



June 8, 2022

MS. DENISE NELSON  
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MILWAUKEE, WI 53209

Via Email Only to [denice.karen.nelson@jci.com](mailto:denice.karen.nelson@jci.com)

SUBJECT: Response to Semi-Annual Operation, Maintenance, and Optimization Progress Report #5  
**Ditch B** Interim Action Treatment System (July 1, 2021 – December 31, 2021)  
JCI/Tyco FTC PFAS, 2700 Industrial Parkway South, Marinette, WI  
BRRTS #02-38-580694

Dear Ms. Nelson:

On May 17, 2022, the Wisconsin Department of Natural Resources (DNR) received *Semi-Annual Operation, Maintenance, and Optimization Progress Report #5* (O&M Progress Report #5) for the Ditch B interim action at the above-referenced site (the "Site"). The report was submitted by Arcadis U.S., Inc. (Arcadis) on behalf of Johnson Controls, Inc. and Tyco Fire Products LP (JCI/Tyco), and was accompanied by the appropriate fee of \$425 required under Wisconsin Administrative Code (Wis. Admin. Code) § NR 749.04(1) for DNR review and response.

The DNR reviewed JCI/Tyco's O&M Progress Report #5 and concurs that the report met applicable regulatory reporting requirements. The operation and maintenance of the Ditch B interim action was effective at reducing the concentration of perfluorooctanoic acid (PFOA) perfluorooctanesulfonic acid (PFOS) in the surface water; however, the DNR found that because the streamflow in Ditch B often exceeds the capacity of the treatment system, the concentrations can exceed the proposed surface water criteria of 95 parts per trillion (ppt) for PFOA and 8 ppt for PFOS in the surface water in Ditch B downstream of the treatment system. This letter includes recommendations for evaluating the effectiveness of the of the interim remedial action in achieving proposed surface water criteria in future Progress Reports (Wis. Admin. Code § NR 724.17(4)(a)).

## Background

JCI/Tyco are investigating and responding to the discharge of per- and polyfluoroalkyl substances (PFAS) to the environment at the JCI/Tyco Fire Technology Center (FTC), located at 2700 Industrial Parkway South in Marinette, Wisconsin. The discharge occurred as the result of training, testing, research and development of PFAS-containing aqueous film forming foams (AFFF) at the Site starting in the early 1960s.

A surface water drainage feature identified as Ditch B begins north of the FTC and flows east toward Pierce Avenue, where it turns and flows southeast and eventually discharges into the Bay of Green Bay in Lake Michigan. Elevated concentrations of PFAS were detected in the surface water of Ditch B - PFOS up to 190 ppt and PFOA up to 3,800 ppt. In October 2019, JCI/Tyco began an interim action to reduce the concentration of PFAS in the surface water in this ditch.

The Ditch B interim action includes a treatment system located at 925 Pine Beach Road in Marinette, which is downstream from the FTC property and approximately 1,250 feet upstream from the mouth into Green Bay. The

system captures surface water flowing in Ditch B and treats the captured water using suspended solids settling, bag filtration and granular activated carbon (GAC). The treated water is then discharged back to Ditch B under a Wisconsin Pollutant Discharge Elimination System (WPDES) General Permit (WI-0046566-07-0) and the associated coverage letter, which specifies the effluent criteria and monitoring requirements.

Operation of the Ditch B treatment system reduces the amount of PFAS that migrates downstream in the ditch; however, the system is currently only able to treat a maximum flow rate of 700 gallons per minute (gpm) and flow in the ditch can exceed 1,500 gpm during wet conditions. During times when the stream flow exceeds the operating capacity of the treatment system, some surface water flowing in Ditch B is not captured and therefore goes untreated as it migrates downstream. JCI/Tyco is implementing other interim actions (e.g., the Groundwater Extraction and Treatment System [GETS]) to further control and reduce the migration of PFAS from the Site into Ditch B.

### **NR 205 WPDES Permit**

The effluent from the Ditch B treatment system is regulated under WPDES General Permit No. WI-0046566-07-0 and the associated coverage letter (updated April 29, 2021). The DNR's Wastewater Program administers the WPDES permit and reviews the monthly electronic discharge monitoring reports submitted by JCI/Tyco. A review of the permit reporting is not included with this letter.

### **Summary O&M Progress Report #5**

#### Operation and Maintenance

JCI/Tyco's O&M Progress Report #5 covered the period from July 1 to December 31, 2021. Flow in Ditch B was variable, but constant, such that the system required operation during the entire reporting period. During this time the system treated over 157.2 million gallons of surface water and operated 95 percent of the time; the 5 percent system downtime was for planned maintenance activities and to repair a broken pipe fitting. The broken fitting resulted in the system being shut down between December 24 and 27, 2021.

Routine system maintenance during this period included removal of accumulated sediment, replacement of spent bag filters and replacement of spent GAC. The spent bag filters were collected in drums and disposed by End Point Solutions, and the spent GAC was shipped to a Cabot Corporation facility in Pryor, Oklahoma to be reactivate and reused in the treatment system. Documentation of the handling of these waste materials was included in Appendix E of O&M Progress Report #5. The sediment was stockpiled in the soil staging area on the FTC property for future disposal at a solid waste landfill.

During this reporting period, the system removed approximately 1.18 pounds of PFOA and 0.12 pounds of PFOS from the surface water in Ditch B. Cumulatively, since initial startup in October 2019, the system has removed approximately 5.68 pounds of PFOA and 0.43 pounds of PFOS from the surface water. These mass estimates were calculated by JCI/Tyco based on the weekly volume treated by the system and the weekly PFAS concentrations measured in the system influent and effluent.

#### Long-Term Monitoring

Historical monitoring of the upstream (pre-treatment) surface water in Ditch B have shown that concentrations of PFOA and PFOS fluctuate; the concentrations recorded during this period were between 43 and 1,900 ppt for PFOA and 17 and 140 ppt for PFOS. The measured concentrations are within the ranges previously detected in Ditch B. All of the influent (pre-treatment) surface water samples had concentrations that exceeded the proposed surface water criteria of 95 ppt for PFOA and 8 ppt for PFOS.

JCI/Tyco measured the concentration of PFOA and PFOS weekly in the treated effluent; the concentrations recorded during this period were < 0.45 to 18 ppt for PFOA and < 0.45 to 1.2 ppt for PFOS. The treatment system, on average, removed over 99 percent of the PFOA and PFOS from the water that it treated. The treated effluent was consistently below the proposed surface water criteria for PFOA and PFOS.

JCI/Tyco collected five monthly surface water samples immediately downstream of the treatment system (SW-39); the surface water concentrations ranged from < 0.81 to 330 ppt for PFOA and from < 0.52 to 28 ppt for PFOS. The concentrations measured in Ditch B were above the proposed surface water criteria of 95 ppt for PFOA and 8 ppt for PFOS in sample collected in August 2021; this sample was collected at a time when the flow in Ditch B exceeded the capacity of the treatment system and some of the streamflow went untreated. The other surface water samples were collected at times when most, if not all, of the streamflow in Ditch B was able to be captured and treated by the system.

#### Revision to Appendix B Operation, Monitoring and Maintenance Plan

JCI/Tyco's approved Operation, Monitoring and Maintenance Plan (OM&M Plan) for the Ditch B interim action included a method to estimate the total stream flow in Ditch B and the amount of PFOA and PFOS migrating downstream from the treatment system in the ditch. JCI/Tyco revised the OM&M Plan to include a new method to estimate the total stream flow and JCI/Tyco removed the methods that accounted for untreated flow in the ditch. The revision was included in Appendix A of O&M Progress Report #5.

On July 1, 2021, JCI/Tyco began reporting the estimated total weekly stream flow in Ditch B using the revised method; the total flow in Ditch B during this reporting period was estimated to be 213.1 million gallons. The total flow in Ditch B often exceeded the capacity of the treatment system, such that some of the surface water in Ditch B went untreated. In O&M Progress Report #5, JCI/Tyco did not evaluate the effectiveness of the interim action during times of high stream flow.

#### **DNR Review of O&M Progress Report #5**

The DNR approves of JCI/Tyco's revision to the OM&M Plan for the new method to estimate the total stream flow in Ditch B, but the DNR does not approve of the removal of means to evaluate the surface water quality when there is high flow that goes untreated in the ditch. The purpose of this interim action is to improve the surface water quality in Ditch B, and as such the evaluation of the effectiveness of the interim action should include a representative evaluation the concentrations of PFOA and PFOS in the surface water in Ditch B downstream of the treatment system.

JCI/Tyco's O&M Progress Report #5 included most of the information specified in the approved OM&M Plan, except for the evaluation of effectiveness in the interim action in restoring surface water in Ditch B. However, JCI/Tyco's O&M Progress Report #5 did include sufficient information for the DNR to evaluate the effectiveness of the interim remedial action in achieving the environmental and public health laws (Wis. Admin. Code § NR 724.17(4)(a)). The DNR used the information provided in Progress Report #5 to calculate the estimated volume of water that went untreated in Ditch B and to estimate the average weekly concentration of PFOA and PFOS in the downstream surface water.

The DNR's evaluation are summarized in attached **Table A.1 and Figures A.1 – A.3**.

- During this reporting period, an estimated 55.9 million gallons of surface water (or approximately 25 percent of the total streamflow) in Ditch B went untreated (**Table A.1**). This primarily occurred at times

when the streamflow in Ditch B exceeded the capacity of the treatment system, but also included times when the system was offline for repairs.

- The five downstream surface water samples collected from SW-39 generally occurred at times of lower streamflow in Ditch B, which tend to overlook the effects high flow has on downstream conditions (**Figure A.1 and Table A.1**).
- JCI/Tyco reported an average removal efficiency for PFOA and PFOS of over 99 percent for water treated by the system. However, the effective removal efficiency of PFAS from the surface water in the ditch was less during times of high streamflow. During this reporting period, the effective removal of PFOA and PFOS from the surface water in Ditch B ranged from 21 to 100 percent, and the average was 82 percent (**Figure A.1**).
- The DNR calculated the average weekly concentrations of PFOA and PFOS for surface water downstream of the treatment system using parameters reported in O&M Progress Report #5. The calculated downstream concentrations ranged from < 0.76 to 797 ppt for PFOA and from < 0.45 to 63 ppt for PFOS (**Table A.1 and Figures A.2 and A.3**).
  - The calculated concentrations closely approximated the surface water concentrations measured at SW-39 for the five times when surface water samples were collected at this downstream location. This suggests that the calculated surface water concentrations are a good approximation of the actual average weekly downstream surface water concentrations.
  - The downstream concentrations were less than proposed surface water criteria for PFOA and PFOS when all, or most, of the streamflow in Ditch B could be treated by the system.
  - The downstream concentrations were greater than the proposed surface water criteria for PFOA and PFOS when not all the streamflow in Ditch B could be treated by the system. (Generally, but not exclusively, surface water criteria were exceeded when more than 600,000 gallons of surface water went untreated in a week).

The Ditch B treatment system, as currently maintained, is effective at removing PFOA and PFOS from the water it treats and reducing the concentration and amount of PFOA and PFOS in the surface water flowing in Ditch B. However, because the system cannot treat all the water in Ditch B during times of high streamflow, the concentrations of PFOA and PFOS downstream of the treatment system are periodically greater than the proposed surface water criteria. The frequency of these exceedances corresponds to the occurrences of high streamflow.

### Next Steps

DNR recommends that JCI/Tyco continue to document operation and maintenance of the Ditch B treatment system in semi-annual O&M Progress Reports (Wis. Admin. Code § NR 724.13(3)) and to include an evaluation like the one the DNR provided in **Table A.1 and Figures A.1 – A.3** to evaluate the effectiveness of the of the interim remedial action in achieving proposed surface water criteria for PFOA and PFOS (Wis. Admin. Code § NR 724.17(4)(a)). (Please note, if JCI/Tyco chooses not to calculate weekly downstream surface water concentrations, then weekly surface water samples at SW-39 are recommended, and the samples should be collected at times representative of high streamflow conditions during that week.)

As a reminder, this Site is subject to an enforcement action and therefore all submittals to the DNR under Wis. Admin. Code chs. NR 700-799 and submittals directed by the DNR must be accompanied by an Wis. Admin. Code ch. NR 749 fee per Wis. Stat. § 292.94. These fees are not pro-ratable or refundable per Wis. Admin. Code § NR 749.04(1). If you have any questions about whether to include a fee with a submittal, please contact DNR staff prior to submitting a document without a fee.

If you have any questions about this letter, please contact me, the DNR Project Manager, at (608) 622-8606 or [Alyssa.Sellwood@wisconsin.gov](mailto:Alyssa.Sellwood@wisconsin.gov).

Sincerely,

A handwritten signature in black ink that reads "Alyssa Sellwood". The signature is written in a cursive style with a large, looped initial "A".

Alyssa Sellwood, PE  
Complex Sites Project Manager  
Remediation & Redevelopment Program

Attachments: Table A.1 – Ditch B Interim Action Evaluation of Effectiveness  
Figure A.1 – Ditch B Interim Action: Surface Water Treatment Effectiveness  
Figure A.2 – Ditch B Downstream Surface Water Concentrations: PFOA  
Figure A.3 – Ditch B Downstream Surface Water Concentrations: PFOS

cc: Ben Verburg, Arcadis (via email: [ben.verburg@arcadis.com](mailto:ben.verburg@arcadis.com))  
Jodie Peotter, DNR (via email: [Jodie.Peotter@wisconsin.gov](mailto:Jodie.Peotter@wisconsin.gov))

**Table A.1**  
**Ditch B Interim Action Evaluation of Effectiveness**  
**Calculations by the DNR Using Data JCI/Tyco Reported in O&M Progress Report #5**

Source		Ditch B Flow Volume (gallons)		
		JCI/Tyco Table 5	JCI/Tyco Table 5	DNR Calculated <sup>(1)</sup>
Week Start Date	Week End Date	Estimated Stream Flow (V <sub>stream</sub> )	Treated Discharge (V <sub>treated</sub> )	Estimated Untreated Flow (V <sub>untreated</sub> )
* Thursday, July 1, 2021	Saturday, July 3, 2021	2,899,700	2,293,461	606,239
Sunday, July 4, 2021	Saturday, July 10, 2021	22,438,600	4,615,500	17,823,100
Sunday, July 11, 2021	Saturday, July 17, 2021	9,476,200	6,474,700	3,001,500
Sunday, July 18, 2021	Saturday, July 24, 2021	14,154,600	6,602,800	7,551,800
Sunday, July 25, 2021	Saturday, July 31, 2021	11,737,200	6,816,700	4,920,500
Sunday, August 1, 2021	Saturday, August 7, 2021	7,820,100	6,587,900	1,232,200
Sunday, August 8, 2021	Saturday, August 14, 2021	6,096,400	6,096,400	0
Sunday, August 15, 2021	Saturday, August 21, 2021	6,416,300	6,416,300	0
Sunday, August 22, 2021	Saturday, August 28, 2021	12,188,800	6,845,100	5,343,700
Sunday, August 29, 2021	Saturday, September 4, 2021	7,073,900	6,998,600	75,300
Sunday, September 5, 2021	Saturday, September 11, 2021	7,794,800	6,999,200	795,600
Sunday, September 12, 2021	Saturday, September 18, 2021	8,264,300	7,032,300	1,232,000
Sunday, September 19, 2021	Saturday, September 25, 2021	7,057,400	7,057,400	0
Sunday, September 26, 2021	Saturday, October 2, 2021	7,070,100	7,070,100	0
Sunday, October 3, 2021	Saturday, October 9, 2021	7,270,800	7,023,100	247,700
Sunday, October 10, 2021	Saturday, October 16, 2021	6,164,400	6,164,400	0
Sunday, October 17, 2021	Saturday, October 23, 2021	5,993,800	5,429,600	564,200
Sunday, October 24, 2021	Saturday, October 30, 2021	5,291,300	5,291,300	0
Sunday, October 31, 2021	Saturday, November 6, 2021	4,843,100	4,812,000	31,100
Sunday, November 7, 2021	Saturday, November 13, 2021	7,207,300	5,464,200	1,743,100
Sunday, November 14, 2021	Saturday, November 20, 2021	5,263,600	5,263,600	0
Sunday, November 21, 2021	Saturday, November 27, 2021	5,073,200	5,073,200	0
Sunday, November 28, 2021	Saturday, December 4, 2021	5,408,300	5,346,600	61,700
Sunday, December 5, 2021	Saturday, December 11, 2021	4,986,300	4,986,300	0
Sunday, December 12, 2021	Saturday, December 18, 2021	12,114,700	5,786,400	6,328,300
Sunday, December 19, 2021	Saturday, December 25, 2021	7,656,600	4,662,700	2,993,900
Sunday, December 26, 2021	** Friday, December 31, 2021	5,351,657	4,037,400	1,314,257
Total (gallons)		213,113,457	157,247,261	55,866,196
Total (million gallons)		213.1	157.2	55.9

Sample Date	PFOS Concentrations (ppt)				PFOA Concentration (ppt)			
	JCI/Tyco Table 4	JCI/Tyco Table 4	JCI/Tyco Table 7	DNR Calculated <sup>(2)</sup>	JCI/Tyco Table 4	JCI/Tyco Table 4	JCI/Tyco Table 7	DNR Calculated <sup>(2)</sup>
	Influent (Surface Water Pre-treatment)	Effluent (Treated Discharge)	Surface Water Sample (SW-39) Post-Treatment	Estimated Surface Water Post-Treatment	Influent (Surface Water Pre-treatment)	Effluent (Treated Discharge)	Surface Water Sample (SW-39) Post-Treatment	Estimated Surface Water Post-Treatment
7/1/2021	97	< 0.49		20	1,100	<0.76		230
7/8/2021	62	< 0.52		49	900	< 0.82		715
7/15/2021	42	< 0.48		13	430	< 0.76		136
7/23/2021	17	< 0.47		9	28	< 0.74		15
7/31/2021	130	< 0.47		54	1,900	1.3		797
8/3/2021	140	1.2	28	23	1,900	18	330	315
8/9/2021	60	< 0.51		< 0.51	940	1.3		1.3
8/18/2021	150	< 0.50		< 0.50	1,800	2.2		2.2
8/27/2021	17	< 0.47		7.5	43	5.1		22
9/3/2021	140	< 0.48	< 0.47	1.5	1,400	3.6	5.8	18
9/11/2021	120	< 0.50		12	940	< 0.78		96
9/13/2021	100	< 0.53		15	880	3.8		134
9/20/2021	120	< 0.49	< 0.52	< 0.49	840	< 0.77	< 0.81	< 0.77
9/30/2021	96	< 0.50		< 0.50	610	< 0.79		< 0.79
10/8/2021	88	< 0.46	7.0	3.0	520	< 0.73	31	18
10/15/2021	92	< 0.45		< 0.45	860	< 0.71		0
10/23/2021	73	< 0.47		6.9	660	< 0.74		62
10/25/2021	82	< 0.48		< 0.48	630	< 0.76		< 0.76
11/1/2021	75	< 0.47	< 0.52	0.48	580	< 0.73	< 0.82	3.7
11/12/2021	84	< 0.54		20	720	2.6		176
11/19/2021	92	<0.51		<0.51	740	< 0.80		< 0.80
11/22/2021	77	< 0.49		< 0.49	740	3.3		3
11/30/2021	100	< 0.52		1.1	740	2.4		11
12/10/2021	99	< 0.50	< 0.52	< 0.50	820	1.4	1.5	1.4
12/13/2021	120	0.61		63	1,000	9.6		527
12/22/2021	100	< 0.50		39	1,400	1.8		549
12/27/2021	110	< 0.52		27	1,300	4.3		322
Proposed Surface Water Criteria = 8 ppt					Proposed Surface Water Criteria = 95 ppt			

**Notes:**

\* The V<sub>treated</sub> for July 1 to July 3, 2021 prorated for number of days in reporting period.

\*\* The V<sub>Stream</sub> and V<sub>Treated</sub> from December 26 to 31, 2021 prorated for number of days in reporting period.

<sup>(1)</sup> V<sub>untreated</sub> = V<sub>stream</sub> - V<sub>treated</sub>

<sup>(2)</sup> Estimated Surface Water Concentration = [(V<sub>untreated</sub> \* Influent Concentration) + (V<sub>treated</sub> \* Effluent Concentration)] / V<sub>stream</sub>

**BOLD** = Surface Water Concentration great than proposed criteria

ppt = parts per trillion or nanograms per liter

Figure A.1  
 Ditch B Interim Action: **Surface Water Treatment Effectiveness**

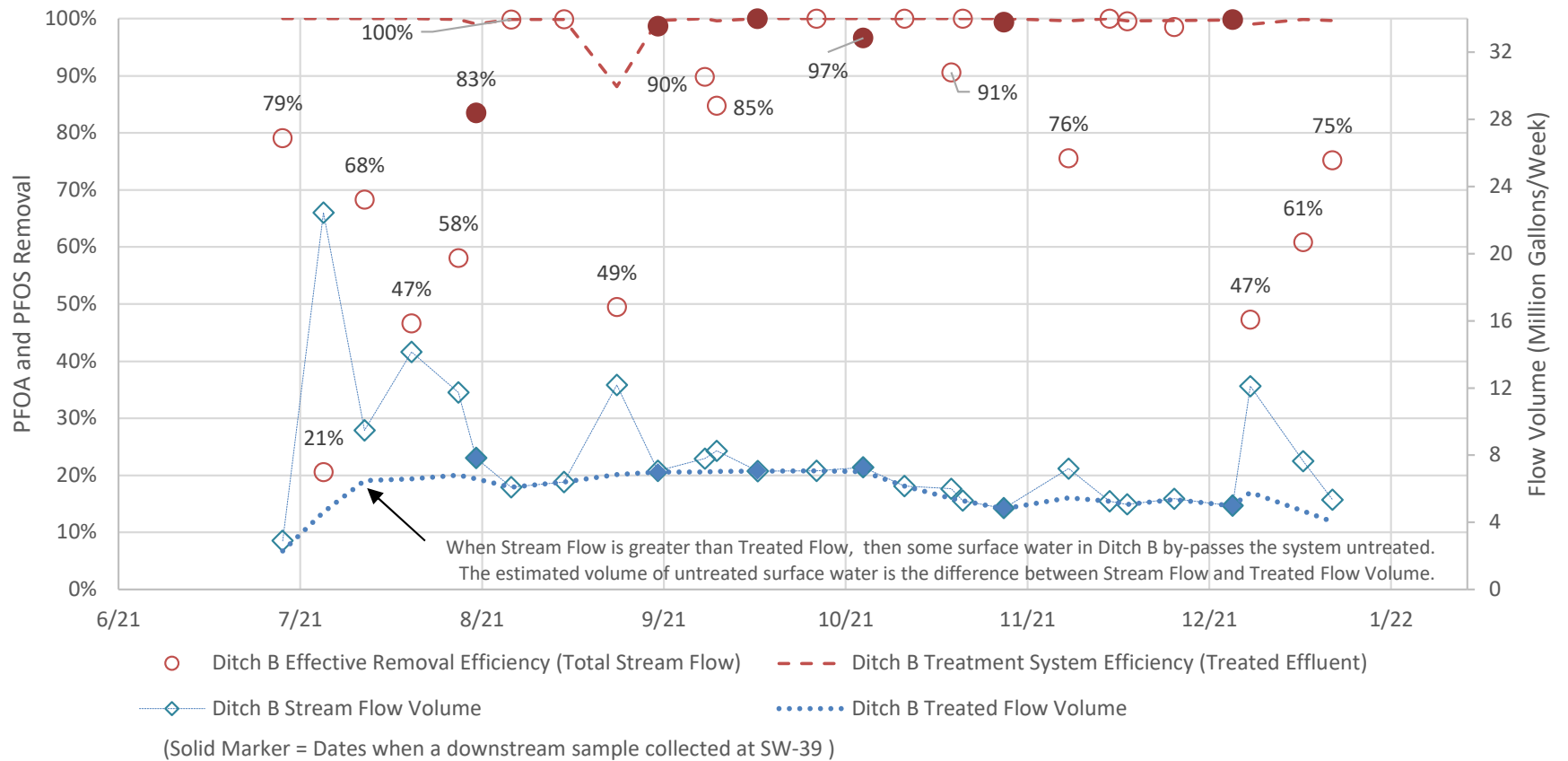


Figure A.2  
 Ditch B Downstream Surface Water Concentrations: **PFOA**  
 (Compare to Figure 6 in Progress Report #5)

