

## HRSD SWIFT Research Center (SRC) Quarterly Report on SWIFT Water Quality Targets

This report documents SWIFT Water Quality results for recharge operations from April 1 – June 30, 2021. Recharge operations at the SRC ceased in January 2021 for well inspection and rehabilitation prompted by observed losses in recharge capacity. Recharge resumed in April 2021.

The compliance requirements are documented in HRSD’s SWIFT Underground Injection Control Inventory Information Package (UIC-IIP) submitted to EPA Region III in January 2018. These requirements are noted in Tables 1-4 and reflect an update to the monitoring and compliance evaluation for Total coliform.

Figures 1 and 2 and Table 6 provide a summary of the data from the referenced quarter of operations relative to the SWIFT Water Quality Targets. Table 6 represents a summary of all analytes that were present above the laboratory reporting limit. A detailed table identifying the parameters monitored for the purpose of evaluating compliance with the SWIFT Water Quality Targets can be found as an Appendix to this report.

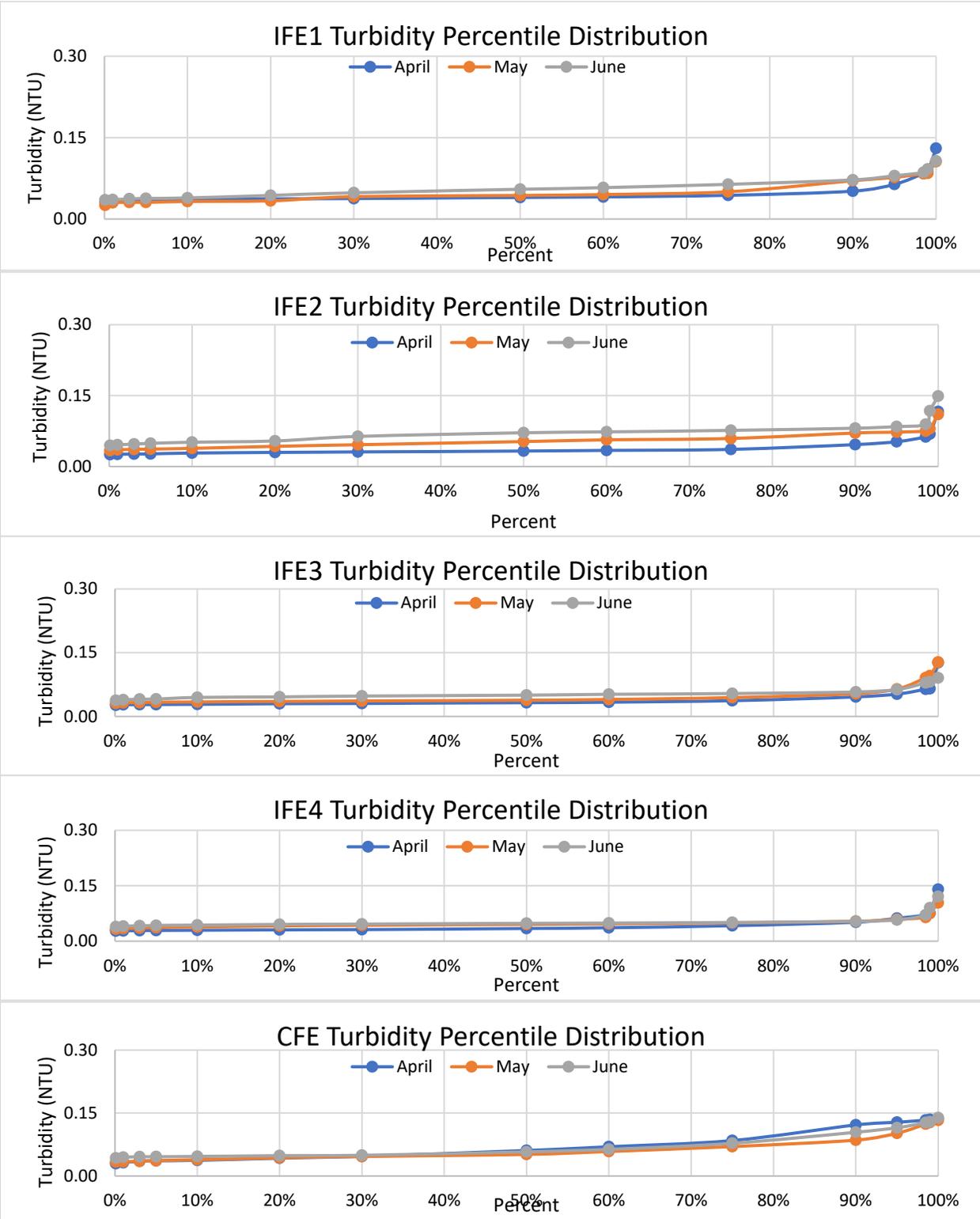
Parameter	Proposed Regulatory Limit	Non-Regulatory Action/Goal
EPA Drinking Water Primary Maximum Contaminant Levels (MCLs)	Meet all primary MCLs	N/A
Total Nitrogen	5 mg/L Monthly Average; 8 mg/L Max Daily	Secondary Effluent Critical Control Point (CCP) Action Limit for Total Inorganic Nitrogen (TIN) = 5 mg/L-N; CCP Action Limit for SWIFT Water Total Nitrogen (TN) = 5 mg/L-N
Turbidity	Individual Filter Effluent (IFE) < 0.15 NTU 95% of time and never >0.3 NTU in two consecutive 15 min measurements	CCP Action Limit IFE of 0.10 NTU to initiate backwash or place a filter in standby
Total Organic Carbon (TOC) <sup>1</sup>	4 mg/L Monthly Average; 6 mg/L Maximum Daily	Critical Operating Point (COP) Action Limit to Initiate GAC Regeneration
Total Coliform <sup>2</sup>	<2 CFU/100 mL for 95% of calendar month observations, applied as the 95 <sup>th</sup> percentile	N/A
E.coli	Non-detect	N/A
TDS <sup>3</sup>	N/A	Monitor PAS Compatibility

**Table 1: SRC Regulatory and Monitoring Limits for SWIFT Water**

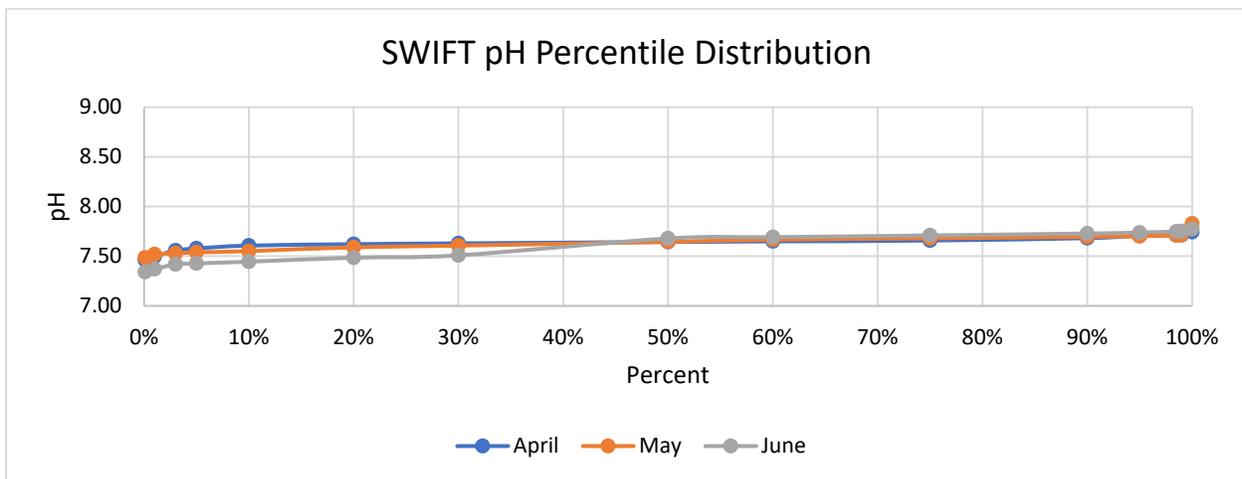
<sup>1</sup> Regulatory limit applies to the TOC laboratory analysis which is collected at a frequency of 3 times per week.

<sup>2</sup> The TC monitoring and compliance evaluation reflects an update effective in January 2020 following consultation with the Virginia Department of Health and EPA Region III UIC staff.

<sup>3</sup> No limit for TDS proposed as the primary driver is aquifer compatibility. The concentration of TDS in SWIFT Water at the SRC generally ranges from 500-850 mg/L.



**Figure 1: Percentile distribution of 15-minute average Individual Filter Effluent (IFE) Turbidities for Biofilters 1-4 (IFE1-4) and Biofilter Combined Filter Effluent (CFE).** There were no 15-minute periods in this quarter with biofilter effluent turbidity values greater than 0.3 NTU. The 95% measured value for each biofilter IFE and the CFE was less than 0.15 NTU for each month in this quarter.



**Figure 2: Distribution of Monthly SWIFT Water pH values.**

Monitoring at the SRC also includes monitoring for performance indicators as documented in Table 2.

Constituent	Category	Trigger Value	Unit	Notes
1,4-Dioxane	Public Health	1	µg/L	CCL4; CA Notification Limit
17-β-Estradiol	Public Health	0.9 <sup>1</sup>	ng/L range	CCL4
DEET	Public Health	200	µg/L	MN Health Guidance Value
Ethinyl Estradiol	Public Health	280 <sup>1</sup>	ng/L range	CCL4
NDMA	Public Health	10	ng/L	CCL4; CA Notification Limit
Perchlorate	Public Health	6	µg/L	CA Notification Limit
PFOA+PFOS	Public Health	70	ng/L	CCL4; EPA Health Advisory
TCEP	Public Health	5	µg/L	MN Health Guidance Value
Cotinine	Treatment Effectiveness	1	µg/L	Surrogate for low molecular weight, partially charged cyclics
Primidone	Treatment Effectiveness	10	µg/L	
Phenytoin	Treatment Effectiveness	2	µg/L	
Meprobamate	Treatment Effectiveness	200	µg/L	High occurrence in wastewater treatment plant effluent
Atenolol	Treatment Effectiveness	4	µg/L	
Carbamazepine	Treatment Effectiveness	10	µg/L	Unique structure
Estrone	Treatment Effectiveness	320	ng/L	Surrogate for steroids
Sucralose	Treatment Effectiveness	150	mg/L	Surrogate for water soluble, uncharged chemicals with moderate molecular weight
Triclosan	Treatment Effectiveness	2,100	µg/L	Chemical of interest

<sup>1</sup> Identified as “To Be Determined” in the UIC-IIP. Since that time, threshold values were identified in *Monitoring Strategies for Constituents of Emerging Concern (CECs) in Recycled Water, Recommendations of a Science Advisory Panel, 2018; SCCWRP Technical Report 1032.*

**Table 2: SRC Non-Regulatory Performance Indicators**

Pathogen Log Removal Value (LRV) is not strictly regulated but the SRC has been designed and is operated to achieve at least 12 LRV for viruses and 10 LRV for *Cryptosporidium* and *Giardia* through a combination of advanced treatment processes and soil aquifer treatment. Table 3 provides a treatment process pathogen LRV summary for recharge conditions. Table 4 provides additional monitoring that is being completed to document compliance with the LRVs for ozone and UV.

Parameter	Floc/Sed (+BAC)	Ozone	BAC+GAC	UV	Cl2	SAT	Total
Enteric Viruses	2	0-3 (TBD)	0	4	0-4	6	12-19
<i>Cryptosporidium</i>	4	0	0	6	0	6	16
<i>Giardia</i>	2.5	0-1.5 (TBD)	0	6	0	6	14.5-16

**Table 3: SRC Pathogen LRV for Potomac Aquifer System (PAS) Recharge.**

<b>Ozone LRV</b>
Ozone Influent Temperature
Ozone Influent Flow
Liquid Phase Ozone Concentration <sup>1</sup>
Contact Time
CT
<b>UV LRV</b>
UV Intensity, each reactor
UVT, GAC Combined Effluent
Reactor Flow, each
Calculated Dose, each Lamp
Status, each

<sup>1</sup> The ozone liquid phase probe is verified with lab grab samples performed at least once per week.

**Table 4: Additional Monitoring to Support Ozone and UV LRV.** All data are collected as continuous measurements. The 15-minute LRV data is submitted in Table 6.

## Critical Control Points

The SRC incorporates Critical Control Points (CCP) throughout the treatment process, per Attachment G of UIC-IIP, to verify that treatment goals are being met at each of the individual processes. A violation of any CCP means that the SRC may not be producing water that meets the treatment goals and will trigger a diversion of the SWIFT Water so that it is not directed to the recharge well. In most instances, the SRC will continue to operate through the CCP violation, but the SWIFT Water will be diverted back to the Nansmond Plant chlorine contact tanks (CCT).

CCPs have alert values at which point the operator is expected to take action to correct the performance as well as the alarm values at which point an automated response will trigger action and prevent flow from going to the recharge well. Both

the alert and alarm values will be measured consistently for a specified duration before action is taken so that blips in online analyzers do not trigger action. The specific values for the alert and alarm levels will be configured as adjustable set points in the Distributed Control System (DCS) and optimized as needed to meet the water quality requirements.

Table 5 shows the current CCPs in effect at the SRC. Modifications have been made to the CCPs since startup as compared to the original design documents in order to optimize their performance. No modifications to the CCPs were made this quarter. Each of the modifications from previous quarters was discussed in the relevant quarterly report for the period.

Parameter	Alert Value	Alarm Value	Unit	Action
<b>Critical Control Points (CCPs)</b>				
Influent Pump Station Conductivity	1,400	1,600	microSiemens per centimeter	Place Biofilters in Filter To Waste
Influent Pump Station Total Inorganic Nitrogen	4.0	5.0	mg/L-N	Place Biofilters in Filter To Waste
Influent Pump Station Turbidity	3.5	5.0	NTU	Place Biofilters in Filter To Waste
Preformed Chloramine Failure on Injection	N/A	Failure	mg/L	Divert SWIFT Water
Total Chlorine Post Injection upstream of ozone	2.0	1.0	mg/L	Divert SWIFT Water
Chloramine injection upstream of ozone	2.0	1.0	mg/L	Divert SWIFT Water
Ozone Feed	N/A	Failure	N/A	Open Biofilter Backwash Waste Valve
Ozone Contactor Calculated LRV – Virus	<120% LRV Goal	<110% LRV Goal	%	Open Biofilter Backwash Waste Valve
Biofilter Individual Effluent Turbidity	0.1	0.15	NTU	Place That Biofilter in Filter To Waste
Biofilter Combined Filter Effluent Turbidity	0.1	0.15	NTU	Place Biofilters in Filter To Waste
GAC Combined Effluent TOC, instantaneous online analyzer	4.0	5.0	mg/L	Divert SWIFT Water
UV Reactor Dose	<120% of Dose Setpoint	<105% of Dose Setpoint	%	Divert SWIFT Water
GAC Combined Effluent Nitrite	0.25	0.50	mg/L-N	Divert SWIFT Water
SWIFT Water TN	4.5	5.0	mg/L-N	Divert SWIFT Water
Ozone dose	70	80	lbs/day	Place Biofilters in Filter To Waste
Tasting System Free Chlorine CT	<110% of Required CT	<100% of Required CT	mg-min/L	Shut Down Tasting System
Tasting System Total Ammonia	0.1	0.3	mg/L-N	Shut Down Tasting System

**Table 5. Critical Control Points for the SRC**

Table 6: Summary of regulatory monitoring for SWIFT Water

Parameter	Units	Maximum Contaminant Level (MCL) or MCL Goal (MCLG) where numerical MCL not expressed. Values noted for indicator compounds are non-regulatory screening values	Minimum Report Level <sup>1</sup>	Required Monitoring Frequency	April 2021			May 2021			June 2021		
					Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples
<b>Regulatory Parameters</b>													
Total Nitrogen (TN)	mg/L	NA	0.50	Daily <sup>3</sup>	4.1	5.1	17	3.5	4.8	30	3.5	4.7	23
NO <sub>3</sub>	mg/L	10	0.01	Daily <sup>3</sup>	3.5	4.5	17	3.0	4.3	30	3.0	4.2	22
NO <sub>2</sub>	mg/L	1	0.01	Daily <sup>3</sup>	<0.01	<0.01	17	<0.01	<0.01	30	<0.01	<0.01	22
Turbidity	NTU	NA	0.01	Continuous	Figure 1								
Total Organic Carbon (TOC)	mg/L	NA	1.0	3x/Wk <sup>3</sup>	3.2	3.8	13	3.4	3.8	19	3.4	3.8	17
pH		NA	NA	Continuous	Figure 2								
TDS <sup>4</sup>	mg/L	Potomac Aquifer System Range: 694-8,720	2.5	Monthly		658	1		726	1		632	1
<b>Disinfection Byproducts</b>													
Bromate	µg/L	10	0.15	Monthly		1.7	1		2.2	1		2.8	1
<b>Trihalomethanes</b>													
Bromodichloromethane	µg/L		1.0	Monthly		1.8	1		1.5	1		2.6	1
Bromoform	µg/L		1.0	Monthly		3.6	1		7.5	1		7.2	1
Chloroform	µg/L		1.0	Monthly		<1.0	1		<1.0	1		1.1	1
Dibromochloromethane	µg/L		1.0	Monthly		4.8	1		5.8	1		7.9	1
Total Trihalomethanes	µg/L	80				9.2			15			19	
<b>HAAs</b>													
Dichloroacetic acid	µg/L		0.60	Monthly		2.1	1		1.5	1		2.2	1
Trichloroacetic acid	µg/L		0.20	Monthly		0.48	1		0.42	1		<0.20	1
Monochloroacetic acid	µg/L		0.60	Monthly		<0.60	1		<0.60	1		<0.60	1
Bromoacetic acid	µg/L		0.40	Monthly		0.55	1		1.4	1		1.6	1
Dibromoacetic acid	µg/L		0.20	Monthly		6.2	1		9.6	1		8.2	1
Total Haloacetic Acids	µg/L	60				9.3			13			12	
<b>Disinfectants<sup>5</sup></b>													
Monochloramine (as Cl <sub>2</sub> )	mg/L	4		Continuous	0.03	0.04		0.03	0.05		0.03	0.03	
Chlorine (as Cl <sub>2</sub> )	mg/L	4		Continuous	2.29	2.79		2.57	3.54		2.48	2.84	
<b>Inorganic Chemical</b>													
Antimony	µg/L	6	2.00	Monthly		<0.50	1		0.52	1		<2.0	1
Arsenic	µg/L	10	0.60	Monthly		0.34	1		0.95	1		<0.60	1
Barium	mg/L	2	0.005	Monthly		0.005	1		0.006	1		0.006	1
Fluoride	mg/L	4.0	0.05	Monthly	0.76	0.82	17	0.91	0.98	28	0.83	1.0	20
<b>Radionuclides</b>													
Beta particles and photon emitters	pCi/L	4 mrem/yr <sup>6</sup>	3	Monthly		16	1		21	1		18	1
Radium 226	pCi/L	5 (226+228)	0.22	Monthly		0.41	1		<0.22	1		0.86	1
Radium 228	pCi/L	5 (226+228)	0.68	Monthly		0.64	1		<0.68	1		<0.68	1
<b>Non-regulatory Performance Indicators</b>													
<b>Public Health Indicators</b>		<b>Trigger Limits</b>											
1,4-dioxane	µg/L	1	0.06	Quarterly	0.27	0.29	3	0.35	0.37	4	0.31	0.33	3
NDMA	ng/L	10	2.0	Quarterly	<2.0	<2.0	3	<2.0	2.6	4	<2.0	<2.0	3
Perfluorooctanoic Acid (PFOA)	ng/L	70 (PFOA+PFOS)	2.0	Quarterly		9.3	1						
Perfluorooctanesulfonic Acid (PFOS)	ng/L	70 (PFOA+PFOS)	2.0	Quarterly		4.3	1						

**Table 6: Summary of regulatory monitoring for SWIFT Water**

Parameter	Units	Maximum Contaminant Level (MCL) or MCL Goal (MCLG) where numerical MCL not expressed. Values noted for indicator compounds are non-regulatory screening values	Minimum Report Level <sup>1</sup>	Required Monitoring Frequency	April 2021			May 2021			June 2021		
					Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples
<b>Treatment Efficacy Indicators</b>		<b>Trigger Limits</b>											
Primidone	ng/L	10,000	50	Quarterly		86	1						
Sucralose	ng/L	150,000,000	1,000	Quarterly		11,000 (R7)	1		27,000	1		8,700	1
<b>Additional Monitoring (Ozone &amp; UV LRV)</b>					<b>Average</b>	<b>Minimum</b>		<b>Average</b>	<b>Minimum</b>		<b>Average</b>	<b>Minimum</b>	
Ozone Virus LRV				Continuous	4.63	3.51		4.54	3.73		4.54	3.59	
Ozone Giardia LRV				Continuous	2.37	1.84		2.26	1.87		2.13	1.71	
UV Dose Reactor 1	mJ/cm <sup>2</sup>			Continuous	>186	>186		>186	>186		>186	>186	
UV Virus LRV Reactor 1				Continuous	>4	>4		>4	>4		>4	>4	
UV Dose Reactor 2	mJ/cm <sup>2</sup>			Continuous	>186	>186		>186	>186		>186	>186	
UV Virus LRV Reactor 2				Continuous	>4	>4		>4	>4		>4	>4	

<sup>1</sup> When minimum reporting limits varied during the quarter, the highest minimum reporting limit used is identified.

<sup>2</sup> Analytical results less than the reporting limit were treated as zero for the purposes of the averaging calculation.

<sup>3</sup> Daily samples are typically not collected on days in which there is no or limited recharge. TOC sample collection occurs routinely on Monday through Friday when recharging. Limited or inconsistent recharge impacts the collection of daily samples, particularly for the microbiological samples collected for total coliform and E coli which have limited holding time requirements. In April, limited or no recharge impacted 13 days of sampling. In May, limited recharge impacted one day of sampling. In June, limited recharge impacted seven days of sampling. An additional day of sampling in June was impacted for the short holding time samples: nitrate, nitrite and microbiological analyses. Recharge was disrupted before these samples could be collected.

<sup>4</sup> TDS of the Potomac Aquifer System is based on the averages within the upper, middle and lower Potomac Aquifer as determined during baseline monitoring.

<sup>5</sup> The maximum residual disinfectant level (or MRDL) MCL for monochloramine and chlorine are based on annual averages.

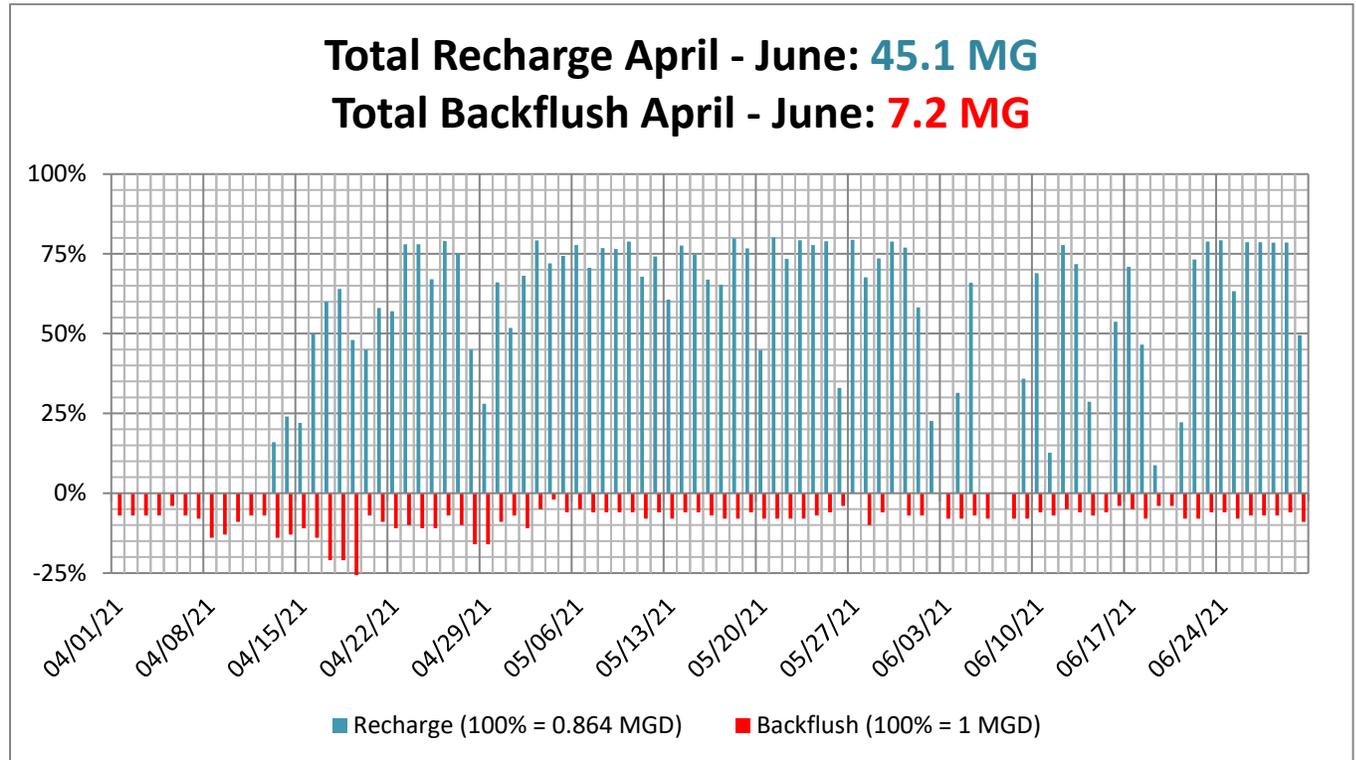
<sup>6</sup> The measurement unit for beta particles and photon emitters is pCi/L while the MCL is expressed as mrem/yr. Per EPA's Implementation Guidance for Radionuclides (EPA 816-F-00-002, March 2002), the screening threshold for beta particles and photon emitters is 50 pCi/L. If sample concentrations exceed 50 pCi/L, each individual beta particle and photon emitter is converted from pCi/L to mrem using the EPA designated conversion tables, currently available in the referenced document.

Contract Laboratory Flags

R7 - LFB/LFBD RPD exceeded the laboratory acceptance limit. Recovery met acceptance criteria.

## Recharge Statistics

The total volume recharged during this operational period was 45.1 million gallons. The backflushed volume was 7.2 million gallons for a net recharge of 37.9 million gallons (Figure 3). Brief backflushing periods occur as part of routine well maintenance on an approximate daily basis. From the start of operation through the end of this reporting period, the SRC has recharged a total volume of 475.4 million gallons.

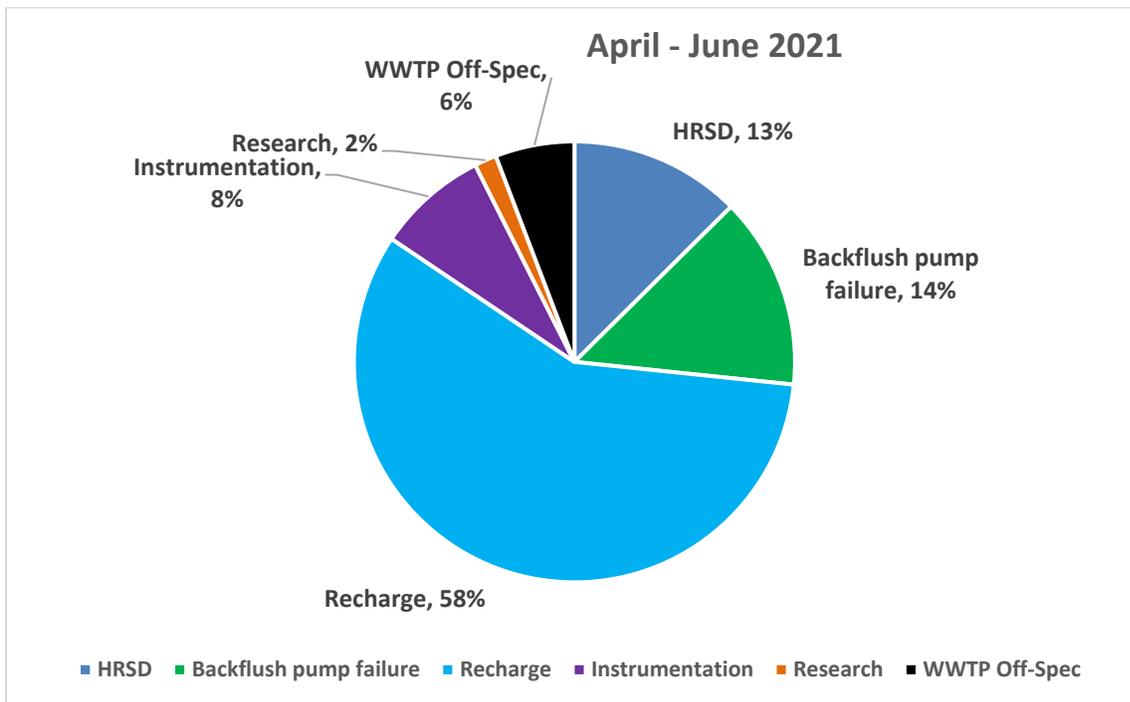


**Figure 3: Recharge and Backflush Volumes, April 1 – June 30, 2021**

HRSD has developed an internal target to recharge 75% of a SWIFT facility's operational capacity. This is a particularly relevant planning target for full-scale operations and HRSD is striving to meet this target at the SRC. Operational redundancies will exist at full-scale facilities (e.g., multiple recharge wells) which will likely result in a higher rate of recharge at full-scale.

The well rehabilitation completed in Quarter 1 of 2021 was effective at cleaning the plugged well screens, however unable to restore full injection capacity of the recharge well. As a result, the well recharge target was adjusted to 600 gallons per minute (gpm, equivalent to 0.864 MGD), down from 700 gpm (~1 MGD). Until a more invasive rehabilitation can occur following the installation of a second recharge well (construction currently underway), recharge well capacity will be monitored and the recharge flow will be adjusted accordingly; the SRC 75% target will be evaluated against the adjusted

flow. Figure 4 depicts the operational activity for this monitoring period identifying the percentage of operational time spent in recharge as well as the general factors precluding recharge.

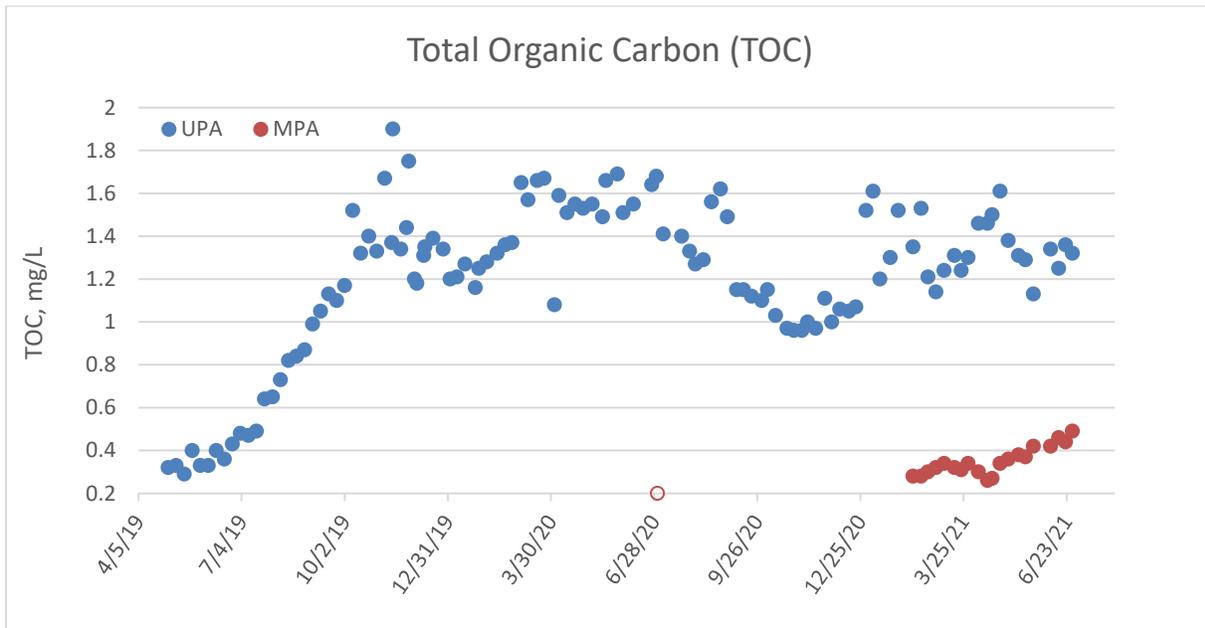


**Figure 4: Operational activity for monitoring period.** Notes: *Recharge*: Recharge of SWIFT Water; *Backflush pump failure*: Period of shutdown due to a catastrophic failure with the backflush pump; *WWTP Off-Spec*: Influent to the SWIFT facility (wastewater facility secondary clarifier effluent) does not meet influent quality requirements (e.g. elevated TOC or TN, or WWTP repairs); *HRSD*: Broad category covering activity within SWIFT facility that may lead to shut-down (e.g. maintenance and repairs, operational problems); *Instrumentation*: On-line analyzer and/or instrumentation maintenance and repair; *Research*: Recharge suspended to accommodate research activities.

### Conventional Monitoring Wells

The conventional monitoring well for the upper zone of the Potomac Aquifer (MW-UPA), located approximately 400 ft from the recharge well, has been routinely monitored to detect the arrival of the recharge front. The recharge front arrived at MW-UPA in the fall of 2019 as evidenced by increasing Total Organic Carbon (TOC) concentrations. TOC observations in the monitoring wells located in the middle and lower zones of the Potomac Aquifer (MW-MPA, MW-LPA) remain < 1.0 mg/L. However, a gradual increase in TOC has been observed in MW-MPA in 2021 and 1,4 dioxane has been detected near the reporting limit consistently since late December of 2020 in MW-MPA (Figure 5 and Table 7). This indicates that the recharge front is beginning to be detected in the MW-MPA. With the exception of the data presented in Table 7, all indicator data are less than the detection limit during this monitoring period. All reported values for these indicators are less than the action thresholds (“trigger values”) identified in Table 2 of this report. Further, results for all regulatory parameters are less than the PMCL and all

regulated organics were non-detect. Nitrite and arsenic observations are described in further detail in the sections below.



**Figure 5: TOC concentration in the Upper and Middle Potomac conventional monitoring wells, MW-UPA and MW-MPA.** Open symbols denote values < the detection limit of 0.2 mg/L.

**Table 7: Indicator compounds quantified in MW-UPA and MW-MPA.** Average values are not calculated when the maximum value reported represents a single sample. During the 2020 operational period, SWIFT Water had an average concentration of 0.33 µg/L of 1,4-dioxane and 10,648 ng/L of sucralose. Contract Lab flagged data, R7: Lab Fortified Blank (LFB)/LFB Duplicate Relative Percent Difference (RPD) exceeded the laboratory acceptance limit. Recovery met acceptance criteria.

		MW-UPA		MW-MPA
		Sucralose, ng/L	1,4-Dioxane, µg/L	1,4-Dioxane, µg/L
Jan 2021	Max	580	0.55	0.08
	Avg	-	0.45	0.07
Feb 2021	Max	470	0.42	0.07
	Avg	-	0.42	<0.06
Mar 2021	Max	990	0.41	<0.06
	Avg	-	0.40	<0.06
Apr 2021	Max	1,200	0.43	<0.06
	Avg	-	0.41	<0.06
May 2021	Max	<1,000	0.43	0.08
	Avg	-	0.40	0.07
Jun 2021	Max	680, R7	0.45	0.1
	Avg	-	0.42	0.08

### **Nitrite in MW-SAT Update**

HRSD continues to monitor nitrite levels within the monitoring well located 50 ft from the recharge well, MW-SAT, and the conventional wells to better understand the occurrence of in situ partial denitrification and the potential for nitrite migration with the recharge front. Nitrite concentration in all screen intervals with the exception of Screen Interval 9 for this monitoring period is < 0.1 mg/L. In Screen 9, the maximum nitrite concentration observed during the monitoring period is 0.15 mg/L. Nitrite remains < 0.01 mg/L in MW-UPA and nitrite concentration in SWIFT Water during this operational period is < 0.01 mg/L (Table 6).

### **Arsenic in MW-SAT Update**

HRSD continues to closely track arsenic concentrations in MW-SAT following an observed increase in arsenic in screen interval 9 in May 2019. It was hypothesized at the time that the well rehabilitation immediately preceding the arsenic spike was a potential contributing factor. The SRC ceased operation in January 2021 to allow for another well inspection and rehabilitation due to observed losses in recharge capacity. This rehabilitation was complete in March 2021 and, in an effort to mitigate the potential for mobilizing arsenic, the well was backflushed for an extended period and monitored to ensure that all surfactants and rehab treatments were completely removed. Recharge operations resumed in April 2021.

As of this time, arsenic concentration in all but one of the screen intervals remains less than 4 µg /L. Interval 9 has the highest observed arsenic concentrations, with a maximum value of 5.1 µg /L in April and decreasing to a maximum of 3.3 µg/L in June. This could indicate that the mitigation step was successful or it may be because the conditions which contributed to the increased arsenic concentrations following the previous well rehab were not present this time. HRSD will continue weekly monitoring during recharge in the screens of MW-SAT and in MW-UPA for the next operational quarter. If trends continue to decline, monitoring will be reduced to monthly. Sample results for screen intervals with an observed a maximum monthly concentration > 1.50 µg/L are documented in Table 8.

**Table 8: Total arsenic concentration in selected screen intervals of MW-SAT.** Total arsenic concentration in the remaining screen intervals was  $\leq 1.50$   $\mu\text{g/L}$  in each month of the monitoring period. Total arsenic concentration observations in the conventional monitoring well, MW-UPA as well as SWIFT Water are  $<1.00$   $\mu\text{g/L}$  during this monitoring period.

MW-Sat Screen	Total Arsenic, $\mu\text{g/L}$					
	April 2021		May 2021		June 2021	
	Max	Avg	Max	Avg	Max	Avg
2	2.0	1.7	2.6	2.1	1.2	1.1
3	1.8	1.7	1.8	1.6	1.4	1.4
4	1.1	1.1	1.6	1.5	1.4	1.3
5	2.8	2.3	2.4	1.7	1.4	1.3
8	2.2	2.0	3.5	3.0	3.5	2.2
9	5.1	3.9	4.0	2.8	3.3	2.8
10	1.8	1.7	1.5	1.1	1.3	1.0

Appendix  
SRC Monitoring Data for SWIFT Water Quality Regulatory Targets

Parameter	Units	Maximum Contaminant Level (MCL) or MCL Goal (MCLG) where numerical MCL not expressed. Values noted for indicator compounds are non-regulatory screening values	Minimum Report Level <sup>1</sup>	Required Monitoring Frequency	April 2021			May 2021			June 2021		
					Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples
<b>Regulatory Parameters</b>													
Total Nitrogen (TN)	mg/L	NA	0.50	Daily <sup>3</sup>	4.1	5.1	17	3.5	4.8	30	3.5	4.7	23
NO <sub>3</sub>	mg/L	10	0.01	Daily <sup>3</sup>	3.5	4.5	17	3.0	4.3	30	3.0	4.2	22
NO <sub>2</sub>	mg/L	1	0.01	Daily <sup>3</sup>	<0.01	<0.01	17	<0.01	<0.01	30	<0.01	<0.01	22
Turbidity	NTU	NA	0.01	Continuous	Figure 1								
Total Organic Carbon (TOC)	mg/L	NA	1.0	3x/Wk <sup>3</sup>	3.2	3.8	13	3.4	3.8	19	3.4	3.8	17
pH		NA	NA	Continuous	Figure 2								
TDS <sup>4</sup>	mg/L	Potomac Aquifer System Range: 694-8,720	2.5	Monthly		658	1		726	1		632	1
<b>Microorganisms</b>													
Total Coliform	MPN/100 mL	MCLG = 0	1	Daily <sup>3</sup>	<1	<1	17	<1	<1	30	<1	<1	22
E. coli	MPN/100 mL	NA	1	Weekly	<1	<1	17	<1	<1	30	<1	<1	22
Cryptosporidium	oocysts/L	Treatment Technique, MCLG = 0	0.098	Quarterly		<0.098	1						
Giardia lamblia	oocysts/L	Treatment Technique, MCLG = 0	0.098	Quarterly		<0.098	1						
Legionella	MPN/100 mL	Treatment Technique, MCLG = 0	10	Quarterly		<10	1						
<b>Disinfection Byproducts</b>													
Bromate	µg/L	10	0.15	Monthly		1.7	1		2.2	1		2.8	1
Chlorite	mg/L	1.0	0.10	Monthly		<0.10	1		<0.10	1		<0.10	1
<b>Trihalomethanes</b>													
Bromodichloromethane	µg/L		1.0	Monthly		1.8	1		1.5	1		2.6	1
Bromoform	µg/L		1.0	Monthly		3.6	1		7.5	1		7.2	1
Chloroform	µg/L		1.0	Monthly		<1.0	1		<1.0	1		1.1	1
Dibromochloromethane	µg/L		1.0	Monthly		4.8	1		5.8	1		7.9	1
Total Trihalomethanes	µg/L	80				9.2			15			19	
<b>HAAs</b>													
Dichloroacetic acid	µg/L		0.60	Monthly		2.1	1		1.5	1		2.2	1
Trichloroacetic acid	µg/L		0.20	Monthly		0.48	1		0.42	1		<0.20	1
Monochloroacetic acid	µg/L		0.60	Monthly		<0.60	1		<0.60	1		<0.60	1
Bromoacetic acid	µg/L		0.40	Monthly		0.55	1		1.4	1		1.6	1
Dibromoacetic acid	µg/L		0.20	Monthly		6.2	1		9.6	1		8.2	1
Total Haloacetic Acids	µg/L	60				9.3			13			12	
<b>Disinfectants<sup>5</sup></b>													
Monochloramine (as Cl <sub>2</sub> )	mg/L	4		Continuous	0.03	0.04		0.03	0.05		0.03	0.03	
Chlorine (as Cl <sub>2</sub> )	mg/L	4		Continuous	2.29	2.79		2.57	3.54		2.48	2.84	
<b>Inorganic Chemical</b>													
Antimony	µg/L	6	2.00	Monthly		<0.50	1		0.52	1		<2.0	1
Arsenic	µg/L	10	0.60	Monthly		0.34	1		0.95	1		<0.60	1
Asbestos	MFL	7	0.20	Monthly		<0.18	1		<0.18	1		<0.20	1
Barium	mg/L	2	0.005	Monthly		0.005	1		0.006	1		0.006	1
Beryllium	µg/L	4	0.10	Monthly		<0.10	1		<0.10	1		<0.10	1

Appendix  
SRC Monitoring Data for SWIFT Water Quality Regulatory Targets

Parameter	Units	Maximum Contaminant Level (MCL) or MCL Goal (MCLG) where numerical MCL not expressed. Values noted for indicator compounds are non-regulatory screening values	Minimum Report Level <sup>1</sup>	Required Monitoring Frequency	April 2021			May 2021			June 2021		
					Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples
Cadmium	µg/L	5	0.10	Monthly		<0.10	1		<0.10	1		<0.10	1
Chromium (total)	µg/L	100	5.0	Monthly		<5.0	1		<5.0	1		<5.0	1
Copper	mg/L	1.3 (action level)	0.005	Monthly		<0.005	1		<0.005	1		<0.005	1
Cyanide (total)	µg/L	200	10	Monthly		<10	1		<10	1		<10	1
Fluoride	mg/L	4.0	0.05	Monthly	0.76	0.82	17	0.91	0.98	28	0.83	1.0	20
Lead	µg/L	15 (action level)	0.10	Monthly		<0.10	1		<0.10	1		<0.10	1
Mercury	µg/L	2	0.10	Monthly		<0.10	1		<0.10	1		<0.10	1
Selenium	µg/L	50	5.0	Monthly		<5.0	1		<5.0	1		<5.0	1
Thallium	µg/L	2	0.20	Monthly		<0.10	1		<0.10	1		<0.20	1
<b>Organic Chemicals</b>													
Acrylamide	µg/L	Treatment Technique, MCLG = 0	0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
Alachlor	µg/L	2	0.1	Monthly		<0.1	1		<0.05	1		<0.05	1
Atrazine	µg/L	3	0.1	Monthly		<0.1	1		<0.05	1		<0.05	1
Benzo(a)pyrene (PAHs)	µg/L	0.2	0.02	Monthly		<0.02	1		<0.02	1		<0.02	1
Di(2-ethylhexyl) adipate	µg/L	400	0.6	Monthly		<0.6	1		<0.6	1		<0.6	1
Di(2-ethylhexyl) phthalate	µg/L	6	0.6	Monthly		<0.6	1		<0.6	1		<0.6	1
Hexachlorocyclopentadiene	µg/L	50	0.1	Monthly		<0.1	1		<0.05	1		<0.05	1
Hexachlorobenzene	µg/L	1	0.1	Monthly		<0.1	1		<0.05	1		<0.05	1
Simazine	µg/L	4	0.07	Monthly		<0.07	1		<0.05	1		<0.05	1
Carbofuran	µg/L	40	0.5	Monthly		<0.5	1		<0.5	1		<0.5	1
Oxamyl (Vydate)	µg/L	200	0.5	Monthly		<0.5	1		<0.5	1		<0.5	1
Chlordane	µg/L	2	0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
Endrin	µg/L	2	0.01	Monthly		<0.01	1		<0.01	1		<0.01	1
Heptachlor	µg/L	0.4	0.01	Monthly		<0.01	1		<0.01	1		<0.01	1
Heptachlor Epoxide	µg/L	0.2	0.01	Monthly		<0.01	1		<0.01	1		<0.01	1
Lindane	µg/L	0.2	0.01	Monthly		<0.01	1		<0.01	1		<0.01	1
Methoxychlor	µg/L	40	0.05	Monthly		<0.05	1		<0.05	1		<0.05	1
Toxaphene	µg/L	3	0.5	Monthly		<0.5	1		<0.5	1		<0.5	1
PCB Arochlor1016	µg/L		0.08	Monthly		<0.08	1		<0.08	1		<0.08	1
PCB Arochlor1221	µg/L		0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
PCB Arochlor1232	µg/L		0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
PCB Arochlor1242	µg/L		0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
PCB Arochlor1248	µg/L		0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
PCB Arochlor1254	µg/L		0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
PCB Arochlor1260	µg/L		0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
Total Polychlorinated Biphenyls (PCBs)	µg/L	0.5				<0.5	1		<0.5	1		<0.5	1
2,4-D	µg/L	70	0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
Dalapon	µg/L	200	1	Monthly		<1	1		<1	1		<1	1
Picloram	µg/L	500	0.1	Monthly		<0.1	1		<0.1	1		<0.1	1
2,4,5-TP (Silvex)	µg/L	50	0.2	Monthly		<0.2	1		<0.2	1		<0.2	1
Dinoseb	µg/L	7	0.2	Monthly		<0.2	1		<0.2	1		<0.2	1
Pentachlorophenol	µg/L	1	0.04	Monthly		<0.04	1		<0.04	1		<0.04	1

Appendix  
SRC Monitoring Data for SWIFT Water Quality Regulatory Targets

Parameter	Units	Maximum Contaminant Level (MCL) or MCL Goal (MCLG) where numerical MCL not expressed. Values noted for indicator compounds are non-regulatory screening values	Minimum Report Level <sup>1</sup>	Required Monitoring Frequency	April 2021			May 2021			June 2021		
					Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples
Dioxin (2,3,7,8-TCDD)	pg/L	30	5	Monthly		<5	1		<5	1		<5	1
Diquat	µg/L	20	0.4	Monthly		<0.4	1		<0.4	1		<0.4	1
Endothall	µg/L	100	5	Monthly		<5	1		<5	1		<5	1
Epichlorohydrin	µg/L	Treatment Technique, MCLG = 0	0.4	Monthly		<0.4	1		<0.4	1		<0.4	1
Glyphosphate	µg/L	700	6	Monthly		<6	1		<6	1		<6	1
Benzene	µg/L	5	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Carbon Tetrachloride	µg/L	5	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Chlorobenzene	µg/L	100	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
2-dibromo-3-chloropropane (DBCP)	µg/L	0.2	0.02	Monthly		<0.02	1		<0.02	1		<0.02	1
o-Dichlorobenzene	µg/L	600	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
p-Dichlorobenzene	µg/L	75	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
1,2-Dichloroethane	µg/L	5	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
1,1-Dichloroethylene	µg/L	7	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
cis-1,2-Dichloroethylene	µg/L	70	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
trans-1,2-Dichloroethylene	µg/L	100	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Dichloromethane	µg/L	5	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
1,2-Dichloropropane	µg/L	5	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Ethylbenzene	µg/L	700	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Ethylene Dibromide (EDB)	µg/L	0.05	0.02	Monthly		<0.02	1		<0.02	1		<0.02	1
Styrene	µg/L	100	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Tetrachloroethylene	µg/L	5	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Toluene	µg/L	1,000	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
1,2,4-Trichlorobenzene	µg/L	70	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
1,1,1-Trichloroethane	µg/L	200	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
1,1,2-Trichloroethane	µg/L	5	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Trichloroethylene	µg/L	5	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
Vinyl Chloride	µg/L	2	1.0	Monthly		<1.0	1		<1.0	1		<1.0	1
p/m-Xylene	µg/L		2.0	Monthly									
o-Xylene	µg/L		1.0	Monthly									
Total Xylene	µg/L	10,000	3.0	Monthly		<3.0	1		<3.0	1		<3.0	1
<b>Radionuclides</b>													
Alpha particles	pCi/L	15	3	Monthly		<3	1		<3	1		<3	1
Beta particles and photon emitters	pCi/L	4 mrem/yr <sup>6</sup>	3	Monthly		16	1		21	1		18	1
Radium 226	pCi/L	5 (226+228)	0.22	Monthly		0.41	1		<0.22	1		0.86	1
Radium 228	pCi/L	5 (226+228)	0.68	Monthly		<0.64	1		<0.68	1		<0.68	1
Uranium	µg/L	30	0.1	Monthly		<0.10	1		<0.10	1		<0.1	1
Strontium-90	pCi/L	NA	0.992	Monthly		<0.462	1		<0.992	1		<0.963	1
Tritium	pCi/L	NA	408	Monthly		<408	1		<269	1		<362	1

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Parameter	Units	Maximum Contaminant Level (MCL) or MCL Goal (MCLG) where numerical MCL not expressed. Values noted for indicator compounds are non-regulatory screening values	Minimum Report Level <sup>1</sup>	Required Monitoring Frequency	April 2021			May 2021			June 2021		
					Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples	Average <sup>2</sup>	Maximum	Numer of Samples
<b>Non-regulatory Performance Indicators</b>													
<b>Public Health Indicators</b>		<b>Trigger Limits</b>											
1,4-dioxane	µg/L	1	0.06	Quarterly	0.27	0.29	3	0.35	0.37	4	0.31	0.33	3
17-β-estradiol	ng/L	0.9	0.40	Quarterly								<0.40	1
DEET	ng/L	200,000	100	Quarterly		<100	1						
Ethinyl estradiol	ng/L	280	0.90	Quarterly			1					<0.90	1
tris(2-carboxyethyl)phosphine (TCEP)	ng/L	5,000	100	Quarterly		<100	1						
NDMA	ng/L	10	2.0	Quarterly	<2.0	<2.0	3	<2.0	2.6	4	<2.0	<2.0	3
Perchlorate	µg/L	6	0.5	Quarterly		<0.5	1						
Perfluorooctanoic Acid (PFOA)	ng/L	70 (PFOA+PFOS)	2.0	Quarterly		9.3	1						
Perfluorooctanesulfonic Acid (PFOS)	ng/L	70 (PFOA+PFOS)	2.0	Quarterly		4.3	1						
<b>Treatment Efficacy Indicators</b>		<b>Trigger Limits</b>											
Cotinine	ng/L	1,000	100	Quarterly		<100	1						
Primidone	ng/L	10,000	50	Quarterly		86	1						
Phenytoin (Dilantin)	ng/L	2,000	200	Quarterly		<200	1						
Meprobamate	ng/L	200,000	50	Quarterly		<50	1						
Atenolol	ng/L	4,000	50	Quarterly		<50	1						
Carbamazepine	ng/L	10,000	50	Quarterly		<50	1						
Estrone	ng/L	320,000	2.0	Quarterly								<2.0	1
Sucralose	ng/L	150,000,000	1,000	Quarterly		11,000 (R7)	1		27,000	1		8,700	1
Triclosan	ng/L	210,000	250	Quarterly		<25	1		<250	1		<25	1
<b>Additional Monitoring (Ozone &amp; UV LRV)</b>													
Ozone Virus LRV				Continuous	Average	Minimum		Average	Minimum		Average	Minimum	
Ozone Giardia LRV				Continuous	4.63	3.51		4.54	3.73		4.54	3.59	
UV Dose Reactor 1	mJ/cm <sup>2</sup>			Continuous	2.37	1.84		2.26	1.87		2.13	1.71	
UV Virus LRV Reactor 1				Continuous	>186	>186		>186	>186		>186	>186	
UV Dose Reactor 2	mJ/cm <sup>2</sup>			Continuous	>4	>4		>4	>4		>4	>4	
UV Virus LRV Reactor 2				Continuous	>186	>186		>186	>186		>186	>186	

<sup>1</sup> When minimum reporting limits varied during the quarter, the highest minimum reporting limit used is identified.

<sup>2</sup> Analytical results less than the reporting limit were treated as zero for the purposes of the averaging calculation.

<sup>3</sup> Daily samples are typically not collected on days in which there is no or limited recharge. TOC sample collection occurs routinely on Monday through Friday when recharging. Limited or inconsistent recharge impacts the collection of daily samples, particularly for the microbiological samples collected for total coliform and E coli which have limited holding time requirements. In April, limited or no recharge impacted 13 days of sampling. In May, limited recharge impacted one day of sampling. In June, limited recharge impacted seven days of sampling. An additional day of sampling in June was impacted for the short holding time samples: nitrate, nitrite and microbiological analyses. Recharge was disrupted before these samples could be collected.

<sup>4</sup> TDS of the Potomac Aquifer System is based on the averages within the upper, middle and lower Potomac Aquifer as determined during baseline monitoring.

<sup>5</sup> The maximum residual disinfectant level (or MRDL) MCL for monochloramine and chlorine are based on annual averages.

<sup>6</sup> The measurement unit for beta particles and photon emitters is pCi/L while the MCL is expressed as mrem/yr. Per EPA's Implementation Guidance for Radionuclides (EPA 816-F-00-002, March 2002), the screening threshold for beta particles and photon emitters is 50 pCi/L. If sample concentrations exceed 50 pCi/L, each individual beta particle and photon emitter is converted from pCi/L to mrem using the EPA designated conversion tables, currently available in the referenced document.

**Contract Laboratory Flags**

R7 - LFB/LFBD RPD exceeded the laboratory acceptance limit. Recovery met acceptance criteria.