg. Monthly	Rpt Only Max. Daily	Lbs/Day		N/A	Rpt Only Avg. Monthly	Rpt Only Max. Daily	N/A	ug/l		1/week	24 hr Composite		

Name of Principal Executive Officer	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that	Date Completed
Title of Officer	qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of a fine and	Signature of Principal Executive Officer or Authorized Agent
	imprisonment for knowing violations.	

EMERGENCY RESPONSE SPILL ALERT SYSTEM WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

REQUIREMENTS:

Title 47, Series 11, Section 2 of the West Virginia Legislative Rules, Environmental Protection, Water Resources - Waste Management, Effective July 1, 1994.

RESPONSIBILITY FOR REPORTING:

Each and every person who may cause or be responsible for any spill or accidental discharge of pollutants into the waters of the State shall give immediate notification to the Division of Water and Waste Management's Emergency Notification Number, 1-800-642-3074. Such notification shall set forth insofar as possible and as soon thereafter as practical the time and place of such spill or discharge, type or types and quantity or quantities of the material or materials therein, action or actions taken to stop such spill or discharge and to minimize the polluting effect thereof, the measure or measures taken or to be taken in order to prevent a recurrence of any such spill or discharge and such additional information as may be requested by the Division of Water and Waste Management. This also applies to spills to the waters of the State resulting from accidents to common carriers by highway, rail and water.

It shall be the responsibility of each industrial establishment or other entity discharging directly to a stream to have available the following information pertaining to those substances that are employed or handled in its operation in sufficiently large amounts as to constitute a hazard in case of an accidental spill or discharge into a public stream:

(1) Potential toxicity in water to man, animals and aquatic life;

(2) Details on analytical procedures for the quantitative estimation of such substances in water and

(3) Suggestions on safeguards or other precautionary measures to nullify the toxic effects of a substance once it has gotten into a stream.

Failure to furnish such information as required by Section 14, Article 11, Chapter 22, Code of West Virginia may be punishable under Section 24, Article 11, Chapter 22, and/or Section 22, Article 11, Chapter 22, Code of West Virginia.

It shall be the responsibility of any person who causes or contributes in any way to the spill or accidental discharge of any pollutant or pollutants into State waters to immediately take any and all measures necessary to contain such spill or discharge. It shall further be the responsibility of such person to take any and all measures necessary to clean-up, remove and otherwise render such spill or discharge harmless to the waters of the State.

When the Director determines it necessary for the effective containment and abatement of spills and accidental discharges, the Director may require the person or persons responsible for such spill or discharge to monitor affected waters in a manner prescribed by the Director until the possibility of any adverse effect on the waters of the State no longer exists.

VOLUNTARY REPORTING BY LAW OFFICERS, U. S. COAST GUARD, LOCK MASTERS AND OTHERS:

In cases involving river and highway accidents where the responsible party may or may not be available to report the incident, law officers, U. S. Coast Guard, Lock Masters and other interested person(s) should make the report.

WHO TO CONTACT:

Notify the following number: 1-800-642-3074

INFORMATION NEEDED:

- Source of spill or discharge
- Location of incident
- Time of incident
- Material spilled or discharged
- Amount spilled or discharged
- Toxicity of material spilled or discharged
- Personnel at the scene
- Actions initiated
- Shipper/Manufacturer identification
- Railcar/Truck identification number
- Container type

NOTICE TO PERMITTEES

The 1999 regular session of the West Virginia legislature revised the Water Pollution Control Act, Chapter 22, Article 11, Section 10 of the Code of West Virginia relating to fees associated with permits. This section of the Code requires all holders of a State water pollution control permit or a national pollutant discharge elimination system permit to be assessed an annual permit fee, based upon rules promulgated by the Secretary of the Department of Environmental Protection. The Secretary has promulgated a final rule in accordance with the code revision to this effect and these rules were effective May 4, 2000. The rules establish an annual permit fee based upon the relative potential to degrade the waters of the State which, in most instances, relate to volume of discharge. However, for sewage facilities, the annual permit fee is based upon the number of customers served by the facility. You may contact the Secretary of State's Office, State Capitol Building, Charleston, WV 25305, to obtain a copy of the rules. The reference is Title 47, Legislative Rules, Department of Environmental Protection, Division of Water Resources, Series 26 Water Pollution Control Permit Fee Schedules.

Based upon the volume of discharge for which your facility is currently permitted, the number of customers served by your facility or for the category you fall within, pursuant to Section 7 of Title 47, Series 26, your annual permit fee is **\$5000.00**. This fee is due no later than the anniversary date of permit issuance in each year of the term of the permit or in the case of coverage under a general permit, the fee is due no later than the anniversary date of your coverage under the general permit. You will be invoiced by this agency at the appropriate time for the fee. Failure to submit the annual fee within ninety(90) days of the due date will render your permit void upon the date you are mailed a certified written notice to that effect.

STATE OF WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF WATER AND WASTE MANAGEMENT

FACT SHEET

1. NAME AND ADDRESS OF APPLICANT

THE CHEMOURS COMPANY FC, LLC 8480 DUPONT RD WASHINGTON, WV 26181

2. NAME AND ADDRESS OF FACILITY

The Chemours Company FC, LLC 8480 DuPont Road Washington, WV 26181

3. STATE NPDES APPLICATION NO. WV0117986

- 4. COUNTY Wood RECEIVING STREAM Ohio River
- 5. PUBLIC NOTICE NO. L-113-23 COMMENT PERIOD: From 12/29/2023 To 01/28/2024
- 6. SIC CODE(s) 2821

7. DESCRIPTION OF APPLICANT'S FACILITY OR ACTIVITY

Chemours is proposing to construct a perfluoroalkoxy alkane (PFA) production facility designated as PFA Finishing Line 2. This facility will be located at Chemours Washington Works, Washington, WV. PFA is a fluorocarbon polymer (SIC Code 2821) and is regulated under the United States Environmental Protection Agency's (USEPA) 40 CFR 414 Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF), Subpart D (Thermoplastics Resins) Effluent Limit Guidelines (ELG) and Subpart J (Direct Discharge Point Sources That Do Not Use End-of-Pipe Biological Treatment) ELGs. Chemours submitted this permit application to authorize discharges of process wastewater and non-contact cooling water (NCCW) from the production area to proposed Outfall 008. The combined wastewater from Outfall 008 will enter the conveyance channel for Outfall 005 downstream of the compliance monitoring point for Outlet 005 contained in WV/NPDES Permit No. WV0001279 which is also issued to Chemours.

The PFA Finishing Line 2 facility will use demineralized water and NCCW from the Site to wash and separate solids so that they can be dried, extruded, and packaged as product. The demineralized water comes from a groundwater header on the Site and is treated using ion exchange (IX). NCCW is generated by treating groundwater from the Ranney Well with granular activated carbon (GAC). The GAC treatment for the Ranney Well was permitted in 2021 in WV/NPDES Permit No. WV0001279 to treat for perfluoroalkoxy alkane (PFOA) and hexafluoropropylene oxide dimer acid (HFPO-DA) but could still contain small amounts. The total discharge flow from proposed Outlet 008 (process wastewater and NCCW) from the PFA Finishing Line 2 process provided in the permit application will be approximately an average monthly flow of 0.411 million gallons per day (MGD) and a maximum daily flow of approximately 0.576 MGD.

During the PFA Line 2 Finishing process, water will be supplied and used as process water and NCCW. Process wastewater will be collected and sent to the Line 2 Wastewater Tank. The remaining water, which consists of NCCW will be collected and discharged through Internal Outfall 208 (0.307 MGD average monthly and 0.43 MGD maximum daily). The process wastewater from the Line 2 Wastewater Tank will be treated using three granular activated carbon (GAC) beds in series, pH control, and a nitrate treatment system prior to discharging through Internal Outfall 801 (0.104 MGD average monthly and 0.146 MGD

Permit No. WV0117986 Page 2 of 9

7. DESCRIPTION OF APPLICANT'S FACILITY OR ACTIVITY(continued)

maximum daily). The wastewaters from Internal Outlets 108 and 208 will combine and receive dechlorination treatment and discharge through Outlet 008 (0.411 MGD average monthly and 0.576 MGD maximum daily).

8. DESCRIPTION OF DISCHARGES(as reported by applicant):

N/A

9. PROPOSED EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Refer to attached Section A and DMR pages of the Draft Permit.

10. RATIONALE FOR PROPOSED EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS INTERNAL OUTFALL NUMBERS

The permittee identified the process wastewater as being discharged through Internal Outlet 801 in the application and the NCCW as being discharged through Internal Outlet 802 in the permit application. In order to maintain consistency with the agency's internal outfall numbering protocol, this permit and fact sheet are designating the process wastewater as Internal Outlet 108 and the NCCW as Internal Outlet 208.

INTERNAL OUTLET 108 OCPSF Effluent Guideline

PFA Finishing Line 2 is subject to the OCPSF effluent guideline (40 CFR 414 Subparts D and J). Specifically, the New Source Performance Standards (NSPS) under 40 CFR 414.44(b) and 40 CFR 414.101. Internal Outlet 108 is being designated as an internal compliance monitoring location for the process wastewater subject to these effluent guideline requirements. The permittee reported that the expected long-term average discharge of process wastewater subject to this effluent guideline will be 0.104 MGD. This flow was used to determine the average monthly and maximum daily effluent limitations for the pollutants identified in this effluent guideline and these effluent limitations are imposed at Internal Outlet 108. Since this is a new discharge, the monitoring waiver allowances provided under 40 CFR 122.44(a)(2) are not allowed for the first permit cycle. Calculations are attached to the fact sheet.

BEST PROFESSIONAL JUDGMENT (BPJ) CONSIDERATION

BPJ limits are established in cases where ELGs are not available for, or do not regulate, a particular pollutant of concern. Based on the information supplied on the process wastewater characteristics at Internal Outlet 108, the agency has determined that HFPO-DA, PFOA, and nitrate are pollutants of concern for consideration of technology based effluent limits. The wastewater characteristics for fluoride, ammonia nitrogen, and sulfate provided in the permit application were deemed to be low (below or near existing water quality criteria) for these pollutants, and these pollutants were not considered pollutants of concern for consideration of technology based effluent limits. The OCPSF effluent guideline did not consider HFPO-DA, PFOA, or nitrate as pollutants of concern and BPJ was evaluated for these pollutants at Internal Outlet 108. Generally, EPA has defined BPT performance as the "average of the best existing performance by well operated plants within each industrial category or subcategory." The BAT level of performance was defined as the "very best control and treatment measures that have been or are capable of being achieved." The 1972 amendments, however, made no distinction regarding the application of BPT or BAT to different types

10. RATIONALE FOR PROPOSED EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

of pollutants (i.e., BPT and BAT applied to all pollutants). The CWA did provide additional guidance for determining the economic achievability of BPT and BAT. The BPT standards required that effluent limits be justified in terms of the "total cost of [industry wide] application of the technology in relation to the effluent reduction benefits to be achieved." Thus, BPT required EPA to consider a cost-benefit test that considered a broad range of engineering factors relating to a category's ability to achieve the limits. For BAT, the EPA must still consider the cost of attainability, however, it is not required to balance cost against the effluent reduction benefit. Generally, as a result, BAT is a more stringent assessment than BPT, and a BAT assessment would result in limits that are at least as stringent as those limits from a BPT assessment. For these reasons, a BAT assessment was evaluated and a BPT assessment was not evaluated.

Internal Outlet 108 HFPO-DA/PFOA BPJ of BAT

The agency reviewed information in EPA's RREL Treatability Database (TD) regarding HFPO-DA and PFOA treatment technologies. No information was available in the TD for these compounds. The agency reviewed EPA's PFAS Basics and EPA Tools for Drinking Water Treatment document. This document identified ion exchange (IX), reverse osmosis (RO), and granulated activated carbon (GAC) as effective treatments for PFAS removal for drinking water. In this document, IX, RO, and GAC were identified as having 90%-99% removal, 93%-99% removal, and >89% to >98% removal of PFAS in drinking water respectively. The permittee provided information in the permit application on treatment options for HFPO-DA and PFOA which included RO, IX, Regenerative IX, and GAC (including combinations of some of these treatments). This information indicated that 2 GAC beds, IX, regenerable IX, and RO can each achieve 99.98% removal of HFPO-DA and PFOA. Combination of technologies indicated that 3 GAC beds, 2 GAC beds with IX, and 4 GAC beds can achieve 99.999% removal, 99.999% removal, and 99.99995% removal respectively. Drinking water and wastewater are not the same thing and comparing the treatment effectiveness may not be appropriate due to the difference in the water/wastewater characteristics. Nevertheless, the treatment technologies reviewed for drinking water (EPA information) and wastewater (permittee information) do suggest comparable removal of HFPO-DA and PFOA. Therefore, the technologies provided by the permittee were evaluated for BPJ of BAT. The permittee supplied information for the aforementioned treatment technologies in the permit application which considered various factors including installation and operational costs per pound of HFPO-DA/PFOA removed over a twenty-year period. Information provided indicated the following costs per pound removed as being: \$34/lb (2 GAC beds, 99.98% removal); \$38/lb (IX, 99.98% removal); \$34/lb (regenerative IX, 99.98% removal); \$368/lb (RO, 99.98% removal); \$46,176/lb (2 GAC beds and IX, 99.999% removal); \$43,824/lb (3 GAC beds, 99.999% removal); and \$541,176/lb (4 GAC beds, 99.99995% removal). The agency has determined that 99.999% removal is considered BPJ of BAT. Permit application information regarding these treatment technologies and costs for PFAS reductions are attached to the fact sheet.

Internal Outlet 108 HFPO-DA BPJ of BAT Effluent Limits

Existing PFA Finishing Line 1 (permitted under WV/NPDES Permit No. WV0001279) currently receives treatment from two GAC (granulated activated carbon) beds in series. The source water used for PFA Finishing Line 1 uses Ranney Well water and demineralized water. Influent and effluent HFPO-DA data were provided from the existing PFA Finishing Line 1 process from 2022 and 2023 (this data was referred to as the W9 Permeate in the application). Additionally, each data set provided percent removal information. Information in the permit application indicates that 2 GAC beds in series can achieve 99.98% removal of HFPO-DA. The permittee's evaluation of this data identifies that the 25th percentile value of the percent removals achieved is 99.98% of HFPO-DA at PFA Finishing Line 1. As the permittee has asserted that

10. RATIONALE FOR PROPOSED EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

99.98% is achievable with 2 GAC beds in series, only the effluent concentration data provided where at least 99.98% removal was achieved was considered in the assessment of the BPJ of BAT effluent limitations for PFA Finishing Line 2. The agency believes this is appropriate because the existing GAC treatment at PFA Finishing Line 1 does not currently have any specific technology-based operational controls/limits imposed which can contribute to less frequent carbon change outs than may be necessary to maintain optimal treatment. Proper operation and maintenance of the GAC beds is required, and the permittee must implement measures to maintain treatment efficiency. Data reported as non-detect were set equal to the detection level. A third GAC bed in series will also be utilized for PFA Finishing Line 2 which the permittee has asserted will provide for an additional 95% removal of HFPO-DA after treatment from the first two GAC beds for the effluent from the PFA Finishing Line 2. Therefore, the appropriate effluent concentration data from PFA Finishing Line 1 was further reduced by 95% to account for the additional reduction in HFPO-DA from use of the third GAC bed. This effluent concentration data was used in accordance with the lognormal effluent limitation derivation procedures provided in Appendix E of EPA's Technical Support Document (TSD) to develop average monthly and maximum daily effluent limitations. These calculated concentration limitations of 0.327 ug/l average monthly and 0.756 ug/l maximum daily are now memorialized as being BPJ of BAT for this discharge. The reported long-term average flow in the permit application for this wastewater is 0.104 MGD. Similar to the OCPSF effluent guideline requirements, this long-term average flow value was multiplied by the calculated concentration limits to determine average monthly and maximum daily mass limitations. These mass limitations are imposed for HFPO-DA at Internal Outlet 108. Future reassessment of BPJ of BAT will utilize the actual long-term average discharge flow in conjunction with the memorialized concentration limits noted above. Calculations are attached to the fact sheet.

Internal Outlet 108 PFOA BPJ of BAT Effluent Limits

The new PFAS Finishing Line 2 process does not use/add any PFOA. The only potential sources of PFOA at Internal Outlet 108 comes from the source water used in the process. Similar to PFA Finishing Line 1, the source water is comprised of Ranney Well water and demineralized water. Existing PFA Finishing Line 1 currently receives treatment from two GAC (granulated activated carbon) beds in series. PFOA effluent data was provided from the existing PFA Finishing Line 1 process (this data was referred to as the W9 Permeate in the application). The agency used the PFOA effluent data provided from 2022 to 2023 in its assessment. Data reported as non-detect were set equal to the detection level. A third GAC bed in series will also be utilized which the permittee has asserted will provide for an additional 95% removal of HFPO-DA after treatment from the first two GAC beds for the effluent from the PFA Finishing Line 2. The agency has assumed that this 3rd GAC bed will also provide for an additional 95% removal of PFOA. This effluent concentration data from PFA Finishing Line 1 was further reduced by 95% to account for the additional reduction in PFOA from use of the third GAC bed. This effluent concentration data was used in accordance with the lognormal effluent limitation derivation procedures provided in Appendix E of EPA's Technical Support Document (TSD) to develop average monthly and maximum daily effluent limitations. These calculated concentration limitations of 0.004 ug/l average monthly and 0.005 ug/l maximum daily are now memorialized as being BPJ of BAT for this discharge. The reported long-term average flow in the permit application for this wastewater is 0.104 MGD. Similar to the OCPSF effluent guideline requirements, this long-term average flow value was multiplied by the calculated concentration limits to determine average monthly and maximum daily mass limitations. These mass limitations are imposed for PFOA at Internal Outlet 108. Future reassessment of BPJ of BAT will utilize the actual long-term average discharge flow in conjunction with the memorialized concentration limits noted above. Calculations are attached to the fact sheet.

10. RATIONALE FOR PROPOSED EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued) Internal Outlet 108 Nitrate BPJ of BAT

Information provided in the permit application indicates the projected nitrate concentration in the wastewater is to be 143 mg/l. The agency reviewed information in EPA's RREL Treatability Database (TD) regarding Nitrate treatment technologies. Information was available in the TD for nitrate influent concentrations ranging from 10 - 100 mg/l (no information was available for treatment technologies with a nitrate influent concentration above 100 mg/l). The TD included nitrate information for reverse osmosis of domestic wastewater (90.4% removal with an influent concentration of 25 mg/l), reverse osmosis of industrial wastewater (95.4% removal with an influent concentration of 65 mg/l), and ion exchange of groundwater wastewater (89.6% removal with an influent concentration of 16 mg/l). The permittee provided information on three treatment options for nitrate which included reverse osmosis (RO), ion exchange (IX), and biological treatment. This information indicated that all three of these treatment technologies can similarly obtain a reduction to 10 mg/l for nitrate for the permittee's wastewater. When considering the influent level of 143 mg /l, this results in a percent removal of 93%. While not directly comparable to the removal rates provided in the TD for nitrate (due to the significantly different influent concentration of nitrate in the permittee's wastewater and the nature of the wastewater), 93% removal is comparable to the removal rates of the technologies in the TD. Therefore, the technologies provided by the permittee were evaluated for BPJ of BAT. The permittee supplied information for RO, IX, and biological treatment in the permit application which considered various factors including installation and operational costs per pound of nitrate removed over a five-year period. While this information was reviewed, it is to be noted that each technology will achieve the same 10 mg/l level for nitrate. Therefore, this treatment level was considered BPJ of BAT since each treatment technology will result in approximately the same 93% reduction. Permit application information regarding these treatment technologies and costs for nitrate reductions are attached to the fact sheet.

There was no effluent data available to calculate actual effluent variability. Therefore, the agency assumed a default coefficient of variation of 0.6 as recommended by EPA's TSD. This resulted in calculated average monthly and maximum daily concentration limits of 15.5 mg/l and 31.1 mg/l respectively. These calculated concentration limitations of 15.5 mg/l average monthly and 31.1 mg/l maximum daily are now memorialized as being BPJ of BAT for this discharge. The reported long-term average flow in the permit application for this wastewater is 0.104 MGD. Similar to the OCPSF effluent guideline requirements, this long-term average flow value was multiplied by the calculated concentration limits to determine average monthly and maximum daily mass limitations. These mass limitations are imposed for nitrate at Internal Outlet 108. Future reassessment of BPJ of BAT will utilize the actual long-term average discharge flow in conjunction with the memorialized concentration limits noted above. Calculations are attached to the fact sheet.

OUTLET 008 Water Quality Based Effluent Limits

A Tier 2 and Tier 1 antidegradation review were conducted for the pollutants of concern at Outlet 008. Information regarding the antidegradation review is included in Section 13 of the Fact Sheet. As concluded from the antidegradation review, the Tier 1 limitations are more stringent water quality based effluent limitations for temperature, nitrate, ammonia nitrogen, total residual chlorine, HFPO-DA, and PFOA. Water quality based effluent limits are imposed for temperature, ammonia nitrogen, and total residual chlorine at Outlet 008. Calculations are attached to the fact sheet. pH limitations are also imposed to protect water quality criteria.

OUTLET 008 HFPO-DA and PFOA Effluent Limits

10. RATIONALE FOR PROPOSED EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

Internal Outlets 108 and 208 combine and ultimately discharge through Outlet 008. Due to the imposition of the technology based limits for HFPO-DA, PFOA, and nitrate at Internal Outlet 108, a comparison of the technology based requirements being implemented was necessary to determine the more stringent requirements (water quality based or technology based) at Outlet 008. In order to account for the low levels of HFPO-DA and PFOA at Internal Outlet 208 (NCCW), a statistical assessment of HFPO-DA and PFOA were evaluated to determine the loads from Internal 208. The Ranney Well water is treated with 2 GAC beds at two locations at the site (the two different locations are denoted as East and West in the permit application). Each location treats Ranney Well water with 2 GAC beds in series and then the treated water from both locations are combined for use at the site. Treated Ranney Well water data was provided in the permit application for both the East and West locations for HFPO-DA and PFOA. It is to be noted that most of the HFPO-DA and PFOA data were non-detect at 50 ng/l and 20 ng/l respectively at both the East and West locations. It was assumed that the quantity of water flow at each Ranney Well location (East and West) was evenly distributed. In order to characterize the combined treated Ranney Well data for both the East and West locations, each particular result was averaged from both locations to obtain a singular result representative of the treated Ranney Well source water. This effluent concentration data was used in accordance with the lognormal effluent limitation derivation procedures provided in Appendix E of EPA's Technical Support Document (TSD) to determine average monthly and max daily concentrations for HFPO-DA and PFOA from the NCCW. The reported long-term average flow in the permit application for the NCCW is 0.307 MGD. Similar to the OCPSF effluent guideline requirements, this long-term average flow value was multiplied by the calculated concentration levels to determine average monthly and maximum daily mass loads for HFPO-DA and PFOA from the NCCW. The loads from Internal Outlets 108 and 208 were added together to determine the allowable loads at Outlet 008 for HFPO-DA and PFOA. The total average monthly flow at Outlet 008 (average flow from Internal Outlets 108 and 208) is 0.411 MGD. This flow was used to calculate the average monthly and maximum daily allowable concentrations for HFPO-DA and PFOA at Outlet 008. These equivalent concentrations and loads were compared to the water quality based concentration and equivalent load limits at Outlet 008. The combined calculated loads and equivalent concentrations from Internal Outlets 108 and 208 were more stringent than the water quality based concentrations and loads and these were imposed at Outlet 008 for HFPO-DA and PFOA. Calculations are attached to the fact sheet.

OUTLET 008 Nitrate Effluent Limits

A similar assessment to the HFPO-DA and PFOA limits noted above was conducted for nitrate at Outlet 008. However, the expected nitrate load from Internal Outlet 208 was deemed negligible and the calculated loads from Internal Outlet 108 were directly applied at Outlet 008. The resultant loads and equivalent concentrations of nitrate were more stringent than the water quality based concentrations and loads and were imposed at Outlet 008 for HFPO-DA and PFOA. Calculations are attached to the fact sheet.

OUTLET 008 Other Monitoring

Copper, iron, fluoride, and nitrite were reported as believed present at Outlet 008 at low levels in the permit application. Therefore, monitoring for copper, fluoride, iron, and nitrite were imposed in order to characterize the discharge. Additionally, monitoring for monitoring for acute whole effluent toxicity was imposed at Outlet 008.

11. RATIONALE FOR VARIANCE DECISIONS

NA.

Outlet No.	Latitude	Longitude	Receiving Stream
008	39°16'11"	81°40'36"	OHIO RV
108	39°16'13"	81°40'31"	OHIO RV
208	39°16'13"	81°40'30"	OHIO RV

12. DETAILED DESCRIPTION OF LOCATION OF DISCHARGE(s)

13. ANTIDEGRADATION

Limitations must control all pollutants which may be discharged at a level which will cause, or have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. Additionally, where a State has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contribute to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must establish effluent limits in an NPDES permit. In determining an appropriate value to be protective of narrative criterion, risk assessment data may be considered. West Virginia does not currently have any numeric water quality criteria prescribed for HFPO-Da or PFOA. However, the agency does have concerns with the toxicity from HFPO-DA and PFOA and its impact on the narrative water quality criteria found in 47 CSR 2, Section 3.2.e which prohibits discharges from discharging materials in concentrations which are harmful to or toxic to man, animal, or aquatic life. Therefore, the agency does possess a narrative water quality criterion which can be used for limiting specific pollutants where the State has no numeric criteria for those pollutants.

In June 2017, HFPO-DA (GenX) became a concern in the Cape Fear River in North Carolina at the Chemours-Fayetteville Works plant where Chemours operates another chemical manufacturing facility. At that time, there were no federal health guidelines for HFPO (GenX). In July 2017, North Carolina reached out to the US EPA for assistance in developing an updated health screening level for HFPO (GenX) to help with this process. Laboratory studies on animals show negative effects to the liver and blood, along with cancer of the liver, pancreas, and testicles. North Carolina in conjunction with the US EPA used available toxicity information to set a health goal for HFPO-DA (GenX) in drinking water at 140 nanograms per liter (ng/L) or parts per trillion (ppt). As a result, the WVDEP used this value to be protective of the State's narrative water quality criteria for human health and the designated uses of the Ohio River in the 2018 permit reissuance for WV/NPDES Permit No. WV0001279. Additionally, the WVDEP previously used EPA's Human Health Advisory Level of 70 ng/l to be protective of the State's narrative water quality criteria for human health and the designated uses of the Ohio River in the 2018 permit reissuance for WV/NPDES Permit No. WV0001279. The WVDEP is continuing to use these values to be protective of the State's narrative water quality criteria for human health and the designated uses of the Ohio River in this permit. These values were used as the water quality criterion for the protection of the State's narrative water quality criteria in the Tier 2 and Tier 1 assessments discussed below.

The discharge from Outlet 008 is a new discharge and both a Tier 2 and Tier 1 antidegradation review are required for the parameters of concern. The agency reviewed all information and determined that HFPO-DA, PFOA, nitrate nitrogen, ammonia nitrogen, total residual chlorine, and temperature were the pollutants of concern with the new discharge which includes an average monthly flow of 0.411 MGD and a maximum daily flow of 0.576 MGD of process wastewater and non-contact cooling water. The permittee supplied stream data from the Ohio River for HFPO-DA. Stream data for the Ohio River was available for PFOA and temperature from data reported in WV/NPDES Permit No. WV0001279 which is also issued to the Chemours facility. Stream data for the Ohio River was available for ammonia nitrogen and nitrate nitrogen from data collected by ORSANCO. The agency assumes stream levels for total residual chlorine to be

13. ANTIDEGRADATION (continued)

zero since it dissipates quickly. This stream data was used to determine baseline water quality for these pollutants in the Tier 2 and Tier 1 assessments.

For the Tier 2 assessment, the BWQ value was used in conjunction with the critical stream flow for human health water quality criteria (harmonic mean flow of 24,500 cfs) and critical stream flow for aquatic life water quality criteria (7Q10 flow of 6,560 cfs) and the maximum discharge flow of 0.576 MGD to determine the necessary Tier 2 limits to ensure that the new discharge will not increase the BWQ level by more than 10% of the remaining assimilative capacity. Calculations are attached to the fact sheet. For the Tier 1 assessment, default mixing zones (ZID=3, CMZ=10, HHCMZ=30) were granted for Outlet 008 for the Tier 1 assessment in conjunction with the stream background data. Calculations are attached to the fact sheet. The calculated Tier 1 water quality-based effluent limits at Outlet 008 are more stringent than the Tier 2 limits for all pollutants of concern noted above. Therefore, the agency has determined that the proposed activity will not cause significant degradation and both Tier 2 and Tier 1 protection are afforded for the uses specified in 47 CSR 2, Section 6.

14. OTHER REQUIREMENT(s)

PFAS (Per- And Polyfluoroalkyl Substances) REQUIREMENTS

Monitoring requirements for 40 PFAS compounds are imposed at Internal Outlet 108, Internal Outlet 208, and Outlet 008 in order to characterize the wastewater discharges. Section D of the permit contains information regarding these compounds and appropriate test method to be used.

The State of West Virginia, Department of Environmental Protection, Division of Water and Waste Management, has made tentative decisions on the application for a State NPDES Permit listed on this Fact Sheet. In order to provide public participation on the proposed issuance of the required permit, the following information is being supplied in accordance with 47 CSR, Series 10, Section 11.3.e.2 and 3, of the West Virginia Legislative Rules.

During the public comment period, any interested person may submit written comments on the draft permit and may request a public hearing, if no public hearing has already been scheduled. A request for a public hearing shall be made in writing and addressed to:

> Director, Division of Water and Waste Management, DEP 601 57th Street SE Charleston, West Virginia 25304-2345 Attention: Lori Derrick

The request shall state the nature of the issues proposed to be raised in the hearing, and must be received within the comment period. The Director shall hold a public hearing whenever he, or she, finds, on the basis of requests, a significant degree of public interest on issues relevant to the draft permit. Any person may submit oral or written statements and data concerning the draft permit, however, reasonable limits may be set upon the time allowed for oral statements, and the submission of statements in writing may be required. A tape recording or written transcript of the hearing shall be made available to the public, upon request.

If information received during the public comment period appears to raise substantial new questions, the Director may reopen the public comment period.

All applicable information concerning the permit application and the tentative decisions is on file and may be inspected, by appointment, or copies obtained, at a nominal cost, at the offices of the Division of Water and Waste Management, 601 57th Street SE, Charleston, West Virginia 25304-2345, Monday through Friday (except State holidays) between 8:00 a.m. and 4:00 p.m.

Requests for additional information should be directed to Lori Derrick at (304) 926-0499 ext 1057.

Chemours Washington Works Outlet 008 HFPO Baseline Water Quality Data and Background Data

BWQ		
Date	HFPO Result	HPFO Value Used
Collected	(ug/l)	(ug/l)
2/16/2022	<0.0026	0.0013
3/16/2022	<0.0026	0.0013
5/11/2022	<0.0025	0.00125
6/1/2022	<0.0025	0.00125
6/30/2022	0.0054	0.0054
8/17/2022	0.003	0.003
9/28/2022	0.0077	0.0077
11/2/2022	0.003	0.003
12/12/2022	<0.0027	0.00135

Average BWQ:

0.002838889 ug/l

Background		
Date	HFPO Result	HPFO Value Used
Collected	(ug/l)	(ug/l)
2/16/2022	<0.0026	0.0013
3/16/2022	<0.0026	0.0013
5/11/2022	<0.0025	0.00125
6/1/2022	<0.0026	0.0013
6/30/2022	0.0038	0.0038
8/17/2022	0.0048	0.0048
9/28/2022	<0.0026	0.0013
11/2/2022	<0.0026	0.0013
12/12/2022	<0.0027	0.00135

Average Background:

0.001966667 ug/l

Tier 2 Review - HFPO DA

Harmonic Mean Stream Flow:	24500	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	0.002839	ug/l
WQC:	0.14	ug/l
10% Remaining Assimilative Capacity:	0.016555	ug/l
Tier 2 Allowable Conc.:	377.6288	ug/l
Tier 2 Allowable Equivalent Load:	1.814069	lbs/day

Tier 2 Review - Ammonia Nitrogen

	, anni e na e gen		
	7Q10 Stream Flow:	6560	cfs
	Expanded Process Flow:	0.576	MGD
	BWQ:	0.0478	mg/l
	WQC:	3.646	mg/l
10% Rem	naining Assimilative Capacity:	0.40762	mg/l
	Tier 2 Allowable Conc.:	2652.802	mg/l
Tier	2 Allowable Equivalent Load:	12743.64	lbs/day

Tier 2 Review - Total Residual Chlorine

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	0	mg/l
WQC:	0.011	mg/l
10% Remaining Assimilative Capacity:	0.0011	mg/l
Tier 2 Allowable Conc.:	8.109694	mg/l
Tier 2 Allowable Equivalent Load:	38.95767	lbs/day

Tier 2 Review - PFOA

Ha	rmonic Mean Stream Flow:	24500	cfs
	Expanded Process Flow:	0.576	MGD
	BWQ:	0.00505	ug/l
	WQC:	0.07	ug/l
10% Remai	ning Assimilative Capacity:	0.011545	ug/l
	Tier 2 Allowable Conc.:	178.8225617	ug/l
Tier 2	Allowable Equivalent Load:	0.859034975	lbs/day

Tier 2 Review - Nitrate Nitrogen

ici z neview - initiate initiogen		
Harmonic Mean Stream Flow:	24500	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	0.8078	mg/l
WQC:	10	mg/l
10% Remaining Assimilative Capacity:	1.72702	mg/l
Tier 2 Allowable Conc.:	25308.37256	mg/l
Tier 2 Allowable Equivalent Load:	121577.3724	lbs/dav

Tier 2 Review - Temperature January

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	43.5	deg F
WQC:	45	deg F
10% Remaining Assimilative Capacity:	43.65	deg F
Tier 2 Allowable Temp.:	1149.367	deg F

Tier 2 Review - Temperature February

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	42.2	deg F
WQC:	45	deg F
10% Remaining Assimilative Capacity:	42.48	deg F
Tier 2 Allowable Temp.:	2106.486	deg F

Tier 2 Review - Temperature March

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	44.3	deg F
WQC:	51	deg F
10% Remaining Assimilative Capacity:	44.97	deg F
Tier 2 Allowable Temp.:	4983.841	deg F

Tier 2 Review - Temperature April

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	48.6	deg F
WQC:	58	deg F
10% Remaining Assimilative Capacity:	49.54	deg F
Tier 2 Allowable Temp.:	6978.702	deg F

Tier 2 Review - Temperature May

7Q10 Stream Flow	: 6560	cfs
Expanded Process Flow	: 0.576	MGD
BWQ	: 46.5	deg F
WQC	: 68	deg F
10% Remaining Assimilative Capacity	48.65	deg F
Tier 2 Allowable Temp.	: 15897.27	deg F

Tier 2 Review - Temperature June

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	47.6	deg F
WQC:	80	deg F
10% Remaining Assimilative Capacity:	50.84	deg F
Tier 2 Allowable Temp.:	23934.34	deg F

Tier 2 Review - Temperature July

						6	56	60	С	fs		
						0.	57	76	Ν	٧GI	D	
						e	69	.4	c	deg	F	
							8	84	c	deg	F	
						70).8	86	d	leg	F	
30	1	10	08	33	3.1	17	57	71	c	leg	F	

Tier 2 Review - Temperature August

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	72.8	deg F
WQC:	84	deg F
10% Remaining Assimilative Capacity:	73.92	deg F
Tier 2 Allowable Temp.:	8329.943013	deg F

Tier 2 Review - Temperature September

· · · · · · · · · · · · · · · · · · ·		
7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	64.6	deg F
WQC:	82	deg F
10% Remaining Assimilative Capacity:	66.34	deg F
Tier 2 Allowable Temp.:	12892.66147	deg F

Tier 2 Review - Temperature October

	7Q10 Stream Flow:	Γ	6560	cfs	
а	anded Process Flow:	L	0.576	MGD	
	BWQ:	L	60.6	deg F	
	WQC:	L	72	deg F	
s	ssimilative Capacity:	L	61.74	deg F	
r	2 Allowable Temp.:	L	8465.191996	deg F	

Tier 2 Review - Temperature November

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	47	deg F
WQC:	67	deg F
10% Remaining Assimilative Capacity:	49	deg F
Tier 2 Allowable Temp.:	14791.89824	deg F

Tier 2 Review - Temperature December

7Q10 Stream Flow:	6560	cfs
Expanded Process Flow:	0.576	MGD
BWQ:	43.7	deg F
WQC:	52	deg F
10% Remaining Assimilative Capacity:	44.53	deg F
Tier 2 Allowable Temp.:	6162.832769	deg F

WATER QUALITY BASED EFFLUENT LIMITATIONS Chemours

Outlet: 008

Stream: Ohio River

Hardness (mg/l):	108	Instream Waste %:	0.01
Temperature (°C):	27	ZID:	3.0
pH:	7.78	CMZ:	10.0
Stream 1Q10 (CFS):	NA	HH CMZ:	30.0
Stream 7Q10 (CFS):	6560	HHA 1/2 Mile Rule CMZ:	30.0
Effluent Flow (MGD):	0.576		

PARAMETER	Baseline Water Quality (mg/l)	Stream Background (mg/l)	End of Pipe WQC RP	RWC WQC RP	Average Monthly Limit (mg/l)	Maximum Daily Limit (mg/l)	Tier Protection Level
Ammonia	0.0478	0.0478	No Data	No Data	18.7575	37.6311	Tier 2
Total Residual Chlorine	0.0000	NA	No Data	No Data	0.0284	0.0570	Tier 2

Outfall discharges to Ohio River and is subject to ORSANCO Pollution Control Standards:	No
Outfall discharges to a Trout Stream:	No
Outfall discharges to a stream exempt from Human Health A Criteria:	No
Outfall discharges to a stream exempt from all Human Health Criteria:	No
Outfall discharges within 1/2 mile upstream of a public drinking water intake:	No
Outfall has limitations for at least one metal using a site specific translator:	No
Outfall has Tier 2.0 antidegradation limitations for at least one pollutant:	Yes

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WATER QUALITY BASED EFFLUENT LIMITATIONS Chemours

Outlet: 008

Stream: Ohio River

Hardness (mg/l):	108	Instream Waste %:	0.00
Temperature (°C):	27	ZID:	3.0
pH:	7.78	CMZ:	10.0
Stream 1Q10 (CFS):	NA	HH CMZ:	30.0
Stream 7Q10 (CFS):	24500	HHA 1/2 Mile Rule CMZ:	30.0
Effluent Flow (MGD):	0.576		

PARAMETER	Baseline Water Quality (mg/l)	Stream Background (mg/l)	End of Pipe WQC RP	RWC WQC RP	Average Monthly Limit (mg/l)	Maximum Daily Limit (mg/l)	Tier Protection Level
Nitrate (as Nitrate-N)	0.8078	0.8080	No Data	No Data	276.5680	403.4611	Tier 2
PFOA	0.00000505	0.00000505	No Data	No Data	0.00195355	0.00284986	Tier 2
HFPO-DA	0.00000284	0.00000197	No Data	No Data	0.00414287	0.00604367	Tier 2

Outfall discharges to Ohio River and is subject to ORSANCO Pollution Control Standards:	No
Outfall discharges to a Trout Stream:	No
Outfall discharges to a stream exempt from Human Health A Criteria:	No
Outfall discharges to a stream exempt from all Human Health Criteria:	No
Outfall discharges within 1/2 mile upstream of a public drinking water intake:	No
Outfall has limitations for at least one metal using a site specific translator:	No
Outfall has Tier 2.0 antidegradation limitations for at least one pollutant:	Yes

WATER QUALITY BASED EFFLUENT LIMITATIONS Chemours Outlet: 008

version 4.5

Stream: Ohio River

Stream 1Q10 (CFS):	NA	Instream Waste %:	0.01
Stream 7Q10 (CFS):	6560	ZID:	3.0
Effluent Flow (MGD):	0.576	CMZ:	10.0

PARAMETER	Stream Background (F)	End of Pipe WQC RP	RWC WQC RP	Ave Mon (F)	Max Daily (F)
January (Temp Max)	43.5	No Data	No Data	54.5	63.1
February (Temp Max)	42.2	No Data	No Data	56.8	65.7
March (Temp Max)	44.3	No Data	No Data	68.7	79.5
April (Temp Max)	48.6	No Data	No Data	82.0	94.9
May (Temp Max)	46.5	No Data	No Data	108.8	126.0
June (Temp Max)	47.6	No Data	No Data	138.1	159.9
July (Temp Max)	69.4	No Data	No Data	110.9	128.3
August (Temp Max)	72.8	No Data	No Data	104.9	121.5
September (Temp Max)	64.6	No Data	No Data	111.3	128.9
October (Temp Max)	60.6	No Data	No Data	94.9	109.9
November (Temp Max)	47.0	No Data	No Data	105.5	122.1
December (Temp Max)	43.7	No Data	No Data	72.2	83.6
			Outfall discharg	jes to Ohio River:	Yes
		Ou	tfall discharges to	o Kanawha River:	No
	Outfall	discharges to KI	NB, KN-60, KNE,	KN, KG, or KNG:	No
		Οι	itfall discharges to	o a Trout Stream:	No

Internal Outlet 108

Chemours Washington Works WV0117986 40 CFR 414 Subpart D

 Outlet 108:
 0.104 MGD

 % of flow subject to 414, Subpart D:
 100.00%

 414 Subpart D LTA Flow:
 0.104 MGD

Pollutant	NSPS I	Factors	Effluent Guideline Limits			
	40 CFR 41	4.44 (mg/l)	(lbs/day)			
	Mon. Ave.	Max. Daily	Mon. Ave.	Max. Daily		
BOD5	24	64	21	56		
TSS	40	130	35	113		
рН	6.0-9.0	Range	6.0-9.0	Range		

Chemours Washington Works WV0117986 40 CFR 414 Subpart J

Outlet 108 = % of flow subject to 414, Subpart J = Total Process Wastewater subject to 414.101 (LTA) = 0.104 MGD 100% 0.104 MGD

	4	0 CFR 414.101 - BAT	Effluent Limitations	
Effluent Characteristics			MA	SS
	Average Monthly (ug/l)	Max. daily (ug/l)	Avg Monthly (lbs/day)	Max. Daily (Ibs/day)
Acenaphthene	19	47	0.016	0.041
Acenaphthylene	19	47	0.016	0.041
Acrylonitrile	94	232	0.082	0.201
Anthracene	19	47	0.016	0.041
Benzene	57	134	0.049	0.116
Benzo(a)anthracene	19	47	0.016	0.041
3,4-Benzofluoranthene	20	48	0.017	0.042
Benzo(k)fluoranthene	19	47	0.016	0.041
Benzo(a)pyrene	20	48	0.017	0.042
Bis(2-ethylhexyl) phthalate	95	258	0.082	0.224
Carbon Tetrachloride	142	380	0.123	0.330
Chlorobenzene	142	380	0.123	0.330
Chloroethane	110	295	0.095	0.256
Chloroform	111	325	0.096	0.282
Chrysene	19	47	0.016	0.041
Di-n-butyl phthalate	20	43	0.017	0.037
1,2-Dichlorobenzene	196	794	0.170	0.689
1,3-Dichlorobenzene	142	380	0.123	0.330
1,4-Dichlorobenzene	142	380	0.123	0.330
1,1-Dichloroethane	22	59	0.019	0.051
1,2-Dichloroethane	180	574	0.156	0.498
1,1-Dichloroethylene	22	60	0.019	0.052
1,2-trans-Dichloroethylene	25	66	0.022	0.057
1,2-Dichloropropane	196	794	0.170	0.689
1,3-Dichloropropylene	196	794	0.170	0.689
Diethyl phthalate	46	113	0.040	0.098
2,4-Dimethylphenol	19	47	0.016	0.041
Dimethyl phthalate	19	47	0.016	0.041
4,6-Dinitro-o-cresol	/8	2//	0.068	0.240
2,4-Dinitrophenol	1207	4291	1.047	3./22
Etnyibenzene	142	380	0.123	0.330
Fluoranthene	22	54	0.019	0.047
Fluorene	19	4/	0.016	0.041
Hexachlorobutadiana	190	794	0.170	0.069
Hexachloroothana	142	704	0.123	0.530
	190	205	0.170	0.069
Methylene Chloride	26	293	0.093	0.230
Nanhthalene	10	170	0.031	0.147
Nitrobenzene	2237	6402	1 940	5 553
2-Nitrophenol	65	231	0.056	0.200
4-Nitrophenol	162	576	0.030	0.500
Phenanthrene	19	47	0.016	0.041
Phenol	19	47	0.016	0.041
Pyrene	20	48	0.017	0.042
Tetrachloroethylene	52	164	0.045	0.142
Toluene	28	74	0.024	0.064
Total Chromium	1110	2770	0.963	2.403
Total Copper	1450	3380	1.258	2.932
Total Cyanide	420	1200	0.364	1.041
Total Lead	320	690	0.278	0.598
Total Nickel	1,690	3,980	1.466	3.452
Total Zinc	1,050	2,610	0.911	2.264
1,2,4-Trichlorobenzene	196	794	0.170	0.689
1,1,1-Trichloroethane	22	59	0.019	0.051
1,1,2-Trichloroethane	32	127	0.028	0.110
Trichloroethylene	26	69	0.023	0.060
Vinyl Chloride	97	172	0.084	0.149

Internal Outlet 108 HFPO-DA PFA Finishing Line 1 HFPO-DA Data

 	· · · · · · · · · · · · · · · · · · ·					
Sample	Influent	Effluent	Percent Removal	3rd GAC Bed		
Date	(ug/l)	(ug/l)	(2 GAC Beds)	Effluent (ug/l)	Уi	(y _i -µ _y)²
1/1/22	34600	0.9	99.9970%	0.045	-3.10109	0.15849975
1/2/22	34200	5.7	99.9800%	0.285	-1.25527	2.09585389
1/3/22	56200	4.3	99.9900%	0.215	-1.53712	1.35921851
1/4/22	49700	4.4	99.9900%	0.22	-1.51413	1.41335193
1/6/22	35500	0.9	99.9970%	0.045	-3.10109	0.15849975
1/8/22	36000	6.8	99.9800%	0.34	-1.07881	2.637905
1/9/22	50300	2	99.9960%	0.1	-2.30259	0.16031009
1/11/22	15000	1.6	99.9900%	0.08	-2.52573	0.03141539
1/12/22	19700	1.2	99.9900%	0.06	-2.81341	0.01219659
1/13/22	26400	2	99.9900%	0.1	-2.30259	0.16031009
1/14/22	52900	1.1	99.9980%	0.055	-2.90042	0.03898633
1/17/22	60600	0.6	99.9990%	0.03	-3.50656	0.64574945
1/21/22	16300	3.9	99.9800%	0.195	-1.63476	1.14108714
1/22/22	69900	10.2	99.9900%	0.51	-0.67334	4.11938969
1/23/22	75500	1.4	99.9980%	0.07	-2.65926	0.00191078
1/24/22	14100	2.3	99.9800%	0.115	-2.16282	0.29176134
1/26/22	27200	0.6	99.9980%	0.03	-3.50656	0.64574945
1/27/22	14900	3.4	99.9800%	0.17	-1.77196	0.8667902
1/28/22	19100	0.7	99.9960%	0.035	-3.35241	0.42176542
1/31/22	48400	2	99.9960%	0.1	-2.30259	0.16031009
2/1/22	41700	7.5	99.9800%	0.375	-0.98083	2.96577744
2/2/22	83000	3.2	99.9960%	0.16	-1.83258	0.7575806
2/3/22	62700	2.4	99.9960%	0.12	-2.12026	0.33954976
2/5/22	53400	3.6	99.9900%	0.18	-1.7148	0.97648804
2/7/22	65100	1.3	99.9980%	0.065	-2.73337	0.00092389
2/8/22	20450	2.4	99.9900%	0.12	-2.12026	0.33954976
2/9/22	32000	0.8	99.9980%	0.04	-3.21888	0.26615622
2/10/22	30500	1.3	99.9960%	0.065	-2./333/	0.00092389
2/11/22	31600	5.7 2	99.9600%	0.200	-1.20027	2.09000009
2/12/22	27000	3 2	99.9900%	0.15	-1.09/12	0.04939031
2/13/22	40400	15	99.9900%	0.15	-1.09712	0.04939031
2/14/22	35000	1.3	99.9970%	0.075	-2.39027	0.0127023
2/16/22	50500	10.2	99.9900 %	0.000	-0.67334	1 11038060
2/10/22	50400	5.2	99.9000 %	0.26	-0.07304	1 83846176
2/18/22	43100	3.6	99,9900%	0.20	-1 7148	0 97648804
2/19/22	16700	2.8	99 9800%	0.10	-1 96611	0.57040004
2/20/22	24400	3.6	99,9900%	0.18	-1.7148	0.97648804
2/27/22	23400	4.4	99.9800%	0.22	-1.51413	1.41335193
2/28/22	27600	2.3	99.9900%	0.115	-2.16282	0.29176134
3/1/22	30300	3.1	99.9900%	0.155	-1.86433	0.70332101
3/2/22	33700	2.1	99.9900%	0.105	-2.25379	0.20176051
3/3/22	83800	1.9	99.9980%	0.095	-2.35388	0.12186672
3/4/22	45800	0.7	99.9980%	0.035	-3.35241	0.42176542
3/7/22	59400	1.9	99.9970%	0.095	-2.35388	0.12186672
3/8/22	46600	1.6	99.9970%	0.08	-2.52573	0.03141539
3/9/22	32900	0.9	99.9970%	0.045	-3.10109	0.15849975
3/10/22	56500	1	99.9980%	0.05	-2.99573	0.08570827
3/11/22	50900	1.4	99.9970%	0.07	-2.65926	0.00191078
3/12/22	19900	0.9	99.9950%	0.045	-3.10109	0.15849975
3/13/22	27000	3.9	99.9900%	0.195	-1.63476	1.14108714
3/15/22	16800	1.8	99.9900%	0.09	-2.40795	0.08704088
3/16/22	13100	1.7	99.9900%	0.085	-2.4651	0.05658142
3/18/22	35100	4.7	99.9900%	0.235	-1.44817	1.57452996

 3/19/22	15700	2.3	99,9900%	0.115	-2.16282	0.29176134	
3/20/22	59800	21	99 9960%	0.105	-2 25379	0 20176051	
3/21/22	90500	19	99 9980%	0.095	-2.35388	0 12186672	
3/23/22	21400	1	99 9950%	0.05	-2 99573	0.08570827	
3/24/22	39700	15	99 9960%	0.075	-2 59027	0.0127025	
3/26/22	45000	43	99 9900%	0.215	-1 53712	1 35921851	
3/27/22	55700	- 1 .0 2.1	00.0000%	0.105	-2 25379	0 20176051	
3/28/22	70500	2.1 13	00 0080%	0.105	-2.23379	0.20170031	
3/20/22	54200	1.5	00 0080%	0.005	-2.75557	0.00092309	
3/20/22	3400	1.1	00 0070%	0.005	5 20832	6 73591496	
3/30/22	16200	0.1	99.9970%	0.005	-0.29002	0.73001400	
3/31/22	10200	0.5	99.9970%	0.025	-3.00000	0.97201240	
4/2/22	227600	3.0	99.9980%	0.18	-1.7148	0.97648804	
4/3/22	38600	1.0	99.9960%	0.08	-2.52573	0.03141539	
4/4/22	25400	1.3	99.9900%	0.005	-2.73337	0.00092389	
4/5/22	27600	1.6	99.9900%	0.08	-2.52573	0.03141539	
4/6/22	25500	0.7	99.9970%	0.035	-3.35241	0.42176542	
4/10/22	33100	4	99.9900%	0.2	-1.60944	1.19581794	
4/11/22	102600	2.4	99.9980%	0.12	-2.12026	0.33954976	
4/12/22	80300	1.1	99.9990%	0.055	-2.90042	0.03898633	
4/13/22	182200	1.2	99.9990%	0.06	-2.81341	0.01219659	
4/14/22	41300	1.1	99.9970%	0.055	-2.90042	0.03898633	
4/15/22	66300	0.6	99.9990%	0.03	-3.50656	0.64574945	
4/16/22	73500	6	99.9900%	0.3	-1.20397	2.24700016	
4/17/22	103200	2.1	99.9980%	0.105	-2.25379	0.20176051	
4/22/22	149000	4	99.9970%	0.2	-1.60944	1.19581794	
4/23/22	27900	3.3	99.9900%	0.165	-1.80181	0.81209424	
4/24/22	31700	6.1	99.9800%	0.305	-1.18744	2.29682821	
4/26/22	26300	4.4	99.9800%	0.22	-1.51413	1.41335193	
4/27/22	33100	3	99.9900%	0.15	-1.89712	0.64939831	
4/28/22	32800	2.6	99.9900%	0.13	-2.04022	0.43923981	
4/29/22	38300	2.9	99.9900%	0.145	-1.93102	0.59590832	
4/30/22	49400	10.6	99.9800%	0.53	-0.63488	4.27701383	
5/1/22	19000	1.9	99.9900%	0.095	-2.35388	0.12186672	
5/2/22	32700	1.8	99.9900%	0.09	-2.40795	0.08704088	
5/3/22	43800	1.6	99.9960%	0.08	-2.52573	0.03141539	
5/9/22	52200	2.6	99.9950%	0.13	-2.04022	0.43923981	
5/13/22	28700	3.9	99.9900%	0.195	-1.63476	1.14108714	
5/14/22	42200	1.6	99.9960%	0.08	-2.52573	0.03141539	
5/15/22	33800	1.7	99.9900%	0.085	-2.4651	0.05658142	
5/16/22	42800	1.4	99.9970%	0.07	-2.65926	0.00191078	
5/17/22	22800	1.1	99.9950%	0.055	-2.90042	0.03898633	
5/19/22	28900	1.2	99.9960%	0.06	-2.81341	0.01219659	
5/20/22	35100	0.7	99.9980%	0.035	-3.35241	0.42176542	
5/21/22	29600	0.5	99.9980%	0.025	-3.68888	0.97201248	
5/24/22	30900	6.1	99.9800%	0.305	-1.18744	2.29682821	
5/25/22	40200	4	99,9900%	0.2	-1.60944	1,19581794	
5/26/22	31500	3.5	99,9900%	0.175	-1.74297	0.92160618	
5/29/22	52300	2.8	99 9900%	0.14	-1.96611	0 54296217	
5/31/22	22600	1.0	99 9900%	0.06	-2 81341	0.01219659	
6/1/22	35800	1.2	00.0000%	0.00	-2.01041	0.01210000	
6/2/22	44400	1.0	99,9980%	0.000	-2 99573	0.08570827	
6/3/22	52800	13	99 9980%	0.065	_2 73337	0 00000027	
6/1/22	23700	1.0 2	99 0000%	0.000	-1 80710	0.64030831	
6/5/22	7300	1.2	99.9900 %	0.15	-7.00712	0.0400000	
6/6/22	50200	63	99.9000 %	0.09	-2.40790	2 30565252	
6/8/22	15200	0.0	00 0000%	0.313	2 20727	2.33303332	
6/0/22	3/000	2.2	00 0000%	0.11	-2.20121	0.24011012	
6/11/22	16000	2.1	33.3300%	0.100	-2.20019	1 02120000	
0/11/22 6/10/00	51200	5.1 E	99.9000% 00.0000%	0.100	-1.00/4	1 7226/120	
0/12/22 6/12/22	30500	10	33.3300%	0.20	1 56065	1.13304130	
0/10/22	39200	4.Z	99.9900% 00.0060%	0.21	-1.00000	1.30490389	
0/14/22	02800	2.3	<u>99.9900%</u>	0.115	-2.10282	0.29176134	

6/18/22	24900	5.6	99.9800%	0.28	-1.27297	2.04491958	
6/19/22	27100	2.2	99.9900%	0.11	-2.20727	0.24571612	
6/20/22	29100	2	99.9900%	0.1	-2.30259	0.16031009	
6/21/22	19600	1.1	99.9900%	0.055	-2.90042	0.03898633	
6/22/22	8500	1.2	99.9900%	0.06	-2.81341	0.01219659	
6/23/22	12600	2	99.9800%	0.1	-2.30259	0.16031009	
6/24/22	26300	5.1	99,9800%	0.255	-1.36649	1,7861809	
6/25/22	17300	3.1	99.9800%	0.155	-1.86433	0.70332101	
6/26/22	17300	1.6	99.9900%	0.08	-2.52573	0.03141539	
6/27/22	19900	1.1	99,9900%	0.055	-2.90042	0.03898633	
6/28/22	19400	11	99 9900%	0.055	-2 90042	0.03898633	
6/29/22	33100	1.3	99 9960%	0.065	-2 73337	0.00092389	
6/30/22	35800	0.5	99,9990%	0.025	-3.68888	0.97201248	
7/1/22	54600	6.2	99,9900%	0.31	-1.17118	2.3463792	
7/2/22	36900	3.4	99,9900%	0.17	-1.77196	0.8667902	
7/3/22	32900	2.7	99,9900%	0.135	-2.00248	0.49068907	
7/4/22	27100	1.2	99,9960%	0.06	-2.81341	0.01219659	
7/5/22	21700	1.8	99,9900%	0.09	-2.40795	0.08704088	
7/6/22	35800	2.2	99,9900%	0.11	-2.20727	0.24571612	
7/7/22	13700	2.1	99.9800%	0.105	-2.25379	0.20176051	
7/10/22	35100	3.1	99,9900%	0.155	-1.86433	0.70332101	
7/11/22	20200	1.9	99,9900%	0.095	-2.35388	0.12186672	
7/12/22	11000	0.9	99,9900%	0.045	-3.10109	0.15849975	
7/13/22	19600	0.9	99,9950%	0.045	-3.10109	0.15849975	
7/14/22	15000	2.9	99.9800%	0.145	-1.93102	0.59590832	
7/15/22	28900	1.3	99.9960%	0.065	-2.73337	0.00092389	
7/22/22	44100	1.3	99.9970%	0.065	-2.73337	0.00092389	
7/23/22	24200	3.1	99.9900%	0.155	-1.86433	0.70332101	
7/24/22	49700	0.6	99.9990%	0.03	-3.50656	0.64574945	
7/25/22	16400	0.9	99.9900%	0.045	-3.10109	0.15849975	
7/26/22	52300	0.6	99.9990%	0.03	-3.50656	0.64574945	
7/27/22	39700	0.7	99.9980%	0.035	-3.35241	0.42176542	
7/28/22	42800	1.1	99.9970%	0.055	-2.90042	0.03898633	
7/29/22	100900	9.8	99.9900%	0.49	-0.71335	3.95859823	
7/31/22	14800	2.4	99.9800%	0.12	-2.12026	0.33954976	
8/1/22	42800	1.7	99.9960%	0.085	-2.4651	0.05658142	
8/2/22	30900	1.3	99.9960%	0.065	-2.73337	0.00092389	
8/4/22	67800	0.6	99.9990%	0.03	-3.50656	0.64574945	
8/5/22	36700	1	99.9970%	0.05	-2.99573	0.08570827	
8/8/22	35100	1.4	99.9960%	0.07	-2.65926	0.00191078	
8/9/22	47800	1.1	99.9980%	0.055	-2.90042	0.03898633	
8/10/22	22400	0.6	99.9970%	0.03	-3.50656	0.64574945	
8/11/22	34100	7.4	99.9800%	0.37	-0.99425	2.91972489	
8/12/22	23900	3.3	99.9900%	0.165	-1.80181	0.81209424	
8/13/22	13000	2.1	99.9800%	0.105	-2.25379	0.20176051	
8/14/22	9500	1.9	99.9800%	0.095	-2.35388	0.12186672	
8/15/22	11600	2.2	99.9800%	0.11	-2.20727	0.24571612	
8/16/22	20900	1	99.9950%	0.05	-2.99573	0.08570827	
8/17/22	40700	0.7	99.9980%	0.035	-3.35241	0.42176542	
8/18/22	41900	0.6	99.9990%	0.03	-3.50656	0.64574945	
8/19/22	74400	0.9	99.9990%	0.045	-3.10109	0.15849975	
8/20/22	55900	5.5	99.9900%	0.275	-1.29098	1.99371108	
8/22/22	48000	3.9	99.9900%	0.195	-1.63476	1.14108714	
8/23/22	13900	1.6	99.9900%	0.08	-2.52573	0.03141539	
8/24/22	40200	0.9	99.9980%	0.045	-3.10109	0.15849975	
8/25/22	19900	1	99.9900%	0.05	-2.99573	0.08570827	
8/26/22	43500	1.1	99.9970%	0.055	-2.90042	0.03898633	
8/27/22	43500	4.5	99.9900%	0.225	-1.49165	1.46729044	
8/28/22	47100	1.7	99.9960%	0.085	-2.4651	0.05658142	
8/29/22	40900	1.9	99.9950%	0.095	-2.35388	0.12186672	
8/30/22	36700	1	99.9970%	0.05	-2.99573	0.08570827	

8/31/22	118900	1.7	99.9990%	0.085	-2.4651	0.05658142	
9/1/22	23500	1.6	99.9900%	0.08	-2.52573	0.03141539	
9/3/22	23800	4	99.9800%	0.2	-1.60944	1.19581794	
9/4/22	28500	2.2	99.9900%	0.11	-2.20727	0.24571612	
9/5/22	36800	1.2	99.9970%	0.06	-2.81341	0.01219659	
9/6/22	39700	0.9	99.9980%	0.045	-3.10109	0.15849975	
9/7/22	58600	0.8	99.9990%	0.04	-3.21888	0.26615622	
9/8/22	38800	7.8	99.9800%	0.39	-0.94161	3.10240308	
9/19/22	44800	9.7	99.9800%	0.485	-0.72361	3.91789029	
9/20/22	26400	6	99.9800%	0.3	-1.20397	2.24700016	
9/21/22	37500	8.7	99.9800%	0.435	-0.83241	3.49900696	
9/22/22	39700	6.7	99.9800%	0.335	-1.09362	2.59000026	
9/23/22	30200	7.4	99.9800%	0.37	-0.99425	2.91972489	
9/24/22	35700	7.4	99.9800%	0.37	-0.99425	2.91972489	
9/25/22	36900	6.9	99.9800%	0.345	-1.06421	2.68553978	
9/26/22	43600	10.5	99.9800%	0.525	-0.64436	4.2378978	
9/28/22	53900	6.2	99.9900%	0.31	-1.17118	2.3463792	
9/29/22	86200	4.2	99.9950%	0.21	-1.56065	1.30490589	
10/2/22	10900	2.5	99.9800%	0.125	-2.07944	0.38879088	
10/8/22	37200	9.1	99.9800%	0.455	-0.78746	3.66919642	
10/9/22	61300	11.9	99.9800%	0.595	-0.51919	4.76888919	
10/14/22	56800	4	99.9900%	0.2	-1.60944	1.19581794	
10/16/22	43000	2.4	99.9900%	0.12	-2.12026	0.33954976	
10/18/22	20600	1	99.9950%	0.05	-2.99573	0.08570827	
10/20/22	39700	4.1	99.9900%	0.205	-1.58475	1.25043212	
10/21/22	55000	3.1	99.9900%	0.155	-1.86433	0.70332101	
10/23/22	75600	1.4	99.9980%	0.07	-2.65926	0.00191078	
10/24/22	62500	1.5	99.9980%	0.075	-2.59027	0.0127025	
10/25/22	70400	0.8	99.9990%	0.04	-3.21888	0.26615622	
10/26/22	56700	1	99.9980%	0.05	-2.99573	0.08570827	
10/29/22	52400	13	99.9800%	0.65	-0.43078	5.16284561	
10/30/22	164600	3.2	99.9980%	0.16	-1.83258	0.7575806	
10/31/22	38900	1.7	99.9960%	0.085	-2.4651	0.05658142	
11/1/22	69300	1.5	99.9980%	0.075	-2.59027	0.0127025	
11/3/22	18200	4.2	99.9800%	0.21	-1.56065	1.30490589	
11/4/22	38800	2.7	99.9900%	0.135	-2.00248	0.49068907	
11/7/22	18200	1.6	99.9900%	0.08	-2.52573	0.03141539	
11/8/22	72000	1.6	99.9980%	0.08	-2.52573	0.03141539	
11/9/22	48600	2.8	99.9900%	0.14	-1.96611	0.54296217	
11/10/22	32400	1.3	99.9960%	0.065	-2.73337	0.00092389	
11/11/22	55100	1.1	99.9980%	0.055	-2.90042	0.03898633	
11/12/22	44000	1.1	99.9980%	0.055	-2.90042	0.03898633	
11/13/22	39100	7.2	99.9800%	0.36	-1.02165	2.82684123	
11/14/22	113000	3	99.9970%	0.15	-1.89712	0.64939831	
11/16/22	36300	2.4	99.9900%	0.12	-2.12026	0.33954976	
11/18/22	38300	5.2	99.9900%	0.26	-1.34707	1.83846176	
11/19/22	42800	2.5	99.9900%	0.125	-2.07944	0.38879088	
11/21/22	51300	1.7	99.9970%	0.085	-2.4651	0.05658142	
11/22/22	22500	3.2	99.9900%	0.16	-1.83258	0.7575806	
11/23/22	37300	1.7	99.9950%	0.085	-2.4651	0.05658142	
11/24/22	32300	2.4	99.9900%	0.12	-2.12026	0.33954976	
11/25/22	10500	1.5	99.9900%	0.075	-2.59027	0.0127025	
11/26/22	16800	1.6	99.9900%	80.0	-2.52573	0.03141539	
11/27/22	24200	1.8	99.9900%	0.09	-2.40795	0.08/04088	
11/28/22	34400	1./	99.9950%	0.085	-2.4651	0.05658142	
11/29/22	45500	1.3	99.9970%	0.065	-2.73337	0.00092389	
11/30/22	/3800	1.2	99.9980%	0.06	-2.81341	0.01219659	
12/1/22	53100	1.1	99.9980%	0.055	-2.90042	0.03898633	
12/2/22	43500	0.9	99.9980%	0.045	-3.10109	0.15849975	
12/3/22	54900	0.6	99.9990%	0.03	-3.50656	0.04574945	
12/4/22	76000	0.6	99.9990%	0.03	-3.50656	0.64574945	

12/5/22	57900	1	99.9980%	0.05	-2.99573	0.08570827	
12/6/22	86000	1.1	99,9990%	0.055	-2.90042	0.03898633	
12/7/22	59700	1.5	99.9970%	0.075	-2.59027	0.0127025	
12/8/22	67100	1.3	99.9980%	0.065	-2.73337	0.00092389	
12/9/22	85700	0.6	99.9990%	0.03	-3.50656	0.64574945	
12/10/22	65900	1.3	99.9980%	0.065	-2.73337	0.00092389	
12/11/22	4900	1	99,9800%	0.05	-2.99573	0.08570827	
12/12/22	65800	1.4	99,9980%	0.07	-2.65926	0.00191078	
12/13/22	26500	0.7	99.9970%	0.035	-3.35241	0.42176542	
12/14/22	44900	0.9	99,9980%	0.045	-3.10109	0.15849975	
12/15/22	59100	1	99,9980%	0.05	-2.99573	0.08570827	
12/16/22	45900	1.5	99,9970%	0.075	-2.59027	0.0127025	
12/17/22	71900	0.9	99.9990%	0.045	-3.10109	0.15849975	
12/18/22	78400	1.6	99.9980%	0.08	-2.52573	0.03141539	
12/19/22	79700	0.9	99.9990%	0.045	-3.10109	0.15849975	
12/20/22	84100	0.8	99,9990%	0.04	-3.21888	0.26615622	
12/21/22	62800	1.4	99.9980%	0.07	-2.65926	0.00191078	
12/22/22	86400	0.1	99.9999%	0.005	-5.29832	6.73581486	
12/24/22	53400	0.8	99.9990%	0.04	-3.21888	0.26615622	
12/25/22	60300	0.9	99,9990%	0.045	-3.10109	0.15849975	
12/26/22	66900	2.1	99.9970%	0.105	-2.25379	0.20176051	
12/27/22	20800	1.6	99.9900%	0.08	-2.52573	0.03141539	
12/28/22	75700	2.5	99.9970%	0.125	-2.07944	0.38879088	
12/29/22	68800	6.7	99.9900%	0.335	-1.09362	2.59000026	
12/31/22	117300	12.9	99.9900%	0.645	-0.4385	5.12781333	
1/1/23	113000	5.2	99.9950%	0.26	-1.34707	1.83846176	
1/5/23	63600	7.1	99.9900%	0.355	-1.03564	2.78000611	
1/6/23	32000	5.8	99.9800%	0.29	-1.23787	2.14651264	
1/7/23	60700	8.5	99.9900%	0.425	-0.85567	3.41254098	
1/8/23	25800	1.6	99.9900%	0.08	-2.52573	0.03141539	
1/11/23	87700	8.1	99.9900%	0.405	-0.90387	3.23677632	
1/12/23	23300	5.8	99.9800%	0.29	-1.23787	2.14651264	
1/13/23	38700	2.1	99.9900%	0.105	-2.25379	0.20176051	
1/14/23	12100	1.9	99.9800%	0.095	-2.35388	0.12186672	
1/15/23	5000	1	99.9800%	0.05	-2.99573	0.08570827	
1/16/23	35200	1.1	99.9970%	0.055	-2.90042	0.03898633	
1/18/23	51100	0.8	99.9980%	0.04	-3.21888	0.26615622	
1/19/23	34500	0.6	99.9980%	0.03	-3.50656	0.64574945	
1/20/23	22300	0.6	99.9970%	0.03	-3.50656	0.64574945	
1/21/23	15600	0.5	99.9970%	0.025	-3.68888	0.97201248	
1/22/23	31000	0.7	99.9980%	0.035	-3.35241	0.42176542	
1/23/23	16800	1.1	99.9900%	0.055	-2.90042	0.03898633	
1/24/23	29500	0.4	99.9990%	0.02	-3.91202	1.46180307	
1/25/23	36700	0.5	99.9990%	0.025	-3.68888	0.97201248	
1/26/23	36200	0.4	99.9990%	0.02	-3.91202	1.46180307	
1/27/23	24600	0.3	99.9990%	0.015	-4.19971	2.24020834	
1/28/23	25900	0.9	99.9970%	0.045	-3.10109	0.15849975	
1/29/23	43400	1.6	99.9960%	0.08	-2.52573	0.03141539	
1/30/23	29500	0.5	99.9980%	0.025	-3.68888	0.97201248	
1/31/23	17800	0.4	99.9980%	0.02	-3.91202	1.46180307	
2/1/23	30900	0.5	99.9980%	0.025	-3.68888	0.97201248	
2/2/23	18800	0.6	99.9970%	0.03	-3.50656	0.64574945	
2/5/23	14900	0.7	99.9950%	0.035	-3.35241	0.42176542	
2/6/23	19700	0.7	99.9960%	0.035	-3.35241	0.42176542	
2/7/23	34500	0.6	99.9980%	0.03	-3.50656	0.64574945	
2/8/23	39700	0.6	99.9980%	0.03	-3.50656	0.64574945	
2/9/23	70600	0.5	99.9990%	0.025	-3.68888	0.97201248	
2/10/23	10700	0.4	99.9960%	0.02	-3.91202	1.46180307	
2/13/23	22500	0.6	99.9970%	0.03	-3.50656	0.64574945	
2/17/23	34600	1.7	99.9950%	0.085	-2.4651	0.05658142	
2/23/23	42400	0.8	99.9980%	0.04	-3.21888	0.26615622	

2/24/23	29500	0.5	99.9980%	0.025	-3.68888	0.97201248	
2/27/23	44400	0.4	99,9990%	0.02	-3.91202	1.46180307	
2/28/23	49100	1.5	99 9970%	0.075	-2 59027	0 0127025	
3/1/23	39000	0.6	99 9980%	0.03	-3 50656	0 64574945	
3/2/23	25900	0.0 1 1	00.0000%	0.00	-0.00000	1 250/3212	
3/3/23	27600	0.8	00 0070%	0.200	-1.00+70	0.26615622	
2/4/22	27000	0.0	99.9970 %	0.04	-3.21000	0.20013022	
3/4/23	45000	10	99.9900%	0.05	-2.99073	0.00070027	
3/5/23	30800	1.3	99.9960%	0.065	-2.73337	0.00092389	
3/6/23	40800	1.6	99.9960%	0.08	-2.52573	0.03141539	
3/7/23	44300	1.3	99.9970%	0.065	-2.73337	0.00092389	
3/8/23	40100	0.7	99.9980%	0.035	-3.35241	0.42176542	
3/9/23	48700	0.6	99.9990%	0.03	-3.50656	0.64574945	
3/10/23	62000	0.4	99.9990%	0.02	-3.91202	1.46180307	
3/11/23	73400	0.4	99.9990%	0.02	-3.91202	1.46180307	
3/12/23	64300	0.3	99.9995%	0.015	-4.19971	2.24020834	
3/13/23	21200	1	99.9950%	0.05	-2.99573	0.08570827	
3/16/23	24000	2.7	99.9900%	0.135	-2.00248	0.49068907	
3/18/23	18900	1	99.9900%	0.05	-2.99573	0.08570827	
3/19/23	30200	5.1	99.9800%	0.255	-1.36649	1.7861809	
3/21/23	21100	3.5	99.9800%	0.175	-1.74297	0.92160618	
3/22/23	16800	2.1	99.9900%	0.105	-2.25379	0.20176051	
3/24/23	38500	1.6	99.9960%	0.08	-2.52573	0.03141539	
4/1/23	10100	0.6	99.9900%	0.03	-3.50656	0.64574945	
4/2/23	5300	0.2	99,9960%	0.01	-4.60517	3.61835595	
4/3/23	28200	0.6	99 9980%	0.03	-3 50656	0 64574945	
4/5/23	27400	0.9	99 9970%	0.045	-3 10109	0 15849975	
4/6/23	14000	0.6	99 9960%	0.03	-3 50656	0 64574945	
4/7/23	29500	0.0	99 9990%	0.00	-4 19971	2 24020834	
4/8/23	40600	0.0	00 0008%	0.015	-5 20832	6 73581/86	
4/0/23	58900	0.1	00 0000%	0.005	-0.23002	2 2/02083/	
4/10/23	40500	0.5	00 0000%	0.013	2 00248	0.40068007	
4/10/20	40300	2.7	99.9900 %	0.135	2.00240	1 46190207	
4/11/23	19100	0.4	99.9970%	0.02	-3.91202	1.40100307	
4/12/23	10100	0.5	99.9960%	0.015	-4.19971	2.24020034	
4/13/23	17100		99.9900%	0.05	-2.99573	0.00070027	
4/14/23	12100	0.4	99.9970%	0.02	-3.91202	1.40100307	
4/16/23	23300	0.1	99.9996%	0.005	-5.29832	0.73581480	
4/17/23	17000	0.1	99.9990%	0.005	-5.29832	6.73581486	
4/18/23	32000	0.3	99.9990%	0.015	-4.19971	2.24020834	
4/19/23	21400	0.7	99.9970%	0.035	-3.35241	0.42176542	
4/20/23	43100	0.2	99.9995%	0.01	-4.60517	3.61835595	
4/21/23	49900	0.3	99.9990%	0.015	-4.19971	2.24020834	
4/22/23	57300	0.2	99.9997%	0.01	-4.60517	3.61835595	
4/23/23	109500	0.2	99.9998%	0.01	-4.60517	3.61835595	
4/25/23	32500	0.3	99.9990%	0.015	-4.19971	2.24020834	
4/26/23	21300	0.2	99.9990%	0.01	-4.60517	3.61835595	
4/28/23	37400	0.1	99.9997%	0.005	-5.29832	6.73581486	
4/30/23	30000	0.1	99.9997%	0.005	-5.29832	6.73581486	
5/1/23	40100	0.8	99.9980%	0.04	-3.21888	0.26615622	
5/2/23	54300	0.2	99.9996%	0.01	-4.60517	3.61835595	
5/4/23	51200	0.1	99.9998%	0.005	-5.29832	6.73581486	
5/5/23	40800	0.1	99.9998%	0.005	-5.29832	6.73581486	
5/6/23	27900	0.3	99.9990%	0.015	-4.19971	2.24020834	
5/7/23	6000	0.3	99.9950%	0.015	-4.19971	2.24020834	
5/18/23	10300	0.1	99.9990%	0.005	-5.29832	6.73581486	
5/20/23	17600	0.1	99.9990%	0.005	-5.29832	6.73581486	
5/22/23	41200	0.1	99,9998%	0.005	-5.29832	6.73581486	
5/23/23	43600	0.1	99,9998%	0.005	-5.29832	6.73581486	
5/24/23	52700	0.1	99,9998%	0.005	-5,29832	6.73581486	
5/25/23	69700	0.1	99,9999%	0.005	-5,29832	6.73581486	
5/26/23	40300	0.1	99 9998%	0.005	-5,29832	6.73581486	
5/27/23	51200	0.1	99 9998%	0.005	-5 20832	6 73581/86	
5,21,20	01200	v.,	00.000070	5.000	0.20002	5 500 1400	

	0.4000		00.00000/	0.005		0 70504400
5/28/23	64600	0.1	99.9998%	0.005	-5.29832	6.73581486
5/29/23	/1/00	0.1	99.9999%	0.005	-5.29832	6.73581486
5/30/23	59500	0.1	99.9998%	0.005	-5.29832	6.73581486
5/31/23	900	0.1	99.9900%	0.005	-5.29832	6.73581486
6/2/23	21800	0.1	99.9995%	0.005	-5.29832	6.73581486
6/3/23	16400	0.1	99.9990%	0.005	-5.29832	6.73581486
6/4/23	32100	0.1	100.0000%	0.005	-5.29832	6.73581486
6/5/23	33700	0.4	99.9990%	0.02	-3.91202	1.46180307
6/6/23	53500	0.5	99.9990%	0.025	-3.68888	0.97201248
6/7/23	39200	0.1	99.9997%	0.005	-5.29832	6.73581486
6/8/23	27800	0.1	99.9996%	0.005	-5.29832	6.73581486
6/9/23	48100	1.1	99.9980%	0.055	-2.90042	0.03898633
6/10/23	22700	2.1	99.9900%	0.105	-2.25379	0.20176051
6/11/23	57900	5.1	99.9900%	0.255	-1.36649	1.7861809
6/12/23	62200	5.3	99.9900%	0.265	-1.32803	1.89047944
6/14/23	31800	5.8	99.9800%	0.29	-1.23787	2.14651264
6/15/23	47700	8.2	99.9800%	0.41	-0.8916	3.28107723
6/20/23	8100	1.2	99.9900%	0.06	-2.81341	0.01219659
6/21/23	45500	0.7	99.9980%	0.035	-3.35241	0.42176542
6/22/23	81800	0.6	99.9990%	0.03	-3.50656	0.64574945
6/24/23	82300	0.6	99.9990%	0.03	-3.50656	0.64574945
6/25/23	38800	1	99.9970%	0.05	-2.99573	0.08570827
6/27/23	49100	3.6	99.9900%	0.18	-1.7148	0.97648804
6/29/23	43700	2.5	99.9900%	0.125	-2.07944	0.38879088
6/30/23	33400	2.1	99.9900%	0.105	-2.25379	0.20176051
7/2/23	26200	5.5	99.9800%	0.275	-1.29098	1.99371108
7/3/23	42000	3	99.9900%	0.15	-1.89712	0.64939831
7/4/23	12900	1.5	99.9900%	0.075	-2.59027	0.0127025
7/7/23	26300	1.2	99.9950%	0.06	-2.81341	0.01219659
7/9/23	32500	1.5	99.9950%	0.075	-2.59027	0.0127025
7/10/23	29600	1.3	99.9960%	0.065	-2.73337	0.00092389
7/11/23	38200	1.9	99.9950%	0.095	-2.35388	0.12186672
7/12/23	35900	3	99,9900%	0.15	-1.89712	0.64939831
7/15/23	26000	2.4	99,9900%	0.12	-2.12026	0.33954976
7/16/23	31100	1.5	99,9950%	0.075	-2.59027	0.0127025
7/18/23	41700	1.6	99 9960%	0.08	-2 52573	0.03141539
7/19/23	29400	1.8	99 9900%	0.00	-2 40795	0.08704088
7/21/23	26700	0.6	99 9980%	0.03	-3 50656	0.64574945
7/22/23	15400	1	99 9900%	0.05	-2 99573	0.08570827
7/23/23	22900	13		0.00	-2.3337	0.00070027
7/24/23	33600	1.0	00 0060%	0.000	-2.13301	0.00032303
7/26/23	25500	3.1	00 0000%	0.00	-2.01341	0.01219009
7/20/23	17300	23	99.9900 /0	0.135	-1.00400	0.20176124
7/20/22	22600	2.3 1.4	99.9900%	0.115	2.10202	0.29170134
7/20/23	32000	1.4	99.9900% 00.0070%	0.07	-2.00920	0.00191078
7/28/23	22000	1.4	99.9970%	0.00	-2.01041	0.01219039
0/1/23	33000	1.4	99.9900%	0.07	-2.00920	0.00191078
8/1/23	35000	0.5	99.9990%	0.025	-3.00000	0.97201248
0/2/23	24900	1.4	99.9900%	0.07	-2.05926	0.00191078
8/6/23	11500	1	99.9900%	0.05	-2.995/3	0.08570827

average 0.10946078

k 408 n 4

μy -2.70297252 oy^2 1.17152438

PERFORMLIM

BPJ OF BAT TECHNOLOGY-BASED EFFLUENT LIMITS								
USE EXCEL TO PERFORM THE LOGNORMAL TRANSFORMATION								
AND CALCULATE THE TRANSFORMED MEAN AND VARIANCE								
		L	OGNORMA	L TRANSF		1EAN =	-2.7030	Outlet 108
		LOGN	IORMAL TR	RANSFORM		NCE =	1.1715	HFPO-DA
NUMBER OF SAMPLES/MONTH FOR COMPLIANCE MONITORING =						4		
	AUTOCORRELATION FACTOR(ne)(USE 0 IF UNKNOWN) =						0	
					n>10	F(X)	0.1204	0.1204
					n>10	V(X)	0.032	0.032
					n<10	σ_n^2	0.4426	N/A
					n<10	μ _n	-2.3385	N/A
					n>10	V(X _{n)}	0.008	N/A
LTA Flow=	0.104	MGD				X.95=	0.288	N/A
						X.99=	N/A	0.831
						VF=	2.987	6.902
		MA	XIMUM DAI	LY EFFLUE	ENT LIMIT	(ug/l) =	N/A	0.756
AVERAGE MONTHLY EFFLUENT LIMIT (ug					(ug/l) =	0.327	N/A	
		MAXIM	UM DAILY	IM DAILY EFFLUENT LIMIT (lbs/day) =			N/A	0.000655
AVERAGE MONTHLY EFFLUENT LIMIT (lbs/day) =						0.000284	N/A	

Internal Outlet 108 PFOA PFA Finishing Line 1 PFOA Effluent Data

Sample	Effluent	3rd GAC Bed		
Date	(ug/l)	Effluent (ug/l)	Уi	(y _i -µ _y)²
1/1/22	0.06	0.003	-5.80914	0.000887
1/2/22	0.06	0.003	-5.80914	0.000887
1/3/22	0.06	0.003	-5.80914	0.000887
1/4/22	0.06	0.003	-5.80914	0.000887
1/5/22	0.06	0.003	-5.80914	0.000887
1/5/22	0.06	0.003	-5.80914	0.000887
1/6/22	0.06	0.003	-5.80914	0.000887
1/7/22	0.06	0.003	-5.80914	0.000887
1/8/22	0.06	0.003	-5.80914	0.000887
1/9/22	0.06	0.003	-5.80914	0.000887
1/10/22	0.06	0.003	-5.80914	0.000887
1/11/22	0.06	0.003	-5.80914	0.000887
1/12/22	0.06	0.003	-5.80914	0.000887
1/13/22	0.06	0.003	-5.80914	0.000887
1/14/22	0.06	0.003	-5.80914	0.000887
1/15/22	0.06	0.003	-5.80914	0.000887
1/16/22	0.06	0.003	-5.80914	0.000887
1/1//22	0.06	0.003	-5.80914	0.000887
1/18/22	0.06	0.003	-5.80914	0.000887
1/19/22	0.06	0.003	-5.80914	
1/20/22	0.06	0.003	-5.00914	0.000007
1/21/22	0.06	0.003	-5.00914	0.000007
1/22/22	0.00	0.003	-5.00914 5.8001/	0.000007
1/23/22	0.00	0.003	-5.00914 5.8001/	0.000007
1/24/22	0.00	0.003	-5.80014	0.000007
1/26/22	0.00	0.003	-5.80914	0.000007
1/27/22	0.00	0.003	-5 80914	0.000887
1/28/22	0.06	0.003	-5 80914	0.000887
1/29/22	0.06	0.003	-5.80914	0.000887
1/30/22	0.06	0.003	-5.80914	0.000887
1/31/22	0.06	0.003	-5.80914	0.000887
2/1/22	0.06	0.003	-5.80914	0.000887
2/2/22	0.06	0.003	-5.80914	0.000887
2/3/22	0.06	0.003	-5.80914	0.000887
2/4/22	0.06	0.003	-5.80914	0.000887
2/5/22	0.06	0.003	-5.80914	0.000887
2/6/22	0.06	0.003	-5.80914	0.000887
2/7/22	0.06	0.003	-5.80914	0.000887
2/8/22	0.06	0.003	-5.80914	0.000887
2/8/22	0.06	0.003	-5.80914	0.000887
2/9/22	0.06	0.003	-5.80914	0.000887
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2/11/22	0.06	0.003	-5.80914	0.000887
2/12/22	0.06	0.003	-5.80914	0.000887
2/13/22	0.06	0.003	-5.80914	0.000887
2/14/22	0.06	0.003	-5.80914	0.000887
2/15/22	0.06	0.003	-5.80914	0.000887

2/16/22	0.06	0.003	-5.80914	0.000887
2/17/22	0.06	0.003	-5.80914	0.000887
2/18/22	0.06	0.003	-5.80914	0.000887
2/19/22	0.06	0.003	-5.80914	0.000887
2/20/22	0.06	0.003	-5.80914	0.000887
2/22/22	0.06	0.003	-5.80914	0.000887
2/23/22	0.06	0.003	-5.80914	0.000887
2/24/22	0.1	0.005	-5.29832	0.29226
2/25/22	0.06	0.003	-5.80914	0.000887
2/26/22	0.06	0.003	-5.80914	0.000887
2/27/22	0.06	0.003	-5.80914	0.000887
2/28/22	0.06	0.003	-5.80914	0.000887
3/1/22	0.06	0.003	-5.80914	0.000887
3/2/22	0.06	0.003	-5.80914	0.000887
3/3/22	0.06	0.003	-5.80914	0.000887
3/4/22	0.06	0.003	-5.80914	0.000887
3/5/22	0.06	0.003	-5.80914	0.000887
3/6/22	0.06	0.003	-5.80914	0.000887
3/7/22	0.06	0.003	-5.80914	0.000887
3/8/22	0.02	0.001	-6.90776	1.142391
3/9/22	0.06	0.003	-5.80914	0.000887
3/10/22	0.02	0.001	-6.90776	1.142391
3/11/22	0.06	0.003	-5.80914	0.000887
3/12/22	0.06	0.003	-5.80914	0.000887
3/13/22	0.02	0.001	-6.90776	1.142391
3/13/22	0.06	0.003	-5.80914	0.000887
3/15/22	0.06	0.003	-5.80914	0.000887
3/15/22	0.06	0.003	-5.80914	0.000887
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3/19/22	0.06	0.003	-5.80914	0.000887
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3/27/22	0.06	0.003	-5.80914	0.000887
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3/29/22	0.06	0.003	-5.80914	0.000887
3/30/22	0.06	0.003	-5.80914	0.000887
3/31/22	0.06	0.003	-5.80914	0.000887
4/1/22	0.2	0.01	-4.60517	1.522159
4/2/22	0.06	0.003	-5.80914	0.000887
4/3/22	0.06	0.003	-5.80914	0.000887
4/4/22	0.06	0.003	-5.80914	0.000887
4/5/22	0.06	0.003	-5.80914	0.000887
4/6/22	0.06	0.003	-5.80914	0.000887
4/7/22	0.06	0.003	-5.80914	0.000887
4/8/22	0.02	0.001	-6.90776	1.142391
4/9/22	0.02	0.001	-6.90776	1.142391
4/10/22	0.02	0.001	-6.90776	1.142391
4/11/22	0.06	0.003	-5.80914	0.000887
4/12/22	0.02	0.001	-6.90776	1.142391

4/13/22	0.02	0.001	-6.90776	1.142391
4/14/22	0.06	0.003	-5.80914	0.000887
4/15/22	0.06	0.003	-5.80914	0.000887
4/16/22	0.06	0.003	-5.80914	0.000887
4/17/22	0.06	0.003	-5.80914	0.000887
4/18/22	0.06	0.003	-5.80914	0.000887
4/19/22	0.06	0.003	-5.80914	0.000887
4/20/22	0.06	0.003	-5.80914	0.000887
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4/23/22	0.06	0.003	-5.80914	0.000887
4/24/22	0.06	0.003	-5.80914	0.000887
4/25/22	0.06	0.003	-5.80914	0.000887
4/26/22	0.06	0.003	-5.80914	0.000887
4/27/22	0.06	0.003	-5.80914	0.000887
4/28/22	0.06	0.003	-5.80914	0.000887
4/29/22	0.06	0.003	-5.80914	0.000887
4/30/22	0.06	0.003	-5.80914	0.000887
5/1/22	0.06	0.003	-5.80914	0.000887
5/2/22	0.06	0.003	-5 80914	0.000887
5/3/22	0.06	0.003	-5 80914	0.000887
5/4/22	0.06	0.003	-5 80914	0.000887
5/5/22	0.06	0.003	-5 80914	0.000887
5/6/22	0.06	0.003	-5 80914	0.000887
5/7/22	0.06	0.003	-5 80914	0.000887
5/8/22	0.00	0.003	-5 80914	0.000887
5/0/22	0.00	0.003	-5 80014	0.000007
5/10/22	0.00	0.003	-5 80914	0.000887
5/11/22	0.00	0.003	-5 80914	0.000887
5/12/22	0.06	0.000	-5 80914	0.000887
5/13/22	0.06	0.000	-5 80914	0.000887
5/14/22	0.00	0.003	-5 80914	0.000887
5/15/22	0.00	0.003	-5 80914	0.000887
5/16/22	0.00	0.000	-6 90776	1 142391
5/17/22	0.02	0.001	-5 80914	0.000887
5/10/22	0.00	0.003	-5 80914	0.000887
5/10/22	0.00	0.003	-5 80914	0.000887
5/20/22	0.00	0.003	-5 80914	0.000887
5/21/22	0.00	0.003	-5 80914	0.000887
5/22/22	0.00	0.003	-5 80914	0.000887
5/23/22	0.00	0.003	-5 80914	0.000887
5/24/22	0.00	0.003	-5 80914	0.000887
5/25/22	0.00	0.003	-5 80914	0.000887
5/26/22	0.00	0.003	-5 80014	0.000007
5/28/22	0.00	0.003	-5 80014	0.000007
5/20/22	0.00	0.003	-6 90776	1 1/2301
5/30/22	0.02	0.001	-5 80014	0.000887
5/31/22	0.00	0.003	-5 80014	0.000007
6/1/22	0.00	0.003	5 80014	0.000007
6/2/22	0.00	0.003	-5.00914	0.000007
6/2/22	0.00	0.003	-5.00914	0.000007
6/1/22	0.00	0.003	-5.00914	0.000007
6/5/22	0.00	0.003	-5.00914	0.000007
6/6/22	0.00	0.003	-5.80014	0.000007
6/8/22	0.00	0.003	-5 8001/	0.000007
0/0/22	0.00	0.000	-5.00314	0.000007
6/8/22	0.06	0.003	-5.80914	0.000887
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6/9/22	0.06	0.003	-5.80914	0.000887
6/10/22	0.1	0.005	-5.29832	0.29226
6/11/22	0.06	0.003	-5.80914	0.000887
6/12/22	0.06	0.003	-5.80914	0.000887
6/13/22	0.06	0.003	-5.80914	0.000887
6/14/22	0.06	0.003	-5.80914	0.000887
6/14/22	0.06	0.003	-5.80914	0.000887
6/15/22	0.02	0.001	-6.90776	1.142391
6/16/22	0.06	0.003	-5.80914	0.000887
6/17/22	0.06	0.003	-5.80914	0.000887
6/17/22	0.5	0.025	-3.68888	4.62271
6/18/22	0.06	0.003	-5.80914	0.000887
6/19/22	0.06	0.003	-5.80914	0.000887
6/20/22	0.02	0.001	-6.90776	1.142391
6/21/22	0.06	0.003	-5.80914	0.000887
6/22/22	0.06	0.003	-5.80914	0.000887
6/23/22	0.06	0.003	-5.80914	0.000887
6/24/22	0.06	0.003	-5.80914	0.000887
6/25/22	0.06	0.003	-5.80914	0.000887
6/26/22	0.06	0.003	-5.80914	0.000887
6/27/22	0.06	0.003	-5.80914	0.000887
6/28/22	0.06	0.003	-5.80914	0.000887
6/29/22	0.06	0.003	-5.80914	0.000887
6/30/22	0.06	0.003	-5.80914	0.000887
7/1/22	0.06	0.003	-5.80914	0.000887
7/2/22	0.06	0.003	-5.80914	0.000887
7/3/22	0.06	0.003	-5.80914	0.000887
7/4/22	0.06	0.003	-5.80914	0.000887
7/5/22	0.06	0.003	-5.80914	0.000887
7/6/22	0.06	0.003	-5.80914	0.000887
7/7/22	0.03	0.0015	-6.50229	0.440049
7/8/22	0.06	0.003	-5.80914	0.000887
7/9/22	0.06	0.003	-5.80914	0.000887
7/10/22	0.06	0.003	-5.80914	0.000887
7/11/22	0.06	0.003	-5.80914	0.000887
7/12/22	0.06	0.003	-5.80914	0.000887
7/13/22	0.06	0.003	-5.80914	0.000887
7/14/22	0.06	0.003	-5.80914	0.000887
7/15/22	0.06	0.003	-5.80914	0.000887
7/16/22	0.06	0.003	-5.80914	0.000887
7/17/22	0.06	0.003	-5.80914	0.000887
7/18/22	0.06	0.003	-5.80914	0.000887
7/19/22	0.1	0.005	-5.29832	0.29226
7/20/22	0.06	0.003	-5.80914	0.000887
7/21/22	0.06	0.003	-5.80914	0.000887
7/22/22	0.06	0.003	-5.80914	0.000887
7/23/22	0.06	0.003	-5.80914	0.000887
7/24/22	0.06	0.003	-5.80914	0.000887
7/25/22	0.06	0.003	-5.80914	0.000887
7/26/22	0.06	0.003	-5.80914	0.000887
7/27/22	0.06	0.003	-5.80914	0.000887
7/28/22	0.06	0.003	-5.80914	0.000887
7/29/22	0.06	0.003	-5.80914	0.000887
7/30/22	0.06	0.003	-5.80914	0.000887

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8/2/22 0.06 0.003 -5.80914 0.000 8/3/22 0.06 0.003 -5.80914 0.000 8/4/22 0.06 0.003 -5.80914 0.000 8/5/22 0.06 0.003 -5.80914 0.000 8/6/22 0.06 0.003 -5.80914 0.000 8/7/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000
8/3/22 0.06 0.003 -5.80914 0.000 8/4/22 0.06 0.003 -5.80914 0.000 8/5/22 0.06 0.003 -5.80914 0.000 8/6/22 0.06 0.003 -5.80914 0.000 8/7/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000 8/0/22 0.06 0.003 -5.80914 0.000
8/4/22 0.06 0.003 -5.80914 0.000 8/5/22 0.06 0.003 -5.80914 0.000 8/6/22 0.06 0.003 -5.80914 0.000 8/6/22 0.06 0.003 -5.80914 0.000 8/7/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000 8/0/22 0.06 0.003 -5.80914 0.000
8/5/22 0.06 0.003 -5.80914 0.000 8/6/22 0.06 0.003 -5.80914 0.000 8/7/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000
8/6/22 0.06 0.003 -5.80914 0.000 8/7/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000
8/7/22 0.06 0.003 -5.80914 0.000 8/8/22 0.06 0.003 -5.80914 0.000 8/0/22 0.06 0.003 -5.80914 0.000
8/8/22 0.06 0.003 -5.80914 0.000 8/0/22 0.06 0.003 -5.80914 0.000
0/9/22 0.00 0.003 -5.80914 0.000
8/10/22 0.06 0.003 -5.80914 0.000
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8/15/22 0.06 0.003 -5.80914 0.000
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8/20/22 0.06 0.003 -5.80914 0.000
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8/22/22 0.06 0.003 -5.80914 0.000
8/23/22 0.06 0.003 -5.80914 0.000
8/24/22 0.06 0.003 -5.80914 0.000
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9/2/22 0.06 0.003 -5.80914 0.000
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9/4/22 0.06 0.003 -5.80914 0.000
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9/7/22 0.06 0.003 -5.80914 0.000
9/8/22 0.06 0.003 -5.80914 0.000
9/9/22 0.06 0.003 -5.80914 0.000
9/10/22 0.06 0.003 -5.80914 0.000
9/11/22 0.06 0.003 -5.80914 0.000
9/12/22 0.06 0.003 -5.80914 0.000
9/13/22 0.06 0.003 -5.80914 0.000
9/14/22 0.06 0.003 -5.80914 0.000
9/15/22 0.06 0.003 -5.80914 0.000
9/16/22 0.06 0.003 -5.80914 0.000
9/17/22 0.06 0.003 -5 80914 0.000
9/18/22 0.06 0.003 -5.80914 0.000
9/19/22 0.06 0.003 -5.80914 0.000
9/20/22 0.06 0.003 -5.80914 0.000
9/21/22 0.06 0.003 -5 80914 0.000
9/22/22 0.06 0.003 -5.80914 0.000
9/23/22 0.06 0.003 -5.80914 0.000

9/24/22	0.06	0.003	-5.80914	0.000887
9/25/22	0.06	0.003	-5.80914	0.000887
9/26/22	0.06	0.003	-5.80914	0.000887
9/27/22	0.06	0.003	-5.80914	0.000887
9/28/22	0.06	0.003	-5.80914	0.000887
9/29/22	0.06	0.003	-5.80914	0.000887
9/30/22	0.06	0.003	-5.80914	0.000887
10/1/22	0.06	0.003	-5.80914	0.000887
10/2/22	0.06	0.003	-5.80914	0.000887
10/3/22	0.06	0.003	-5.80914	0.000887
10/4/22	0.06	0.003	-5.80914	0.000887
10/4/22	0.06	0.003	-5.80914	0.000887
10/5/22	0.06	0.003	-5.80914	0.000887
10/6/22	0.06	0.003	-5.80914	0.000887
10/7/22	0.06	0.003	-5.80914	0.000887
10/8/22	0.06	0.003	-5.80914	0.000887
10/9/22	0.06	0.003	-5.80914	0.000887
10/10/22	0.06	0.003	-5.80914	0.000887
10/11/22	0.06	0.003	-5.80914	0.000887
10/12/22	0.06	0.003	-5.80914	0.000887
10/13/22	0.06	0.003	-5.80914	0.000887
10/14/22	0.06	0.003	-5.80914	0.000887
10/15/22	0.06	0.003	-5.80914	0.000887
10/16/22	0.06	0.003	-5.80914	0.000887
10/17/22	0.06	0.003	-5.80914	0.000887
10/18/22	0.06	0.003	-5.80914	0.000887
10/19/22	0.06	0.003	-5.80914	0.000887
10/20/22	0.06	0.003	-5.80914	0.000887
10/21/22	0.06	0.003	-5.80914	0.000887
10/22/22	0.06	0.003	-5.80914	0.000887
10/23/22	0.06	0.003	-5.80914	0.000887
10/24/22	0.06	0.003	-5.80914	0.000887
10/25/22	0.06	0.003	-5.80914	0.000887
10/26/22	0.06	0.003	-5.80914	0.000887
10/27/22	0.06	0.003	-5.80914	0.000887
10/28/22	0.06	0.003	-5.80914	0.000887
10/29/22	0.02	0.001	-6.90776	1.142391
10/30/22	0.06	0.003	-5.80914	0.000887
10/31/22	0.06	0.003	-5.80914	0.000887
11/1/22	0.06	0.003	-5.80914	0.000887
11/2/22	0.06	0.003	-5.80914	0.000887
11/3/22	0.06	0.003	-5.80914	0.000887
11/4/22	0.06	0.003	-5.80914	0.000887
11/5/22	0.06	0.003	-5.80914	0.000887
11/6/22	0.06	0.003	-5.80914	0.000887
11/7/22	0.06	0.003	-5.80914	0.000887
11/7/22	0.06	0.003	-5.80914	0.000887
11/8/22	0.06	0.003	-5.80914	0.000887
11/9/22	0.06	0.003	-5.80914	0.000887
11/10/22	0.06	0.003	-5.80914	0.000887
11/11/22	0.06	0.003	-5.80914	0.000887
11/12/22	0.06	0.003	-5.80914	0.000887
11/13/22	0.06	0.003	-5.80914	0.000887
11/14/22	0.06	0.003	-5.80914	0.000887
11/16/22	0.06	0.003	-5.80914	0.000887

11/17/22	0.06	0.003	-5.80914	0.000887
11/18/22	0.06	0.003	-5.80914	0.000887
11/19/22	0.06	0.003	-5.80914	0.000887
11/20/22	0.06	0.003	-5.80914	0.000887
11/21/22	0.06	0.003	-5.80914	0.000887
11/22/22	0.06	0.003	-5.80914	0.000887
11/23/22	0.06	0.003	-5.80914	0.000887
11/24/22	0.06	0.003	-5.80914	0.000887
11/25/22	0.06	0.003	-5.80914	0.000887
11/26/22	0.06	0.003	-5.80914	0.000887
11/27/22	0.06	0.003	-5.80914	0.000887
11/28/22	0.06	0.003	-5.80914	0.000887
11/29/22	0.06	0.003	-5.80914	0.000887
11/30/22	0.06	0.003	-5.80914	0.000887
12/1/22	0.06	0.003	-5.80914	0.000887
12/2/22	0.06	0.003	-5.80914	0.000887
12/3/22	0.03	0.0015	-6.50229	0.440049
12/4/22	0.02	0.001	-6.90776	1.142391
12/5/22	0.02	0.001	-6.90776	1.142391
12/6/22	0.02	0.001	-6.90776	1.142391
12/7/22	0.02	0.001	-6.90776	1.142391
12/8/22	0.02	0.001	-6.90776	1.142391
12/9/22	0.02	0.001	-6.90776	1.142391
12/10/22	0.06	0.003	-5.80914	0.000887
12/11/22	0.06	0.003	-5.80914	0.000887
12/12/22	0.06	0.003	-5.80914	0.000887
12/13/22	0.06	0.003	-5.80914	0.000887
12/14/22	0.06	0.003	-5.80914	0.000887
12/15/22	0.06	0.003	-5.80914	0.000887
12/16/22	0.06	0.003	-5.80914	0.000887
12/17/22	0.06	0.003	-5.80914	0.000887
12/18/22	0.06	0.003	-5.80914	0.000887
12/19/22	0.06	0.003	-5.80914	0.000887
12/20/22	0.06	0.003	-5.80914	0.000887
12/21/22	0.06	0.003	-5.80914	0.000887
12/22/22	0.02	0.001	-6.90776	1.142391
12/24/22	0.06	0.003	-5.80914	0.000887
12/25/22	0.06	0.003	-5.80914	0.000887
12/26/22	0.06	0.003	-5.80914	0.000887
12/27/22	0.06	0.003	-5.80914	0.000887
12/28/22	0.06	0.003	-5.80914	0.000887
12/29/22	0.06	0.003	-5.80914	0.000887
12/30/22	0.06	0.003	-5.80914	0.000887
12/31/22	0.06	0.003	-5.80914	0.000887
1/1/23	0.06	0.003	-5.80914	0.000887
1/2/23	0.06	0.003	-5.80914	0.000887
1/3/23	0.06	0.003	-5.80914	0.000887
1/4/23	0.06	0.003	-5.80914	0.000887
1/4/23	0.06	0.003	-5.80914	0.000887
1/5/23	0.06	0.003	-5.80914	0.000887
1/6/23	0.06	0.003	-5.80914	0.000887
1/7/23	0.06	0.003	-5.80914	0.000887
1/8/23	0.06	0.003	-5.80914	0.000887
1/9/23	0.06	0.003	-5.80914	0.000887
1/10/23	0.06	0.003	-5.80914	0.000887

1/11/23	0.06	0.003	-5.80914	0.000887
1/12/23	0.06	0.003	-5.80914	0.000887
1/13/23	0.06	0.003	-5.80914	0.000887
1/14/23	0.06	0.003	-5.80914	0.000887
1/15/23	0.06	0.003	-5.80914	0.000887
1/16/23	0.06	0.003	-5.80914	0.000887
1/17/23	0.06	0.003	-5.80914	0.000887
1/18/23	0.06	0.003	-5.80914	0.000887
1/19/23	0.06	0.003	-5.80914	0.000887
1/20/23	0.06	0.003	-5.80914	0.000887
1/21/23	0.06	0.003	-5.80914	0.000887
1/22/23	0.06	0.003	-5.80914	0.000887
1/23/23	0.06	0.003	-5.80914	0.000887
1/24/23	0.06	0.003	-5.80914	0.000887
1/25/23	0.06	0.003	-5.80914	0.000887
1/26/23	0.06	0.003	-5.80914	0.000887
1/27/23	0.06	0.003	-5.80914	0.000887
1/28/23	0.06	0.003	-5.80914	0.000887
1/29/23	0.06	0.003	-5.80914	0.000887
1/30/23	0.06	0.003	-5.80914	0.000887
1/31/23	0.06	0.003	-5.80914	0.000887
2/1/23	0.06	0.003	-5.80914	0.000887
2/2/23	0.06	0.003	-5.80914	0.000887
2/3/23	0.06	0.003	-5.80914	0.000887
2/4/23	0.06	0.003	-5.80914	0.000887
2/5/23	0.06	0.003	-5 80914	0.000887
2/6/23	0.06	0.003	-5 80914	0.000887
2/7/23	0.06	0.003	-5.80914	0.000887
2/8/23	0.06	0.003	-5.80914	0.000887
2/9/23	0.06	0.003	-5.80914	0.000887
2/10/23	0.06	0.003	-5.80914	0.000887
2/13/23	0.06	0.003	-5.80914	0.000887
2/15/23	0.06	0.003	-5.80914	0.000887
2/17/23	0.06	0.003	-5.80914	0.000887
2/23/23	0.06	0.003	-5.80914	0.000887
2/24/23	0.06	0.003	-5.80914	0.000887
2/27/23	0.06	0.003	-5.80914	0.000887
2/28/23	0.06	0.003	-5.80914	0.000887
3/1/23	0.06	0.003	-5.80914	0.000887
3/2/23	0.06	0.003	-5.80914	0.000887
3/3/23	0.06	0.003	-5.80914	0.000887
3/4/23	0.06	0.003	-5.80914	0.000887
3/5/23	0.06	0.003	-5.80914	0.000887
3/6/23	0.06	0.003	-5.80914	0.000887
3/7/23	0.06	0.003	-5.80914	0.000887
3/8/23	0.06	0.003	-5.80914	0.000887
3/9/23	0.06	0.003	-5.80914	0.000887
3/10/23	0.06	0.003	-5.80914	0.000887
3/11/23	0.07	0.0035	-5.65499	0.033832
3/12/23	0.06	0.003	-5.80914	0.000887
3/13/23	0.06	0.003	-5.80914	0.000887
3/14/23	0.06	0.003	-5.80914	0.000887
3/15/23	0.06	0.003	-5.80914	0.000887
3/16/23	0.06	0.003	-5.80914	0.000887
3/17/23	0.06	0.003	-5.80914	0.000887

3/18/23	0.06	0.003	-5.80914	0.000887
3/19/23	0.06	0.003	-5.80914	0.000887
3/20/23	0.06	0.003	-5.80914	0.000887
3/21/23	0.06	0.003	-5.80914	0.000887
3/22/23	0.06	0.003	-5.80914	0.000887
3/23/23	0.06	0.003	-5.80914	0.000887
3/24/23	0.06	0.003	-5.80914	0.000887
3/25/23	0.06	0.003	-5.80914	0.000887
3/26/23	0.06	0.003	-5.80914	0.000887
3/27/23	0.06	0.003	-5.80914	0.000887
3/28/23	0.06	0.003	-5.80914	0.000887
3/29/23	0.06	0.003	-5.80914	0.000887
3/30/23	0.06	0.003	-5.80914	0.000887
3/31/23	0.06	0.003	-5.80914	0.000887
4/1/23	0.06	0.003	-5.80914	0.000887
4/2/23	0.06	0.003	-5.80914	0.000887
4/3/23	0.06	0.003	-5 80914	0.000887
4/5/23	0.06	0.003	-5 80914	0.000887
4/6/23	0.06	0.003	-5 80914	0.000887
4/7/23	0.06	0.003	-5 80914	0.000887
4/8/23	0.06	0.000	-5 80914	0.000887
4/0/23	0.00	0.000	-5 80014	0.000887
4/3/23	0.00	0.003	-5 80014	0.000007
4/10/23	0.00	0.003	-5 80014	0.000007
4/11/23	0.00	0.003	5 80014	0.000887
4/12/23	0.00	0.003	-5.80914	0.000887
4/13/23	0.00	0.003	-5.80914	0.000887
4/14/23	0.00	0.003	-5.60914	0.000887
4/10/23	0.00	0.003	-5.80914	0.000887
4/11/23	0.00	0.003	-5.80914	0.000887
4/10/23	0.00	0.003	-5.80914	0.000887
4/19/23	0.00	0.003	-5.60914	0.000887
4/20/23	0.00	0.003	-5.60914	0.000887
4/21/23	0.00	0.003	-5.60914	0.000887
4/22/23	0.00	0.003	-5.60914	0.000887
4/23/23	0.00	0.003	-5.60914	0.000887
4/23/23	0.06	0.003	-5.60914	0.000887
4/20/23	0.06	0.003	-5.60914	0.000887
4/21/23	0.06	0.003	-5.80914	0.000887
4/20/23	0.06	0.003	-5.60914	0.000887
4/29/23	0.06	0.003	-5.80914	0.000887
4/30/23	0.06	0.003	-5.80914	0.000887
5/1/23	0.06	0.003	-5.80914	0.000887
5/2/23	0.06	0.003	-5.80914	0.000887
5/4/23	0.06	0.003	-5.80914	0.000887
5/5/23	0.06	0.003	-5.80914	0.000887
5/6/23	0.06	0.003	-5.80914	0.000887
5/7/23	0.06	0.003	-5.80914	0.000887
5/18/23	0.06	0.003	-5.80914	0.000887
5/20/23	0.06	0.003	-5.80914	0.000887
5/22/23	0.06	0.003	-5.80914	0.000887
5/23/23	0.06	0.003	-5.80914	0.000887
5/24/23	0.06	0.003	-5.80914	0.000887
5/25/23	0.06	0.003	-5.80914	0.000887
5/26/23	0.06	0.003	-5.80914	0.000887
5/27/23	0.06	0.003	-5.80914	0.000887

5/28/23	0.06	0.003	-5.80914	0.000887
5/29/23	0.06	0.003	-5.80914	0.000887
5/30/23	0.06	0.003	-5.80914	0.000887
5/31/23	0.06	0.003	-5.80914	0.000887
6/2/23	0.06	0.003	-5.80914	0.000887
6/3/23	0.06	0.003	-5.80914	0.000887
6/4/23	0.06	0.003	-5.80914	0.000887
6/5/23	0.06	0.003	-5.80914	0.000887
6/6/23	0.06	0.003	-5.80914	0.000887
6/7/23	0.06	0.003	-5.80914	0.000887
6/8/23	0.06	0.003	-5.80914	0.000887
6/9/23	0.06	0.003	-5.80914	0.000887
6/10/23	0.06	0.003	-5.80914	0.000887
6/11/23	0.06	0.003	-5.80914	0.000887
6/12/23	0.06	0.003	-5.80914	0.000887
6/13/23	0.06	0.003	-5.80914	0.000887
6/14/23	0.06	0.003	-5.80914	0.000887
6/15/23	0.06	0.003	-5 80914	0.000887
6/16/23	0.06	0.003	-5 80914	0.000887
6/16/23	0.06	0.003	-5 80914	0.000887
6/17/23	0.06	0.003	-5 80914	0.000887
6/18/23	0.06	0.000	-5 80914	0.000887
6/10/23	0.00	0.003	-5 80914	0.000887
6/20/23	0.00	0.000	-5 80914	0.000887
6/21/23	0.00	0.003	-5 80914	0.000887
6/22/23	0.00	0.003	-5 80014	0.000007
6/23/23	0.00	0.003	-5 80014	0.000007
6/24/23	0.00	0.003	-5 80914	0.000007
6/25/23	0.00	0.003	-5 80914	0.000887
6/26/23	0.00	0.003	-5 80914	0.000887
6/27/23	0.00	0.000	-5 80914	0.000887
6/28/23	0.00	0.003	-5 80914	0.000887
6/28/23	0.00	0.003	-5 80914	0.000887
6/20/23	0.00	0.003	-5 80914	0.000887
6/30/23	0.00	0.000	-5 80914	0.000887
7/1/23	0.00	0.003	-5 80914	0.000887
7/2/23	0.00	0.003	-5 80914	0.000887
7/3/23	0.00	0.003	-5 80914	0.000887
7/4/23	0.00	0.003	-5 80914	0.000887
7/5/23	0.00	0.003	-5 80914	0.000887
7/6/23	0.00	0.003	-5 80914	0.000887
7/7/23	0.00	0.003	-5 80914	0.000887
7/8/23	0.00	0.003	-5 80914	0.000887
7/0/23	0.00	0.000	-5 80014	0.000007
7/10/23	0.00	0.003	-5 80014	0.000007
7/11/23	0.00	0.003	-5 80014	0.000007
7/12/23	0.00	0.003	-5 80014	0.000007
7/13/23	0.00	0.003	-5 80014	0.000007
7/1//23	0.00	0.003	5 80014	0.000007
7/15/22	0.00	0.003	-5.00914	0.000007
7/16/22	0.00	0.003	-5.00914	0.000007
7/17/23	0.00	0.003	-5.00914	0.000007
7/18/23	0.00	0.003	-5.00914	0.000007
7/10/23	0.00	0.003	-5.80014	0.000007
7/21/23	0.00	0.000	-5 8001/	0.000007
1/21/20	0.00	0.000	0.00014	0.000007

7/23/23 0.06 0.003 -5.80914 0.000887 7/24/23 0.06 0.003 -5.80914 0.000887 7/26/23 0.06 0.003 -5.80914 0.000887 7/28/23 0.06 0.003 -5.80914 0.000887 7/28/23 0.06 0.003 -5.80914 0.000887 7/29/23 0.06 0.003 -5.80914 0.000887 7/31/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003	7/22/23	0.06	0.003	-5.80914	0.000887
7/24/23 0.06 0.003 -5.80914 0.000887 7/25/23 0.06 0.003 -5.80914 0.000887 7/27/23 0.06 0.003 -5.80914 0.000887 7/28/23 0.06 0.003 -5.80914 0.000887 7/29/23 0.06 0.003 -5.80914 0.000887 7/30/23 0.06 0.003 -5.80914 0.000887 7/31/23 0.06 0.003 -5.80914 0.000887 8//23 0.06 0.003 -5.80914 0.000887 8//23 0.06 0.003 -5.80914 0.000887 8//23 0.06 0.003 -5.80914 0.000887 8//23 0.06 0.003 -5.80914 0.000887 8//23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003	7/23/23	0.06	0.003	-5.80914	0.000887
7/25/23 0.06 0.003 -5.80914 0.000887 7/26/23 0.06 0.003 -5.80914 0.000887 7/28/23 0.06 0.003 -5.80914 0.000887 7/30/23 0.06 0.003 -5.80914 0.000887 7/30/23 0.06 0.003 -5.80914 0.000887 7/31/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/223 0.06 0.003 -5.80914 0.000887 8/4/23 0.06 0.003 -5.80914 0.000887 8/23 0.06 0.003 -5.80914 0.000887 8/7/23 0.06 0.003 -5.80914 0.000887 8/9/23 0.06 0.003 -5.80914 0.000887 8/11/23 0.06 0.003 -5.80914 0.000887 8/11/23 0.06 0.003 -5.80914 0.000887 8/11/23 0.06 0.003 -5.80914 0.000887 8/11/23 0.06 0.003	7/24/23	0.06	0.003	-5.80914	0.000887
7/26/23 0.06 0.003 -5.80914 0.000887 7/27/23 0.06 0.003 -5.80914 0.000887 7/29/23 0.06 0.003 -5.80914 0.000887 7/20/23 0.06 0.003 -5.80914 0.000887 7/31/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/4/23 0.06 0.003 -5.80914 0.000887 8/4/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.00087 8/1/23 0.06 0.003 -5.80914 0.00087 8/1/23 0.06 0.003 <td< td=""><td>7/25/23</td><td>0.06</td><td>0.003</td><td>-5.80914</td><td>0.000887</td></td<>	7/25/23	0.06	0.003	-5.80914	0.000887
7/27/23 0.06 0.003 -5.80914 0.000887 7/28/23 0.06 0.003 -5.80914 0.000887 7/30/23 0.06 0.003 -5.80914 0.000887 7/31/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.00087 8/1/23 0.06 0.003 -5.80914 0.00087 8/1/23 0.06 0.003 -5.80914 0.00087 8/1/23 0.06 0.003 -5.	7/26/23	0.06	0.003	-5.80914	0.000887
7/28/23 0.06 0.003 -5.80914 0.00887 7/30/23 0.06 0.003 -5.80914 0.000887 7/30/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/2/23 0.06 0.003 -5.80914 0.000887 8/4/23 0.06 0.003 -5.80914 0.000887 8/4/23 0.06 0.003 -5.80914 0.000887 8/7/23 0.06 0.003 -5.80914 0.000887 8/7/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.000887 8/1/23 0.06 0.003 -5.80914 0.00087 8/1/23 0.06 0.003 -5.80914 0.00087 8/1/23 0.06 0.003 -5.80914 0.00087 8/1/23 0.06 0.003 -5.	7/27/23	0.06	0.003	-5.80914	0.000887
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8/5/23 0.06 0.003 -5.80914 0.00887 8/6/23 0.06 0.003 -5.80914 0.00887 8/8/23 0.06 0.003 -5.80914 0.00887 8/9/23 0.06 0.003 -5.80914 0.00887 8/9/23 0.06 0.003 -5.80914 0.00887 8/10/23 0.06 0.003 -5.80914 0.00887 8/11/23 0.06 0.003 -5.80914 0.00887 8/11/23 0.06 0.003 -5.80914 0.00887 8/14/23 0.06 0.003 -5.80914 0.00887 8/14/23 0.06 0.003 -5.80914 0.00887 8/14/23 0.06 0.003 -5.80914 0.00887 8/16/23 0.06 0.003 -5.80914 0.00887 8/14/23 0.06 0.003 -5.80914 0.00887 8/12/23 0.06 0.003 -5.80914 0.00887 8/20/23 0.06 0.003 <t< td=""><td>8/4/23</td><td>0.06</td><td>0.003</td><td>-5.80914</td><td>0.000887</td></t<>	8/4/23	0.06	0.003	-5.80914	0.000887
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	8/16/23	0.06	0.003	-5 80914	0.000887
	8/17/23	0.06	0.003	-5 80914	0.000887
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8/29/23 0.06 0.003 -5.80914 0.000887 8/30/23 0.06 0.003 -5.80914 0.000887 8/31/23 0.06 0.003 -5.80914 0.000887 9/1/23 0.06 0.003 -5.80914 0.000887 9/1/23 0.06 0.003 -5.80914 0.000887 9/2/23 0.06 0.003 -5.80914 0.000887 9/3/23 0.06 0.003 -5.80914 0.000887 9/4/23 0.06 0.003 -5.80914 0.000887 9/5/23 0.06 0.003 -5.80914 0.000887 9/6/23 0.06 0.003 -5.80914 0.000887 9/7/23 0.06 0.003 -5.80914 0.000887 9/8/23 0.06 0.003 -5.80914 0.000887 9/9/23 0.06 0.003 -5.80914 0.000887 9/10/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003	8/28/23	0.06	0.003	-5.80914	0.000887
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9/6/23 0.06 0.003 -5.80914 0.000887 9/7/23 0.06 0.003 -5.80914 0.000887 9/8/23 0.06 0.003 -5.80914 0.000887 9/8/23 0.06 0.003 -5.80914 0.000887 9/9/23 0.06 0.003 -5.80914 0.000887 9/10/23 0.06 0.003 -5.80914 0.000887 9/11/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003 -5.80914 0.000887 9/13/23 0.06 0.003 -5.80914 0.000887 9/14/23 0.06 0.003 -5.80914 0.000887	9/5/23	0.06	0.003	-5.80914	0.000887
9/7/23 0.06 0.003 -5.80914 0.000887 9/8/23 0.06 0.003 -5.80914 0.000887 9/9/23 0.06 0.003 -5.80914 0.000887 9/9/23 0.06 0.003 -5.80914 0.000887 9/10/23 0.06 0.003 -5.80914 0.000887 9/11/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003 -5.80914 0.000887 9/13/23 0.06 0.003 -5.80914 0.000887 9/14/23 0.06 0.003 -5.80914 0.000887	9/6/23	0.06	0.003	-5.80914	0.000887
9/8/23 0.06 0.003 -5.80914 0.000887 9/9/23 0.06 0.003 -5.80914 0.000887 9/10/23 0.06 0.003 -5.80914 0.000887 9/10/23 0.06 0.003 -5.80914 0.000887 9/11/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003 -5.80914 0.000887 9/13/23 0.06 0.003 -5.80914 0.000887 9/14/23 0.06 0.003 -5.80914 0.000887	9/7/23	0.06	0.003	-5.80914	0.000887
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9/10/23 0.06 0.003 -5.80914 0.000887 9/11/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003 -5.80914 0.000887 9/13/23 0.06 0.003 -5.80914 0.000887 9/14/23 0.06 0.003 -5.80914 0.000887	9/9/23	0.06	0.003	-5.80914	0.000887
9/11/23 0.06 0.003 -5.80914 0.000887 9/12/23 0.06 0.003 -5.80914 0.000887 9/13/23 0.06 0.003 -5.80914 0.000887 9/14/23 0.06 0.003 -5.80914 0.000887	9/10/23	0.06	0.003	-5.80914	0.000887
9/12/23 0.06 0.003 -5.80914 0.000887 9/13/23 0.06 0.003 -5.80914 0.000887 9/14/23 0.06 0.003 -5.80914 0.000887	9/11/23	0.06	0.003	-5.80914	0.000887
9/13/23 0.06 0.003 -5.80914 0.000887 9/14/23 0.06 0.003 -5.80914 0.000887	9/12/23	0.06	0.003	-5.80914	0.000887
9/14/23 0.06 0.003 -5.80914 0.000887	9/13/23	0.06	0.003	-5.80914	0.000887
	9/14/23	0.06	0.003	-5.80914	0.000887

9/15/23	0.06	0.003	-5.80914	0.000887
9/16/23	0.06	0.003	-5.80914	0.000887
9/17/23	0.06	0.003	-5.80914	0.000887
9/18/23	0.06	0.003	-5.80914	0.000887
9/19/23	0.06	0.003	-5.80914	0.000887
9/20/23	0.06	0.003	-5.80914	0.000887
9/21/23	0.06	0.003	-5.80914	0.000887
9/22/23	0.06	0.003	-5.80914	0.000887
9/23/23	0.06	0.003	-5.80914	0.000887
9/23/23	0.06	0.003	-5.80914	0.000887
9/24/23	0.06	0.003	-5.80914	0.000887
9/25/23	0.06	0.003	-5.80914	0.000887
9/26/23	0.06	0.003	-5.80914	0.000887
9/27/23	0.06	0.003	-5.80914	0.000887
9/28/23	0.06	0.003	-5.80914	0.000887
9/29/23	0.06	0.003	-5.80914	0.000887
9/30/23	0.06	0.003	-5.80914	0.000887
10/2/23	0.06	0.003	-5.80914	0.000887

average 0.002987825

k 616

n 4

μy -5.83892818 oy^2 0.050902529

	BPJ OF BAT TECHNOLOGY-BASED EFFLUENT LIMITS									
	USE EXCEL TO PERFORM THE LOGNORMAL TRANSFORMATION									
	AND CALCULATE THE TRANSFORMED MEAN AND VARIANCE									
		L	.OGNORM/	AL TRANSF	ORMED M	EAN =	-5.8389	Outlet 108		
		LOGN	IORMAL TF	RANSFORM	IED VARIA	NCE =	0.0509	PFOA		
NUMBE	R OF SAMF	PLES/MON	TH FOR CC	MPLIANCE	MONITOR	RING =	4			
	AUTOCOF	RELATION	I FACTOR(ne)(USE 0	IF UNKNC	WN) =	0			
					n>10	E(X)	0.0030	0.0030		
					n>10	V(X)	0.000	0.000		
					n<10	σ_n^2	0.0130	N/A		
					n<10	μ _n	-5.8200	N/A		
					n>10	V(X _{n)}	0.000	N/A		
LTA Flow=	0.104	MGD				X.95=	0.004	N/A		
						X.99=	N/A	0.005		
						VF=	1.206	1.648		
	MAXIMUM DAILY EFFLUENT LIMIT (ug/I) =							0.005		
		AVERAG	GE MONTH	LY EFFLUE	ENT LIMIT	(ug/l) =	0.004	N/A		
		MAXIM	UM DAILY	EFFLUENT	LIMIT (lbs	/day) =	N/A	0.000004		
		AVERAGE	MONTHLY	EFFLUENT	LIMIT (lbs	/day) =	0.000003	N/A		

Ranney Well HFPO-DA and PFOA Data

Date	Ranney Raw HFPO-DA (ng/l)	Ranney Raw PFOA (ng/l)	East lag HFPO-DA (ng/l)	West lag HFPO-DA (ng/l)	Combined lag HPFO-DA (ng/l)	East lag PFOA (ng/l)	West lag PFOA (ng/l)	Combined lag PFOA (ng/l)
1/24/2022	12 200	20.000	<50	<50	50	100	200	150
2/2/2022	12,300	28,000	<50	< <u>-</u> 30 80	65	100	200	100
2/8/2022	11,400	28,000	<50	160	105	300	300	300
2/16/2022	9,700	27,000	<50	<50	50	<20	<20	20
2/28/2022	8,300	28,100	<50	<50	50	<20	<20	20
3/15/2022	8,000	25,300	<50	<50	50	<20	<20	20
3/29/2022	8,700	22,300	<50	<50	50	<20	<20	20
4/28/2022	9,400	23,000	<50	<50	50	<20	<20	20
5/4/2022	8,600	25,400	<50	<50	50	<20	<20	20
5/10/2022	8,500	26,000	<50	<50	50	<20	<20	20
5/18/2022	8,000	23,600	<50	<50	50	<20	<20	20
5/24/2022	9,200	21,200	<50	<50	50	<20	<20	20
5/31/2022	12,000	24,200	400	<50	225	20	<20	20
6/9/2022	11,500	26,700	<50	<50	50	<20	<20	20
6/15/2022	11,100	26,800	<50	<50	50	<20	<20	20
6/22/2022	10,100	25,100	100	/0	85	<20	<20	20
7/12/2022	12,000	30,400	<50	<50	50	<20	<20	20
7/20/2022	12,900	27,700	<50	<50	50	<20	<20	20
7/20/2022	12 200	24,300	<50	<50	50	<20	<20	20
8/2/2022	15,500	24,000	<50	<50	50	<20	<20	20
8/9/2022	14 100	24,000	<50	<50	50	<20	<20	20
8/17/2022	14,700	26,000	<50	<50	50	<20	<20	20
8/23/2022	15,300	25,000	<50	<50	50	<20	<20	20
8/30/2022	14,600	22,900	<50	<50	50	<20	<20	20
9/7/2022	14,700	24,900	<50	<50	50	<20	<20	20
9/13/2022	16,200	24,200	<50	<50	50	<20	<20	20
9/19/2022	12,600	23,700	<50	<50	50	<20	<20	20
9/27/2022	13,400	26,600	<50	<50	50	<20	<20	20
10/4/2022	11,900	24,000	<50	<50	50	<20	<20	20
#########	15,400	21,200	<50	<50	50	<20	<20	20
#########	15,900	24,700	<50	<50	50	<20	<20	20
#########	14,700	20,500	<100	100	100	<20	<20	20
########	13,400	20,900	<50	<50	50	<20	<20	20
########	12,600	29,900	<50	<50	50	<20	<20	20
12/6/2022	15,200	21,800	100	60	80	<20	<20	20
#########	14,700	22,700	<50	<50	50	<20	<20	20
1/3/2023	11,900	22,100	200	100	150	<20	<20	20
1/24/2023	12 400	20,700	<50	<50	50	<20	<20	20
1/24/2023	13 300	18 900	<50	<50	50	<20	<20	20
2/27/2023	19,700	23,900	<50	<50	50	<20	<20	20
3/7/2023	19,300	23,700	<50	<50	50	<20	<20	20
3/14/2023	15,900	21,000	<50	<50	50	<20	100	60
3/22/2023	17,400	22,200	<50	<50	50	<20	<20	20
3/28/2023	20,300	24,500	50	<50	50	<20	<20	20
4/11/2023	14,900	20,500	<50	<50	50	<20	<20	20
4/18/2023	20,900	21,300	200	500	350	<20	40	30
4/25/2023	16,900	19,900	<50	<50	50	<20	<20	20
5/1/2023	22,600	20,100	200	<50	125	30	30	30
5/9/2023	18,900	20,400	200	<50	125	<20	<20	20
5/16/2023	17,500	23,560	<50	<50	50	400	<20	210
5/23/2023	16,300	23,500	<50	<50	50	<20	<20	20
6/20/2022	14,000	18,430	<100	<100	100	<20	<20	20
6/27/2022	16 300	24,500	~50	~50	50	<20	20	20
7/4/2023	20,300	23,700	100	300	200	<20	<20	20
7/11/2023	19 100	22,500	50	400	200	<20	60	40
7/18/2023	14.400	21.600	<50	80	65	<20	30	25
7/25/2023	17,300	23,600	<50	50	50	<20	<20	20
7/31/2023	11,700	21,000	<50	<50	50	<20	<20	20

Sample Date	HFPO-DA (ng/l)	yi	(y _i -µ _y) ²
1/24/2022	50	3.912023	0.044896
2/2/2022	65	4.174387	0.002548
2/8/2022	105	4.65396	0.280953
2/16/2022	50	3.912023	0.044896
2/28/2022	50	3.912023	0.044896
3/15/2022	50	3.912023	0.044896
3/29/2022	50	3.912023	0.044896
4/28/2022	50	3.912023	0.044896
5/4/2022	50	3.912023	0.044896
5/10/2022	50	3.912023	0.044896
5/18/2022	50	3.912023	0.044896
5/24/2022	50	3.912023	0.044896
5/31/2022	225	5.4161	1.669754
6/9/2022	50	3.912023	0.044896
6/15/2022	50	3.912023	0.044896
6/22/2022	85	4.442651	0.101596
7/6/2022	50	3.912023	0.044896
7/13/2022	50	3.912023	0.044896
7/20/2022	50	3.912023	0.044896
7/27/2022	50	3.912023	0.044896
8/2/2022	50	3.912023	0.044896
8/9/2022	50	3.912023	0.044896
8/17/2022	50	3.912023	0.044896
8/23/2022	50	3.912023	0.044896
8/30/2022	50	3.912023	0.044896
9/7/2022	50	3.912023	0.044896
9/13/2022	50	3.912023	0.044896
9/19/2022	50	3.912023	0.044896
9/27/2022	50	3.912023	0.044896
10/4/2022	50	3.912023	0.044896
10/17/2022	50	3.912023	0.044896
10/24/2022	50	3.912023	0.044896
10/28/2022	100	4.60517	0.23161
11/15/2022	50	3.912023	0.044896
11/29/2022	50	3.912023	0.044896
12/6/2022	80	4.382027	0.066624
12/13/2022	50	3.912023	0.044896
12/20/2022	50	3.912023	0.044896
1/3/2023	150	5.010635	0.78628
1/24/2023	50	3.912023	0.044896
2/27/2023	50	3.912023	0.044896
2/2//2023	50	3.912023	0.044090
3/1/2023	50	3.912023	0.044690
3/14/2023	50	3.912023	0.044090
3/28/2023	50	3.912023	0.044090
4/11/2023	50	3 012023	0.044090
4/18/2023	350	5 857033	3 00683/
4/25/2023	50	3 912023	0.044896
5/1/2023	125	4 828314	0.496184
5/9/2023	125	4 828314	0.406184
5/16/2023	50	3 912023	0.044896
5/23/2023	50	3 912023	0.044896
6/1/2023	100	4.60517	0.23161
6/20/2023	50	3,912023	0.044896
6/27/2023	50	3.912023	0.044896
7/4/2023	200	5.298317	1.37923
7/11/2023	225	5.4161	1.669754
7/18/2023	65	4.174387	0.002548
7/25/2023	50	3.912023	0.044896
7/31/2023	50	3.912023	0.044896

average	71.31147541
k	61
n	4
uy	4.123910631
oy2	0.208864014

	Internal Outlet 208 HFPO-DA Contribution							
	USE E	XCEL TO P	ERFORM T	HE LOGN	ORMAL TR	ANSFO	RMATION	
	AND	CALCULAT	E THE TRA	NSFORME	ED MEAN A	AND VA	RIANCE	
		L	.OGNORM/	AL TRANSF	ORMED N	IEAN =	4.1239	Outlet 208
		LOGN	IORMAL TF	RANSFORM	IED VARIA	NCE =	0.2089	HFPO-DA
NUMBER	R OF SAMF	PLES/MONT	TH FOR CO	MPLIANCE	MONITOR	RING =	4	
	AUTOCOF	RELATION	I FACTOR(ne)(USE 0	IF UNKNC	WN) =	0	
					n>10	E(X)	68.6034	68.6034
					n>10	V(X)	1093.198	1093.198
					n<10	σ_n^2	0.0564	N/A
					n<10	μ _n	4.2001	N/A
					n>10	V(X _{n)}	273.299	N/A
LTA Flow=	0.307	MGD				X.95=	98.587	N/A
						X.99=	N/A	178.919
						VF=	1.478	2.608
		MAXI	MUM DAIL`	Y CONCEN	TRATION	(ug/l) =	N/A	0.186
		AVERAGE	AVERAGE MONTHLY CONCENTRATION (ug/l) = 0.105					N/A
			MAXIN	IUM DAILY	LOAD (lbs	/day) =	N/A	0.000476
			AVERAGE	MONTHLY	LOAD (lbs	/day) =	0.000270	N/A

Sample Date	PFOA (ng/l)	Уi	(y _i -µ _y) ²
1/24/2022	150	5.010635	3.321736
2/2/2022	100	4.60517	2.008166
2/8/2022	300	5.703782	6.328798
2/16/2022	20	2,995732	0.036995
2/28/2022	20	2 995732	0.036995
3/15/2022	20	2 995732	0.036995
3/29/2022	20	2 005732	0.036005
4/28/2022	20	2.005732	0.036005
5/4/2022	20	2.005732	0.036005
5/10/2022	20	2.990732	0.030993
5/18/2022	20	2.990732	0.030995
5/24/2022	20	2.995732	0.030995
5/24/2022	20	2.995732	0.036995
5/51/2022	20	2.995732	0.036995
0/9/2022	20	2.995732	0.036995
6/15/2022	20	2.995732	0.036995
6/22/2022	20	2.995732	0.036995
7/6/2022	20	2.995732	0.036995
//13/2022	20	2.995732	0.036995
7/20/2022	20	2.995732	0.036995
7/27/2022	20	2.995732	0.036995
8/2/2022	20	2.995732	0.036995
8/9/2022	20	2.995732	0.036995
8/17/2022	20	2.995732	0.036995
8/23/2022	20	2.995732	0.036995
8/30/2022	20	2.995732	0.036995
9/7/2022	20	2.995732	0.036995
9/13/2022	20	2.995732	0.036995
9/19/2022	20	2.995732	0.036995
9/27/2022	20	2.995732	0.036995
10/4/2022	20	2.995732	0.036995
10/17/2022	20	2.995732	0.036995
10/24/2022	20	2.995732	0.036995
10/28/2022	20	2.995732	0.036995
11/15/2022	20	2.995732	0.036995
11/29/2022	20	2.995732	0.036995
12/6/2022	20	2.995732	0.036995
12/13/2022	20	2.995732	0.036995
12/20/2022	20	2.995732	0.036995
1/3/2023	20	2.995732	0.036995
1/24/2023	20	2.995732	0.036995
1/31/2023	20	2.995732	0.036995
2/27/2023	20	2.995732	0.036995
3/7/2023	20	2.995732	0.036995
3/14/2023	60	4.094345	0.821329
3/22/2023	20	2.995732	0.036995
3/28/2023	20	2,995732	0.036995
4/11/2023	20	2,995732	0.036995
4/18/2023	30	3 401197	0.045422
4/25/2023	20	2 995732	0.036995
5/1/2023	30	3 401107	0.045/22
5/9/2023	20	2 005722	0.036005
5/16/2023	20	5 3/7100	4 661/22
5/23/2023	210	2 005722	-1.001400 0 03600E
6/1/2023	20	2.990102	0.000990
6/20/2023	20	2.990102	0.030993
6/27/2022	20 25	2.995/32	0.030995
0/2//2023	∠5 00	3.2100/0	0.000949
7/11/2022	20	2.995/32	0.030995
7/11/2023	40	3.0888/9	0.250808
7/18/2023	25	3.218876	0.000949
7/25/2023	20	2.995732	0.036995
7/31/2023	20	2.995732	0.036995

average	32.62295082
k	61
n	4
uy	3.188072326
oy2	0.32286236

Internal Outlet 208 PFOA Contribution

USE EXCEL TO PERFORM THE LOGNORMAL TRANSFORMATION AND CALCULATE THE TRANSFORMED MEAN AND VARIANCE

	LO	GNORMAL TRANSFOR	MED MEAN =	3.1881	Outlet 208
	LOGNO	VARIANCE =	0.3229	PFOA	
NUMBEF	R OF SAMPLES/MONTH	NITORING =	4		
	AUTOCORRELATION F	ACTOR(ne)(USE 0 IF L	JNKNOWN) =	0	
		n>1	0 E(X)	28.4886	28.4886
		n>1	0 V(X)	309.280	309.280
		n<1	$0 \sigma_n^2$	0.0910	N/A
		n<1	0 µ _n	3.3040	N/A
		n>1	0 V(X _{n)}	77.320	N/A
LTA Flow=	0.307 MGD		X.95=	44.712	N/A
			X.99=	N/A	90.897
			VF=	1.643	3.191
	MAXIM	JM DAILY CONCENTRA	ATION (ug/l) =	N/A	0.085
	AVERAGE N	IONTHLY CONCENTRA	ATION (ug/l) =	0.048	N/A
		MAXIMUM DAILY LO	AD (lbs/day) =	N/A	0.000218
	A	/ERAGE MONTHLY LO/	AD (lbs/day) =	0.000123	N/A

Outlet 008 - Combined Loads and Water Quality Based Limits Comparison Chemours WV0117986 Outelt 008 Average Flow = 0.411 MGD

Internal Outlet 108

	Average	Max
Pollutant	Monthly	Daily
	(lbs/day)	(lbs/day)
HFPO-DA	0.000284	0.000665
PFOA	0.000003	0.000006
Nitrate	NA	NA

Internal Outlet 208					
	Average	Max			
Pollutant	Monthly	Daily			
	(lbs/day)	(lbs/day)			
HFPO-DA	0.00027	0.000476			
PFOA	0.000123	0.000218			
Nitrate	13.4	27.0			

Outlet 008

	WQ	BELs	WQBELs		Technolo	gy Based	Technology Based	
Pollutant	Average	Max	Average	Max	Average	Max	Average	Max
Fonutant	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
	(ug/l)	(ug/l)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(ug/l)	(ug/l)
HFPO-DA	4.14287	6.04367	0.014201	0.020716	0.000554	0.001141	0.161623	0.332872
PFOA	1.95355	2.84986	0.006696	0.009769	0.000126	0.000224	0.036759	0.065349
Nitrate	276568	403461	948.00	1382.96	13.4	27.0	3909.28	7876.91

The water quality based effluent limits at Outlet 008 were compared to the combined calculated loads from Internal Outlets 108 and 208. Equivalent concentrations were determined using the average flow for Outlet 008. The combined loads and equivalent concentrations were both more stringent than the water quality based limits.

Nitrate Technology and Cost Information from Permit Application



40 CFR	Point Source Category	Range of Pollutant Limitations ^(a)
439	Pharmaceutical Manufacturing	 84.1 (mg/L) - 84.1 (mg/L) Daily maximum (Concentration) 29.4 (mg/L) - 29.4 (mg/L) Maximum monthly average (Concentration)
440	Ore Mining and Dressing	100 (mg/L) - 100 (mg/L) Monthly average (Concentration)
445	Landfills	10 (mg/L) - 10 (mg/L) Daily maximum (Concentration) 4.9 (mg/L) - 4.9 (mg/L) Maximum monthly average (Concentration)
449	Airport De-icing	14.7 (mg/L) - 14.7 (mg/L) Daily maximum (Concentration)
471	Nonferrous Metals Forming and Metal Powders	Production-based limits

Notes:

mg/L = milligrams per liter

Concentration-based limits are in mg NH₃-N/L, with the exception of Part 440 which provides the units as mg NH₃/L.

3.2.4 Nitrate

In contrast to the ammonia ELGs presented in Table 6, EPA only developed nitrate limitations for the fertilizer and the steam electric power generation point source categories. The manufacturing process for PFA Line 2 is not similar to either of these two-point source categories. The technologies considered by EPA in the Part 423 ELGs were, however, used as a starting point for identifying potentially applicable technologies for the PFA Line 2 process wastewater. The subsections below provide an overview and comparison of IX, RO, and biological treatment for control of nitrate from the PFA Line 2 process wastewater. All three technologies are capable of achieving 10 mg/L Nitrate as N, which is the EPA maximum contaminant level (MCL) for nitrate (EPA, 2002). These technologies are discussed in the following subsections.

3.2.4.1 Ion Exchange

IX resins for nitrate operate on similar principles as those for PFAS as described above in Section 3.1.2. IX resins will remove nitrate from solution through selective adsorption of nitrate from the influent water stream. Nitrate can be removed using either nitrate selective or non-selective anionic resins. After use, resins can be regenerated for re-use using a high salt concentration solution to desorb the nitrate ions. Nitrate ion exchange resins are often able to remove nitrate to levels of 10 mg/L Nitrate as N in the effluent water. The benefit of IX resin treatment systems is the rapidity of removal of nitrate from solution, and the relative availability and the quick installation timelines of IX treatment systems. Potential disadvantages include generation of a high ionic strength, nitrate rich waste stream totaling between 6 to 12% of the

influent volume, and at nitrate concentrations found in the waste stream here, potentially up to two regeneration cycles being required daily.

3.2.4.2 Reverse Osmosis

RO systems for nitrate operate on the same principles as those for PFAS as described in Section 3.1.3. RO systems are often able to remove nitrate to levels of 10 mg/L Nitrate as N in the permeate (i.e., effluent) water. The benefit of RO systems is the rapidity of nitrate removal from the effluent, and the relative availability and the quick installation timelines of RO treatment systems. RO systems may be able to also remove some PFAS species. Potential disadvantages include generation of waste volumes (reject water) that are potentially uneconomical to manage compared to other available technologies.

3.2.4.3 Biological Treatment

Biological treatment systems for nitrate utilize microbial communities to perform denitrification reactions, producing nitrogen (N_2) gas as the final degradation product. In a biological system (e.g., membrane bioreactor [MBR], moving bed biofilm reactors [MBBR], or sequencing batch reactor [SBR]), the influent stream rich in nitrate is in contact with the microbial community for a period of time which allows the denitrification reactions to occur. Often the length of time is on the order of a few hours (e.g., 4 to 6 hours). For this waste stream, a carbon substrate (e.g., methanol or glycerin) and nutrients would need to be added in stoichiometric quantities to promote the growth of the microbial communities. Periodically biosolids from the system would need to be removed to maintain efficient operation of the system and to promote stable microbial populations. The biosolids will require dewatering and proper disposal.

Biological systems are often able to remove nitrate to levels of 10 mg/L Nitrate as N in the effluent water. The benefit of biological systems is the relatively low operational cost of the system, as fewer specialty chemicals or materials are needed and fewer wastes requiring specialized management are generated. Potential disadvantages of biological systems include a higher capital cost, large footprint requirements, and potential biological upsets. Biological system installations include large tanks to accommodate the hydraulic residence needed for denitrification that are both costly and require a large footprint.

3.2.4.4 Summary and Comparison of Technologies

All three technologies (IX, RO, biological treatment) can achieve similar performance for nitrate removal, often to levels of 10 mg/L Nitrate as N in the effluent water. Each technology has benefits and potential disadvantages as summarized below in Table 7.

The costs represent an opinion of probable cost to install and operate a treatment system for five years at the facility (inflation and time-value of money are not accounted for in this estimate). These cost values are conceptual estimates of probable cost and have uncertainties of at least +50% and -30%. Additionally, these costs were developed based on prior professional experience from designing and operating similar systems. The opinions of probable cost are provided in

Appendix C. Costing based on vendor quotations and additional design details may vary from the values presented here.

Nitrate Treatment Technology	Ion Exchange Resins (IX)	Reverse Osmosis (RO)	Biological Treatment
Potential Treatment Effectiveness	1	1	1
Technology Maturity	1	1	1
Installation Availability	2	2	1
Potential Applicability	1	1	1
Waste Generation	3	3	1
Complexity	2	2	2
Footprint Requirements	1	1	2
Cost per pound nitrate removed	\$46	\$61	\$19 - \$34

Table 7	Nitrate	Treatment	Technolog	zy Evaluation
				3 /

Notes:

1 = most favorable; 2 = intermediate; 3 = least favorable

Nitrate as N

Costs estimated over a 5-year operational period.

Biological Treatment includes SBR: Sequencing Batch Reactor; MBBR: Moving Bed Biofilm Reactor; MBR: Membrane Bioreactor cost ranges

4 FACTORS FOR THE BEST PRACTICABLE CONTROL TECHNOLOGY EVALUATIONS

This analysis is provided to aid in the development of TBELs. The PFA manufacturing process is subject to the existing BPT standards at 40 CFR 414 Subpart D (thermoplastic resins). Fluorocarbon resins are identified as regulated thermoplastic resins at 40 CFR 414.40.

The BPT factors outlined in 40 CFR 125.3(d)(1) also apply to the BAT factors in 40 CFR 125.3(d)(3). In considering the most feasible control technology, multiple factors must be compared to determine the overall merit of each of the PFAS- and nitrate-removal technologies. The following six criteria were considered in this evaluation:

- 1. Age of equipment and facilities involved
- 2. Process employed
- 3. Engineering aspects of the application of control techniques
- 4. Process changes
- 5. Non-water quality environmental impact (including energy requirements)



4.2 Nonconventional Pollutants Evaluation (Nitrate)

4.2.1 The Age of Equipment and Facilities Involved

Section 4.1.1 describes the age of the facilities involved. The site has adequate space for the nitrate removal processes that this section describes.

4.2.2 The Process Employed

Section 4.1.2 describes the processes employed. There are no additional process-related factors unique to nitrate removal.

4.2.3 Engineering Aspects of the Application of Control Techniques

The three technologies, RO, IX and biological treatment, are all expected to be able to achieve a reduction of nitrate to 10 mg/L Nitrate as N in the effluent water. The benefits of RO and IX are relatively straightforward operations of the systems, but with the disadvantage of significant waste volumes being generated. The benefits of biological treatment are utilizing efficient biological processes to minimize waste volumes, with the disadvantage of a slightly more complicated operations and greater operating footprint.

4.2.4 Process Changes

No additional process changes would limit the mass of nitrate discharged through Outfall 008.

4.2.5 Non-Water Quality Environmental Impact (Including Energy Requirements)

RO and IX are anticipated to have the highest non-water quality impacts. These two processes require either energy input to run the process, in the case of RO, or require substantial quantities of produced reagent material, in the case of IX. Additionally, these two processes generate significant waste volumes which require appropriate disposal. Biological treatment does consume an organic substrate material (e.g., methanol) to keep the process operational, but results in much lower waste volumes.

4.2.6 Total Cost of Application of Technology in Relation to Effluent Reduction Benefits

All three technologies considered for nitrate removal provide similar levels of treatment. The costs of the three treatment technologies presented in 3.2.4.4 indicate that the biological treatment system has the lowest cost per pound of nitrate removed. Biological treatment costs are less than the other technologies as there is less waste to dispose of. The cost of treatment in the technology selection process will not meaningfully affect the resultant effluent concentrations since the technologies provide similar levels of treatment.

4.2.7 Comparison to the Cost of Treatment at a POTW

Sending nitrate containing wastewater to a POTW was not considered feasible. The Site does not send wastes to nearby POTWs, and the cost of establishing a connection to these POTWs sewer

• *BPT optimization*: One of the benefits of GAC is the ability, within limits, to optimize its performance by monitoring and controlling the carbon replacement frequency to reduce HFPO-DA breakthrough concentrations. The evaluation of BPT presented in Section 4 leveraged site-specific experience with this technology on similar process wastewater and the operations and maintenance (O&M) costs reflect the replacement frequency for that application. For PFA Line 2, Chemours expects that increased removal of HFPO-DA from the process wastewater can be achieved with a modest increase in breakthrough monitoring leading to an increase in GAC changeout frequency. Here the more frequent breakthrough monitoring would provide earlier identification of when HFPO-DA concentrations would begin to increase to levels that would trigger GAC change out. The potential increase to costs associated with more frequent GAC change outs may range from 10% to 25% for a fraction of a percent increase in HFPO-DA mass removal.

5.2 Nonconventional Pollutants Evaluation (Nitrate)

Section 4.2.8 indicated that the three nitrate treatment technologies had similar capabilities and that Chemours was in the process of selecting an available technology. In evaluating the BAT for this application, two additional tools are available to provide increased removal of the parameters of concern while maintaining the economic achievability beyond BPT:

- *Process changes:* Chemours is designing multiple parts of the PFA Line 2 process to minimize overall wastewater flow. Water used for scrubbing of polymer drying discharge air and rinsing of the PFA polymer is largely recirculated to limit wastewater volume. An important net effect of this is to reduce the hydraulic load to downstream treatment units, thereby contributing to overall cost optimization of the treatment system.
- *BPT optimization:* Of the three technologies considered, process changes can be evaluated to increase the performance of each technology. For IX systems, nitrate selective resins can be utilized, for RO systems a two-step RO system can be employed to decrease the volume of wastewater generated and operate the RO units at a more optimum efficiency. For biological systems nutrient loading, carbon substrate addition and system temperatures can be controlled to optimize nitrate removal.

Attachment D Opinions of Probable Cost Nitrate Treatment

Tables D-1 Opinions of Probable Cost for Ion Exchange (IX) Treatment System for Nitrate as N Removal Chemours PFA Line2 Chemours PFA Line2 Chemours Washington Works, West Virginia

Chemours WW PFA Line 2 Design Flow: 100 gallons per minute (gpm)						
Average Daily Volume: 104,000 gallons per day (gpd) Treatment Train: Bag filter skid- Ion Exchange (IX) System- Backwash S Treatment Goal: Removal to ≤ 10 mg/L of Nitrate as N	ystem (Assume	es no other p	pretreatment is necess	sary)		
Ref: AACE (2005)	1	Ingineer's	Opinion of Probable	e Cos	sts	
Item Capital Costs	Qty	Unit	Unit Cost		Total	Notes
Feed Pump & Bag Filtration System	1	each	\$ 79,000	\$	79,000	One (1) feed pump skid with duplex pumps and One (1) bag filtration skid with two (2) 304SS bag filter housings, valves, fittings, and 300 5 micron bags.
IX System (Vessels + Resin)	1	each	\$ 79,538	\$	79,538	One (1) IX systems, with two vessels operated in lead/lag, with 32.5 cf per vessel. A total of 75 cf of IX resin. Based on budgetary quote for 164cf scaled to 75 cf using a factor of 0.95.
Backwash System (Treated Water Tank + Pump Skid) Subtotal Equipment Cost	1	each	\$ 78,000	\$ \$	78,000 236,538	One (1) 12,000 gallon HDPE tank and One (1) duplex pump skid.
Installation Cost of Equipment	40%	of	Equipment Cost	\$	94,615	_anchors). Does not include interconnecting piping, electrical etc.
Subtotal Installed Cost of Equipment Non-Component Costs (Specialized Trades)				\$	331,153	_
Civil & Earthworks	25%	of	Equipment Cost	\$	59,000	Includes civil, earthworks, concrete pad, gradings. Does not includes any utility relocation. Power wiring, supply and transformation, controls wiring, Assumes
Electrical	30%	of	Equipment Cost	\$	71,000	required line power is available. Does not include infrastructure costs for new line power from switchgear/utility. Single point of disconnect for treatment system.
Instrumentation & Controls	15%	of	Equipment Cost	\$	35,000	Instrumentation, automation, and controls
Piping	Lump S	Sum		\$	80,000	_ components.
Subtotal Non-Component Cost Subtotal Installed Equipment and Construction Costs				\$ \$	245,000 576,153	-
1 · T			Installed			-
Division 1 Allowances	3%	of	Equipment & Construction Cost	\$	17,000	Insurance, general requirements
Contractor Profit & Overhead	15%	of	Installed Equipment & Construction Cost	\$	86,000	General contractor overhead and profit
Total of Installed Equipment & Construction Costs				\$	679,153	-
Indirect Costs			Total Installed			
Engineering and Design	15%	of	Equipment & Construction Costs	\$	102,000	Engineering & design for system comprised of vendor fabricated sub- components
Permitting	5%	of	Total Installed Equipment & Construction	\$	34,000	Construction permit, discharge permit
Construction Management & Project Management	6%	of	Total Installed Equipment & Construction	\$	41,000	AACE/CSI standard factors.
Freight	7%	of	Costs Equipment Cost	\$	16,558	AACE/CSI standard factors.
Startup and Commissioning	7%	of	Equipment Cost	\$	16,558	Startup and commissioning of process, mechanical, and electrical equipment associated with the PFAS treatment system
Subtotal of Indirect Costs				\$ ¢	210,115	
Subiolal Capital Costs Contingency	15%	of	Subtotal Capital	\$ \$	133,390	
eenningeney	1070		Costs	÷	100,070	-
C ₀ ,Capital Cost +50%				\$ \$ \$	1,030,000 1,545,000 721,000	-
Annual Operations & Maintonance Costs				Ψ	721,000	
IX Usage & Replacement	75	cf	\$ 184.06	\$	13,805	SBA A520E resin replacement and disposal
IX Regeneration Waste Stream Disposal	720 2.202	Ibs kgallons	\$ 27.77 \$ 300.00	\$ \$	19,996 660,600	NaCl cost for renegration Assume disposal cost of \$0.3/gal
Waste Stream Transport	18,386,700	lbs	\$ 0.05	\$ \$	919,335	Assume transport cost of \$0.05/Ib.
Sampling & Analytical Vendor O&M visit	12 52	events events	\$ 1,500 \$ 1,500	\$ \$	18,000 78,000	Assume monthly effluent samples for compliance Assume weekly 10hr O&M visits, \$150/hr turnkey cost
Equipment Maintenance	2%	of	Equipment Cost	\$ \$	4,731	AACE/CSI standard factors
				ψ	1,714,400	
C,Annual Cost +70% -70%				\$ \$ \$	1,720,000 2,930,000 520,000	
n,Years	5				,	
Capital & Annual O&M Costs over 5 Years				\$	9,630,000	1
+50% -30%				\$ \$	14,445,000 6,741,000	
AACE Class 4 band preliminary estimate (-30% to $+50\%$). Not for bud evaluation and implementation from the information available at the tin variable factors. General conditions are subject to change which may be	getary purpose ne of the estime ead to a change	es and is on ate. The find to in the estim	ly meant to be used j al costs of the projec mate. Costs have bee	for in et will en roi	teralternative l depend on fin unded up. Cost	comparison. The estimates have been prepared for guidance in project al approved design, actual labor and material costs, and competitive t information is preliminary and has been generated from the following

Table D-2 **Opinions of Probable Cost for Reverse Osmosis (RO) Treatment System for Nitrate as N Removal Chemours PFA Line2** Chemours Washington Works, West Virginia

Basis of Cost Estimate (Scope and Assumptions) Chemours WW PFA Line 2										
Design Flow: 100 gallons per minute (gpm)										
Average Daily Volume: 104,000 gallons per day (gpd) Treatment Train: Reverse Osmosis System- Backwash System (Assume	s no other pre	treatment is	e necessary)							
Treatment Goal: Removal to $\leq 10 \text{ mg/L of Nitrate as N}$	3 no onior pre-	Ioannon,	necessary,							
Ref: AACE (2005)		Engineer's	Opinion of Probab	le Co	sts					
Item	Qty	Unit	Unit Cost		Total	Notes				
	1	1-	ф <u>175</u> 000	¢	175 000	One (1) skidded MMF system with anciellary systems to backwash.				
Multimedia Filter System	1	each	\$ 175,000	\$	175,000	Engineers estimate.				
Reverse Osmosis System	1	each	\$ 200,000	\$	200,000	One (1) RO system, configured to furnish 92.5% recovery RO. Engineers estimate.				
					277.000	-				
Subtotal Equipment Cost	4007	£		\$	375,000	Includes installation cost of balance of equipment: (labor, supports,				
Installation Cost of Equipment	40%	ot	Equipment Cost	\$	150,000	anchors). Does not include interconnecting piping, electrical etc.				
Subtotal Installed Cost of Equipment Non-Component Costs (Specialized Trades)				\$	525,000	-				
Civil & Farthworks	25%	of	Equinment Cost	\$	94.000	Includes civil, earthworks, concrete pad, gradings. Does not includes				
	2370	U1	Equipment Cost	Ψ	21,000	any utility relocation.				
Electrical	200%	of	Equinment Cost	¢	113 000	required line power is available. Does not include infrastructure costs				
	3070	01	Equipment Cost	Φ	113,000	for new line power from switchgear/utility. Single point of disconnect				
Instrumentation & Controls	15%	of	Equipment Cost	\$	56,000	for treatment system. Instrumentation, automation, and controls.				
Piping	Lump	Sum	* *	\$	80,000	500 LF 4" Sch.40 PVC piping to and from the treatment system				
Subtotal Non-Component Cost	-			\$	343,000	_components.				
Subtotal Installed Equipment and Construction Costs				\$	868,000	- -				
			Installed							
Division 1 Allowances	3%	of	Equipment &	\$	26,000	Insurance, general requirements				
			Construction Cost							
	150/	-f	Installed	ው	120.000					
Contractor Profit & Overhead	13%0	OI	Equipment & Construction Cost	\$	130,000	General contractor overhead and profit				
Total of Installed Equipment & Construction Costs				\$	1,024,000	-				
				·+		-				
Indirect Costs			Total Installed							
Engineering and Design	15%	of	Equipment &	¢	154 000	Engineering & design for system comprised of vendor fabricated sub-				
Engliteering and Design	1.0 / 0	01	Construction	φ	1,000	components.				
			Cosis Total Installed							
Permitting	5%	of	Equipment &	\$	51,000	Construction permit, discharge permit				
			Construction Costs							
			Total Installed							
Construction Management & Project Management	6%	of	Equipment &	\$	61,000	AACE/CSI standard factors.				
			Costs							
Freight	7%	of	Equipment Cost	\$	26,250	AACE/CSI standard factors.				
Startup and Commissioning	7%	of	Equipment Cost	\$	26,250	equipment associated with the PFAS treatment system.				
Subtotal of Indirect Costs				\$ ¢	318,500	, , , ,				
Subiolal Capital Cosis	1 70 /	£	Subtotal Capital	>	1,342,300					
Contingency	15%	ot	Costs	\$	201,375	-				
C₀.Capital Cost				<u>\$</u>	1.550,000	-				
+50%				\$	2,325,000	-				
-30%				\$	1,085,000					
Annual Operations & Maintenance Costs										
Waste Stream Disposal	2,957	kgallons	\$ 300.00 \$ 0.05	\$ ¢	886,950	Assume disposal cost of \$0.3/gal				
RO Chemicals Usage (Antiscalant and cleaning chemicals)	1	sum	\$ 10,000	ф \$	10,000	Lump annual estimate				
Sampling & Analytical	12	events	\$ 1,500	\$	18,000	Assume monthly effluent samples for compliance				
Vendor O&M visit Equipment Maintenance	52 2%	events of	\$ 1,500 Equipment Cost	\$ \$	78,000 7,500	Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors				
Annual O&M Subtotal	2/0	01	Lyupment	\$	2,234,789					
C,Annual Cost				\$	2,240,000					
+70%				\$ ¢	3,810,000					
-/ 0/0				Φ	000,000					
n,Years	5									
				Æ	13 750 000	1				
Capital & Annual O&M Costs over 5 Years +50%				\$ \$	12,750,000 19.125,000					
-30%				\$	8,925,000					
AACE Class 4 band preliminary estimate $(-30\% \text{ to } +50\%)$. Not for but	dgetary purpo) ses and is c	only meant to be use	ed for	· interalternati	ve comparison. The estimates have been prepared for guidance in				
project evaluation and implementation from the information available competitive variable factors. General conditions are subject to change	at the time of t which may let	the estimate ad to a cha	2. The final costs of noe in the estimate.	the p Cost	rojeci wili uep s have been ro	end on final approved design, actual tabor and material costs, and unded up Cost information is preliminary and has been generated				
from the following sources:	······		.8	C .	/					

Table D-3 Opinions of Probable Cost for Sequencing Batch Reactor (SBR) Biological Treatment System for Nitrate as N Removal Chemours PFA Line2

Chemours Washington Works	s, West Virginia
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Name the milling space of milling space of milling space of the first set of the space of the s	Basis of Cost Estimate (Scope and Assumptions) Chemours WW PFA Line 2						
where the first product of the product of the product of the product of the theorem and the product of the pro	Design Flow: 100 gallons per minute (gpm)						
transmitten en e	Treatment Train: Pre-Equilization Tank - Sequencing Batch Reactor (S	BR) systen	n - Post-Equi	lization Tank /	Re-aera	tion Tank (Assu	mes no other pretreatment is necessary)
$\frac{1}{100} \frac{1}{100} \frac{1}$	Treatment Goal: Removal to ≤ 10 mg/L of Nitrate as N Ref: AACE (2005)						
Control Contro	Item	Otv	Engineer Unit	r's Opinion of I Unit Cost	Probabl	e Costs Total	Notes
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Capital Costs	\mathbf{x}	0		,	I VIIII	
$ \frac{2}{2} \text{end} 8 8 8 8 8 8 8 8 8 $	SBR Tanks	2	each	\$ 79,8	879 \$	159,759	Two (2) SBRs operating in parallel. Based on budgetary quote for 75 gpm scaled to 100 gpm using a factor of 0.75.
And Participation and The sector allows in the sector and the sector allows of paginons (first index of paginons) (first i	Pre/Post Equilization Tanks	2	each	\$ 82,3	344 \$	164,687	5 and 1 5 1 5 5 5r 6
Schemic Marken, Doing Statem 1 or orb 5 124051 Installance Doing Statem 40 4 124051 Installance Doing Statem 40% 4 20005 Installance Doing Statem 30% af Figures Doing Statem Installance Doing Statem 5 30005 90000 Installance Doing Statem 5 30000 900000 Installance Doing Statem Figures Doing Statem 900000 Installance Doing Statem Figures Doing Statem 9000000 Installance Doing Statem Figures Doing Statem 9000000000000000000000000000000000000	Mechanical Mixers Fill Pumps, Decant Pumps, and Re-aeration Blowers	3 2	each each	\$ 37,2 \$ 56,0	224	111,073	
Solution (1997) milling (1997) Solution (2007) Solution (2007) Solution (2007) Solution (2007) Local actives (2007) Properties (2007) (2007) (2007) (2007) Mechanical active (1500) (2007) (2007) (2007) (2007) State (2007)	Carbon and Nutrient Dosing Systems	1 1	each	\$ 124,0 \$ 86.8)81 \$ 256 \$	124,081 86 856	
Institution Core of Frigures 1 40% of Figures 2 core 5 1000 Figures 2 core 10000 Figures 2 core 10000 Figures 2 core	Sludge Dewatering System Subtotal Equipment Cost	1	Caun	φ ου,	\$30 <u>\$</u>	759,098	-
Subset of Lander Control Equipment Sint A Parthonics Solution Particle (Control Equipment (Contro Equipment (Control Equipment (Control Equipment (Contro	Installation Cost of Equipment	40%	of	Equipment C	Cost \$	303,639	Includes installation cost of balance of equipment: (labor, supports, anchors). Does not include interconnecting piping electrical etc.
Nan Company of Cost Sparking Transport Sparker and Cost Sparking Transport Parameter in Sparking	Subtotal Installed Cost of Equipment				\$	1,062,737	allehols). Does not metude interconnecting piping, electron etc.
Sch & Enthanks 22% at proposed (s) 19,000 19,000 Note that the structure control scale. Assume the structure control scale. Assu	Non-Component Costs (Specialized Trades)	/	2	-	۰	100.000	Includes civil, earthworks, concrete pad, gradings, Does not includes any
Rechaid 30% of paper an analysis of several se	Civil & Earthworks	25%	of	Equipment Cost		190,000	utility relocation. Power wiring, supply and transformation, controls wiring, Assumes
Inite control & Centrels (Centrels (Electrical	30%	of	Equipment C	Cost \$	228,000	required line power is available. Does not include infrastructure costs for new line power from switchgear/utility. Single point of disconnect for treatment system
hoging Liberal for Component on Liberal for Component on Libera for Component on Liberal for Component on Liberal for Co	Instrumentation & Controls	15%	of	Equipment C	Cost \$	114,000	Instrumentation, automation, and controls
Approximation Approximation Image: Construction Constructin Constructin Construction Constructin Construction Co	Piping	Lun	np Sum		\$	80,000	500 LF 4" Sch.40 PVC piping to and from the treatment system
Distance Instituted Progeneurs and Construction Costs Institute Engineering Construction Cost Institute Engineering Construction Cost Institute Engineering Construction Cost Institute Construction Cost Total of boundled Projement & Construction Cost Institute Construction Cost Institute Construction Cost Institute Construction Cost Institute Construction Cost Total of boundled Projement & Construction Cost Institute Construction Cost Institute Construction Cost Institute Construction Cost Institute Construction Cost Address Costs Institute Construction Cost Institute Construction Cost Institute Construction Cost Institute Construction Cost Address Costs Institute Construction Cost Institute Construction Cost Institute Construction Cost Institute Construction Cost Reservation Management & Project Management Costs 19% off Figurement & Costs Situte Costs Situte Costs Subsolid of Indirect Costs Institute Costs Situte Costs Situte C	Subtotal Non-Component Cost				\$	612,000	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Subtotal Installed Equipment and Construction Costs				\$	1,674,737	
$\frac{1}{12} + \frac{1}{12} $	Division 1 Allowances	3%	of	Installed Equipment Construction (& \$ Cost	50,000	Insurance, general requirements
Total of parallel Equipment & Construction Const 3 1075 7.37 Indirect Const Total Installed Equipment & Generation Status of Construction Compared & Construction Constru	Contractor Profit & Overhead	15%	of	Installed Equipment of Construction (& \$ Cost	251,000	General contractor overhead and profit
Indirect Casts Ingineering and Design 13% of Ford Installed Fagingment & Second Second 5 286,000 Fordinacting & design for system comprised of worder fabricated sub- components. Permitting 5% of Ford Installed Control 5 99,000 Construction permit, discharge permit Permitting 5% of Control 5 99,000 Construction permit, discharge permit Control Control Control 5 119,000 ACLECSI randord factors. Control Control Control 5 51,107 Statuted factors. Statute and Controlscioning 7% of Explorement Kee 5 51,107 Statute and Controlscioning 7% of Explorement Kee 5 51,107 Control Control 5 51,000 5 2,0001 Control 5 5,0001 5 3,00001 5 3,00001 Controlscion 5 3,1000 Statute and Addied consity in Light, 200 gol of worte shelds produced per dry. Controlscion 30 roll off 5 3,00001 Statute and Addied consity in Light, 200 gol of worte shelds produced per dry. Statute and Addied consity in Light, 200 gol of worte shelds produced per dry. <	Total of Installed Equipment & Construction Costs				\$	1,975,737	
Transmission of the set of the s	Indirect Costs						
high serving and Design 15% or Purphered Ac 3 296,000 implement Ac inclination interviews of venture interviews				Total Install	ed		
Permitting 5% of Komponent & Grant installed Construction Management & Project Management & Project Management & S% of Komponent & Coast Train Installed Free Coast Train Installed Free Management & Project Management & S% of Komponent & S 119,000 AACE/CSI standard factors. Coast Train Installed Free Management & Project Management & S% of Komponent Coast & S31,137 AACE/CSI standard factors. Coast Standard Information of Standard Information (Standard Information (Standard Information)) Standard Official Coast & S31,137 AACE/CSI standard factors. Substant Coast & S31,137 AACE/CSI standard factors. Coast & S31,137 AACE/CSI standard factors. Substant Coast & S31,137 AACE/CSI standard factors. Substant Coast & S31,137 AACE/CSI standard factors. Substant Coast & S31,137 AACE/CSI standard factors. Coast & S31,137 AACE/CSI standard factors. Coast & S31,137 AACE/CSI standard factors. Substant Coast & S31,137 AACE/CSI standard factors. Coast & S31,137 AACE/CSI standard factors. Annual Operations & Maintenance Coast Annual Operations & Maintenance Coast Annual Operations & Maintenance Coast Annual Operations & Maintenance Coast Annual OAAM National Coast & S1,1300 Y S1,132 Additional daily charge and OAAM Standard & S1,230 Provided per day. Annual OAAM National & S1, S1,230 Provided Per day. Annual OAAM National & S1, S1,230 Provided Per day. Annual OAAM National & S1, S1,230 Provided Per day. Annual OAAM Nationa & S1, S1,230 Provided Per day. Annual	Engineering and Design	15%	of	Equipment Constructio Costs	& \$ n	296,000	Engineering & design for system comprised of vendor fabricated sub- components.
Permitating 5% of Equipment on Costs Construction Costs Total Installed \$ 99,000 Construction permit, discharge permit Construction Costs Costs Total Installed Installed Installed Installed Construction Costs 6% of Equipment Cost \$ 5,1,17 Startup and Commissioning 7% of Equipment Cost \$ 5,1,17 Subtract of Indirect Corres Subtract Optiment \$ \$ 2,596,011 Contraction Subtract Optiment \$ \$ 2,596,011 Contraction Subtract Optiment \$ \$ 3,109,000 Contraction \$ \$ 3,109,000 \$ 9,000 Contraction \$ \$ 3,109,000 \$ \$ Contraction \$ \$ 3,109,000 \$ \$ Contraction \$ \$ 3,109,000 \$ \$ -200% \$ \$ \$ 3,109,000 \$ \$ -201% \$ \$ \$ \$ \$ \$ -201% \$ \$ \$ \$ \$ \$ Value Cost \$ \$ \$ \$ \$ <td< td=""><td></td><td></td><td></td><td>Total Install</td><td>ed</td><td></td><td></td></td<>				Total Install	ed		
Construction Management & Project Management 0% of Fourignent Construction Construction Management & Project Management 0% of Equipment Construction Constructin Construct	Permitting	5%	of	Equipment of Construction	& \$	99,000	Construction permit, discharge permit
Construction Management & Project Management Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Freight Fr				Costs Total Install	ed		
Construction Cross Startup and Commissioning Freigh Subtoal of Indirect Coss Subtoal of Indirect Coss Subtoal of Indirect Coss Subtoal Capital Costs Subtoal Capital Costs Contingency 15% of Subtoal Capital Costs Costs Costs Subtoal Capital Cost Costs Costs Subtoal Capital Cost Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Costs Cost Cost Costs Costs Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Co	Construction Management & Project Management	6%	of	Equipment	& \$	119,000	AACE/CSI standard factors.
Freight 7% of Fquipment Cost S 5,1,13 ACE/CSI standard factors. Startup and Commissioning 7% of Equipment Cost Subtoal of Indirect Costs Subto	, , , , , , , , , , , , , , , , , , ,			Constructio Costs	n		
Shrtup and Commissioning 7% of Equipment Cost \$ 53.17 Subtraid of Indirect Costs 5 620.274 Subtraid Capital Cost 5 620.274 Capital Cost 5 2.596.01 Capital Cost 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 3.109.99 Sumpling & Analytical 12 events 5 Veado O&M visit 52 events 5 Equipment Maintenance 2% of Equipment Cost 5 -7% 5 360.000 -7% 5 -7% 5 30.000 -7%	Freight	7%	of	Equipment C	Cost \$	53,137	AACE/CSI standard factors.
Subtoral of indirect Casts Subtoral Capital Costs Subtoral Capital Costs Ce ₀ Capital Cost -30% Contingency -30% Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector Cector	Startup and Commissioning	7%	of	Equipment C	Cost \$	53,137	Startup and commissioning of process, mechanical, and electrical equipment associated with the PFAS treatment system.
Subtroat Capital Costs 5 2.2990.000 Contingency 15% of Subtroat Capital Contingency 15% of Subtroat Capital Costs 5 2.990.000 +50% 5 4.485,000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.990.000 -30% 5 2.090.000 -30% 5 3.00.99 Sampling & Analytical 12 cvents 5 Vendor O&M visit 52 events 5 1.500 Sampling & Analytical 52 events 5 1.500 Annual OdM Subtroat 22% of Equipment Cost 5 Annual OdM Subtroat 5 360,000 -70% 5 360,000 -70% 5 50,0000 -20% 5 50,0000 <t< td=""><td>Subtotal of Indirect Costs</td><td></td><td></td><td></td><td>\$ \$</td><td>620,274</td><td></td></t<>	Subtotal of Indirect Costs				\$ \$	620,274	
Contingency 15% of Costs 3 309,402 C _b Capital Cost S 2,990,000 +50% S 4,485,000 -30% S 2,093,000 Annual Operations & Maintenance Costs Waste Sludge disposal + Additional Costs 30 roll offs S 3,109,99 \$ 94,733 I roll off ontains 10 tons of sludge, \$2650 per roll off, \$12 additonal daily charge and 40% fuel surcharge. Waste Sludge disposal + Additional Costs 30 roll offs \$ 3,109,99 \$ 94,733 I roll off contains 10 tons of sludge, \$2650 per roll off, \$12 additonal daily charge and 40% fuel surcharge. Wender O& Wrisit 12 events \$ 1,500 \$ 18,000 Assume monthly effluent samples for compliance. Vender O& Wrisit 22 events \$ 1,510 \$ 78,000 Assume weekly 10hr O& Mr visits, \$150/hr turnkey cost. Equipment Maintenance 2% of Fquipment Cost \$ 210,000 +70% \$ 30,000 \$ 70,000 +70% \$ 70,000 +50% \$ 2,0000 +50% \$ 2,0000 +70% \$ 2,0000 +50% \$ 2,0000 +50%	Subtotal Capital Cosis	150/	-f	Subtotal Cap	ې ital	2,596,011	
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C,Annual Cost \$ 210,000 +70% \$ 360,000 -70% \$ 70,000 n,Years 5 Capital & Annual O&M Costs over 5 Years \$ 4,040,000 +50% \$ 6,060,000 -30% \$ 2,828,000	Annual O&M Subtotal				\$	205,915	
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Capital & Annual O&M Costs over 5 Years \$ 4,040,000 +50% \$ 6,060,000 -30% \$ 2,828,000	n,Years	5					
Capital & Annual O&M Costs over 5 Years \$ 4,040,000 +50% \$ 6,060,000 -30% \$ 2,828,000 AACE Class 4 band preliminary estimate (-30% to +50%) . Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the full context.							_
-30% \$ 2,828,000 AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from	Capital & Annual O&M Costs over 5 Years +50%				\$ \$	4,040,000 6,060,000	
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competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from	AACE Class 4 band preliminary estimate $(-30\%$ to $+50\%)$. Not for by project evaluation and implementation from the information available	idgetary pi	urposes and a contract of the estimates of the estimates and a contract of the estimates and a	is only meant to hate. The final c) be use	d for interaltern the project will	native comparison. The estimates have been prepared for guidance in depend on final approved design actual labor and material costs and
	competitive variable factors. General conditions are subject to change	which ma	y lead to a c	hange in the est	timate.	Costs have been	rounded up. Cost information is preliminary and has been generated from

Table D-4 **Opinions of Probable Cost for Moving Bed Biofilm Reactor (MBBR) Biological Treatment System for Nitrate as N Removal Chemours PFA Line2**

Chemours Washington Works, West Virginia

Treatment Goal: Removal to ≤ 10 mg/L of Nitrate as N Ref: AACE (2005)						
Item	Qty	Engineer' Unit	s Opinion of Proba Unit Cost	ible C	osts Total	Notes
Capital Costs						Denitrification MBBR tank sizing is based on 142 mg/L nitrate and a flow
Denitrification MBBR Tanks	2	each	\$ 77,145	\$	154,289	rate of 75 gpm. Based on budgetary quote for 75 gpm scaled to 100 gpm using a factor of 0.75.
Biofilm Media Re-aeration Tank	1 1	each each	\$ 392,973 \$ 68,728	\$ \$	392,973 68,728	
Transfer Pumps, Mechanical Mixers, and Re-aeration Blowers	2	each	\$ 78,369	\$	156,739	
Carbon and Nutrient Dosing Systems Sludge Dewatering System	1	each each	\$ 124,081 \$ 49.632	\$ \$	124,081 49.632	
Subtotal Equipment Cost				\$	946,442	-
Installation Cost of Equipment	40%	of	Equipment Cost	\$	378,577	Includes installation cost of balance of equipment: (labor, supports, anchors). Does not include interconnecting piping, electrical etc.
Subtotal Installed Cost of Equipment				\$	1,325,019	-
Civil & Easthwarks	250/	-f	E-minut Cost	¢	227.000	Includes civil, earthworks, concrete pad, gradings. Does not includes any
Civil & Earthworks	23%	01	Equipment Cost	2	237,000	utility relocation.
	200/	C		¢	004.000	Power wiring, supply and transformation, controls wiring, Assumes required line power is available. Does not include infrastructure costs for
Electrical	30%	of	Equipment Cost	\$	284,000	new line power from switchgear/utility. Single point of disconnect for
Instrumentation & Controls	15%	of	Equipment Cost	\$	142.000	treatment system. Instrumentation, automation, and controls.
Piping	Lump	o Sum		\$	80.000	500 LF 4" Sch.40 PVC piping to and from the treatment system
Subtotal Non-Component Cost	P			\$	743,000	_components.
Subtotal Installed Equipment and Construction Costs				\$	2,068,019	-
			Installed			
Division 1 Allowances	3%	of	Equipment & Construction Cost	\$	62,000	Insurance, general requirements
			Construction Cost			
Contractor Profit & Overhead	15%	of	Installed	¢	310,000	General contractor overhead and profit
Contractor Front & Overnead	1370	01	Construction Cost	φ	510,000	General contractor overhead and prom
Total of Installed Equipment & Construction Costs				\$	2,440,019	-
						-
Indirect Costs			Total Installed			
Engineering and Design	15%	of	Equipment &	\$	366,000	Engineering & design for system comprised of vendor fabricated sub-
			Construction			components.
			Total Installed			
Permitting	5%	of	Equipment & Construction	\$	122,000	Construction permit, discharge permit
			Costs			
			Total Installed			
Construction Management & Project Management	6%	of	Construction	\$	146,000	AACE/CSI standard factors.
Freight	7%	of	Costs Equipment Cost	\$	66 251	A ACE/CSI standard factors
Startun and Commissioning	7%	of	Equipment Cost	ф Ф	66 251	Startup and commissioning of process, mechanical, and electrical equipm
Startup and Commissioning	//0	01	Equipment Cost	ۍ د	766 502	associated with the PFAS treatment system.
Subtotal Capital Costs				ֆ \$	3,206,521	
Contingency	15%	of	Subtotal Capital	\$	480,978	
			Costs			-
C ₀ ,Capital Cost				\$	3,690,000	_
+50% -30%				\$ \$	5,535,000 2,583,000	
				-		
Annual Operations & Maintenance Costs						Assume sludge density is 1kg/L, 200 gal of waste sludge produced per da
Waste Sludge disposal + Additional Costs	30	roll offs	\$ 3,109.99	\$	94,733	1 roll off contains 10 tons of sludge, \$2650 per roll off, \$12 additonal da
Sampling & Analytical	12	events	\$ 1,500	\$	18,000	Assume monthly effluent samples for compliance.
Vendor O&M visit	52	events	\$ 1,500	\$	78,000	Assume weekly 10hr O&M visits, \$150/hr turnkey cost.
Equipment Maintenance Annual O&M Subtotal	2%	of	Equipment Cost	<u>\$</u> \$	209,662	_AACE/CSI standard factors
					,	
C.Annual Cost				\$	210.000	
+70%				\$	360,000	
-70%				\$	70,000	
n,Years	5					
						•
Capital & Annual O&M Costs over 5 Years				\$ \$	4,740,000	
+50%				φ	,,110,000	

sources:

Table D-5 Opinions of Probable Cost for Membrane Bioreactor (MBR) Treatment System for Nitrate as N Removal Chemours PFA Line2 Chemours PFA Line2 Chemours Washington Works, West Virginia

Basis of Cost Estimate (Scope and Assumptions)						
Chemours WW PFA Line 2 Design Flow: 100 gallons per minute (gpm)						
Average Daily Volume: 104,000 gallons per day (gpd)						
Treatment Train: Membrane Bioreactor (MBR) system - Sludge Dewaterin	ng System (Assumes no	o other pretreatment	t is ne	ecessary)	
Ref: AACE (2005)						
Itom		Engineer	's Opinion of Prob	oable	Costs	Notos
Capital Costs	Qty				1 Viai	110105
Anoxic Tank	1	each	\$ 275,459	\$	275,459	Anoxic tank sizing is based on 142 mg/L nitrate and a flow rate of 75 gpm. Covered bolted steel. Installed cost. Based on budgetary quote for 75 gpm scaled to 100 gpm using a factor of 0.75.
Mechanical mixers for anoxic tank	1	each	\$ 23,575	\$	23,575	
Membrane Tank Membrane Skid	1	sum sum	\$ 112,913 \$ 514,935	\$ \$	112,913 514,935	Installed cost
Re-aeration Tank and Blowers	1	each	\$ 98,024	\$	98,024	
RAS and Permeate Pumps	2	each	\$ 14,890 \$ 124,081	\$ \$	29,779	
Conical Thickening Tank	1	each	\$ 124,081 \$ 201,011	ֆ \$	201,011	Installed cost
Sludge Dewatering System	1	each	\$ 286,626	\$	286,626	-
Subtotal Equipment Cost		2		\$	1,666,403	Includes installation cost of balance of equipment: (labor, supports,
Installation Cost of Equipment	40%	of	Equipment Cost	\$	430,808	anchors). Does not include interconnecting piping, electrical etc.
Subtotal Installed Cost of Equipment Non-Component Costs (Specialized Trades)				\$	2,097,211	- Includes civil earthworks, concrete pad, gradings, Does not includes any
Civil & Earthworks	25%	of	Equipment Cost	\$	417,000	utility relocation. Power wiring, supply and transformation, controls wiring, Assumes
Electrical	30%	of	Equipment Cost	\$	500,000	required line power is available. Does not include infrastructure costs for new line power from switchgear/utility. Single point of disconnect for treatment system.
Instrumentation & Controls	15%	of	Equipment Cost	\$	250,000	Instrumentation, automation, and controls.
Piping	Lump) Sum		\$	80,000	500 LF 4" Sch.40 PVC piping to and from the treatment system
Subtotal Non-Component Cost				\$	1,247,000	_components.
Subtotal Installed Equipment and Construction Costs				\$	3,344,211	-
Division 1 Allowances	3%	of	Installed Equipment & Construction Cost	\$ t	100,000	Insurance, general requirements
Contractor Profit & Overhead		of	Installed Equipment & Construction Cost	\$ t	502,000	General contractor overhead and profit
Total of Installed Equipment & Construction Costs			Construction	<u>\$</u>	3.946.211	-
10ιαι 03 Πιδιατικά Ειγατριποπι & Constraction Costs				Ψ	J,7TU,211	-
Indirect Costs Engineering and Design	15%	of	Total Installed Equipment & Construction	\$	592,000	Engineering & design for system comprised of vendor fabricated sub- components.
Permitting	5%	of	Total Installed Equipment & Construction Costs	\$	197,000	Construction permit, discharge permit
Construction Management & Project Management	6%	of	Total Installed Equipment & Construction	\$	237,000	AACE/CSI standard factors.
Freight	7%	of	Equipment Cost	\$	116,648	AACE/CSI standard factors.
Startup and Commissioning	7%	of	Equipment Cost	\$	116,648	Startup and commissioning of process, mechanical, and electrical
Subtotal of Indirect Costs			1 1	\$	1.259.296	equipment associated with the PFAS treatment system.
Subtotal Capital Costs				\$	5,205,508	
Contingency	15%	of	Subtotal Capital Costs	\$	780,826	-
C ₀ ,Capital Cost +50% -30%				\$ \$ \$	5,990,000 8,985,000 4,193,000	-
Annual Operations & Maintenance Costs						
Waste Sludge disposal + Additional Costs	30	roll offs	\$ 3,109.99	\$	94,733	Assume sludge density is 1kg/L, 200 gal of waste sludge produced per day, 1 roll off contains 10 tons of sludge, \$2650 per roll off, \$12 additonal daily charge and 40% fuel surcharge
Membrane Chemicals Usage (Antiscalant and cleaning chemicals)	1	sum	\$ 15,000.00	\$	15,000	Lump annual estimate
Membrane Replacement	1	sum	\$ 4,500.00	\$	4,500	5 year replacement; annualized
Sampling & Analytical Vendor O&M visit	12 52	events events	\$ 1,500 \$ 1,500	ծ Տ	18,000 78,000	Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits. \$150/hr turnkey cost.
Equipment Maintenance	2%	of	Equipment Cost	\$	33,328	AACE/CSI standard factors
Annual O&M Subtotal				\$	243,561	
C,Annual Cost +70%				\$ \$	250,000 430,000	
-7070 n,Years	5			Э	80,000	
Capital & Annual O&M Costs over 5 Years				\$ ¢	7,240,000]
-30%				ծ \$	10,860,000 5 <u>,068,000</u>	
AACE Class 4 hand preliminary estimate (-30% to \pm 50%) Not for hud	getary nur	poses and i	s only meant to be	used i	for interalterna	tive comparison. The estimates have been prepared for guidance in

AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources:

Table D-6GeosyntEstimated Amount of Nitrate as N Removed
Chemours PFA Line2

Chemours Washington Works, West Virginia

Item	Value	Units
Nitrate Influent Contration	142.9	mg/L
Flow Rate	104,000	gpd
Nitrate Influent Mass per day	124	lbs
Target Nitrate Maximum Effluent Concentration	10	mg/L
Nitrate Concentration difference after removal	132.9	mg/L
Mass of Nitrate removed per day	115.3	lbs
Projected Mass of Nitrate removed over 5 years	210,000	lbs

Notes:

mg/L - milligram per Liter gpd - gallons per day lbs - pounds

Table D-7GeosynEstimated Cost per pound of Nitrate as N Removed
Chemours Washington Works, West Virginia

	Ι	on Exchange Resins (IX)	Reverse Osmosis (RO)		Biological Treatment (SBR)			Biological Treatment (MBBR)	Biological Treatment (MBR)	
Estimated Capital & Annual O&M Costs over 5 Years	\$	9,630,000	\$	12,750,000	\$	4,040,000	\$	4,740,000	\$	7,240,000
Cost per pound of Nitrate as N removed	\$	46	\$	61	\$	19	\$	23	\$	34

Notes:

- 115.3 lbs of Nitrate as N removed per day; 210,000 lbs of Nitrate as N removed over 5 years.

- Costs were evaluated over a five year time frame since in a future permit renewal the nitrate

wastes may be directed to a different treatment system.

IX - Ion Exchange

RO - Reverse Osmosis

MBBR - Moving Bed Biofilm Reactor

SBR - Sequencing Batch Reactor

MBR - Membrane Bioreactor

HFPO-DA and PFOA Technology and Cost Information from Permit Application

Geosyntec Consultants



Figure 2 Proposed Location of PFA Line 2 and Outfall 008

3 TREATMENT TECHNOLOGIES REVIEW

3.1 PFAS Removal

In developing the ELGs for the OCPSF point source category, EPA evaluated 12 in-plant treatment technologies (EPA, 1987). EPA's 1987 methodology and other ELGs considered treatment technologies (e.g., GAC) on an individual basis when a single pollutant was being considered. EPA considered treatment trains, i.e., combinations of technologies, when water streams contained pollutants that required different treatment mechanisms. Of the technologies reviewed by EPA when establishing the categorical limitations, three are also generally accepted technologies for PFAS removal: GAC, IX resins, and RO (Speth, 2020) along with a variant of IX, regenerable ion exchange. Several other organizations provide an overview of treatment technologies for PFAS (HDR, 2020; ITRC, 2022; Barr Engineering Co. and Hazen & Sawyer, 2023). These technologies, and the combination of two GAC vessels with IX and additional GAC vessels, are described in the subsections below, providing a high-level explanation of each technology and including the benefits and potential disadvantages for each technology.



Note that each of these treatments are not anticipated to require pretreatment aside from the planned removal of solids by the bag filters. The water supplied to the process is already of high quality having received pre-treatment beforehand as it was treated at the Ranney Well treatment system and then received further treatment during the demineralization process.

3.1.1 Granular Activated Carbon (GAC)

GAC is a mature technology within the water treatment and remediation industries and is widely used to treat various organic constituents of concern, commonly including PFAS. The term GAC refers to media that is manufactured from carbonaceous raw materials, such as coal, peat, wood, or coconut shells, which is 'activated' by treating it thermally or chemically under anoxic (low oxygen) conditions. This removes volatile organic matter and creates an intricate internal porous structure and surface charges which promote sorption. Different combinations of raw material and activation conditions will tend to select for different ranges of adsorbable organic species.

The sorptive capacity of GAC media is finite and once exceeded, constituents of concern will break through into the treated effluent requiring the periodic replacement of the GAC media. GAC media can either be single-use sacrificial, where it is disposed after being expended, or reactivated, where it is specially treated under high temperature to remove previously adsorbed contaminants and regain its sorptive capacity to be reused. Reactivating GAC can help reduce the rate of media disposal, but its treatment performance tends to be lessened relative to first use "virgin" GAC.

Whether single-use sacrificial GAC or reactivated GAC is used, a potential disadvantage is the logistics of managing the replacement of the media during sustained operations of a large-scale treatment facility. These efforts can be substantive, requiring frequent hauling in of fresh media and transporting and disposing residuals (i.e., expended media) offsite.

GAC is the most commonly selected PFAS treatment technology. It is broadly commercially available, has easily implementable residuals management options, and also treats other organic potential pollutants that may be present in water sources.

3.1.2 Ion Exchange

IX uses small beads of a polymeric resin matrix which incorporate molecular functional groups that act as contaminant exchange sites to treat target ionic constituents. Prior to treatment, the exchange sites are bonded with a common and relatively benign ion (Cl⁻, OH⁻, Na⁺, H⁺, etc.) whose affinity for the functional group on the resin at the anticipated operating conditions is less than that of the target ionic constituents to be treated. In operation, ions are exchanged at the functional group, where target contaminant ions with higher affinity for the exchange site displace those of a lesser affinity. The hierarchy of affinity for the exchange site is referred to as the selectivity.

IX resins have finite number of exchange sites per unit of media. Once most of the exchange sites are filled with target ionic constituents or higher affinity competing ions, the media becomes expended and target constituents will start breaking through the media bed into the treated effluent.



IX resins are characterized by the charge of the ions they exchange, with cationic resins targeting cations and anionic resins targeting anions. Within each grouping there are multiple variations, such as the polymer matrix chemistry, the structure of the polymer matrix itself and the specific functional groups employed. Some anionic IX resins have been demonstrated to have sufficient affinity to provide effective removal of anionic PFAS, such as PFOA and HFPO-DA. These resins are most commonly polystyrene strong-base anionic resins with tributylamine functional groups, in either macroporous or gel polymer matrix structures.

For most PFAS, IX and GAC provide equivalent treatment removal capabilities, though IX resins tend to provide better treatment capacity per unit of media than GAC. Further, compared to GAC, there are three potential disadvantages for IX. First, the majority of the resins used for PFAS treatment are single-use sacrificial applications and generate a solid waste (i.e., expended resin) to be disposed. The expended resin is typically incinerated in a cement kiln operating at very high (greater than 3,000 degrees Fahrenheit) temperatures compared to GAC reactivation systems which operate at around 1,200 degrees Fahrenheit. IX resins therefore tend to be more energy intensive. Second, regeneration of expended resin typically involves the use of difficult-to-handle solvents such as methanol and produces a concentrated PFAS liquid waste stream that still requires disposal through incineration, deep well injection, or some other method. Last, IX is not proven technology for Chemours PFAS manufacturing wastewater.

For this facility, applying IX as a technology for HFPO-DA removal presents challenges due to the presence of nitrate in the influent wastewater. Nitrate ions will compete for ion exchange sites with HFPO-DA, potentially leading to less removal of HFPO-DA. This permit application includes nitrate treatment after HFPO-DA removal by GAC for outfall 801 flows. Nitrate waste disposal costs would be significantly increased if nitrate treatment was sequenced before HPFO-DA removal.

3.1.3 Regenerable Ion Exchange

An alternative to single-use sacrificial IX is regenerable IX. Expended IX resins can generally be regenerated by immersing the expended resin in a chemical solution concentrated with select common ions (e.g., Cl⁻, OH⁻, Na⁺, H⁺, etc.) to displace the target ionic constituents from the exchange sites. Since the affinity for ions at exchange sites in the resin is equilibrium driven, common ions with lower affinity for exchange sites during operation can become favored when present in the elevated concentrations used during the regeneration process. Once the resin is regenerated with a common ion, the IX resin can be returned to operation. The spent regenerant solution is a mix of the excess common ions and the target treatment ion, which was released from the resin during regeneration, and must be managed as a liquid waste stream.

Regeneration of IX resins is a common practice for many IX applications, though both regenerable IX and IX are not proven technologies for Chemours PFAS manufacturing wastewater. Regenerating IX resins for PFAS treatment is, however, still comparatively novel and requires a more involved regeneration process than simply using a brine, mineral acid, or caustic solution as a regenerant.



Regenerable IX for PFAS has the potential to reduce the volume of the waste products generated relative to single-use sacrificial media, whether IX resins or GAC. Additionally, the liquid stream produced in regeneration must still be managed for disposal, and it is a concentrated liquid waste stream.

Last, as described in detail above IX, regenerable IX will also be challenged with the presence of nitrate in the influent wastewater.

3.1.4 Reverse Osmosis

RO membrane systems in water treatment are a separation technology consisting of a semi-permeable layer that allows water to flow through while rejecting other dissolved constituents in the water. The technology is non-selective and removes most constituents from water to a high degree, with some minor exceptions, such as dissolved gases and small non-ionic polar molecules. This characteristic is highly beneficial in applications where the goal is producing high purity water, but less beneficial when the treatment produces a large volume stream of contaminant-enriched reject which then has to be further handled and treated.

One potential disadvantage of using RO membrane systems is the strict influent water quality requirements. RO membranes have little to no tolerance for suspended solids, whether from particulate matter present in the influent or suspended solids formed during the treatment process itself from precipitation or biological activity. Additionally, RO membranes have minimal tolerance for chemical oxidants and are easily fouled by dissolved organics or inorganic ions that can form sparingly soluble salts or hydroxide/oxide precipitates (e.g., calcium, strontium, barium, iron, manganese, carbonate, sulfate, phosphate, etc.). Special care is required in designing RO systems and the upstream pretreatment to achieve treatment objectives and minimize operational challenges.

Another potential disadvantage with RO membrane systems in a PFAS removal application is that they only concentrate the PFAS, along with most of the other dissolved constituents, into a liquid reject stream, called either the reject or the concentrate. The proportion of reject generated will vary based on the design of the membrane system and its operation but will typically range from 5% to 50% of the influent flow rate. This waste stream must either be further treated or disposed as a liquid waste. In the absence of further treatment, the volume of liquid waste generated and the logistical challenge for its disposal can be significant.

3.1.5 Combination Technologies

One way to increase the effective capacity of GAC is to include an additional IX or GAC vessel in series after the primary treatment (i.e., two GAC vessels in series). For most PFAS, including HFPO-DA, IX and GAC generally provide equivalent treatment removal capabilities. They have similar pretreatment requirements and similarly can be deployed in a pressure filter configuration. This analysis conservatively assumes that each additional GAC or IX treatment unit is capable of an additional 95% removal in addition to the removal achieved by the first two GAC vessels. This removal rate is assumed based on literature sources indicating that for certain longer chain PFAS



(e.g., perfluorooctanesulfonic acid [PFOS]) both IX and GAC can remove upwards of 99% PFAS (AWWA, 2019; Barr Engineering Co. and Hazen & Sawyer, 2023). Therefore a removal value of 95% was considered appropriate as HFPO-DA is a shorter chain, more mobile compound than PFOS.

Further, the introduction of additional IX or GAC in series will significantly extend the effective capacity of the primary treatment vessels beyond their initial breakthrough. This will reduce the media replacement frequency of the primary GAC vessels. Three combination treatment cases are considered in this technology review and evaluation:

- Two GAC vessels followed by one IX treatment unit
- Two GAC vessels followed by one additional GAC vessel
- Two GAC vessels followed by two additional GAC vessels

These combination treatments are operated in a lead-mid-lag series configuration. In the case where all vessels are GAC, when the lead vessel needs to the replaced, the remaining vessels will be rotated such that the mid vessel becomes the new lead vessel, the lag vessel becomes the new mid vessel, and a virgin or a regenerated GAC vessel will be the new lag vessel. However, in cases of high influent concentrations, such as in Outfall 801 wastewater streams, and where the third treatment is IX, the lag vessel will likely not be rotated. First, for the case where all vessels are GAC, the third and potentially fourth vessels receive a much lower influent concentration. Keeping them separate reduces the potential for low-level cross contamination when placing a previous lead bed in a lag position. Second, for the IX case, piping and infrastructure are typically not built for rotating between GAC and IX, and this would lead to greater operational complexity.

A challenge associated with introducing a third and potentially fourth treatment vessel is increased complexity of the system. More items must be designed, procured, installed, and then operated. Additionally, this may also lead to more waste generation.

3.1.6 Summary and Comparison of Technologies

Table 4 provides an evaluation for each technology based on a number of factors, ranging from most favorable (score of one) to least favorable (score of three) and the incremental cost per pound of HFPO-DA removed per technology, and Figure 4 provides a graphical description of this information. The incremental cost per pound represents the cost of removing the mass that each technology unit removes. The supporting calculations for these costs are presented in Attachment C.

These rankings, cost ranges, and the preceding technology descriptions above were based on professional experience designing and implementing PFAS treatment systems and literature describing PFAS treatment systems, including documentation from Barr Engineering Co. and Hazen & Sawyer (2023), ITRC (2022) and HDR (2020).

The costs represent an opinion of probable cost to install and operate a treatment system for 20 years at the facility (inflation and time-value of money are not accounted for in this estimate)


assuming 100 gallon per minute influent flow rates. These cost values are conceptual estimates of probable cost and have uncertainties of at least +50% and -30%. Additionally, these costs were developed based on prior professional experience from designing and operating similar systems. The opinions of probable cost are provided in Attachment C. Costing based on vendor quotations and additional design details may vary from the values presented here.



Table 4	PFAS Treatment Technology Evaluation
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PFAS Treatment Technology	Granular Activated Carbon (GAC)	Ion Exchange Resins (IX)	Regenerable IX (Regen-IX)	Reverse Osmosis (RO)	Combination Technology 2 GAC Vessels 1 IX Vessel	Combination Technology 2 GAC Vessels 1 GAC Vessel	Combination Technology 2 GAC Vessels 1 GAC Vessel 1 GAC Vessel
Potential Treatment Effectiveness	1	1	1	2	1	1	1
Technology Maturity	1	1	2	1	1	1	1
Degree of Adoption for PFAS	1	2	2	3	2	2	3
Potential Applicability	1	1	1	3	1	1	3
Waste Generation	1	2	1	3	2	1	1
Complexity	1	2	3	3	2	2	2
Commercial Availability	1	1	3	1	1	1	1
Anticipated Total Removal Rate	99.98%	99.98%	99.98%	99.98%	99.999%	99.999%	99.99995%
1 st Technology Removal	99.98%	99.98%	99.98%	99.98%			
2 nd Technology Additional Removal					0.019%	0.019%	
3 rd Technology Additional Removal							0.00095%
Incremental cost per pound HFPO-DA removed 1 st Technology	\$34	\$38	\$34	\$368			
Incremental cost per pound HFPO-DA removed 2 nd Technology					\$46,176	\$43,824	
Incremental cost per pound HFPO-DA removed 3 rd Technology							\$541,176

Notes:

1 = most favorable; 2 = intermediate; 3 = least favorable

Costs are presented for technologies used individually. Derivation of costs is presented in Attachment C, Table C-9.

First technology removal rates for IX, RO and Regenerable IX are assumed to be the same as GAC removal rates based on similar effluent performance in literature. Second and third technology removal rates are assumed to be 95% as described in Section 3.1.5.



20 Year GAC HFPO-DA Removal Rates and Treatment Costs



Figure 3 20-Year GAC HFPO-DA Removal Rates and Treatment Costs

Appendix C. Costing based on vendor quotations and additional design details may vary from the values presented here.

Nitrate Treatment Technology	Ion Exchange Resins (IX)	Reverse Osmosis (RO)	Biological Treatment
Potential Treatment Effectiveness	1	1	1
Technology Maturity	1	1	1
Installation Availability	2	2	1
Potential Applicability	1	1	1
Waste Generation	3	3	1
Complexity	2	2	2
Footprint Requirements	1	1	2
Cost per pound nitrate removed	\$46	\$61	\$19 - \$34

Table 7	Nitrate	Treatment	Technolog	zy Evaluation
				3 /

Notes:

1 = most favorable; 2 = intermediate; 3 = least favorable

Nitrate as N

Costs estimated over a 5-year operational period.

Biological Treatment includes SBR: Sequencing Batch Reactor; MBBR: Moving Bed Biofilm Reactor; MBR: Membrane Bioreactor cost ranges

4 FACTORS FOR THE BEST PRACTICABLE CONTROL TECHNOLOGY EVALUATIONS

This analysis is provided to aid in the development of TBELs. The PFA manufacturing process is subject to the existing BPT standards at 40 CFR 414 Subpart D (thermoplastic resins). Fluorocarbon resins are identified as regulated thermoplastic resins at 40 CFR 414.40.

The BPT factors outlined in 40 CFR 125.3(d)(1) also apply to the BAT factors in 40 CFR 125.3(d)(3). In considering the most feasible control technology, multiple factors must be compared to determine the overall merit of each of the PFAS- and nitrate-removal technologies. The following six criteria were considered in this evaluation:

- 1. Age of equipment and facilities involved
- 2. Process employed
- 3. Engineering aspects of the application of control techniques
- 4. Process changes
- 5. Non-water quality environmental impact (including energy requirements)



6. Total cost of application of technology compared to effluent reduction benefits to be achieved from application

In addition, the feasibility and cost of treatment of the wastewaters by a publicly owned treatment works (POTW) was reviewed as part of the evaluation.

4.1 HFPO-DA Evaluation

4.1.1 The Age of Equipment and Facilities Involved

The Site has been an active manufacturing facility for 75 years starting in 1948. Over the Site history, hundreds of products have been manufactured for use in the automotive, construction, and electronics industries, amongst other applications. Because of the long operating history at the Site, where many different products are manufactured using various equipment and conveyances, available space is often limited and can pose a design constraint. The PFA Line 2 and associated conveyance and infrastructure, including a GAC treatment system, will be newly constructed as part of this project as shown above in Figure 2. Based on project planning details, there is adequate room to install a two bed GAC PFAS treatment system, and since a new PFAS treatment system will be installed, age of equipment is not of concern regarding treatment capabilities.

4.1.2 The Process Employed

The facility and process employed are described in Sections 1 and 2 and the NPDES Permit Application. In short, a new facility is being constructed to wash and separate PFA solids. This process discharges water at Outfall 008 originating from two water streams discharged at two upstream internal outfalls:

- Internal outfall 801: this stream will have a daily average flow of 0.104 MGD consisting of contact process water which requires treatment for PFAS and nitrate removal. The maximum daily flow is 0.146 MGD due to additional water needed for product batches and rinsing.
- Internal outfall 802: this stream will have a daily average flow of 0.307 MGD consisting of NCCW which does not require further treatment for PFAS removal. The maximum daily flow is 0.430 MGD is due to additional water needed for process cooling. The NCCW used in the process comes directly from the Ranney Well treatment system which removes PFAS with GAC; Ranney Well treatment system performance is described in Section 6.1.2 and Attachment A.

4.1.3 Engineering Aspects of the Application of Control Techniques

Candidate technologies for treatment of PFAS are presented in Section 3 and include GAC, IX, Regenerable IX, RO, and combination technologies consisting of GAC-IX and GAC with an additional one or two carbon vessels. IX, Regenerable IX, and RO are considered more challenging technologies. IX and Regenerable IX create spent resins or liquids from the resin regeneration process that must be disposed of but are often more challenging to manage than GAC. Similarly, RO generates a large volume of reject water that must be disposed, often by such means as water incineration or deep well injection.

Meanwhile, GAC has been used successfully in many applications at the Site to remove HFPO-DA and PFOA. Example treatment systems include the Ranney Well, the Domestic Well, the Dryer Belt Wash Water, and the W9 systems. GAC treatment can be effectively managed to remove the desired level of compounds and there are commercially available options for managing spent GAC. For example, the daily average percent removal with the GAC for the Ranney Well is 99.24% for HFPO-DA and 99.86% for PFOA as shown in Attachment A¹. Based on the data presented in Attachment B-1, the daily average percent removal of HFPO-DA with GAC for the W9 permeate treatment system² is 96.67% and the median is 99.99%.

4.1.4 **Process Changes**

No additional process changes would limit the mass of HFPO-DA discharged through Outfall 008.

4.1.5 Non-Water Quality Environmental Impact (Including Energy Requirements)

Non-water quality impacts for GAC, IX, and Regenerable IX are relatively similar. Both produce spent media which must be disposed of or regenerated, though IX media requires higher temperatures for destruction which requires greater energy inputs. Conversely, RO for PFAS creates a significant volume of additional wastewater that need to be managed. Unlike, for instance a desalination plant which might discharge reject brine back into a saline water body through a diffuser, the PFAS-enriched reject water stream cannot be discharged to a waterbody but must either be destroyed using an energy intensive process such as water incineration or be shipped to appropriate disposal facilities such as deep well injection often located hundreds to thousands of miles distant from source of origin.

4.1.6 As Total Cost of Application of Technology in Relation to Effluent Reduction Benefits

The estimates of probable cost for removing one pound of HFPO-DA are described in Section 3.1.7. The costs for GAC, IX, and Regenerable IX as the first technology are similar at \$34, \$38, and \$34 per pound respectively while the costs for RO were substantially higher at \$368 per pound (Table 4). The costs for RO are much higher due to the requirement to manage the disposal of the reject water, assumed here to be 5% of the flow volume disposed via water incineration – potentially an underestimate of the volume of water to be disposed.

¹ The percent removal calculations for the Ranney Well do not include specifying the removal efficiency as 100 percent when the effluent concentration of HFPO-DA or PFOA are non-detect. This is because the majority of the effluent data is non-detect (82% for HFPO-DA and 87% for PFOA). Instead the effluent was set to the reporting limit. The average of the East and West vessel daily average performances are reported here.

² The W9 permeate treatment system receives wastewaters from PFA Line 1, FEP, and Fine Powder



GAC, IX, and Regenerable IX are considered to be economically achievable first technology options, with GAC having other more favorable attributes as described in other subsections and summarized below in Section 4.1.8.

A first GAC treatment system (two vessels in series) is anticipated to remove 99.98% of influent HFPO-DA at an estimated cost of \$34 per pound of HFPO-DA removed with the opinions of probable cost provided in Attachment C.³ Adding an additional treatment unit such as IX or GAC removes an additional increment of 0.019% of the original total load assuming a removal rate capability of 95%. This removal corresponds to an estimated incremental cost of \$43,824 to \$46,176 per pound of HFPO-DA removed, respectively, as documented in Attachment C, Table C-9.⁴

Adding a fourth GAC vessel, provides a very small increment of total load removal at 0.00095% assuming a 95% removal rate of influent concentrations. This removal has an even greater incremental cost per pound HFPO-DA removed of \$541,176.

4.1.7 Comparison to the Cost of Treatment at a POTW

Sending PFAS containing wastes to a POTW was not considered a feasible option. The overwhelming majority of POTWs, including those local to the Site, cannot provide the necessary treatment to remove PFAS.

4.1.8 Best Practicable Control Technology Determination

Considering the discussion above, two GAC vessels is considered BPT. A third GAC vessel was included following discussion with WVDEP. Two GAC vessels are considered BPT for the following reasons:

- GAC has been demonstrated to successfully remove HFPO-DA from water streams at the facility before, and Site staff are familiar with the operation of GAC systems
- GAC is capable of removing other components present in the influent such as VertrelTM XF and E1 which are non-polar, while IX will not be able to remove these compounds
- GAC has more favorable waste management aspects as GAC disposal or regeneration involves the destruction of adsorbed GAC while IX produces a waste stream requiring further management and RO creates large volumes of waste to be managed
- GAC has limited environmental impacts compared to RO
- Two GAC vessels followed by a third GAC vessel are anticipated to achieve a >99.99% HFPO-DA removal rate

³ Incremental cost per pound removal values are calculated as the cost of operating the additional technology for 20 years divided by the mass of HFPO-DA removed by the technology over the 20-year operating period.

⁴ Incremental cost per pound removal values are calculated as the cost of operating the additional technology for 20 years divided by the mass of HFPO-DA removed by the technology over the 20-year operating period.



4.2 Nonconventional Pollutants Evaluation (Nitrate)

4.2.1 The Age of Equipment and Facilities Involved

Section 4.1.1 describes the age of the facilities involved. The site has adequate space for the nitrate removal processes that this section describes.

4.2.2 The Process Employed

Section 4.1.2 describes the processes employed. There are no additional process-related factors unique to nitrate removal.

4.2.3 Engineering Aspects of the Application of Control Techniques

The three technologies, RO, IX and biological treatment, are all expected to be able to achieve a reduction of nitrate to 10 mg/L Nitrate as N in the effluent water. The benefits of RO and IX are relatively straightforward operations of the systems, but with the disadvantage of significant waste volumes being generated. The benefits of biological treatment are utilizing efficient biological processes to minimize waste volumes, with the disadvantage of a slightly more complicated operations and greater operating footprint.

4.2.4 Process Changes

No additional process changes would limit the mass of nitrate discharged through Outfall 008.

4.2.5 Non-Water Quality Environmental Impact (Including Energy Requirements)

RO and IX are anticipated to have the highest non-water quality impacts. These two processes require either energy input to run the process, in the case of RO, or require substantial quantities of produced reagent material, in the case of IX. Additionally, these two processes generate significant waste volumes which require appropriate disposal. Biological treatment does consume an organic substrate material (e.g., methanol) to keep the process operational, but results in much lower waste volumes.

4.2.6 Total Cost of Application of Technology in Relation to Effluent Reduction Benefits

All three technologies considered for nitrate removal provide similar levels of treatment. The costs of the three treatment technologies presented in 3.2.4.4 indicate that the biological treatment system has the lowest cost per pound of nitrate removed. Biological treatment costs are less than the other technologies as there is less waste to dispose of. The cost of treatment in the technology selection process will not meaningfully affect the resultant effluent concentrations since the technologies provide similar levels of treatment.

4.2.7 Comparison to the Cost of Treatment at a POTW

Sending nitrate containing wastewater to a POTW was not considered feasible. The Site does not send wastes to nearby POTWs, and the cost of establishing a connection to these POTWs sewer



networks would likely be greater than the cost of installing and operating a nitrate treatment system at the facility.

4.2.8 Best Practicable Control Technology Determination

The three technologies, RO, IX and biological treatment, are all expected to be able to achieve a reduction of nitrate to 10 mg/L Nitrate as N in the effluent water. At present, Chemours is evaluating with water treatment vendors which nitrate technology is available for implementation and will install a selected technologies to meet nitrate TBELs (factors for Nitrate TBEL development are described below in Section 6.2).

5 FACTORS FOR THE BEST AVAILABLE CONTROL TECHNOLOGY EVALUATIONS

Requirements for the BAT evaluation are outlined in 40 CFR 125.3(d)(3). The following section outlines a BAT analysis for the new discharge, which applies to toxic and non-conventional pollutants, such as PFAS. This analysis acknowledges that the existing BAT limits at 40 CFR 414 Subpart J apply to the new discharge and no additional evaluation of the constituents regulated therein is included. This BAT analysis is for the nonconventional pollutants in the new discharge (there are no toxic pollutants, as defined in the CWA regulations, in the proposed PFA discharge) that are not regulated by the OCPSF BAT regulations.

The BAT analysis includes the same factors as BPT, presented in Sections 4.1.1 through 4.1.5 and 4.2.1 through 4.2.5, with the addition of the following:

The cost of achieving such effluent reduction.

In its development of the effluent limitations for the OCPSF category, EPA described its approach to determining BAT as emphasizing "additional treatment techniques applied in addition to the treatment systems currently employed for BPT, as well as process changes and improvements in internal process control and treatment technology optimization" (EPA, 1987). EPA also considered the incremental costs of the BAT regulations beyond BPT.

5.1 HFPO-DA Evaluation

Section 4.1.8 concludes that GAC is the BPT for this application. In evaluating the BAT for this application, two additional tools are available to provide increased removal of the parameters of concern while maintaining the economic achievability beyond BPT:

• *Process changes*: Chemours is designing multiple parts of the PFA Line 2 process to minimize overall wastewater flow. Water used for scrubbing of polymer drying discharge air and rinsing of the PFA polymer is largely recirculated to limit wastewater volume. An important net effect of this is to reduce the hydraulic load to downstream treatment units, thereby contributing to overall cost optimization of the treatment system.

• *BPT optimization*: One of the benefits of GAC is the ability, within limits, to optimize its performance by monitoring and controlling the carbon replacement frequency to reduce HFPO-DA breakthrough concentrations. The evaluation of BPT presented in Section 4 leveraged site-specific experience with this technology on similar process wastewater and the operations and maintenance (O&M) costs reflect the replacement frequency for that application. For PFA Line 2, Chemours expects that increased removal of HFPO-DA from the process wastewater can be achieved with a modest increase in breakthrough monitoring leading to an increase in GAC changeout frequency. Here the more frequent breakthrough monitoring would provide earlier identification of when HFPO-DA concentrations would begin to increase to levels that would trigger GAC change out. The potential increase to costs associated with more frequent GAC change outs may range from 10% to 25% for a fraction of a percent increase in HFPO-DA mass removal.

5.2 Nonconventional Pollutants Evaluation (Nitrate)

Section 4.2.8 indicated that the three nitrate treatment technologies had similar capabilities and that Chemours was in the process of selecting an available technology. In evaluating the BAT for this application, two additional tools are available to provide increased removal of the parameters of concern while maintaining the economic achievability beyond BPT:

- *Process changes:* Chemours is designing multiple parts of the PFA Line 2 process to minimize overall wastewater flow. Water used for scrubbing of polymer drying discharge air and rinsing of the PFA polymer is largely recirculated to limit wastewater volume. An important net effect of this is to reduce the hydraulic load to downstream treatment units, thereby contributing to overall cost optimization of the treatment system.
- *BPT optimization:* Of the three technologies considered, process changes can be evaluated to increase the performance of each technology. For IX systems, nitrate selective resins can be utilized, for RO systems a two-step RO system can be employed to decrease the volume of wastewater generated and operate the RO units at a more optimum efficiency. For biological systems nutrient loading, carbon substrate addition and system temperatures can be controlled to optimize nitrate removal.

Attachment A

Ranney Well Granular Activated Carbon Filter Results & Nitrate Data

Table A-1 Ranney Well Granular Activated Carbon Filter Results Chemours Washington Works, West Virginia

Date	Ranney Raw HFPO-DA (ng/l)	Ranney Raw PFOA (ng/l)	East lag HFPO-DA (ng/l)	West lag HFPO-DA (ng/l)	East lag %Removal HFPO-DA	West lag %Removal HFPO-DA	East lag PFOA (ng/l)	West lag PFOA (ng/l)	East lag %Removal PFOA	West lag %Removal PFOA
1/24/2022	12,300	30,000	<50	<50	99.59%	99.59%	100	200	99.67%	99.33%
2/2/2022	11,400	28,000	<50	80	99.56%	99.30%	100	100	99.64%	99.64%
2/8/2022	11,800	28,900	<50	160	99.58%	98.64%	300	300	98.96%	98.96%
2/16/2022	9,700	27,000	<50	<50	99.48%	99.48%	<20	<20	99.93%	99.93%
2/28/2022	8,300	28,100	<50	<50	99.40%	99.40%	<20	<20	99.93%	99.93%
3/15/2022	8,000	25,300	<50	<50	99.38%	99.38%	<20	<20	99.92%	99.92%
3/29/2022	8,700	22,300	<50	<50	99.43%	99.43%	<20	<20	99.91%	99.91%
4/11/2022	9,000	25,000	<100"	<100"	98.89%	98.89%	<20	<20	99.92%	99.92%
4/26/2022										
4/28/2022	9,400	23,000	<50	<50	99.47%	99.47%	<20	<20	99.91%	99.91%
5/10/2022	8,000	25,400	<50	<50	99.4270	99.4270	<20	<20	99.9270	99.9270
5/18/2022	8,000	23,600	<50	<50	99.38%	99.38%	<20	<20	99.92%	99.92%
5/24/2022	9,200	21,200	<50	<50	99.46%	99.46%	<20	<20	99.91%	99.91%
5/31/2022	12,000	24,200	400	<50	96.67%	99.58%	20	<20	99.92%	99.92%
6/9/2022	11,500	26,700	<50	<50	99.57%	99.57%	<20	<20	99.93%	99.93%
6/15/2022	11,100	26,800	<50	<50	99.55%	99.55%	<20	<20	99.93%	99.93%
6/22/2022	10,100	25,100	100	70	99.01%	99.31%	<20	<20	99.92%	99.92%
6/29/2022 ^c			<50	<50			<20	<20		
7/6/2022	11,900	30,400	<50	<50	99.58%	99.58%	<20	<20	99.93%	99.93%
7/13/2022	12,900	27,700	<50	<50	99.61%	99.61%	<20	<20	99.93%	99.93%
7/20/2022	11,100	24,500	<50	<50	99.55%	99.55%	<20	<20	99.92%	99.92%
7/27/2022	13,300	24,000	<50	<50	99.62%	99.62%	<20	<20	99.92%	99.92%
8/2/2022 ^u	15,600	24,600	<50	<50	99.68%	99.68%	<20	<20	99.92%	99.92%
8/9/2022	14,100	26,000	<50	<50	99.65%	99.65%	<20	<20	99.92%	99.92%
8/1//2022	14,700	26,400	<50	<50	99.66%	99.66%	<20	<20	99.92%	99.92%
8/20/2022	13,500	23,000	<50	<50	99.07%	99.07%	<20	<20	99.9278	99.9270
9/7/2022	14,000	22,900	<50	<50	99.66%	99.66%	<20	<20	99.92%	99.92%
9/13/2022	16.200	24,200	<50	<50	99.69%	99.69%	<20	<20	99.92%	99.92%
9/19/2022	12,600	23,700	<50	<50	99.60%	99.60%	<20	<20	99.92%	99.92%
9/27/2022	13,400	26,600	<50	<50	99.63%	99.63%	<20	<20	99.92%	99.92%
10/4/2022	11,900	24,000	<50	<50	99.58%	99.58%	<20	<20	99.92%	99.92%
10/17/2022	15,400	21,200	<50	<50	99.68%	99.68%	<20	<20	99.91%	99.91%
10/24/2022	15,900	24,700	<50	<50	99.69%	99.69%	<20	<20	99.92%	99.92%
10/28/2022	14,700	20,500	<100	100	99.32%	99.32%	<20	<20	99.90%	99.90%
11/15/2022	13,400	20,900	<50	<50	99.63%	99.63%	<20	<20	99.90%	99.90%
11/29/2022	12,600	29,900	<50	<50	99.60%	99.60%	<20	<20	99.93%	99.93%
12/6/2022	15,200	21,800	100	60	99.34%	99.61%	<20	<20	99.91%	99.91%
12/13/2022	14,700	22,700	<50	<50	99.66%	99.66%	<20	<20	99.91%	99.91%
12/20/2022	14,900	22,100	200	< <u>-</u> 100	99.00%	99.00%	<20	<20	99.91%	99.91%
1/10/2023 ^e	11,800	22,700		<50		99.58%		<20		99.91%
1/24/2023	12 400	20,900	<50	<50	99.60%	99.60%	<20	<20	99.90%	99.90%
1/31/2023	13,300	18,900	<50	<50	99.62%	99.62%	<20	<20	99.89%	99.89%
2/27/2023	19,700	23,900	<50	<50	99.75%	99.75%	<20	<20	99.92%	99.92%
3/7/2023	19,300	23,700	<50	<50	99.74%	99.74%	<20	<20	99.92%	99.92%
3/14/2023	15,900	21,000	<50	<50	99.69%	99.69%	<20	100	99.90%	99.52%
3/22/2023	17,400	22,200	<50	<50	99.71%	99.71%	<20	<20	99.91%	99.91%
3/28/2023	20,300	24,500	50	<50	99.75%	99.75%	<20	<20	99.92%	99.92%
4/11/2023	14,900	20,500	<50	<50	99.66%	99.66%	<20	<20	99.90%	99.90%
4/18/2023	20,900	21,300	200	500	99.04%	97.61%	<20	40	99.91%	99.81%
4/25/2023	16,900	19,900	<50	<50	99.70%	99.70%	<20	<20	99.90%	99.90%
5/1/2023	22,600	20,100	200	<50	99.12%	99.78%	30	30	99.85%	99.85%
5/16/2022	18,900	20,400	200	<50	98.94% 00.710/	99./4%	<20	<20	99.90%	99.90%
5/10/2023	17,300	23,300	< <u>50</u>	< <u>50</u>	99./170 00.60%	97./170 00.600/2	400 <20	<20	90.30% 00.01%	77.7270 00.010/2
5/30/2023	17 300	23,300	4 200	1 200	75 72%	93.05/0	90	70	99.9170	99.69%
6/1/2023	14.000	18.430	<100	<100	99.29%	99.29%	<20	<20	99.89%	99.89%
6/20/2023	15,800	24,300	<50	<50	99.68%	99.68%	<20	<20	99.92%	99.92%
6/27/2023	16,300	23,700	<50	<50	99.69%	99.69%	<20	30	99.92%	99.87%
7/4/2023	20,300	23,500	100	300	99.51%	98.52%	<20	<20	99.91%	99.91%
7/11/2023	19,100	22,700	50	400	99.74%	97.91%	<20	60	99.91%	99.74%
7/18/2023	14,400	21,600	<50	80	99.65%	99.44%	<20	30	99.91%	99.86%

Table A-1 Ranney Well Granular Activated Carbon Filter Results Chemours Washington Works, West Virginia

Date	Ranney Raw HFPO-DA (ng/l)	Ranney Raw PFOA (ng/l)	East lag HFPO-DA (ng/l)	West lag HFPO-DA (ng/l)	East lag %Removal HFPO-DA	West lag %Removal HFPO-DA	East lag PFOA (ng/l)	West lag PFOA (ng/l)	East lag %Removal PFOA	West lag %Removal PFOA
7/25/2023	17,300	23,600	<50	50	99.71%	99.71%	<20	<20	99.92%	99.92%
7/31/2023	11,700	21,000	<50	<50	99.57%	99.57%	<20	<20	99.90%	99.90%
Daily Mean	13,952	23,819	134	90	99.10%	99.38%	34	32	99.86%	99.87%
95th Percentile	20,210	28,780	200	272	99.74%	99.74%	98	94	99.93%	99.93%
99th Percentile	21,529	30,148	1,806	752	99.75%	99.76%	337	236	99.93%	99.93%

Notes:

^a Sample corrected for baseline drift of Internal Standard blank above the lowest calibration.

^b Results not included due to questionable sample.

^c Only lag beds were sampled.

 $^{\rm d}$ West lead carbon replaced 7/28/22. West lag became west Lead.

^eReplaced east lead bed.

^f West lead replaced on 6/20/23; lag became lead.

ng/l - nanograms per liter

--- No Results / Not Applicable



Attachment B W9 Permeate System HFPO-DA Data

	Influent HFPO-DA	Effuent HFPO-DA	Removal
Date	DL (µg/l)	DL (µg/l)	Efficiencv ¹
1/1/22	34,600	0.9	99.997%
1/2/22	34,200	5.7	99.98%
1/3/22	56,200	4.3	99.99%
1/4/22	49,700	4.4	99.99%
1/5/22	12,900	616.0	95.23%
1/6/22	35,500	0.9	99.997%
1/7/22	37,100	47.5	99.87%
1/8/22	36,000	6.8	99.98%
1/9/22	50,300	2.0	99.996%
1/10/22	43,900	30.1	99.93%
1/11/22	15,000	1.6	99.99%
1/12/22	19,700	1.2	99.99%
1/13/22	26,400	2.0	99.99%
1/14/22	52,900	0.4	99.99870
1/15/22	< 100	9.4	
1/10/22	< 100 60.600	0.6	99 999%
1/18/22	48 100	56.7	99.88%
1/19/22	< 100	0.6	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
1/20/22	< 100	56.7	
1/21/22	16,300	3.9	99.98%
1/22/22	69,900	10.2	99.99%
1/23/22	75,500	1.4	99.998%
1/24/22	14,100	2.3	99.98%
1/25/22	2,400	13.6	99.43%
1/26/22	27,200	0.6	99.998%
1/27/22	14,900	3.4	99.98%
1/28/22	19,100	0.7	99.996%
1/29/22	20,300	23.6	99.88%
1/31/22	48,400	2.0	99.996%
2/1/22	41,700	7.5	99.98%
2/2/22	83,000	3.2	99.996%
2/3/22	62,/00	2.4	99.996%
2/4/22	53,200	9.5	99.70%
2/5/22	2 400	1.0	99.9970
2/0/22	65 100	1.9	99 998%
2/8/22	20,450	2.4	99.99%
2/9/22	32,000	0.8	99.998%
2/10/22	36,500	1.3	99.996%
2/11/22	31,600	5.7	99.98%
2/12/22	27,600	3.0	99.99%
2/13/22	53,300	3.0	99.99%
2/14/22	49,400	1.5	99.997%
2/15/22	35,900	1.3	99.996%
2/16/22	50,500	10.2	99.98%
2/17/22	50,400	5.2	99.99%
2/18/22	43,100	3.6	99.99%
2/19/22	16,700	2.8	99.98%
2/20/22	24,400	3.6	99.99%
2/25/22	900	17.0	98.04%
2/20/22	23 400	13.4 A A	00 08%
2/28/22	23,400	23	99.99%
3/1/22	30.300	3.1	99.99%
3/2/22	33.700	2.1	99.99%
3/3/22	83.800	1.9	99.998%
3/4/22	45,800	0.7	99.998%
3/5/22	46,600	17.8	99.96%
3/6/22	42,000	10.6	99.97%
3/7/22	59,400	1.9	99.997%
3/8/22	46,600	1.6	99.997%
3/9/22	32,900	0.9	99.997%
3/10/22	56,500	1.0	99.998%
3/11/22	50,900	1.4	99.997%
3/12/22	19,900	0.9	99.995%
3/13/22	27,000	3.9	99.99%
3/15/22	10,800	1.8	99.99%
5/10/22	15,100	1./	11.11/0

	Influent	Effuent	Removal
Date			Efficiency ¹
3/17/22	16 900	22.5	99.87%
3/18/22	35,100	4 7	99.99%
3/19/22	15.700	2.3	99.99%
3/20/22	59,800	2.1	99.996%
3/21/22	90,500	1.9	99.998%
3/23/22	21,400	1.0	99.995%
3/24/22	39,700	1.5	99.996%
3/26/22	45,000	4.3	99.99%
3/27/22	55,700	2.1	99.996%
3/28/22	70,500	1.3	99.998%
3/29/22	54,200	1.1	99.998%
3/30/22	3,400	0.1	99.997%
3/31/22	16,200	0.5	99.997%
4/1/22	12,800	37.1	99.71%
4/2/22	227,600	3.6	99.998%
4/3/22	38,600	1.6	99.996%
4/4/22	25,400	1.3	99.99%
4/5/22	27,600	1.6	99.99%
4/6/22	25,500	0.7	99.99/%
4/8/22	11,500	18.0	99.84% 00.070/
4/9/22	23 100	3.0	99.97%
4/10/22	102 600	4.0 2.4	99.99%
4/12/22	80 300	1.1	99,999%
4/13/22	182 200	1.1	99.999%
4/14/22	41,300	1.1	99.997%
4/15/22	66.300	0.6	99.999%
4/16/22	73,500	6.0	99.99%
4/17/22	103,200	2.1	99.998%
4/18/22	1,200	1.2	99.90%
4/20/22	17,600	11.1	99.94%
4/22/22	149,000	4.0	99.997%
4/23/22	27,900	3.3	99.99%
4/24/22	31,700	6.1	99.98%
4/25/22	37,800	9.6	99.97%
4/26/22	26,300	4.4	99.98%
4/27/22	33,100	3.0	99.99%
4/28/22	32,800	2.6	99.99%
4/29/22	38,300	2.9	99.99%
4/30/22	49,400	10.6	99.98%
5/1/22	19,000	1.9	99.99%
5/2/22	32,700	1.8	99.99%
5/3/22	45,800	1.0	99.996%
5/5/22	23,300	0.5 2.0	99.9770
5/5/22	< 100	2.9	08 00%
5/8/22	100	2.2	97 30%
5/9/22	52,200	2.6	99.995%
5/12/22	6.000	4.4	99.93%
5/13/22	28.700	3.9	99.99%
5/14/22	42,200	1.6	99.996%
5/15/22	33,800	1.7	<u>9</u> 9.99%
5/16/22	42,800	1.4	99.997%
5/17/22	22,800	1.1	99.995%
5/19/22	28,900	1.2	99.996%
5/20/22	35,100	0.7	99.998%
5/21/22	29,600	0.5	99.998%
5/22/22	38,700	72.5	99.81%
5/23/22	33,700	13.6	99.96%
5/24/22	30,900	6.1	99.98%
5/25/22	40,200	4.0	99.99%
5/26/22	31,500	3.5	99.99%
3/28/22	2,800	/.0	99./3%
5/20/22	52,300	۷.۵	77.7770
5/29/22	1 200	2.0	00 820/
5/29/22 5/30/22 5/31/22	1,300	2.0	99.85%
5/29/22 5/30/22 5/31/22 6/1/22	1,300 22,600 35,800	2.0 1.2 1.3	99.85% 99.99% 99.996%
5/29/22 5/30/22 5/31/22 6/1/22 6/2/22	1,300 22,600 35,800 44,400	2.0 1.2 1.3 1.0	99.85% 99.99% 99.996% 99.998%

Date	Influent HFPO-DA DL (µg/l)	Effuent HFPO-DA DL (µg/l)	Removal Efficiency ¹
6/4/22	23,700	3.0	99.99%
6/5/22	7,300	1.8	99.98%
6/6/22	50,200	6.3	99.99%
6/8/22	15,800	2.2	99.99%
6/9/22	34,900	2.1	99.99%
6/10/22	29.600	11.2	99.96%
6/11/22	16.000	3.7	99.98%
6/12/22	51,800	5.0	99 99%
6/13/22	39,500	4.2	99.99%
6/14/22	62,800	2.3	99,996%
6/15/22	100	1.3	JJ.JJ070
6/13/22	22 200	6.5	00.079/
6/1//22	23,300	6.5	99.97%
6/18/22	24,900	3.0	99.98%
6/19/22	27,100	2.2	99.99%
6/20/22	29,100	2.0	99.99%
6/21/22	19,600	1.1	99.99%
6/22/22	8,500	1.2	99.99%
6/23/22	12,600	2.0	99.98%
6/24/22	26,300	5.1	99.98%
6/25/22	17,300	3.1	99.98%
6/26/22	17,300	1.6	99.99%
6/27/22	19,900	1.1	99.99%
6/28/22	19,400	1.1	99.99%
6/29/22	33,100	1.3	99.996%
6/30/22	35,800	0.5	99.999%
7/1/22	54,600	6.2	99.99%
7/2/22	36,900	3.4	99.99%
7/3/22	32,900	2.7	99.99%
7/4/22	27.100	1.2	99.996%
7/5/22	21.700	1.8	99,99%
7/6/22	35,800	2.2	99.99%
7/7/22	13 700	2.2	99.98%
7/8/22	1 700	0.0	99.95%
7/9/22	19 600	10.2	99.95%
7/10/22	35 100	3.1	90.00%
7/11/22	20,200	J.1 1.0	00 000/
7/12/22	11,000	1.9	77.7770 00.000/
7/12/22	10,000	0.9	77.7770
7/13/22	19,000	0.9	99.993% 00.000/
//14/22	15,000	2.9	99.98%
7/15/22	28,900	1.3	99.996%
7/16/22	200	10.7	94.65%
7/17/22	< 100	3.9	
7/18/22	2,400	2.0	99.92%
7/19/22	< 100	10.2	
7/20/22	300	4.8	98.40%
7/21/22	7,200	2.3	99.97%
7/22/22	44,100	1.3	99.997%
7/23/22	24,200	3.1	99.99%
7/24/22	49,700	0.6	99.999%
7/25/22	16,400	0.9	99.99%
7/26/22	52,300	0.6	99.999%
7/27/22	39,700	0.7	99.998%
7/28/22	42,800	1.1	99.997%
7/29/22	100,900	9.8	99.99%
7/30/22	8,000	3.5	99.96%
7/31/22	14,800	2.4	99.98%
8/1/22	42.800	1.7	99.996%
8/2/22	30.900	1.3	99.996%
8/3/22	19.700	5.8	99,97%
8/4/22	67.800	0.6	99,999%
8/5/22	36 700	1.0	99.997%
8/6/22	24 000	6.6	90 070/-
0/0/22 8/7/22	24,000	0.0	77.7/70 00.600/
0/ 1/ 22	25 100	1.0	99.08%
8/8/22	35,100	1.4	99.990%
8/9/22	47,800	1.1	99.998%
8/10/22	22,400	0.6	99.997%
8/11/22	34,100	7.4	99.98%
8/12/22	23,900	3.3	99.99%
8/13/22	13,000	2.1	99.98%

	Influent	Effuent	Removal
Date	HFPO-DA	HFPO-DA	Efficiency ¹
8/14/22	9,500	1.9	99.98%
8/15/22	11,600	2.2	99.98%
8/16/22	20,900	1.0	99.995%
8/17/22	40,700	0.7	99.998%
8/18/22	41,900	0.6	99.999%
8/19/22	/4,400	0.9	99.999%
8/20/22	300	4.0	98.67%
8/22/22	48,000	3.9	99.99%
8/23/22	13,900	1.6	99.99%
8/24/22	40,200	0.9	99.998%
8/25/22	19,900	1.0	99.99%
8/26/22	43,500	1.1	99.997%
8/28/22	43,300	4.5	99.9976
8/29/22	40,900	1.9	99.995%
8/30/22	36,700	1.0	99.997%
8/31/22	118,900	1.7	99.999%
9/1/22	23,500	1.6	99.99%
9/2/22	27,900	20.8	99.93%
9/3/22	23,800	4.0	99.98%
9/4/22	28,500	1.2	99.99%
9/6/22	39.700	0.9	99.998%
9/7/22	58,600	0.8	99.999%
9/8/22	38,800	7.8	99.98%
9/9/22	18,200	19.5	99.89%
9/10/22	30,900	14.3	99.95%
9/11/22	32,200	8.5	99.97%
9/12/22	26,100	8.0	99.97%
9/14/22	14.300	5.4	99.96%
9/15/22	32,600	10.3	99.97%
9/16/22	27,900	11.9	99.96%
9/17/22	45,700	14.3	99.97%
9/18/22	39,600	14.6	99.96%
9/19/22	44,800	9.7	99.98%
9/20/22	37 500	8.7	99.98%
9/22/22	39,700	6.7	99.98%
9/23/22	30,200	7.4	99.98%
9/24/22	35,700	7.4	99.98%
9/25/22	36,900	6.9	99.98%
9/26/22	43,600	10.5	99.98%
9/27/22	33,100	12.7	99.96%
9/28/22	33,900 86,200	0.2 4 2	99.99%
9/30/22	< 100	1.4	77.77570
10/1/22	900	1.2	99.87%
10/2/22	10,900	2.5	99.98%
10/3/22	58,200	42.9	99.93%
10/4/22	24,300	10.7	99.96%
10/5/22	21,300	9.3	99.96%
10/0/22	36,100	11.1	99.97%
10/8/22	37,200	9.1	99.98%
10/9/22	61,300	11.9	99.98%
10/10/22	29,500	14.4	99.95%
10/11/22	6,900	23.7	99.66%
10/12/22	17,300	24.4	99.86%
10/13/22	25,400	ð.2 4 0	99.90% 00.00%
10/15/22	3.200	2.8	99.91%
10/16/22	43,000	2.4	99.99%
10/17/22	600	1.2	99.80%
10/18/22	20,600	1.0	99.995%
10/19/22	1,000	8.5	99.15%
10/20/22	39,700	4.1	99.99%
10/21/22	55,000	3.1	99.99%

		Effuent	Removal
Date	DL (ug/l)	DL (ug/l)	Efficiency ¹
10/22/22	200	2.0	99.00%
10/23/22	75,600	1.4	99.998%
10/24/22	62,500	1.5	99.998%
10/25/22	70,400	0.8	99.999%
10/26/22	56,700	1.0	99.998%
10/27/22	48,200	15.3	99.97%
10/28/22	29,000	8.2	99.97%
10/29/22	52,400	13.0	99.98%
10/30/22	38 900	3.2	99.998%
11/1/22	69 300	1.7	99.990%
11/2/22	19,900	11.0	99.94%
11/3/22	18,200	4.2	99.98%
11/4/22	38,800	2.7	99.99%
11/5/22	31,600	37.6	99.88%
11/6/22	55,400	38.4	99.93%
11/7/22	18,200	1.6	99.99%
11/8/22	72,000	1.6	99.998%
11/9/22	48,600	2.8	99.99%
11/10/22	52,400	1.3	99.996%
11/11/22	44 000	1.1	97.990% 90.008%
11/12/22	39,100	7.2	99 98%
11/14/22	113,000	3.0	99.997%
11/16/22	36,300	2.4	99.99%
11/17/22	28,200	15.3	99.95%
11/18/22	38,300	5.2	99.99%
11/19/22	42,800	2.5	99.99%
11/20/22	1,600	2.1	99.87%
11/21/22	51,300	1.7	99.997%
11/22/22	22,500	3.2	99.99%
11/23/22	37,300	2.4	99.993%
11/24/22	10 500	1.5	99.99%
11/26/22	16,800	1.6	99.99%
11/27/22	24,200	1.8	99.99%
11/28/22	34,400	1.7	99.995%
11/29/22	45,500	1.3	99.997%
11/30/22	73,800	1.2	99.998%
12/1/22	53,100	1.1	99.998%
12/2/22	43,500	0.9	99.998%
12/3/22	54,900	0.6	99.999%
12/4/22	76,000	0.6	99.999%
12/6/22	86.000	1.1	99.999%
12/7/22	59,700	1.5	99.997%
12/8/22	67,100	1.3	99.998%
12/9/22	85,700	0.6	99.999%
12/10/22	65,900	1.3	99.998%
12/11/22	4,900	1.0	99.98%
12/12/22	65,800	1.4	99.998%
12/13/22	26,500	0.7	99.997%
12/14/22	59 100	1.0	99.990%
12/16/22	45.900	1.5	99.997%
12/17/22	71,900	0.9	99.999%
12/18/22	78,400	1.6	99.998%
12/19/22	79,700	0.9	99.999%
12/20/22	84,100	0.8	99.999%
12/21/22	62,800	1.4	99.998%
12/22/22	86,400	< 0.1	99.9999%
12/24/22	53,400	0.8	99.999%
12/25/22	66,000	0.9	99.999%
12/20/22	20,900	1.1	99.99/70
12/27/22	75,700	2.5	99 997%
12/29/22	68.800	6.7	99.99%
12/30/22	800	13.1	98.36%
12/31/22	117,300	12.9	99.99%

	Influent HEPO_DA	Effuent HFPO_DA	Removal
Date	DL (ug/l)		Efficiency ¹
1/1/23	113.000	5.2	99.995%
1/2/23	< 100	2.3	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
1/3/23	300	1.3	99.57%
1/4/23	59,950	15.5	99.97%
1/5/23	63,600	7.1	99.99%
1/6/23	32,000	5.8	99.98%
1/7/23	60,700	8.5	99.99%
1/8/23	25,800	1.6	99.99%
1/9/23	31,000	21.5	99.93%
1/10/23	< 100	13.6	
1/11/23	87,700	8.1	99.99%
1/12/23	23,300	5.8	99.98%
1/13/23	38,700	2.1	99.99%
1/14/23	12,100	1.9	99.98%
1/15/23	5,000	1.0	99.98%
1/10/23	100	1.1	99.997%
1/18/23	51,100	0.8	99 998%
1/19/23	34,500	0.6	99 998%
1/20/23	22,300	0.6	99.997%
1/21/23	15,600	0.5	99.997%
1/22/23	31,000	0.7	99.998%
1/23/23	16,800	1.1	99.99%
1/24/23	29,500	0.4	99.999%
1/25/23	36,700	0.5	99.999%
1/26/23	36,200	0.4	99.999%
1/27/23	24,600	0.3	99.999%
1/28/23	25,900	0.9	99.997%
1/29/23	43,400	1.6	99.996%
1/30/23	29,500	0.5	99.998%
1/31/23	17,800	0.4	99.998%
2/1/23	30,900	0.5	99.998%
2/2/23	18,800	0.6	99.99/%
2/3/23	400	0.3	97.30%
2/4/23	14 900	0.7	00.005%
2/6/23	19,700	0.7	99,996%
2/7/23	34,500	0.6	99.998%
2/8/23	39,700	0.6	99.998%
2/9/23	70,600	0.5	99.999%
2/10/23	10,700	0.4	99.996%
2/13/23	22,500	0.6	99.997%
2/15/23	< 100	0.6	
2/17/23	34,600	1.7	99.995%
2/23/23	42,400	0.8	99.998%
2/24/23	29,500	0.5	99.998%
2/27/23	44,400	0.4	99.999%
2/28/23	49,100	1.5	99.997%
3/1/23	39,000	0.6	99.998%
3/2/23	25,900	4.1	99.98%
3/3/23	45,000	0.8	99.99/% 00.008%
3/5/23	30.800	1.0	99 996%
3/6/23	40 800	1.5	99,996%
3/7/23	44.300	1.3	99.997%
3/8/23	40,100	0.7	99.998%
3/9/23	48,700	0.6	99.999%
3/10/23	62,000	0.4	<u>9</u> 9.999%
3/11/23	73,400	0.4	99.999%
3/12/23	64,300	0.3	99.9995%
3/13/23	21,200	1.0	99.995%
3/14/23	20,500	11.3	99.94%
3/15/23	1,100	3.9	99.65%
3/16/23	24,000	2.7	99.99%
3/17/23	1,500	3.1	99.79%
3/18/23	18,900	1.0	99.99%
3/19/23	30,200	5.1	99.98%
3/20/23	0,000	13.9	77.00% 00.089/

	Influent	Effuent	Removal
Data	HFPO-DA	HFPO-DA	Efficiency ¹
3/22/23	DL (μg/l) 16.800	DL (μg/l) 2.1	99.99%
3/22/23	38 500	1.6	99 996%
3/31/23	400	0.6	99.85%
4/1/23	10,100	0.6	99.99%
4/2/23	5,300	0.2	99.996%
4/3/23	28,200	0.6	99.998%
4/5/23	27,400	0.9	99.997%
4/6/23	14,000	0.6	99.996%
4/7/23	29,500	0.3	99.999%
4/8/23	40,600	< 0.1	99.9998%
4/9/23	58,900	0.3	99.999%
4/10/23	40,500	2.7	99.99%
4/11/23	15,800	0.4	99.997%
4/12/23	18,100	0.3	99.998%
4/13/23	17,100	1.0	99.99%
4/14/23	12,100	0.4	99.997%
4/10/23	23,300	< 0.1 0.1	00 000%
4/18/23	32,000	0.1	99,999%
4/19/23	21,400	0.7	99.997%
4/20/23	43.100	0.2	99,99954%
4/21/23	49.900	0.3	99.999%
4/22/23	57,300	0.2	99.99965%
4/23/23	109,500	0.2	99.99982%
4/25/23	32,500	0.3	99.999%
4/26/23	21,300	0.2	99.999%
4/27/23	300	< 0.1	99.97%
4/28/23	37,400	0.1	99.9997%
4/29/23	22,200	463.7	97.91%
4/30/23	30,000	0.1	99.9997%
5/1/23	40,100	0.8	99.998%
5/2/23	54,300	0.2	99.9996%
5/4/23	51,200	< 0.1	99.9998%
5/5/23	40,800	< 0.1	99.9998%
5/7/23	6,000	0.3	99.999%
5/18/23	10 300	< 0.1	99 999%
5/20/23	17.600	< 0.1	99.999%
5/22/23	41.200	< 0.1	99.9998%
5/23/23	43,600	0.1	99.9998%
5/24/23	52,700	< 0.1	99.9998%
5/25/23	69,700	< 0.1	99.9999%
5/26/23	40,300	< 0.1	99.9998%
5/27/23	51,200	< 0.1	99.9998%
5/28/23	64,600	< 0.1	99.9998%
5/29/23	71,700	< 0.1	99.9999%
5/30/23	59,500	< 0.1	99.9998%
5/31/23	900	< 0.1	99.99%
6/2/23	21,800	< 0.1	99.9995%
6/4/22	10,400	0.1	77.777% 100.000/2
6/5/23	32,100	0.1	00 000%
6/6/23	53 500	0.4	99 999%
6/7/23	39,200	< 0.1	99 9997%
6/8/23	27.800	< 0.1	99.9996%
6/9/23	48,100	1.1	99.998%
6/10/23	22,700	2.1	99.99%
6/11/23	57,900	5.1	99.99%
6/12/23	62,200	5.3	99.99%
6/13/23	3,900	7.8	99.80%
6/14/23	31,800	5.8	99.98%
6/15/23	47,700	8.2	99.98%
6/16/23	900	19.4	97.84%
6/18/23	< 100	3.4	00.000/
6/20/23	8,100	1.2	99.99%
6/22/22	45,500	0./	99.998%
6/22/23	< 100	0.0	77.777%0
6/24/23	82.300	0.7	99,999%
0.220	02,000	0.0	

	Influent	Effuent	Removal
Date		DL (µg/l)	Efficiency ¹
6/25/23	38 800	10	99.997%
6/26/23	31,100	27.2	99.91%
6/27/23	49,100	3.6	99.99%
6/28/23	700	3.7	99.48%
6/29/23	43,700	2.5	99.99%
6/30/23	33,400	2.1	99.99%
7/1/23	< 24,314	23.6	
7/2/23	26,200	5.5	99.98%
7/3/23	42,000	3.0	99.99%
7/4/23	12,900	1.5	99.99%
7/5/23	< 100	2.0	
7/6/23	3,500	1.7	99.95%
7/7/23	26,300	1.2	99.995%
7/8/23	4,500	3.2	99.93%
7/9/23	32,500	1.5	99.995%
7/10/23	29,600	1.3	99.996%
7/11/23	38,200	1.9	99.995%
7/12/23	35,900	3.0	99.99%
7/13/23	6,600	2.1	99.97%
7/14/23	21,400	6.9	99.97%
7/15/23	26,000	2.4	99.99%
7/16/23	31,100	1.5	99.995%
7/17/23	400	1.5	99.63%
7/18/23	41,700	1.0	99.996%
7/19/23	29,400	1.8	99.99%
7/21/23	26,700	0.6	99.998%
7/22/23	13,400	1.0	99.99%
7/23/23	22,900	1.5	99.99%
7/24/25	35,000	28.6	99.990%
7/26/23	27,500	20.0	99.90%
7/27/23	17 300	23	99.99%
7/28/23	32,600	1.4	99.996%
7/29/23	35,000	1.2	99.997%
7/30/23	23,100	10.1	99.96%
7/31/23	33,000	1.4	99.996%
8/1/23	35,000	0.5	99.999%
8/2/23	24,900	1.4	99.99%
8/5/23	27,900	1,427.9	94.88%
8/6/23	11,500	1.0	99.99%
8/7/23	< 100	7.5	
		Daily Average	99.91%
		25th Percentile	99.98%
	50th	Percentile (Median)	99.99%

Notes:

1 - Removal efficiencies were not calculated if the influent was non-detect.

DL - Detection Limit

 μ g/l - micrograms per liter

Table B-2 Influent HFPO-DA Concentration (µg/l) for W9 Permeate System Chemours Washington Works, West Virginia

	2022										2023									
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	34,600	41,700	30,300	12,800	19,000	35,800	54,600	42,800	23,500	900	69,300	53,100	113,000	30,900	39,000	10,100	40,100	39,600		35,000
2	34,200	83,000	33,700	227,600	32,700	44,400	36,900	30,900	27,900	10,900	19,900	43,500		18,800	25,900	5,300	54,300	21,800	26,200	24,900
3	56,200	62,700	83,800	38,600	43,800	52,800	32,900	19,700	23,800	58,200	18,200	54,900	300	20	27,600	28,200	49,900	16,400	42,000	
4	49,700	3,200	45,800	25,400	25,500	23,700	27,100	67,800	28,500	24,300	38,800	76,000	59,950	400	45,000	36,700	51,200	32,100	12,900	25,700
5	12,900	53,400	46,600	27,600		7,300	21,700	36,700	36,800	21,300	31,600	57,900	63,600	14,900	30,800	27,400	40,800	33,700		27,900
6	35,500	2,400	42,000	25,500	200	50,200	35,800	24,000	39,700	32,300	55,400	86,000	32,000	19,700	40,800	14,000	27,900	53,500	3,500	11,500
7	37,100	65,100	59,400	13,400		34,500	13,700	500	58,600	36,100	18,200	59,700	60,700	34,500	44,300	29,500	6,000	39,200	26,300	
8	36,000	20,450	46,600	11,500	100	15,800	1,700	35,100	38,800	37,200	72,000	67,100	25,800	39,700	40,100	40,600		27,800	4,500	33,800
9	50,300	32,000	32,900	18,300	52,200	34,900	19,600	47,800	18,200	61,300	48,600	85,700	31,000	70,600	48,700	58,900		48,100	32,500	
10	43,900	36,500	56,500	33,100		29,600	35,100	22,400	30,900	29,500	32,400	65,900		10,700	62,000	40,500		22,700	29,600	
11	15,000	31,600	50,900	102,600		16,000	20,200	34,100	32,200	6,900	55,100	4,900	87,700	14,400	73,400	15,800		57,900	38,200	
12	19,700	27,600	19,900	80,300	6,000	51,800	11,000	23,900	26,100	17,300	44,000	65,800	23,300	3,400	64,300	18,100	429,000	62,200	35,900	
13	26,400	53,300	27,000	182,200	28,700	39,500	19,600	13,000	21,600	23,400	39,100	26,500	38,700	22,500	21,200	17,100		3,900	6,600	
14	52,900	49,400	25,700	41,300	42,200	62,800	15,000	9,500	14,300	56,800	113,000	44,900	12,100	31,800	20,500	12,100		31,800	21,400	
15		35,900	16,800	66,300	33,800		28,900	11,600	32,600	3,200	26,600	59,100	5,000		1,100	17,100		47,700	26,000	
16		50,500	13,100	73,500	42,800	22,800	200	20,900	27,900	43,000	36,300	45,900	35,200	32,500	24,000	23,300		900	31,100	
17	60,600	50,400	16,900	103,200	22,800	23,300		40,700	45,700	600	28,200	71,900	100	34,600	1,500	17,000			400	
18	48,100	43,100	35,100	1,200	16,600	24,900	2,400	41,900	39,600	20,600	38,300	78,400	51,100	38,000	18,900	32,000	10,300		41,700	
19		16,700	15,700		28,900	27,100		74,400	44,800	1,000	42,800	79,700	34,500	6,000	30,200	21,400	10,600	51,600	29,400	
20		24,400	59,800	17,600	35,100	29,100	300	55,900	26,400	39,700	1,600	84,100	22,300	19,400	8,000	43,100	17,600	8,100	49,500	
21	16,300	14,500	90,500		29,600	19,600	7,200	300	37,500	55,000	51,300	62,800	15,600	34,300	21,100	49,900	45,400	45,500	26,700	
22	69,900			149,000	38,700	8,500	44,100	48,000	39,700	200	22,500	86,400	31,000	30,200	16,800	57,300	41,200	81,800	15,400	
23	75,500		21,400	27,900	33,700	12,600	24,200	13,900	30,200	75,600	37,300	59,700	16,800	42,400	8,100	109,500	43,600		22,900	
24	14,100		39,700	31,700	30,900	26,300	49,700	40,200	35,700	62,500	32,300	53,400	29,500	29,500	38,500	45,100	52,700	82,300	33,600	
25	2,400	900	55,600	37,800	40,200	17,300	16,400	19,900	36,900	70,400	10,500	60,300	36,700	37,600		32,500	69,700	38,800	27,500	
26	27,200	15,700	45,000	26,300	31,500	17,300	52,300	43,500	43,600	56,700	16,800	66,900	36,200	51,600	18,500	21,300	40,300	31,100	25,500	
27	14,900	23,400	55,700	33,100	24,600	19,900	39,700	43,500	33,100	48,200	24,200	20,800	24,600	44,400	16,000	300	51,200	49,100	17,300	
28	19,100	27,600	70,500	32,800	2,800	19,400	42,800	47,100	53,900	29,000	34,400	75,700	25,900	49,100	14,200	37,400	64,600	700	32,600	
29	20,300		54,200	38,300	52,300	33,100	100,900	40,900	86,200	52,400	45,500	68,800	43,400		18,600	22,200	71,700	43,700	35,000	
30			3,400	49,400	1,300	35,800	8,000	36,700		164,600	73,800	800	29,500		24,200	30,000	59,500	33,400	23,100	
31	48,400		16,200		22,600		14,800	118,900		38,900		117,300	17,800		400		900		33,000	
Avg	35,431	34,618	40,357	54,582	27,356	28,831	26,786	35,694	35,679	38,000	39,267	60,771	34,598	28,219	28,123	30,457	58,114	37,237	25,872	26,467

Notes:

µg/l - micrograms per liter

Table B-3Anticipated Effluent HFPO-DA (µg/l) for W9 Permeate SystemChemours Washington Works, West Virginia

	2022									2023										
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	6.9	8.3	6.1	2.6	3.8	7.2	10.9	8.6	4.7	0.2	13.9	10.6	22.6	6.2	7.8	2.0	8.0	7.9		7.0
2	6.8	16.6	6.7	45.5	6.5	8.9	7.4	6.2	5.6	2.2	4.0	8.7		3.8	5.2	1.1	10.9	4.4	5.2	5.0
3	11.2	12.5	16.8	7.7	8.8	10.6	6.6	3.9	4.8	11.6	3.6	11.0	0.06	0.004	5.5	5.6	10.0	3.3	8.4	
4	9.9	0.6	9.2	5.1	5.1	4.7	5.4	13.6	5.7	4.9	7.8	15.2	12.0	0.08	9.0	7.3	10.2	6.4	2.6	5.1
5	2.6	10.7	9.3	5.5		1.5	4.3	7.3	7.4	4.3	6.3	11.6	12.7	3.0	6.2	5.5	8.2	6.7		5.6
6	7.1	0.5	8.4	5.1	0.04	10.0	7.2	4.8	7.9	6.5	11.1	17.2	6.4	3.9	8.2	2.8	5.6	10.7	0.7	2.3
7	7.4	13.0	11.9	2.7		6.9	2.7	0.1	11.7	7.2	3.6	11.9	12.1	6.9	8.9	5.9	1.2	7.8	5.3	
8	7.2	4.1	9.3	2.3	0.02	3.2	0.3	7.0	7.8	7.4	14.4	13.4	5.2	7.9	8.0	8.1		5.6	0.9	6.8
9	10.1	6.4	6.6	3.7	10.4	7.0	3.9	9.6	3.6	12.3	9.7	17.1	6.2	14.1	9.7	11.8		9.6	6.5	
10	8.8	7.3	11.3	6.6		5.9	7.0	4.5	6.2	5.9	6.5	13.2		2.1	12.4	8.1		4.5	5.9	
11	3.0	6.3	10.2	20.5		3.2	4.0	6.8	6.4	1.4	11.0	1.0	17.5	2.9	14.7	3.2		11.6	7.6	
12	3.9	5.5	4.0	16.1	1.2	10.4	2.2	4.8	5.2	3.5	8.8	13.2	4.7	0.7	12.9	3.6	85.8	12.4	7.2	
13	5.3	10.7	5.4	36.4	5.7	7.9	3.9	2.6	4.3	4.7	7.8	5.3	7.7	4.5	4.2	3.4		0.8	1.3	
14	10.6	9.9	5.1	8.3	8.4	12.6	3.0	1.9	2.9	11.4	22.6	9.0	2.4	6.4	4.1	2.4		6.4	4.3	
15		7.2	3.4	13.3	6.8		5.8	2.3	6.5	0.6	5.3	11.8	1.0		0.2	3.4		9.5	5.2	
16		10.1	2.6	14.7	8.6	4.6	0.04	4.2	5.6	8.6	7.3	9.2	7.0	6.5	4.8	4.7		0.2	6.2	
17	12.1	10.1	3.4	20.6	4.6	4.7		8.1	9.1	0.1	5.6	14.4	0.0	6.9	0.3	3.4			0.08	
18	9.6	8.6	7.0	0.2	3.3	5.0	0.5	8.4	7.9	4.1	7.7	15.7	10.2	7.6	3.8	6.4	2.1		8.3	
19		3.3	3.1		5.8	5.4		14.9	9.0	0.2	8.6	15.9	6.9	1.2	6.0	4.3	2.1	10.3	5.9	
20		4.9	12.0	3.5	7.0	5.8	0.06	11.2	5.3	7.9	0.3	16.8	4.5	3.9	1.6	8.6	3.5	1.6	9.9	
21	3.3	2.9	18.1		5.9	3.9	1.4	0.1	7.5	11.0	10.3	12.6	3.1	6.9	4.2	10.0	9.1	9.1	5.3	
22	14.0			29.8	7.7	1.7	8.8	9.6	7.9	0.0	4.5	17.3	6.2	6.0	3.4	11.5	8.2	16.4	3.1	
23	15.1		4.3	5.6	6.7	2.5	4.8	2.8	6.0	15.1	7.5	11.9	3.4	8.5	1.6	21.9	8.7		4.6	
24	2.8		7.9	6.3	6.2	5.3	9.9	8.0	7.1	12.5	6.5	10.7	5.9	5.9	7.7	9.0	10.5	16.5	6.7	
25	0.5	0.2	11.1	7.6	8.0	3.5	3.3	4.0	7.4	14.1	2.1	12.1	7.3	7.5		6.5	13.9	7.8	5.5	
26	5.4	3.1	9.0	5.3	6.3	3.5	10.5	8.7	8.7	11.3	3.4	13.4	7.2	10.3	3.7	4.3	8.1	6.2	5.1	
27	3.0	4.7	11.1	6.6	4.9	4.0	7.9	8.7	6.6	9.6	4.8	4.2	4.9	8.9	3.2	0.06	10.2	9.8	3.5	
28	3.8	5.5	14.1	6.6	0.6	3.9	8.6	9.4	10.8	5.8	6.9	15.1	5.2	9.8	2.8	7.5	12.9	0.1	6.5	
29	4.1		10.8	7.7	10.5	6.6	20.2	8.2	17.2	10.5	9.1	13.8	8.7		3.7	4.4	14.3	8.7	7.0	
30			0.7	9.9	0.3	7.2	1.6	7.3		32.9	14.8	0.2	5.9		4.8	6.0	11.9	6.7	4.6	
31	9.7		3.2		4.5		3.0	23.8		7.8		23.5	3.6		0.08		0.2		6.6	
Avg	7.1	6.9	8.1	10.9	5.5	5.8	5.4	7.1	7.1	7.6	7.9	12.2	6.9	5.6	5.6	6.1	11.6	7.4	5.2	5.3

Notes:

Anticipated concentrations are estimated by applying a 99.98% reduction factor to the influent data presented in Table B-2. $\mu g/l$ - micrograms per liter

Sample Date	PFOA (µg/L)
8/29/2021	< 0.06
8/30/2021	< 0.06
8/31/2021	< 0.06
9/1/2021	0.2
9/2/2021	< 0.06
9/3/2021	< 0.06
9/4/2021	< 0.06
9/5/2021	2.7
9/6/2021	< 0.06
9/7/2021	< 0.06
9/8/2021	< 0.06
9/10/2021	< 0.06
9/11/2021	< 0.06
9/12/2021	< 0.06
9/13/2021	< 0.06
9/14/2021	3.5
9/15/2021	< 0.06
9/16/2021	< 0.06
9/17/2021	< 0.06
9/18/2021	< 0.06
9/19/2021	< 0.06
9/20/2021	< 0.06
9/21/2021	< 0.06
9/22/2021	< 0.06
9/23/2021	< 0.06
9/24/2021	< 0.06
9/25/2021	< 0.06
9/26/2021	< 0.06
9/27/2021	< 0.06
9/28/2021	< 0.06
9/29/2021	< 0.06
9/30/2021	< 0.06
10/1/2021	< 0.06
10/2/2021	< 0.06
10/3/2021	< 0.06
10/4/2021	< 0.06
10/5/2021	< 0.06
10/6/2021	< 0.06
10/7/2021	< 0.06
10/8/2021	< 0.06
10/9/2021	< 0.06
10/10/2021	< 0.06
10/11/2021	< 0.06
10/12/2021	< 0.06
10/13/2021	< 0.06
10/14/2021	< 0.06

Sample Date	PFOA (µg/L)
10/17/2021	< 0.06
10/18/2021	< 0.06
10/19/2021	< 0.06
10/24/2021	< 0.06
10/25/2021	< 0.06
10/26/2021	< 0.06
10/27/2021	< 0.06
10/29/2021	< 0.06
10/30/2021	< 0.06
10/31/2021	< 0.06
11/1/2021	< 0.06
11/2/2021	< 0.06
11/3/2021	< 0.06
11/4/2021	< 0.06
11/5/2021	< 0.06
11/6/2021	< 0.06
11/7/2021	< 0.06
11/10/2021	< 0.06
11/11/2021	< 0.06
11/12/2021	< 0.06
11/13/2021	< 0.06
11/14/2021	< 0.06
11/15/2021	< 0.06
11/16/2021	< 0.06
11/17/2021	< 0.06
11/18/2021	< 0.06
11/19/2021	< 0.06
11/21/2021	< 0.06
11/22/2021	< 0.06
11/23/2021	< 0.06
11/24/2021	< 0.06
11/26/2021	< 0.06
11/27/2021	< 0.06
11/28/2021	< 0.06
11/29/2021	< 0.06
11/30/2021	< 0.06
12/1/2021	< 0.06
12/2/2021	< 0.06
12/3/2021	< 0.06
12/4/2021	<0.06
12/5/2021	<0.06
12/6/2021	<0.06
12/7/2021	<0.06
12/8/2021	<0.06
12/9/2021	<0.06
12/10/2021	< 0.06

Table B-4 PFOA Removal Efficiency for W9 Permeate System

Chemours Washington Works, West Virginia

Sample Date	PFOA (µg/L)
12/11/2021	< 0.06
12/12/2021	< 0.06
12/13/2021	< 0.06
12/14/2021	< 0.06
12/15/2021	< 0.06
12/16/2021	< 0.06
12/17/2021	< 0.06
12/18/2021	< 0.06
12/19/2021	< 0.06
12/20/2021	< 0.06
12/21/2021	< 0.06
12/22/2021	< 0.06
12/23/2021	< 0.06
12/24/2021	< 0.06
12/25/2021	< 0.06
12/26/2021	< 0.06
12/27/2021	< 0.06
12/28/2021	< 0.06
12/29/2021	< 0.06
12/30/2021	< 0.06
1/1/2022	< 0.06
1/2/2022	< 0.06
1/3/2022	< 0.06
1/4/2022	< 0.06
1/5/2022	< 0.06
1/5/2022	< 0.06
1/6/2022	< 0.06
1/7/2022	< 0.06
1/8/2022	< 0.06
1/9/2022	< 0.06
1/10/2022	< 0.06
1/11/2022	< 0.06
1/12/2022	< 0.06
1/13/2022	< 0.06
1/14/2022	< 0.06
1/15/2022	< 0.06
1/16/2022	< 0.06
1/17/2022	< 0.06
1/18/2022	< 0.06
1/19/2022	< 0.06
1/20/2022	< 0.06
1/21/2022	< 0.06
1/22/2022	< 0.06
1/23/2022	< 0.06
1/24/2022	< 0.06
1/25/2022	< 0.06

Sample Date	PFOA (µg/L)
1/26/2022	< 0.06
1/27/2022	< 0.06
1/28/2022	< 0.06
1/29/2022	< 0.06
1/30/2022	< 0.06
1/31/2022	< 0.06
2/1/2022	< 0.06
2/2/2022	< 0.06
2/3/2022	< 0.06
2/4/2022	< 0.06
2/5/2022	< 0.06
2/6/2022	< 0.06
2/7/2022	< 0.06
2/8/2022	< 0.06
2/8/2022	< 0.06
2/9/2022	< 0.06
2/10/2022	< 0.06
2/11/2022	< 0.06
2/12/2022	< 0.06
2/13/2022	< 0.06
2/14/2022	< 0.06
2/15/2022	< 0.06
2/16/2022	< 0.06
2/17/2022	< 0.06
2/18/2022	< 0.06
2/19/2022	< 0.06
2/20/2022	< 0.06
2/22/2022	< 0.06
2/23/2022	< 0.06
2/24/2022	0.1
2/25/2022	< 0.06
2/26/2022	< 0.06
2/27/2022	< 0.06
2/28/2022	< 0.06
3/1/2022	< 0.06
3/2/2022	< 0.06
3/3/2022	< 0.06
3/4/2022	< 0.06
3/5/2022	< 0.06
3/6/2022	< 0.06
3/7/2022	< 0.06
3/8/2022	< 0.02
3/9/2022	< 0.06
3/10/2022	< 0.02
3/11/2022	< 0.06
3/12/2022	< 0.06

Sample Date	PFOA (µg/L)
3/13/2022	< 0.02
3/13/2022	< 0.06
3/15/2022	< 0.06
3/15/2022	< 0.06
3/16/2022	< 0.06
3/17/2022	< 0.06
3/18/2022	< 0.06
3/19/2022	< 0.06
3/20/2022	< 0.06
3/21/2022	< 0.06
3/22/2022	< 0.06
3/23/2022	< 0.06
3/24/2022	< 0.06
3/26/2022	< 0.06
3/27/2022	< 0.06
3/28/2022	< 0.06
3/29/2022	< 0.06
3/30/2022	< 0.06
3/31/2022	< 0.06
4/1/2022	0.2
4/2/2022	< 0.06
4/3/2022	< 0.06
4/4/2022	< 0.06
4/5/2022	< 0.06
4/6/2022	< 0.06
4/7/2022	< 0.06
4/8/2022	< 0.02
4/9/2022	< 0.02
4/10/2022	< 0.02
4/11/2022	< 0.06
4/12/2022	< 0.02
4/13/2022	< 0.02
4/14/2022	< 0.06
4/15/2022	< 0.06
4/16/2022	< 0.06
4/17/2022	< 0.06
4/18/2022	< 0.06
4/19/2022	< 0.06
4/20/2022	< 0.06
4/21/2022	< 0.06
4/22/2022	< 0.06
4/23/2022	< 0.06
4/24/2022	< 0.06
4/25/2022	< 0.06
4/26/2022	< 0.06
4/27/2022	< 0.06

Sample Date	PFOA (µg/L)
4/28/2022	< 0.06
4/29/2022	< 0.06
4/30/2022	< 0.06
5/1/2022	< 0.06
5/2/2022	< 0.06
5/3/2022	< 0.06
5/4/2022	< 0.06
5/5/2022	< 0.06
5/6/2022	< 0.06
5/7/2022	< 0.06
5/8/2022	< 0.06
5/9/2022	< 0.06
5/10/2022	< 0.06
5/11/2022	< 0.06
5/12/2022	< 0.06
5/13/2022	< 0.06
5/14/2022	< 0.06
5/15/2022	< 0.06
5/16/2022	< 0.02
5/17/2022	< 0.06
5/19/2022	< 0.06
5/19/2022	< 0.06
5/20/2022	< 0.06
5/21/2022	< 0.06
5/22/2022	< 0.06
5/23/2022	< 0.06
5/24/2022	< 0.06
5/25/2022	< 0.06
5/26/2022	< 0.06
5/28/2022	< 0.06
5/29/2022	< 0.02
5/30/2022	< 0.06
5/31/2022	< 0.06
6/1/2022	< 0.06
6/2/2022	< 0.06
6/3/2022	< 0.06
6/4/2022	< 0.06
6/5/2022	< 0.06
6/6/2022	< 0.06
6/8/2022	< 0.06
6/8/2022	< 0.06
6/9/2022	< 0.06
6/10/2022	0.1
6/11/2022	< 0.06
6/12/2022	< 0.06
6/13/2022	< 0.06

Sample Date	PFOA (µg/L)
6/14/2022	< 0.06
6/14/2022	< 0.06
6/15/2022	< 0.02
6/16/2022	< 0.06
6/17/2022	< 0.06
6/17/2022	0.5
6/18/2022	< 0.06
6/19/2022	< 0.06
6/20/2022	< 0.02
6/21/2022	< 0.06
6/22/2022	< 0.06
6/23/2022	< 0.06
6/24/2022	< 0.06
6/25/2022	< 0.06
6/26/2022	< 0.06
6/27/2022	< 0.06
6/28/2022	< 0.06
6/29/2022	< 0.06
6/30/2022	< 0.06
7/1/2022	< 0.06
7/2/2022	< 0.06
7/3/2022	< 0.06
7/4/2022	< 0.06
7/5/2022	< 0.06
7/6/2022	< 0.06
7/7/2022	< 0.03
7/8/2022	< 0.06
7/9/2022	< 0.06
7/10/2022	< 0.06
7/11/2022	< 0.06
7/12/2022	< 0.06
7/13/2022	< 0.06
7/14/2022	< 0.06
7/15/2022	< 0.06
7/16/2022	< 0.06
7/17/2022	< 0.06
7/18/2022	< 0.06
7/19/2022	0.1
7/20/2022	< 0.06
7/21/2022	< 0.06
7/22/2022	< 0.06
7/23/2022	< 0.06
7/24/2022	< 0.06
7/25/2022	< 0.06
7/26/2022	< 0.06
7/27/2022	< 0.06

Sample Date	PFOA (µg/L)
7/28/2022	<0.06
7/29/2022	< 0.06
7/30/2022	< 0.06
7/31/2022	< 0.06
8/1/2022	< 0.06
8/2/2022	< 0.06
8/3/2022	< 0.06
8/4/2022	< 0.06
8/5/2022	< 0.06
8/6/2022	< 0.06
8/7/2022	< 0.06
8/8/2022	< 0.06
8/9/2022	< 0.06
8/10/2022	< 0.06
8/11/2022	< 0.06
8/12/2022	< 0.06
8/13/2022	< 0.06
8/14/2022	< 0.06
8/15/2022	< 0.06
8/16/2022	< 0.06
8/17/2022	< 0.06
8/18/2022	< 0.06
8/19/2022	< 0.06
8/20/2022	< 0.06
8/21/2022	< 0.06
8/22/2022	<0.06
8/23/2022	<0.06
8/24/2022	<0.06
8/25/2022	<0.06
8/26/2022	<0.06
8/27/2022	<0.06
8/28/2022	<0.06
8/29/2022	<0.06
8/30/2022	<0.06
0/1/2022	<0.00
9/1/2022	<0.00
9/2/2022	<0.00
9/3/2022	<0.00
9/5/2022	<0.00
9/6/2022	<0.00
9/7/2022	<0.06
9/8/2022	<0.06
9/9/2022	<0.06
9/10/2022	< 0.06
9/11/2022	< 0.06
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Table B-4 PFOA Removal Efficiency for W9 Permeate System

Chemours Washington Works, West Virginia

Sample Date	PFOA (µg/L)
9/12/2022	< 0.06
9/13/2022	< 0.06
9/14/2022	< 0.06
9/15/2022	< 0.06
9/16/2022	< 0.06
9/17/2022	< 0.06
9/18/2022	< 0.06
9/19/2022	< 0.06
9/20/2022	< 0.06
9/21/2022	< 0.06
9/22/2022	< 0.06
9/23/2022	< 0.06
9/24/2022	< 0.06
9/25/2022	< 0.06
9/26/2022	< 0.06
9/27/2022	< 0.06
9/28/2022	< 0.06
9/29/2022	< 0.06
9/30/2022	< 0.06
10/1/2022	< 0.06
10/2/2022	< 0.06
10/3/2022	< 0.06
10/4/2022	< 0.06
10/4/2022	< 0.06
10/5/2022	< 0.06
10/6/2022	< 0.06
10/7/2022	< 0.06
10/8/2022	< 0.06
10/9/2022	< 0.06
10/10/2022	< 0.06
10/11/2022	< 0.06
10/12/2022	< 0.06
10/13/2022	< 0.06
10/14/2022	< 0.06
10/15/2022	< 0.06
10/16/2022	< 0.06
10/17/2022	< 0.06
10/18/2022	< 0.06
10/19/2022	< 0.06
10/20/2022	< 0.06
10/21/2022	< 0.06
10/22/2022	< 0.06
10/23/2022	< 0.06
10/24/2022	< 0.06
10/25/2022	< 0.06
10/26/2022	< 0.06

PFOA (µg/L)
< 0.06
< 0.06
< 0.02
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
< 0.06
<0.06
< 0.06
< 0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.06
<0.00
<0.06
<0.03
<0.03
<0.02
<0.02
<0.02
<0.02
<0.02
<0.02
<0.06

Table B-4 PFOA Removal Efficiency for W9 Permeate System

Chemours Washington Works, West Virginia

Sample Date	PFOA (µg/L)
12/12/2022	< 0.06
12/13/2022	< 0.06
12/14/2022	< 0.06
12/15/2022	< 0.06
12/16/2022	< 0.06
12/17/2022	< 0.06
12/18/2022	< 0.06
12/19/2022	< 0.06
12/20/2022	< 0.06
12/21/2022	< 0.06
12/22/2022	< 0.02
12/24/2022	< 0.06
12/25/2022	< 0.06
12/26/2022	< 0.06
12/27/2022	< 0.06
12/28/2022	< 0.06
12/29/2022	< 0.06
12/30/2022	< 0.06
12/31/2022	< 0.06
1/1/2023	< 0.06
1/2/2023	< 0.06
1/3/2023	< 0.06
1/4/2023	< 0.06
1/4/2023	< 0.06
1/5/2023	< 0.06
1/6/2023	< 0.06
1/7/2023	< 0.06
1/8/2023	< 0.06
1/9/2023	< 0.06
1/10/2023	< 0.06
1/11/2023	< 0.06
1/12/2023	< 0.06
1/13/2023	< 0.06
1/14/2023	< 0.06
1/15/2023	< 0.06
1/16/2023	< 0.06
1/17/2023	< 0.06
1/18/2023	< 0.06
1/19/2023	< 0.06
1/20/2023	< 0.06
1/21/2023	< 0.06
1/22/2023	< 0.06
1/23/2023	< 0.06
1/24/2023	< 0.06
1/25/2023	< 0.06
1/26/2023	< 0.06

Sample Date	PFOA (µg/L)					
1/27/2023	< 0.06					
1/28/2023	< 0.06					
1/29/2023	< 0.06					
1/30/2023	< 0.06					
1/31/2023	< 0.06					
2/1/2023	< 0.06					
2/2/2023	< 0.06					
2/3/2023	< 0.06					
2/4/2023	< 0.06					
2/5/2023	< 0.06					
2/6/2023	< 0.06					
2/7/2023	< 0.06					
2/8/2023	< 0.06					
2/9/2023	< 0.06					
2/10/2023	< 0.06					
2/13/2023	< 0.06					
2/15/2023	< 0.06					
2/17/2023	< 0.06					
2/23/2023	< 0.06					
2/24/2023	< 0.06					
2/27/2023	< 0.06					
2/28/2023	< 0.06					
3/1/2023	< 0.06					
3/2/2023	< 0.06					
3/3/2023	< 0.06					
3/4/2023	< 0.06					
3/5/2023	< 0.06					
3/6/2023	< 0.06					
3/7/2023	< 0.06					
3/8/2023	< 0.06					
3/9/2023	< 0.06					
3/10/2023	< 0.06					
3/11/2023	0.07					
3/12/2023	< 0.06					
3/13/2023	< 0.06					
3/14/2023	< 0.06					
3/15/2023	< 0.06					
3/16/2023	< 0.06					
3/17/2023	< 0.06					
3/18/2023	< 0.06					
3/19/2023	< 0.06					
3/20/2023	< 0.06					
3/21/2023	< 0.06					
3/22/2023	< 0.06					
3/23/2023	< 0.06					
3/24/2023	< 0.06					

Sample Date	PFOA (µg/L)
3/25/2023	< 0.06
3/26/2023	< 0.06
3/27/2023	< 0.06
3/28/2023	< 0.06
3/29/2023	< 0.06
3/30/2023	< 0.06
3/31/2023	< 0.06
4/1/2023	< 0.06
4/2/2023	< 0.06
4/3/2023	< 0.06
4/5/2023	< 0.06
4/6/2023	<0.06
4/7/2023	< 0.06
4/8/2023	<0.06
4/9/2023	<0.06
4/10/2023	<0.06
4/11/2023	<0.06
4/12/2023	<0.06
4/13/2023	<0.06
4/14/2023	<0.06
4/16/2023	<0.06
4/17/2023	<0.06
4/18/2023	<0.06
4/19/2023	<0.00
4/20/2023	<0.00
4/21/2023	<0.00
4/22/2023	<0.00
4/23/2023	<0.00
4/25/2023	<0.00
4/26/2023	<0.00
4/27/2023	<0.00
4/28/2023	<0.00
4/29/2023	<0.00
4/30/2023	<0.00
5/1/2023	<0.00
5/2/2023	<0.00
5/4/2023	<0.00
5/5/2023	<0.00
5/6/2023	<0.00
5/7/2023	<0.00
5/18/2023	<0.00
5/20/2023	<0.00
5/22/2023	<0.00
5/22/2023	<0.00
5/24/2023	<0.00
5/25/2023	<0.00
512512025	~0.00

Sample Date	PFOA (µg/L)
5/26/2023	< 0.06
5/27/2023	< 0.06
5/28/2023	< 0.06
5/29/2023	< 0.06
5/30/2023	< 0.06
5/31/2023	< 0.06
6/2/2023	<0.06
6/3/2023	<0.06
6/4/2023	<0.06
6/5/2023	< 0.06
6/6/2023	< 0.06
6/7/2023	<0.06
6/8/2023	< 0.06
6/9/2023	<0.06
6/10/2023	<0.06
6/11/2023	<0.06
6/12/2023	<0.06
6/13/2023	<0.06
6/14/2023	<0.06
6/15/2023	<0.00
6/16/2023	<0.00
6/16/2023	<0.00
6/17/2023	<0.00
6/18/2023	<0.00
6/19/2023	<0.00
6/20/2023	<0.06
6/21/2023	<0.06
6/22/2023	<0.00
6/23/2023	<0.00
6/24/2023	<0.00
6/25/2023	<0.00
6/26/2023	<0.00
6/27/2023	<0.00
6/28/2023	<0.00
6/28/2023	<0.00
6/20/2023	<0.00
6/30/2023	<0.00
7/1/2023	<0.00
7/2/2023	<0.00
7/2/2023	<0.00
7/2/2023	<0.00
7/5/2023	<0.00
7/6/2023	<0.00
7/7/2023	<0.00
7/8/2023	<0.00
7/0/2023	<0.00
11912023	~0.00

Table B-4 PFOA Removal Efficiency for W9 Permeate System

Chemours Washington Works, West Virginia

Sample Date	PFOA (µg/L)
7/10/2023	< 0.06
7/11/2023	< 0.06
7/12/2023	< 0.06
7/13/2023	< 0.06
7/14/2023	< 0.06
7/15/2023	< 0.06
7/16/2023	< 0.06
7/17/2023	< 0.06
7/18/2023	< 0.06
7/19/2023	< 0.06
7/21/2023	< 0.06
7/22/2023	< 0.06
7/23/2023	< 0.06
7/24/2023	< 0.06
7/25/2023	< 0.06
7/26/2023	< 0.06
7/27/2023	< 0.06
7/28/2023	< 0.06
7/29/2023	< 0.06
7/30/2023	< 0.06
7/31/2023	< 0.06
8/1/2023	< 0.06
8/2/2023	< 0.06
8/3/2023	< 0.06
8/4/2023	< 0.06
8/5/2023	< 0.06
8/6/2023	< 0.06
8/7/2023	< 0.06
8/8/2023	< 0.06
8/9/2023	< 0.06
8/10/2023	< 0.06
8/11/2023	< 0.06
8/12/2023	< 0.06
8/13/2023	< 0.06
8/14/2023	< 0.06
8/15/2023	< 0.06
8/16/2023	< 0.06
8/17/2023	< 0.06
8/18/2023	< 0.06
8/19/2023	< 0.06
8/20/2023	< 0.06
8/21/2023	< 0.06
8/22/2023	< 0.06
8/23/2023	< 0.06
8/24/2023	< 0.06
8/25/2023	< 0.06

Sample Date	PFOA (µg/L)					
8/26/2023	< 0.06					
8/27/2023	< 0.06					
8/28/2023	< 0.06					
8/29/2023	< 0.06					
8/30/2023	< 0.06					
8/31/2023	< 0.06					
9/1/2023	< 0.06					
9/2/2023	< 0.06					
9/3/2023	< 0.06					
9/4/2023	< 0.06					
9/5/2023	< 0.06					
9/6/2023	< 0.06					
9/7/2023	< 0.06					
9/8/2023	< 0.06					
9/9/2023	< 0.06					
9/10/2023	< 0.06					
9/11/2023	< 0.06					
9/12/2023	< 0.06					
9/13/2023	< 0.06					
9/14/2023	< 0.06					
9/15/2023	< 0.06					
9/16/2023	< 0.06					
9/17/2023	< 0.06					
9/18/2023	< 0.06					
9/19/2023	< 0.06					
9/20/2023	< 0.06					
9/21/2023	< 0.06					
9/22/2023	< 0.06					
9/23/2023	< 0.06					
9/23/2023	< 0.06					
9/24/2023	< 0.06					
9/25/2023	< 0.06					
9/26/2023	< 0.06					
9/27/2023	< 0.06					
9/28/2023	< 0.06					
9/29/2023	<0.06					
9/30/2023	<0.06					
10/2/2023	<0.06					

Notes:

< - Analyte not detected above associated reporting limit. µg/l - micrograms per liter Attachment C Opinions of Probable Cost HFPO-DA Treatment

Gee Opinions of Probable Cost for Granular Activated Carbon (GAC) Treatment System for HFPO-DA Removal Chemours PFA Line2 Chemours Washington Works, West Virginia

Champing WW DEA Line 2						
Chemours WW PFA Line 2 Design Flow: 100 gallons per minute (gpm)						
Average Daily Volume: 104,000 gallons per day (gpd)	orntion Syst	em Backw	ash System (Assume	e no ot	har protractmon	t is necessary)
Treatment Goal: 99.98% removal of HFPO-DA	orption Syst	em- backw	ash System (Assume	s no oi	ner pretreatmen	t is necessary)
Ref: AACE (2005)		Engineer	's Oninion of Prob	able Co	nete	
Item	Qty	Unit	Unit Cost		Total	Notes
Capital Costs						One (1) feed numbers with dupley number and One (1) has filtration
Feed Pump & Bag Filtration System	1	each	\$ 79,000	\$	79,000	skid with two (2) 304SS bag filter housings, valves, fittings, and 300 5 micron bags.
GAC System (Vessels + Media)	1	each	\$ 143,000	\$	143,000	One (1) GAC system, with two vessels operated in lead/lag, with 5,000 lbs per vessel. A total of 10,000 lbs of GAC.
Backwash System (Treated Water Tank + Pump Skid)	1	each	\$ 78,000	\$	78,000	skid.
Subtotal Equipment Cost				\$	300,000	Includes installation cost of holence of aquinments (labor guments
Installation Cost of Equipment	40%	of	Equipment Cost	\$	120,000	anchors). Does not include interconnecting piping, electrical etc.
Subtotal Installed Cost of Equipment				\$	420,000	-
Civil & Earthworks	250/	of	Equipment Cost	¢	75 000	Includes civil, earthworks, concrete pad, gradings. Does not includes any
CIVII & Earthworks	25%	01	Equipment Cost	2	/5,000	utility relocation.
Electrical	30%	of	Equipment Cost	\$	90,000	required line power is available. Does not include infrastructure costs for new line power from switchgear/utility. Single point of disconnect for
Instrumentation & Controls	15%	of	Equipment Cost	\$	45,000	Instrumentation, automation, and controls
Piping	Lump	o Sum		\$	80,000	500 LF 4" Sch.40 PVC piping to and from the treatment system
Subtotal Non-Component Cost				\$	290,000	components.
Subtotal Installed Equipment and Construction Costs				\$	710,000	-
Division 1 Allowances	3%	of	Installed Equipment & Construction Cost	\$	21,000	Insurance, general requirements
Contractor Profit & Overhead	15%	of	Installed Equipment & Construction Cost	\$	107,000	General contractor overhead and profit
Total of Installed Equipment & Construction Costs				\$	838,000	-
Indirect Costs						
			Total Installed			
Engineering and Design	15%	of	Equipment & Construction Costs Total Installed	\$	126,000	Engineering & design for system comprised of vendor fabricated sub- components.
Permitting	5%	of	Equipment & Construction Costs Total Installed	\$	42,000	Construction permit, discharge permit
Construction Management & Project Management	6%	of	Equipment & Construction	\$	50,000	AACE/CSI standard factors.
Freight	7%	of	Costs Equipment Cost	\$	21,000	AACE/CSI standard factors.
Startup and Commissioning	7%	of	Equipment Cost	\$	21,000	Startup and commissioning of process, mechanical, and electrical
Subtotal of Indirect Costs				\$	260,000	equipment associated with the PFAS treatment system.
Subtotal Capital Costs			Subtotal Capital	\$	1,098,000	
Contingency	15%	of	Costs	\$	164,700	-
C ₀ ,Capital Cost				\$	1,270,000	
+50% -30%				\$ \$	1,905,000 889,000	
Annual Operations & Maintenance Costs						
GAC Usage & Replacement	53,500	lbs	\$ 2.50	\$	133.750	Assume \$2.5/lb GAC, reactivated. GAC utilization rate is based on
Sampling & Analytical	12	events	\$ 1,500	\$	18,000	adsorption coefficient values in Wang et. al., 2019 Assume monthly effluent samples for compliance.
Vendor O&M visit	52	events	\$ 1,500	\$	78,000	Assume weekly 10hr O&M visits, \$150/hr turnkey cost
Equipment Maintenance <i>Annual O&M Subtotal</i>	2%	of	Equipment Cost	<u>\$</u> \$	6,000 235,750	AACE/CSI standard factors
					,	
C,Annual Cost				\$	240,000	
+70%				\$ \$	410,000	
-70%				Ψ	00,000	
n,Years	20					
Capital & Annual O&M Costs over 20 Years				\$	6,070,000	
				\$	9.105.000	
+50%				÷		

sources:

Non-binding vendor quotes (Sales tax may vary); Publicly available costs; Previous project experience and bids; Cost estimation manuals, and standard factors.

References:

Wang et. al., 2019, Adsorption behaviour and mechanisms of emerging perfluoro-2-propoxypropanoic acid (GenX) on acitvated carbons and resins, Chemical Engineering Journal, vol 364, pp 132-138.

Table C-2 Opinions of Probable Cost for Ion Exchange (IX) Treatment System for HFPO-DA Removal Chemours PFA Line2 Chemours PFA Line2 Chemours Washington Works, West Virginia

Description (Figure 2) and (Figure	Basis of Cost Estimate (Scope and Assumptions) Chemours WW PFA Line 2						
Provide for the first section for the first section of the first section	Design Flow: 100 gallons per minute (gpm)						
The activity of the read of arbitrary and a second	Treatment Train: Bag filter skid- Ion Exchange (IX) System- Backwash	System (A	Assumes no	other pretreatment is	s nece	ssary)	
Image: Second Version: For Number Version: Second Version: Second Version: Produce V	Treatment Goal: 99.98% removal of HFPO-DA Ref: AACE (2005)						
Credit Geno Constraint Constraint <thconstraint< th=""> Constraint Constra</thconstraint<>	Item	Oty	Engineer' Unit	s Opinion of Proba Unit Cost	ble C	losts Total	Notes
Carl Prog & Dig Tilestins System 1 code 5 79300 5 Use of the system of the	Capital Costs	~~,		Cint 2022		I Vuu	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Feed Pump & Bag Filtration System	1	each	\$ 79,000	\$	79,000	One (1) feed pump skid with duplex pumps and One (1) bag filtration skid with two (2) 304SS bag filter housings, valves, fittings, and 300 5 micron bags.
Backends System (Transfer Varen Stord) 1 each 5 5 5000 5 7500 Jackends System (Transfer Varen Stord) 1 900 of 5 7500 Jackends Netter (Stord) 1 900 of 1 1000 Stord) Stord) 1 1000 1 1000 Stord) Stord) 1 1000 1 1000 Stord) 1 1000 1 1000 1 1000 Stord) 1 1000 1 1000 1 1000 Stord) 1 1000 1 1000 1 1000 1000 Stord) 1 1000 1 1000 1 1000 1000 Stord) 1 1000 1 1000 1 1000 1000 Stord) 1 1000 1 1000 1 10000 1000 Stord) 1 1000 1 10000 1 10000 10000 Stord) 1 10000 1 100000 1 100000 100000 Stord) 1 100000 1 1000000 1 1000000 1000000	IX System (Vessels + Resin)	1	each	\$ 140,000	\$	140,000	One (1) IX systems, with two vessels operated in lead/lag, with 68 cf per vessel. A total of 136 cf of IX resin.
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Backwash System (Treated Water Tank + Pump Skid) Subtotal Equipment Cost	1	each	\$ 78,000	\$ \$	78,000	skid.
Sour Composition Table 1:2000 Chi & Tarburds 25% off Tapipment Cost 3:400 Indidat civit, ambertics, corarts yid, pailings. Due not include: Chi & Tarburds 25% off Tapipment Cost 5 8:400 Indidat civit, ambertics, corarts yid, pailings. Due not include: Retrictal 20% off Experiment Cost 5 8:400 Indidat civit, ambertics, corarts yid, pailings. Due not include: Financial and the statute of the	Installation Cost of Equipment	40%	of	Equipment Cost	\$	118,800	Includes installation cost of balance of equipment: (labor, supports, anchors). Does not include interconnecting piping, electrical etc.
Circle Furtheaster 25% of Epipear Care S 26,00 Product S Produc S Product S Product S	Non-Component Costs (Specialized Trades)				Ф	413,000	-
EStimid 2005 of Estimated Sec. 2005 of Estimated Sec. 2005 Sec. 20	Civil & Earthworks	25%	of	Equipment Cost	\$	74,000	Includes civil, earthworks, concrete pad, gradings. Does not includes any utility relocation.
Latronachtion & Control Perng Subsidi Ave-Composed Cost Subsidi Ave-Cost Subsidi	Electrical	30%	of	Equipment Cost	\$	89,000	required line power is available. Does not include infrastructure costs for new line power from switchgear/utility. Single point of disconnect
Piprig National from Compared (and Solutional Reaction Exception Costs) S NUMB Solutional Reaction Exception Costs Driving 1 Allowanses 2% of Solutional (and costs) Solutional (and costs) Contraction Costs 2% of Solutional (and costs) Solutional (and costs) Contraction Costs 2% of Solutional (and costs) Solutional (and costs) Contraction Costs 1% of Solutional (and costs) Construction Costs Total of hemoload Equipment & Construction Costs Total Insulated Equipment & Solutional (and costs) Solutional (and costs) Construction Costs Projection Costs Total Insulated Equipment & Solutional (and costs) Total Insulated Equipment & Solutional (and costs) Solutional (and costs) Permitting 5% of Equipment & Solutional (and costs) Solutional (and costs) Construction Permittion 5% of Solutional (and costs) Permitting 5% of Equipment & Solutional (and costs) Construction Permittion 5% of Solutional (and costs) Construction Permittion 5% 0 Solutional (and costs) Construction Permittion 5 20,000 AACE/CSI (and costs) Construction Permittion 5 1,20,000 So	Instrumentation & Controls	15%	of	Equipment Cost	\$	45,000	for treatment system. Instrumentation, automation, and controls 500 LF 4" Sch.40 PVC piping to and from the treatment system
Submark leading Toppingen and Construction Cost 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Piping	Lum	p Sum		\$	80,000	_components.
Division I Allowances 3% of Pratinet Beginnent & Contraction Cest \$ 21,000 Instance, general requirements Contractor Profil & Overhead 15% of Pagintent & Contractor \$ 100,000 General contractor everhead and profil. Total of DataBild Epagement & Construction Costs Instance Instance Instance Instance Total of DataBild Epagement & Construction Costs Instance Instance Instance Instance Paginters A S 125% of Paginters A S 125000 Enginters A Paginters A Construction S 125000 Construction Instance Instance Paginters A Paginters A S 125000 Construction Instance Paginters A Paginters A S 12000 Construction Instance Paginters A Paginters A S 12000 Construction of the Paginters A Paginters A Project Management A Project Management A S 12000 Statistical of Indirect Cost S 10000 Construction of S 10000 Construction Cost Trial Instance S 10000 Construction of S Statistof Cognit Cost S 10000 <	Subtotal Non-Component Cost Subtotal Installed Equipment and Construction Costs			× 11 1	\$ \$	288,000 703,800	-
Lastabled Instabled Instabled Instabled Instabled Cartraction Profile & Overhead 195% of Fragment & S 106,000 General contractor overhead and profil. Tend of burneliced Equipment & Construction Clust Image: State Instabled Image: State Instabled Image: State Instabled Engineering and Design 195% of Fragment & S 125,000 Engineering & design for system comprised of vonder fabricated sub- components. Permitting 5% of Fragment & S 42,000 Construction permit, discharge permit. Construction Management & Project Management 6% of Equipment & S 50,000 AACEPCSI standard factors. Construction Management & Project Management 6% of Equipment & S 50,000 AACEPCSI standard factors. Construction Management & Project Management 6% of Equipment & S 50,000 AACEPCSI standard factors. Construction Management & Project Management 6% of Equipment & S 1,00,910 Sutterial Construction of the system comprised of vonder fabricated system. Sutterial Construction Management & Project Management 6% of Equipment Cost S 20,790 Sutterial Cost Cost S Sutterial Cost Cost S Sutterial Cost Cost S Suterial Cost S 1,000,30	Division 1 Allowances	3%	of	Installed Equipment & Construction Cost	\$ t	21,000	Insurance, general requirements
Total of betadled Equipment & Construction Cause Total Installed Frighteering and Design 15% uf Total Installed Frighteering and Design 15% uf Construction Costs Total Installed Engineering & discharge permit. Permaiting 9% of Construction Costs 42,000 Construction permit, discharge permit. Construction Management & Project Management 6% uf Equipment & Construction 5 50,000 ACE/CSI standard factors. Construction Management & Project Management 6% uf Equipment & Construction 5 20,790 ACE/CSI standard factors. Startup and Cornnik-sinning 7% of Equipment Ac 5 20,790 ACE/CSI standard factors. Startup and Cornnik-sinning 7% of Equipment Ac 5 20,790 ACE/CSI standard factors. Construction Advised Corput 7% of Equipment Ac 5 20,790 ACE/CSI standard factors. Startup and Cornnik-sinning 7% of Equipment Ac 5 1,000,780 Costs 15% of Startup and commission of proces, mechanical, and descrical 5 Applied 12 events S 1,200,900 -1	Contractor Profit & Overhead	15%	of	Installed Equipment & Construction Cost	\$ t	106,000	General contractor overhead and profit.
Indirect Costs Figinescring and Design Figinescring an	Total of Installed Equipment & Construction Costs				\$	830,800	- -
Ingeneering and Design 15% of Logupment & Construction \$ 125,000 Engineering & design for system camprised of vender fabricated sub- components. Permitting 5% of Construction \$ 42,000 Construction permit, discharge permit. Construction Management & Project Management 6% of Figupment & Construction \$ 20,000 AACE/CSI standard factors. Fright 7% of Equipment & Construction \$ 20,700 Saturbal disclers. Statup and Commissioning 7% of Equipment Construction \$ 20,700 Saturbal disclers. Statup and Commissioning 7% of Equipment Construction \$ 1.089,300 Construction & Statup and Commissioning 7% of Equipment Construction \$ 1.08,300 Construction & Statup and Commissioning 7% of Equipment Construction \$ 1.08,300 Construction & Amountain Construction & Statup and Commissioning of process, mechanical, and electrical statup and commissionin	Indirect Costs						
Permitting 5% of Fordination Function \$42,000 Construction permit, discharge permit. Contraction (Contraction) Total Installed Equipment & Solution \$42,000 Construction permit, discharge permit. Contraction (Contraction) Total Installed Equipment & Solution \$50,000 ACCE/CSI standard factors. Freight 7% of Equipment Cost Solution \$20,790 ACE/CSI standard factors. Startup and Commissioning 7% of Equipment Cost Solution \$20,790 ACE/CSI standard factors. Contraction Solution 7% of Equipment Cost Solution \$20,790 ACE/CSI standard factors. Samup and Commissioning 7% of Subtoal Capital Cost \$10,893,380 Contraction Solution Contraction Solution Subtoal Capital Cost \$10,893,380 Contraction Solution 480 cf \$365,000 \$175,200 Capital Cost \$12 events \$1,5000 Assume monthy effuors tamples for compliance. Numed Operations & Maintenance 2% cf \$365,000 \$15,000 Annual Oken Cost \$2 events \$1,000 Assume monthy effuors tamples for compliance. Annual Oken Cost \$2 events \$1,2000 Assume weakly 100 CAM visits, S15	Engineering and Design	15%	of	Total Installed Equipment & Construction Costs	\$	125,000	Engineering & design for system comprised of vendor fabricated sub- components.
Permitting 5% of Pagninetric Construction Construction Total Itability 5 42.000 Construction permit, discharge permit, Construction Construction Construction Management 0% of Fright 50,000 AACE/CSI standard factors. Pright 7% of Fright 50,000 AACE/CSI standard factors. Pright 7% of Equipment Cest 5 20,790 Startup and Commissioning of process, mechanical, and electrical subtratal of Indirect Costs Subtratal of Indirect Costs Subtratal Contangency 15% of Equipment Cest 5 1.089,380 Contangency 15% of Subtratal Capital Costs Subtratal Capital Costs 5 1.080,407 Capital Cost +50% 5 1.500 5 1.500 5 1.500 Xuage Replacement 480 cf \$ 365,001 \$ 1.800,000 Annual Operations & Multificance Costs 5 1.500 \$ 1.800,000 Assume monthly effluent samples for compliance. Vendor O&M visit 52 events \$ 1.500 \$ 5.900 Rapitional Maintenance Annual OAM Subtratal 2% of \$ 5.900 Rapitional Maintenance Annual OAM Subtrata				Total Installed			
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Integrin 1.0 50 Equipment Cost 20,799 Saturbus and commissioning of process, mechanical, and electrical equipment associated with the PEAS treatment system. Startup and Commissioning Subtoral of Indirect Costs 5 20,799 Saturbus and commissioning of process, mechanical, and electrical equipment associated with the PEAS treatment system. Subtoral Costs 5 1,089,380 Contingency 15% of Subtoral Costs Concapital Cost 5 1,63,407 Concapital Cost 5 1,500,000 -30% 5 1,500,000 -30% 5 1,500 Sampling & Analytical 12 corts Vendor ORM visit 52 corts Equipment Maintenance 5 365,00 Annual Odd Subtoral 6 5 Control Operations & Maintenance 22 Vendor ORM visit 52 corts Startup and Commission of the project standard factors 5 Annual Odd Subtoral 6 5 Capital & Annual Odd Subtoral 5 1,500 Capital & Annual Odd Subtoral 5 1,500 Capital & Annual Odd Subtoral 5 1,500 Annual Odd Subtoral 5 3,500 Capital & Annual	Freight	7%	of	Costs Fauinment Cost	\$	20,790	AACE/CSI standard factors
Subtoral of Indirect Costs Subtoral of Indirect Costs Subtoral of Indirect Costs Subtoral Copital Costs Subtoral Cost Subtoral Costs Subtoral Costs Subtoral Costs Subtoral Costs Subtoral Costs Subtoral Costs Subtoral Cost Costs Subtoral Cos	Startun and Commissioning	7%	of	Equipment Cost	Ψ \$	20,790	Startup and commissioning of process, mechanical, and electrical
Subtoid Capital Costs \$ 1,089,380 Contingency 15% of Subtoial Capital C ₀ Capital Cost \$ 163,407 C ₀ Capital Cost \$ 1,200,000 +50% \$ 1,200,000 -30% \$ 1,500.5 Xubase & Replacement 480 cf \$ 365,00 \$ 175,200 Sampling & Analytical 12 events \$ 1,500.5 \$ 18,000 Yendor O&W visit 52 events \$ 1,500.5 \$ 18,000 Equipment Maintenance 2% of \$ 294,000 \$ 277,140 C_Annual O&M Subtoial 2% s \$ 280,000 +70% \$ 280,000 \$ 277,140 C_Annual O&M Costs over 20 Years \$ 1,000,5 \$ 0,800,000 -70% \$ 0,000 \$ 480,000 -70% \$ 0,000 \$ 0,000 -70% \$ 0,000 \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000 -70% \$ 0,000	Subtotal of Indirect Costs	170	UI UI	Equipment Coo.	\$	258,580	equipment associated with the PFAS treatment system.
Contingency 15% of Subtroat Capital Costs \$ 163,407 Costs \$ 163,407 Costs \$ 163,407 Costs \$ 1264,000 -30% \$ 1,260,000 -30% \$ 1,260,000 -30% \$ 1,800,000 -30% \$ 1,800,000 Sumpling & Analytical 12 events \$ 1,500 \$ Yendor O&M visit 52 events \$ 1,500 \$ 18,000 Assume weekly 10hr O&M visits, S150/br turnkey cost 5 5,940 ACE/CS1 standard factors Annual O&M Subtotal \$ 280,000 \$ 280,000 -70% \$ 480,000 -70% \$ 480,000 -70% \$ 480,000 -70% \$ 90,000 -70% \$ 480,000 -70% \$ 90,000 -70% \$ 90,000 \$ 480,000 -70% \$ 90,000 \$ 480,000 -70% \$ 90,000 \$ 480,000 -70% \$ 90,000 \$ 6,860,000 -70% \$ 90,000	Subtotal Capital Costs			G-1statel Conital	\$	1,089,380	
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Annual Operations & Maintenance Costs IX Usage & Replacement 480 cf \$ 365.00 \$ 175,200 CalRes 2301 resin replacement and disposal. Sampling & Analytical 12 events \$ 1,500 \$ 18,000 Assume monthly effluent samples for compliance. Vendor O&M visit 52 events \$ 1,500 \$ 78,000 Assume monthly effluent samples for compliance. Equipment Maintenance 2% of Equipment Cost \$ 5,940 AACE/CS1 standard factors Annual O&M Subtotal S 277,140 ACE/CS1 standard factors \$ 277,140 C,Annual Cost \$ 280,000 +70% \$ 480,000 -70% -70% \$ 90,000 -70% \$ 90,000 -70% -70% \$ 90,000 -70% \$ 90,000 -70% -70% \$ 10,290,000 -50% \$ 10,290,000 -50% -30% \$ 10,290,000 -30% \$ 4,802,000 -30% AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will d	-30%				\$	882,000	
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Equipment Maintenance 2% of Equipment Cost \$ 5.940 AACE/CSI standard factors Annual O&M Subtotal \$ 277,140 \$ 277,140 C,Annual Cost \$ 280,000 \$ 480,000 +70% \$ 480,000 \$ 90,000 -70% \$ 90,000 \$ 90,000 n,Years 20 \$ 480,000 \$ \$ AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources:	Vendor O&M visit	52	events	\$ 1,500	\$	78,000	Assume weekly 10hr O&M visits, \$150/hr turnkey cost
C,Annual Cost \$ 280,000 +70% \$ 480,000 -70% \$ 90,000 n,Years 20 Capital & Annual O&M Costs over 20 Years \$ 6,860,000 +50% \$ 10,290,000 +50% \$ 10,290,000 -30% \$ 4,802,000 AACE Class 4 band preliminary estimate (-30% to +50%) . Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources:	Equipment Maintenance <i>Annual O&M Subtotal</i>	2%	of	Equipment Cost	\$ \$	<u>5,940</u> 277,140	AACE/CSI standard factors
+70% \$ 480,000 -70% \$ 90,000 n,Years 20 Capital & Annual O&M Costs over 20 Years \$ 6,860,000 +50% \$ 10,290,000 -30% \$ 4,802,000 AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources:	C,Annual Cost				\$	280,000	
n,Years 20 Capital & Annual O&M Costs over 20 Years \$ 6,860,000 +50% \$ 10,290,000 -30% \$ 4,802,000 AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources:	+70%				\$ ¢	480,000	
Capital & Annual O&M Costs over 20 Years \$ 6,860,000 +50% \$ 10,290,000 -30% \$ 4,802,000 AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources:	n,Years	20			Ф	70,000	
Capital & Annual O&M Costs over 20 Years \$ 6,860,000 +50% \$ 10,290,000 -30% \$ 4,802,000 AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources:							
AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources:	Capital & Annual O&M Costs over 20 Years +50% -30%				\$ \$ \$	6,860,000 10,290,000 4,802,000	
	AACE Class 4 band preliminary estimate $(-30\% \text{ to } +50\%)$. Not for bud project evaluation and implementation from the information available of competitive variable factors. General conditions are subject to change from the following sources:	lgetary pu at the time which may	rposes and ? of the estin y lead to a c	is only meant to be nate. The final costs change in the estima	used 5 of th 1te. Co	for interaltern e project will a osts have been	ative comparison. The estimates have been prepared for guidance in lepend on final approved design, actual labor and material costs, and rounded up. Cost information is preliminary and has been generated

Gerophic Control of Chemours PFA Line2

Chemours Washington Works, West Virginia

Basis of Cost Estimate (Scope and Assumptions)						
Design Flow: 100 gallons per minute (gpm)						
Average Daily Volume: 104,000 gallons per day (gpd) Treatment Train: Regen IX with Superloader for offsite disposal (Assu	mes no othe	er pretreatme	nt is necessary)			
Treatment Goal: 99.98% removal of HFPO-DA	neo ne -	A presente	It is needed , ,			
Ref: AACE (2005)		Engineer	s Opinion of Prob	able C	osts	
Capital Costs	Qty	Unit	Unit Cost		Total	Notes
Treatment Equipment	1	each	\$ 123,515	\$	123,515	Based on budgetary estimate from vendor for 1000 gpm from 2020
	1	aab	ф <u>576 Л02</u>	¢	576 102	scaled down using a 0.75 factor and annual inflation of 5%. Based on budgetary estimate from vendor for 1000gpm scaled down
Subtotal Equipment Cost	1	each	\$	<u>\$</u> 2	699,917	using a 0.75 factor and annual inflation of 5%.
Installation Cost of Equipment	40%	of	Equipment Cost	ф \$	279,967	Includes installation cost of balance of equipment: (labor, supports,
Subtotal Installed Cost of Equipment			₩ 1 • • • • •	\$	979,884	_anchors). Does not include interconnecting piping, electrical etc.
Non-Component Costs (Specialized Trades)						-
Civil & Earthworks	25%	of	Equipment Cost	\$	175,000	any utility relocation.
	/	2	. ~			Power wiring, supply and transformation, controls wiring, Assumes required line power is available. Does not include infrastructure costs
Electrical	30%	of	Equipment Cost	\$	210,000	for new line power from switchgear/utility. Single point of disconnect
Instrumentation & Controls	15%	of	Equipment Cost	\$	105,000	for treatment system. Instrumentation, automation, and controls
Piping	Lun	np Sum	1 1	\$	80,000	500 LF 4" Sch.40 PVC piping to and from the treatment system
Subtotal Non-Component Cost		-		\$	570,000	_ components.
Subtotal Installed Equipment and Construction Costs				\$	1,549,884	-
Division 1 Allowances	3%	of	Installed Equipment &	\$	46.000	Insurance, general requirements.
			Construction Cost	Ŷ		Instrunce, general requiremente.
			Installed			
Contractor Profit & Overhead	15%	of	Equipment &	\$	232,000	General contractor overhead and profit.
Total of Installed Fauinment & Construction Costs			Construction Cost	\$	1 827 884	-
				Ψ	1,027,000.	-
Indirect Costs			Total Installed			
Engineering and Design	15%	of	Equipment &	\$	274,000	Engineering & design for system comprised of vendor fabricated sub-
			Construction Costs			components.
			Total Installed			
Permitting	5%	of	Construction	\$	91,000	Construction permit, discharge permit
			Costs Total Installed			
Construction Management & Project Management	6%	of	Equipment &	\$	110,000	AACE/CSI standard factors.
Construction 1/1	~		Construction Costs	¥	,	
Freight	7%	of	Equipment Cost	\$	48,994	AACE/CSI standard factors.
Startup and Commissioning	7%	of	Equipment Cost	\$	48,994	_ equipment associated with the PFAS treatment system.
Subtotal of Indirect Costs Subtotal Capital Costs				\$ \$	572,988 2.400,873	-
Contingency	15%	of	Subtotal Capital	\$	360,131	
			Costs	·		-
C ₀ ,Capital Cost				\$ ¢	2,770,000	-
-30%				ծ \$	4,155,000 1,939,000	
Annual Operations & Maintenance Costs						
IX Volume	100	CF				Prorated proportionally by flow from prior estimate; empirical testing or
D	16	ovente				vendor consultation recommended. Preliminary estimate; empirical testing or vendor consultation
Kegens per year	10 1.600	events	۰¢ 35.00	¢	56 000	recommended.
Sampling & Analytical	12	events	\$ 1,500	\$	18,000	Assume monthly effluent samples for compliance.
Vendor O&M visit Equipment Maintenance	52 2%	events of	\$ 1,500 Equipment Cost	\$ \$	78,000 13,998	Assume weekly 10hr O&M visits, \$150/hr turnkey cost. AACE/CSI standard factors
Annual O&M Subtotal			~-11	\$	165,998	
C,Annual Cost +70%				\$ \$	170,000 290.000	
-70%				\$	50,000	
n,Years	20					
						-
Capital & Annual O&M Costs over 20 Years				\$ \$	6,170,000 9,255,000	
+50%				U U	J.233,000	

the following sources:

Non-binding vendor quotes (Sales tax may vary); Publicly available costs; Previous project experience and bids; Cost estimation manuals, and standard factors.
Table C-4 Opinions of Probable Cost for Reverse Osmosis (RO) Treatment System for HFPO-DA Removal Chemours PFA Line2

Chemours Washington Works, West Virginia

Basis of Cost Estimate (Scope and Assumptions) Chemours WW PFA Line 2							
Design Flow: 100 gallons per minute (gpm)							
Average Daily Volume: 104,000 gallons per day (gpd) Treatment Train: Reverse Osmosis System- Backwash System (Assumes	no other pretre	atment is 1	necessary)				
Treatment Goal: 99.98% removal of HFPO-DA Ref: AACE (2005)							
		ngineer's	Opinion of Probab	le Co	osts		
Capital Costs	Qty	Unit	Unit Cost		Total	Notes	
Multimedia Filter System	1	each	\$ 175,000 \$ 200,000	\$ \$	175,000	One (1) skidded MMF system with anciellary systems to backwash.	
Reverse Osmosis System	1	each	\$ 200,000	Э	200,000	-	
Subtotal Equipment Cost				\$	375,000	Includes installation cost of balance of equipment: (labor, supports,	
Installation Cost of Equipment	40%	of	Equipment Cost	\$	150,000	anchors). Does not include interconnecting piping, electrical etc.	
Subtotal Installed Cost of Equipment Non-Component Costs (Specialized Trades)				\$	525,000	-	
Civil & Earthworks	25%	of	Equipment Cost	\$	94,000	Includes civil, earthworks, concrete pad, gradings. Does not includes any	
						Power wiring, supply and transformation, controls wiring, Assumes	
Electrical	30%	of	Equipment Cost	\$	113,000	required line power is available. Does not include infrastructure costs for new line power from switchgear/utility. Single point of disconnect for	
						treatment system.	
Instrumentation & Controls	15%	of	Equipment Cost	\$	56,000	Instrumentation, automation, and controls 500 LF 4" Sch 40 PVC piping to and from the treatment system	
Piping	Lump S	um		\$	80,000	components.	
Subtotal Non-Component Cost Subtotal Installed Eauipment and Construction Costs				<u>\$</u> \$	343,000 868,000	-	
			Installed		,	-	
Division 1 Allowances	3%	of	Equipment &	\$	26,000	Insurance, general requirements	
			Construction Cost				
			Installed				
Contractor Profit & Overhead	15%	of	Equipment & Construction Cost	\$	130,000	General contractor overhead and profit	
Total of Installed Equipment & Construction Costs				\$	1,024,000	-	
					1,02 1,000	-	
Indirect Costs			Total Installed				
Engineering and Design	15%	of	Equipment &	\$	154.000	Engineering & design for system comprised of vendor fabricated sub-	
	10,0	01	Construction Costs	Ŷ	10 1,000	components.	
			Total Installed				
Permitting	5%	of	Equipment & Construction	\$	51,000	Construction permit, discharge permit	
			Costs				
			Total Installed Equipment &				
Construction Management & Project Management	6%	of	Construction	\$	61,000	AACE/CSI standard factors.	
Freight	7%	of	Costs Equipment Cost	\$	26,250	AACE/CSI standard factors.	
Startup and Commissioning	7%	of	Equipment Cost	\$	26,250	Startup and commissioning of process, mechanical, and electrical	
Subtotal of Indirect Costs				\$	318,500	equipment associated with the PFAS treatment system.	
Subtotal Capital Costs			Subtotal Capital	\$	1,342,500		
Contingency	15%	of	Costs	\$	201,375	_	
C. Canital Cost				•	1 550 000	-	
+50%				\$	2,325,000	-	
-30%				\$	1,085,000		
Annual Operations & Maintenance Costs							
RO Concentrate Waste Disposal (Non-Hazardous)	14,916,076	lbs	\$ 0.16	\$	2,386,572	Assume reject $\sim 5\%$ of flow treated and requires incineration disposal. Assume transport cost of \$2625 per load and the additional cost energy	
RO Concentrate Waste Transport + Additional Costs	355	loads	\$ 1,313	\$	704,785	surcharge of \$0.016 per pound.	
RO Chemicals Usage (Antiscalant and cleaning chemicals) Sampling & Analytical	1 12	sum events	\$ 10,000 \$ 1,500	\$ \$	10,000 18,000	Lump annual estimate Assume monthly effluent samples for compliance	
Vendor O&M visit	52	events	\$ 1,500	\$	78,000	Assume weekly 10hr O&M visits, \$150/hr turnkey cost.	
Equipment Maintenance <i>Annual O&M Subtotal</i>	2%	of	Equipment Cost	\$ \$	7,500	AACE/CSI standard factors	
				Ψ	5,204,057		
C.Annual Cost				\$	3.210.000		
+70%				\$	5,450,000		
-70%				\$	970,000		
n,Years	20						
				¢			
Capital & Annual O&M Costs over 20 Years +50%				\$ \$	05,750,000 98,625,000		
-30%		1 •	1 1 1	\$	46,025,000		
AACE Class 4 band preliminary estimate $(-30\%$ to $+50\%)$. Not for bud evaluation and implementation from the information available at the tin	getary purposes 1e of the estima	s and is on te. The fin	ly meant to be used al costs of the proiec	for in t will:	teralternative depend on fin	comparison. The estimates have been prepared for guidance in project al approved design, actual labor and material costs, and competitive	
variable factors. General conditions are subject to change which may le	ead to a change	in the esti	mate. Costs have be	en roi	unded up. Cost	information is preliminary and has been generated from the following	

Non-binding vendor quotes (Sales tax may vary); Publicly available costs; Previous project experience and bids; Cost estimation manuals, and standard factors.

Table C-5

Opinions of Probable Cost for Combined Granular Activated Carbon (GAC) + Ion Exchange (IX) Treatment System for HFPO-DA Removal Chemours PFA Line2

Chemours Washington Works, West Virginia

Average Daily Volume: 104,000 gallons per day (gpd)						
Treatment Train: Bag filter skid- Granular Activated Carbon (GAC) Ads	orption Syst	tem- Ion Ex	change (IX) System	- Back	wash System (A	ssumes no other pretreatment is necessary)
Treatment Goal: 99.98% removal rate by first two GAC vessels and 95% Ref: AACE (2005)	removal ra	te by Ion Ex	kchange.			
		Engine	er's Opinion of Pr	obable	e Costs	
Item Capital Costs	Qty	Unit	Unit Cost		Total	Notes
	1	1	¢ 5 0.000	¢	50.000	One (1) feed pump skid with duplex pumps and One (1) bag filtration skid
Feed Pump & Bag Filtration System	1	each	\$ 79,000	\$	79,000	with two (2) 30488 bag filter housings, valves, fittings, and 300 5 micron bags.
GAC System (Vessels + Media)	1	each	\$ 143,000	\$	143,000	One (1) GAC system, with two vessels operated in lead/lag, with 5,000 lbs $ransee = 1.4 \text{ total of } 10,000 \text{ lbs of } CAC$
						per vessel. A total of 10,000 lbs of GAC.
IX System (Vessels + Resin)	1	each	\$ 83,244	\$	83,244	Based on cost estimate for 2 vessel system scaled down using a 0.75 factor.
Backwash System (Treated Water Tank + Pumn Skid)	1	each	\$ 78,000	\$	78 000	One (1) 12 000 gallon HDPE tank and One (1) 250 gnm duplex nump skid
Subtotal Equipment Cost	Ĩ	cuon	\$ 70,000	\$	383.244	-
Installation Cost of Equipment	40%	of	Equipment Cost	\$	153,298	Includes installation cost of balance of equipment: (labor, supports, anchors).
Subtotal Installed Cost of Equipment			1 1	\$	536,542	Does not include interconnecting piping, electrical etc.
Non-Component Costs (Specialized Trades)					,	-
						Includes site preparation and demolition, building construction, electrical and
Building / Housing for Equipment	1	each	\$ 500,000	\$	500,000	plumbing. Assumes ion exchange (IX) system cannot be accomodated within the exiting facility and will require its own
Civil & Earthworks	25%	of	Equipment Cost	\$	96,000	utility relocation.
						Power wiring, supply and transformation, controls wiring, Assumes required
Electrical	30%	of	Equipment Cost	\$	115,000	power from switchgear/utility. Single point of disconnect for treatment
Instrumentation & Controls	15%	of	Equipment Cost	¢	57.000	system.
Pining	I J Jimr	Sum	Equipment Cost	ֆ Տ	80.000	500 LF 4" Sch 40 PVC nining to and from the treatment system components
Subtotal Non-Component Cost	Luin	Jun		\$	848,000	-
Subtotal Installed Equipment and Construction Costs				\$	1,384,542	-
	20/	C	Installed	¢	12 000	T I I I I
Division I Allowances	3%	of	Equipment & Construction Cost	\$	42,000	Insurance, general requirements
			T (11 1			
Contractor Profit & Overhead	15%	of	Equipment &	\$	208,000	General contractor overhead and profit
			Construction Cost			
Total of Installed Equipment & Construction Costs				\$	1,634,542	-
Indirect Costs						
			Total Installed			Engineering & design for system comprised of vendor fabricated sub-
Engineering and Design	15%	of	Construction	\$	245,000	components.
			Costs Total Installed			
Permitting	5%	of	Equipment &	\$	82,000	Construction permit, discharge permit
			Construction			
			Total Installed			
Construction Management & Project Management	6%	of	Construction	\$	98,000	AACE/CSI standard factors.
Freight	7%	of	Costs Equipment Cost	\$	26.827	AACE/CSI standard factors.
Startup and Commissioning	7%	of	Equipment Cost	\$	26,827	Startup and commissioning of process, mechanical, and electrical equipment
Subtotal of Indirect Costs	,,,,		24p	\$	478,654	associated with the PFAS treatment system.
Subtotal Capital Costs				\$	2,113,197	
Contingency	15%	of	Costs	\$	316,979	
C. Capital Cast				•	2 4 40 000	-
+50%				\$ \$	3,660,000	-
-30%				\$	1,708,000	
Annual Operations & Maintenance Costs						
GAC Usage & Replacement	53,500	lbs	\$ 2.50	\$	133,750	Assume \$2.5/lb GAC, reactivated. GAC utilization rate is based on adsorption coefficient values in Wang et. al 2019.
	40	2	ф -	*		CalRes 2301 resin replacement and disposal. Assumes IX resin usage will be
IA Usage & Replacement	48	ct	5 365.00	\$	17,520	10% as a third treatment unit behind two prior GAC units as it would be as the primary treatment mechanism.
Sampling & Analytical	12	events	\$ 1,500 \$ 1,500	\$ ¢	18,000	Assume monthly effluent samples for compliance.
Equipment Maintenance	52 2%	of	ہ 1,500 Equipment Cost	ծ \$	78,000	AACE/CSI standard factors
Annual O&M Subtotal				\$	254,935	
C,Annual Cost +70%				\$ \$	260,000 440.000	
-70%				\$	80,000	
n,Years	20					
						_
Capital & Annual O&M Costs over 20 Years				\$ ¢	7,640,000	
+30%				Φ	11,400,000	

Non-binding vendor quotes (Sales tax may vary); Publicly available costs; Previous project experience and bids; Cost estimation manuals, and standard factors.



Page 1 of 1





Table C-6

Opinions of Probable Cost for 3 Vessel Granular Activated Carbon (GAC) Treatment System for HFPO-DA Removal Chemours PFA Line2 Chemours Washington Works, West Virginia

Basis of Cost Estimate (Scope and Assumptions) Chemours WW PFA Line 2						
Design Flow: 100 gallons per minute (gpm) Average Daily Volume: 104.000 gallons per day (gpd)						
Treatment Train: Bag filter skid- Granular Activated Carbon (GAC) Adso Treatment Goal: 99 98% removal rate by first two GAC vessels and 95%	orption Syst	tem- Backw	rash System (Assume bequent GAC vesse	es no	other pretreatmer	t is necessary)
Ref: AACE (2005)	Teme	Engineer	's Oninion of Prob	able (Costs	
Item	Qty	Unit	Unit Cost	abre-	Total	Notes
Feed Pump & Bag Filtration System	1	each	\$ 79,000	\$	79,000	One (1) feed pump skid with duplex pumps and One (1) bag filtration skid with two (2) 304SS bag filter housings, valves, fittings, and 300 5 micron bags.
GAC System (Vessels + Media)	1	each	\$ 205,977	\$	205,977	One (1) GAC system, with three vessels operated in lead/mid/lag, with 5,000 lbs per vessel. A total of 15,000 lbs of GAC. Based on cost estimate for 2 vessel system scaled up using a 0.9 factor.
Backwash System (Treated Water Tank + Pump Skid) Subtotal Equipment Cost	1	each	\$ 78,000	\$ \$	78,000 362,977	One (1) 12,000 gallon HDPE tank and One (1) 250 gpm duplex pump skid.
Installation Cost of Equipment	40%	of	Equipment Cost	\$	145,191	Includes installation cost of balance of equipment: (labor, supports, anchors). Does not include interconnecting piping, electrical etc.
Subtotal Installed Cost of Equipment Non-Component Costs (Specialized Trades)				\$	508,167	·
Building / Housing for Equipment	1	each	\$ 500,000	\$	500,000	Includes site preparation and demolition, building construction, electrical and plumbing. Assumes a GAC system with three vessels cannot be accomodated within the exiting facility and will require its own.
Civil & Earthworks	25%	of	Equipment Cost	\$	91,000	Includes civil, earthworks, concrete pad, gradings. Does not includes any utility relocation. Power wiring, supply and transformation, controls wiring, Assumes
Electrical	30%	of	Equipment Cost	\$	109,000	required line power is available. Does not include infrastructure costs for new line power from switchgear/utility. Single point of disconnect for treatment system.
Instrumentation & Controls	15%	of	Equipment Cost	\$	54,000	Instrumentation, automation, and controls
Piping	Lumj	o Sum		\$	80,000	500 LF 4" Sch.40 PVC piping to and from the treatment system components.
Subtotal Non-Component Cost Subtotal Installed Equipment and Construction Costs				\$ \$	834,000 1,342,167	
Division 1 Allowances	3%	of	Installed Equipment & Construction Cost	\$	40,000	Insurance, general requirements
Contractor Profit & Overhead	15%	of	Installed Equipment & Construction Cost	\$	201,000	General contractor overhead and profit
Total of Installed Equipment & Construction Costs				\$	1,583,167	
Indirect Costs			Total Installed			
Engineering and Design	15%	of	Equipment & Construction Costs	\$	237,000	Engineering & design for system comprised of vendor fabricated sub- components.
Permitting	5%	of	Equipment & Construction Costs	\$	79,000	Construction permit, discharge permit
Construction Management & Project Management	6%	of	Equipment & Construction Costs	\$	95,000	AACE/CSI standard factors.
Freight	7%	of	Equipment Cost	\$	25,408	AACE/CSI standard factors.
Startup and Commissioning	7%	of	Equipment Cost	\$	25,408	Startup and commissioning of process, mechanical, and electrical equipment associated with the PFAS treatment system.
Subtotal of Indirect Costs Subtotal Capital Costs				\$ \$	461,817	
Contingency	15%	of	Subtotal Capital Costs	\$	306,748	
C ₀ ,Capital Cost +50% -30%				\$ \$ \$	2,360,000 3,540,000 1,652,000	
Annual Operations & Maintenance Costs						Assume \$2.5/lb GAC_reactivated_Assumes 10% more consumption in
GAC Usage & Replacement	58,850	lbs	\$ 2.50	\$	147,125	GAC from 2 vessels to a 3 vessel system. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019.
Sampling & Analytical Vendor O&M visit	12 52	events	\$ 1,500 \$ 1,500	\$ \$	18,000 78,000	Assume weekly 10hr 0&M visits \$150/hr turnkey cost
Equipment Maintenance Annual O&M Subtotal	2%	of	Equipment Cost	\$ \$	7,260 250,385	AACE/CSI standard factors
C,Annual Cost +70%				\$ \$	260,000 450,000	
-70%				ֆ \$	80,000	
n, Y ears	20					
Capital & Annual O&M Costs over 20 Years +50%				\$ \$	7,560,000 11,340,000	
-30% 4 ACE Class 4 hand preliminary estimate (-30% to +50%). Not for bud	aotary nurt	poses and is	only meant to be us	\$ sed fo	5,292,000 r interalternative	comparison The estimates have been prepared for guidance in project
evaluation and implementation from the information available at the tin variable factors. General conditions are subject to change which may le	ne of the est ad to a chu	timate. The in the in the interview of the instance in the ins	final costs of the pro	oject 1 2 heen	will depend on fin	t information is preliminary and has been generated from the following

sources:

Non-binding vendor quotes (Sales tax may vary); Publicly available costs; Previous project experience and bids; Cost estimation manuals, and standard factors.

References:

Wang et. al., 2019, Adsorption behaviour and mechanisms of emerging perfluoro-2-propoxypropanoic acid (GenX) on acitvated carbons and resins, Chemical Engineering Journal, vol 364, pp 132-138.









Table C-7 Opinions of Probable Cost for 4 Vessel Granular Activated Carbon (GAC) Treatment System for HFPO-DA Removal Chemours PFA Line2 Chemours PFA Line2 Chemours Washington Works, West Virginia

Basis of Cost Estimate (Scope and Assumptions) Chemours WW PFA Line 2 Design Flow: 100 gallons per minute (gpm) Average Daily Volume: 104,000 gallons per day (gpd) Treatment Train: Bag filter skid- Granular Activated Carbon (GAC) Adso Treatment Goal: 99 98% removal rate by first two GAC vessels and 95%	orption Sys	tem- Backw	ash Sys	tem (Assume	es no o	other pretreatmen	t is necessary)
Ref: AACE (2005)	Tenno vui Tu	te by cuch b	ioseque		01.		
		Engin	eer's C) pinion of Pr	obab	le Costs	
Item	Qty	Unit	l	J nit Cost		Total	Notes
Feed Pump & Bag Filtration System	1	each	\$	79,000	\$	79,000	One (1) feed pump skid with duplex pumps and One (1) bag filtration skid with two (2) 304SS bag filter housings, valves, fittings, and 300 5 micron bags.
GAC System (Vessels + Media)	1	each	\$	266,847	\$	266,847	One (1) GAC system, with four vessels operated in lead/mid/lag, with 5,000 lbs per vessel. A total of 20,000 lbs of GAC. Based on cost estimate for 2 vessel system scaled up using a 0.9 factor given they are highly modular systems.
Backwash System (Treated Water Tank + Pump Skid) Subtotal Equipment Cost	1	each	\$	78,000	\$ \$	78,000 423,847	One (1) 12,000 gallon HDPE tank and One (1) 250 gpm duplex pump skid.
Installation Cost of Equipment	40%	of	Equ	ipment Cost	\$	169,539	Includes installation cost of balance of equipment: (labor, supports, anchors). Does not include interconnecting piping, electrical etc.
Subtotal Installed Cost of Equipment Non-Component Costs (Specialized Trades)					\$	593,386	_
Building / Housing for Equipment	1	each	\$	750,000	\$	750,000	Includes site preparation and demolition, building construction, electrical and plumbing. Assumes a GAC system with four vessels cannot be accomodated within the exiting facility and will require its own.
Civil & Earthworks	25%	of	Equ	ipment Cost	\$	106,000	Includes civil, earthworks, concrete pad, gradings. Does not includes any utility relocation.
Electrical	30%	of	Equ	ipment Cost	\$	127,000	Power wiring, supply and transformation, controls wiring, Assumes required line power is available. Does not include infrastructure costs for new line power from switchgear/utility. Single point of disconnect for treatment system.

Instrumentation & Controls		15%	of	Equipment Cost	\$	64,000	Instrumentation, automation, and controls
Piping		Lumj	p Sum		\$	120,000	750 LF 4" Sch.40 PVC piping to and from the treatment system components.
Subtotal Installed Eq	Subtotal Non-Component Cost uipment and Construction Costs				\$ \$	1,167,000 1,760,386	-
				Installed			_
Division 1 Allowances		3%	of	Equipment & Construction Cost	\$	53,000	Insurance, general requirements
				Installed			
Contractor Profit & Overhead		15%	of	Equipment & Construction Cost	\$	264,000	General contractor overhead and profit
Total of Installed	Equipment & Construction Costs				\$	2,077,386	-
Indirect Costs							
				Total Installed			
Engineering and Design		15%	of	Equipment & Construction Costs	\$	312,000	Engineering & design for system comprised of vendor fabricated sub- components.
				Total Installed			
Permitting		5%	of	Construction Costs	\$	104,000	Construction permit, discharge permit
				Total Installed			
Construction Management & Project M	anagement	6%	of	Construction Costs	\$	125,000	AACE/CSI standard factors.
Freight		7%	of	Equipment Cost	\$	29,669	AACE/CSI standard factors.
Startup and Commissioning		7%	of	Equipment Cost	\$	29,669	Startup and commissioning of process, mechanical, and electrical equipment associated with the PEAS treatment system
	Subtotal of Indirect Costs				\$ \$	600,339	
	Subibiui Capitui Cosis				Ψ	2,077,725	
	Contingency	15%	of	Subtotal Capital	\$	401,659	
	Contingency	15%	of	Subtotal Capital Costs	\$	401,659	-
	Contingency C ₀ ,Capital Cost +50%	15%	of	Subtotal Capital Costs	\$ 	401,659 3,080,000 4,620,000	-
	Contingency C ₀ ,Capital Cost +50% -30%	15%	of	Subtotal Capital Costs	\$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000	-
Annual Operations & Maintenance C	Contingency C ₀ ,Capital Cost +50% -30%	15%	of	Subtotal Capital Costs	\$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000	
Annual Operations & Maintenance O GAC Usage & Replacement	Contingency C ₀ ,Capital Cost +50% -30%	15% 64,200	of lbs	Subtotal Capital Costs \$ 2.50	\$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on
Annual Operations & Maintenance O GAC Usage & Replacement	Contingency C ₀ ,Capital Cost +50% -30%	15% 64,200	of lbs	Subtotal Capital Costs \$ 2.50 \$ 1.500	\$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019.
Annual Operations & Maintenance O GAC Usage & Replacement Sampling & Analytical Vendor O&M visit	Contingency C ₀ ,Capital Cost +50% -30%	15% 64,200 12 52	of lbs events events	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500	\$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 78,000	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits. \$150/hr turnkey cost
Annual Operations & Maintenance O GAC Usage & Replacement Sampling & Analytical Vendor O&M visit Equipment Maintenance	Contingency C ₀ ,Capital Cost +50% -30%	15% 64,200 12 52 2%	of lbs events events of	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500 Equipment Cost	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 78,000 8,477	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors
Annual Operations & Maintenance O GAC Usage & Replacement Sampling & Analytical Vendor O&M visit Equipment Maintenance	Contingency C ₀ ,Capital Cost +50% -30% Costs Annual O&M Subtotal	15% 64,200 12 52 2%	of lbs events events of	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500 Equipment Cost	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 78,000 8,477 264,977	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors
Annual Operations & Maintenance O GAC Usage & Replacement Sampling & Analytical Vendor O&M visit Equipment Maintenance	Contingency C ₀ ,Capital Cost +50% -30% Costs Annual O&M Subtotal C,Annual Cost	15% 64,200 12 52 2%	of lbs events events of	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500 Equipment Cost	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 78,000 8,477 264,977 270,000	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors
Annual Operations & Maintenance O GAC Usage & Replacement Sampling & Analytical Vendor O&M visit Equipment Maintenance	Contingency C ₀ ,Capital Cost +50% -30% Costs Annual O&M Subtotal C,Annual Cost +70%	15% 64,200 12 52 2%	of lbs events events of	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500 Equipment Cost	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 78,000 8,477 264,977 270,000 460,000	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors
Annual Operations & Maintenance O GAC Usage & Replacement Sampling & Analytical Vendor O&M visit Equipment Maintenance	Contingency C ₀ ,Capital Cost +50% -30% Costs Costs Annual O&M Subtotal C,Annual Cost +70% -70%	15% 64,200 12 52 2%	of lbs events events of	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500 Equipment Cost	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 78,000 8,477 264,977 270,000 460,000 90,000	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors
Annual Operations & Maintenance C GAC Usage & Replacement Sampling & Analytical Vendor O&M visit Equipment Maintenance	Contingency C ₀ ,Capital Cost +50% -30% Costs Annual O&M Subtotal C,Annual Cost +70% -70% n,Years	15% 64,200 12 52 2% 20	of lbs events events of	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500 Equipment Cost	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 78,000 8,477 264,977 270,000 460,000 90,000	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors
Annual Operations & Maintenance O GAC Usage & Replacement Sampling & Analytical Vendor O&M visit Equipment Maintenance	Contingency C ₀ ,Capital Cost +50% -30% Costs Annual O&M Subtotal C,Annual Cost +70% -70% n,Years	15% 64,200 12 52 2% 20	of lbs events events of	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500 Equipment Cost	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 78,000 8,477 264,977 270,000 460,000 90,000	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors
Annual Operations & Maintenance O GAC Usage & Replacement Sampling & Analytical Vendor O&M visit Equipment Maintenance Capital & Ana	Contingency C ₀ ,Capital Cost +50% -30% Costs Annual O&M Subtotal C,Annual Cost +70% -70% n,Years mual O&M Costs over 20 Years +50%	15% 64,200 12 52 2% 20	of lbs events events of	Subtotal Capital Costs \$ 2.50 \$ 1,500 \$ 1,500 Equipment Cost	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	401,659 3,080,000 4,620,000 2,156,000 160,500 18,000 8,477 264,977 270,000 460,000 90,000 12,720,000 12,720,000	Assume \$2.5/lb GAC, reactivated. Assumes 12% more consumption in GAC with the inclusion of a fourth vessel. GAC utilization rate is based on adsorption coefficient values in Wang et. al., 2019. Assume monthly effluent samples for compliance. Assume weekly 10hr O&M visits, \$150/hr turnkey cost AACE/CSI standard factors

AACE Class 4 band preliminary estimate (-30% to +50%). Not for budgetary purposes and is only meant to be used for interalternative comparison. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. General conditions are subject to change which may lead to a change in the estimate. Costs have been rounded up. Cost information is preliminary and has been generated from the following sources: Non-binding vendor quotes (Sales tax may vary); Publicly available costs; Previous project experience and bids; Cost estimation manuals, and standard factors.

References:

Wang et. al., 2019, Adsorption behaviour and mechanisms of emerging perfluoro-2-propoxypropanoic acid (GenX) on acitvated carbons and resins, Chemical Engineering Journal, vol 364, pp 132-138.







Table C-8Estimated Amount of HFPO-DA Removed
Chemours PFA Line2

Chemours Washington Works, West Virginia

Item	First Technology	Second Technology	Third Technology	Units
HFPO-DA Influent Mass over 20 years ^{1,2}	178,924	35.8	1.79	lbs
HFPO-DA Removal Rate ^{3,4}	99.98%	95%	95%	%
Cumulative Total Removal Rate	99.98%	99.999%	99.99995%	%
Incremental Removal Rate	99.98%	0.019%	0.00095%	%
HFPO-DA Effluent Mass over 20 years	35.8	1.7892	0.0895	lbs
Mass of HFPO-DA removed per day	24.5	0.0047	0.000233	lbs
Projected Mass of HFPO-DA removed over 20 years	178,888	34	1.7	lbs

Notes:

lbs - pounds

1 - The first technology HFPO-DA influent mass over 20 years (178,924) per day is calculated by multilplying the HFPO-DA influent concentration of 28.24 milligrams per liter a daily flow rate of 104,000 gallons per day and projecting this mass over 20 years.

2 - The second technology HFPO-DA influent mass over 20 years values are taken by the effluent mass over 20 years of the prior technology.

3 - 99.98% removal for the first technology (2 GAC vessels) is estimated based on W9 permeate system data presented in Table B-1.

4 - The removal rates in the second technology (IX vessel or a third GAC vessel) and third technology (fourth GAC vessel) are assumed to be 95%.

Table C-9 Incremental Cost per Pound of HFPO-DA Removed Chemours PFA Line 2 Chemours Washington Works, West Virginia

	First Technology	2 GAC Vessels	IX	Regen-IX	RO	2 GAC Vessels	2 GAC Vessels	2 GAC Vessels
	Estimated Total Removal Rate	99.98%	99.98%	99.98%	99.98%	99.98%	99.98%	99.98%
	Estimated Incremental Removal Rate	99.98%	99.98%	99.98%	99.98%	99.98%	99.98%	99.98%
F * (Estimated Increment Removed	99.98%	99.98%	99.98%	99.98%	99.98%	99.98%	99.98%
First Technology	Influent over 20 years (lbs)	178,924	178,924	178,924	178,924	178,924	178,924	178,924
reemology	Effluent over 20 years (lbs)	35.8	35.8	35.8	35.8	35.8	35.8	35.8
	Mass removed over 20 years (lbs)	178,888	178,888	178,888	178,888	178,888	178,888	178,888
	Cost of Technology over 20 years	\$6,070,000	\$6,860,000	\$6,170,000	\$65,750,000	\$6,070,000	\$6,070,000	\$6,070,000
	Cost per Pound Removed	<u>\$34</u>	<u>\$38</u>	<u>\$34</u>	\$368	<u>\$34</u>	<u>\$34</u>	<u>\$34</u>
	Second Technology					1 IX Vessel	1 GAC Vessel	1 GAC Vessel
	Estimated Total Removal Rate					99.999%	99.999%	99.999%
	Estimated Incremental Removal Rate					~95%	~95%	~95%
	Estimated Increment Removed					0.019%	0.019%	0.019%
Second	Influent over 20 years (lbs)					35.8	35.8	35.8
rechnology	Effluent over 20 years (lbs)					1.79	1.79	1.79
	Mass removed over 20 years (lbs)					34.0	34.0	34.0
	Cost of Technology over 20 years					\$1,570,000	\$1,490,000	\$1,490,000
	Cost per Pound Removed					<u>\$46,176</u>	<u>\$43,824</u>	<u>\$43,824</u>
	Third Technology							1 GAC Vessel
	Estimated Total Removal Rate							99.99995%
	Estimated Incremental Removal Rate							~95%
	Estimated Increment Removed							0.00095%
Third	Influent over 20 years (lbs)							1.79
rechnology	Effluent over 20 years (lbs)							0.089
	Mass removed over 20 years (lbs)							1.70
	Cost of Technology over 20 years	-						\$920,000
	Cost per Pound Removed							<u>\$541,176</u>

Notes:

GAC - Granular Activated Carbon IX - Ion Exchange Regen-IX - Regenerable Ion Exchange

RO - Reverse Osmosis

1 - 99.98% removal for 2 GAC vessels is estimated based on W9 permeate system data presented in Table B-1.

2 - First technology removal rates for IX, RO and Regenerable IX are assumed to be the same as GAC removal rates based on similar effluent performance in literature.

3 - The removal rates in the second technology (IX vessel or a third GAC vessel) and third technology (fourth GAC vessel) are assumed to be 95%.

4 - The additional cost of technologies for the combined technology is calculated as the full cost of that technology scenario (either two or three

technologies) minus the full cost of the prior technology scenario (e.g. one or two technologies).

References:

AWWA, 2019. Per- and Polyfluoroalkyl Substances (PFAS) Treatment.

Barr Engineering Co., Hazen & Sawyer, 2023. Evaluation of Current Alternatives and Estimated Cost Curves for PFAS Removal and Destruction from Municipal Wastewater, Biosolids, Landfill Leachate, and Compost Contact Water. Prepared for the Minnesota

Example Calculation: First Technology (2 GAC Vessels) 20 Year Cost per Pound Total pounds over 20 years. Total Cost over 20 years. **Step 1: Define Removal Rates** Incremental Removal Rate = 99.98%Total Removal Rate = 99.98%Step 2: Calculate Flow and Influent, Effluent and Removal Mass Quantities $20 Year Flow = \frac{104,000 \ gal}{day} \times \frac{3.78541 \ L}{gal} \times \frac{365 \ day}{yr} \times 20 \ yr = 2,873,883,272 \ L$ Influent Mass = Influent Concentration × 20 Year Flow = $\frac{28.24 \text{ mg}}{L}$ × $\frac{lb}{453.592 \text{ ma}}$ × 2,873,883,272 L = 178,924 lb Mass Removed = Influent Mass \times Incremental Removal Rate = 178,924 lb \times 99.98% = 178,888 lb Effluent Mass = Influent Mass \times (1 – Incremental Removal Rate) = 178,924 lb \times (1 – 99.98%) = 35.8 lb **Cost Per Pound Removal Calculation** Step 3: Calculate Cost per Pound Removed 1st Treatment Technology: 2 GAC Vessels **Chemours Washington Works** $Cost per Pound Removed = \frac{Cost of Technology}{Mass Removed} = \frac{\$6,070,000}{178,888 \, lb} = \$34/lb$ Washington, WV Geosyntec[▶] Figure consultants C-1 Note: Figure depicts calculations presented in Tables C-8 and the cost per pound removal of 2 GAC vessels in Table C-9. Worthington, OH November 2023

Example Calculation: Second Technology (1 GAC vessels following the first 2 GAC vessels) 20 Year Cost per Pound

Total pounds over 20 years. Total Cost over 20 years.

Step 1: Define Removal Rates

First Technology Removal Rate = 99.98% [2 GAC vessles]

Second Technology Removal Rate = \sim 95% [Either 1 IX bed or 1 GAC vessel]

Two Technology Removal Rate

- $= Technology \ Removal \ Rate + (1 First \ Technology \ Removal \ Rate) \times Second \ Technology \ Removal \ Rate$
- $= 99.98\% + (1 99.98\%) \times 95\% = 99.999\%$

Step 2: Calculate Flow and Influent, Effluent and Removal Mass Quantities

Influent Mass = First Technology Effluent Mass = 35.8 lb

 $Mass \ Removed = Influent \ Mass \times Second \ Technology \ Removal \ Rate = 35.8 \ lb \times 95\% = 34.0 \ lb \ Mass \ M$

 $Effluent \ Mass = Influent \ Mass \times (1 - Second \ Technoogy \ Removal \ Rate) = 35.8 \ lb \times (1 - 95\%) = 1.79 \ lb$

Step 3: Calculate Cost of Technology over 20 years

Cost of Second Technology = Total Cost of Second Technology (3 GAC) - Total Cost of First Technology (2 GAC)

Cost of Second Technology = 7,560,000 - 6,070,000 = 1,490,000

