

Lake Memphremagog PFAS Sampling - Preliminary Results Update September 16, 2021

Introduction

On July 20 and August 20, 2021, water quality monitoring experts from the Vermont Department of Environmental Conservation (VTDEC) collected water samples from sites in Lake Memphremagog and its tributaries, and in adjacent wastewater effluent. These samples were then analyzed for 36 forms of Per- and Polyfluorinated Alkyl Substances (PFAS), including the five Vermont Regulated PFAS (PFHpA, PFHxS, PFOA, PFNA, PFOS), at an accredited laboratory.

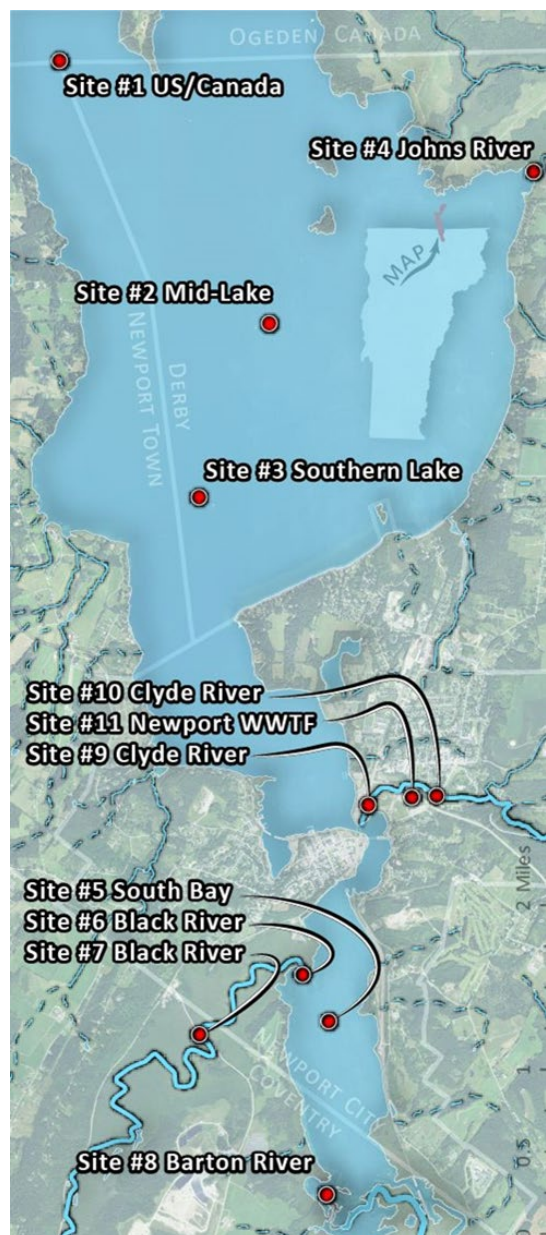
PFAS Surface Water & Effluent Sample Collection Sites

VTDEC collected surface water samples from ten sites within the Lake Memphremagog watershed (Figure 1), including three sites on the Main Lake—a US/Canada border site, a mid-lake site, and southern site. South Bay and four major tributaries—Johns, Clyde, Black, and Barton Rivers—and the Newport City Wastewater Treatment Facility (WWTF) effluent were also sampled.

PFAS Laboratory Analysis Information

Given the sensitivity of PFAS analyses, which are measured in parts per trillion, and potential for field contamination, field duplicates, duplicate blanks, and equipment blanks were collected and analyzed to assess the quality of laboratory analysis and to ensure that cross-contamination during sampling did not occur. Based on US EPA PFAS Method 537.1, each PFAS analyte has a **laboratory reporting limit**, which is defined as the lowest analyte concentration that meets the Data Quality Objectives defined in the method. The laboratory reporting limit is 1.8 nanograms per liter (ng/L or parts per trillion) for

Figure 1. Lake Memphremagog watershed PFAS Sampling Sites



most forms of PFAS. PFAS analyte values below the laboratory reporting limit are defined as **ND** or non-detect in the tables below.

Laboratories typically obtain PFAS analyte results below the laboratory reporting limit but still above a detection limit. These results, as defined in the US EPA Method 537.1, are intended for statistical determination of laboratory equipment precision, and not to produce “accurate quantitation” for the purposes of results reporting. VTDEC received some PFAS results for samples above the detection limit but below the laboratory reporting limit; therefore, per EPA guidelines, the results presented below are only results above the laboratory reporting limits.

Lake and Tributary Preliminary Results

Please note that these results from July 20 and August 20, 2021, are **only preliminary** and there will be one additional round of sampling conducted in October, after which a complete analysis and report with a more detailed interpretation of findings will be produced by VTDEC.

Lake and tributary water samples collected on July 20, 2021 and analyzed for PFAS show concentrations below detection limits for all site samples, with two exceptions—a value of 2.81 ng/L for PFOS in the Main Lake (Site 2) and a value of 2.22 ng/L for PFBA at the mouth of the John’s River (Site 4).

Lake and tributary water samples collected on August 20, 2021 and analyzed for PFAS show concentrations below detection limits for all sites sampled, with two exceptions—a value of 2.48 ng/L for PFBA at the Black River upper site (Site 7) and a value of 1.84 ng/L for PFBA at the mouth of the Clyde River (Site 9). See Tables 1 and 2 below for results of the PFAS sampling on July 20 and August 20, 2021.

These very low concentrations are consistent with PFAS surface water concentrations found in remote areas worldwide and concentrations found in atmospheric precipitation. These values are well below the Vermont drinking water guidance of 20 ng/L (sum of five PFAS analytes).

Table 1. Surface Water PFAS concentrations (ng/L) for the five Vermont regulated PFAS at Vermont Lake Memphremagog sites, collected July 20, 2021.

Site	Main Lake-Border	Main Lake-Mid	Main Lake-South	Johns R.-mouth	South Bay-Center	Black R.-mouth	Black R.-above	Barton R.-mouth	Clyde R.-mouth	Clyde R.-above
Analytes	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
PHFpA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHxS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFOA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFNA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFOS	ND	2.81	ND	ND	ND	ND	ND	ND	ND	ND
PFBA ¹	ND	ND	ND	2.22	ND	ND	ND	ND	ND	ND

¹PFBA is not one of the five Vermont Regulated PFAS

Table 2. Surface Water PFAS concentrations (ng/L) for the five Vermont regulated PFAS at Vermont Lake Memphremagog sites, collected August 20, 2021.

Site	Main Lake- Border	Main Lake- Mid	Main Lake- South	Johns R.- mouth	South Bay- Center	Black R.- mouth	Black R.- above	Barton R.- mouth	Clyde R.- mouth	Clyde R.- above
Analytes	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
PHFpA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHxS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFOA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFNA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFOS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFBA	ND	ND	ND	ND	ND	ND	2.48	ND	1.84	ND

¹PFBA is not one of the five Vermont Regulated PFAS

WWTF Effluent Results

VTDEC collected wastewater effluent samples from the Newport WWTF on July 20 and August 20, 2021. A total of ten PFAS analytes were detected in the Newport City WWTF effluent during these sampling events. See Table 3 for these results.

Table 3. Effluent PFAS detections (ng/L) for the 36 PFAS compounds at Newport WWTF, collected July 20 and August 20, 2021.

Analytes	Newport WWTF Effluent	
	7/20/2021	8/20/2021
Analytes	Site 11	Site 11
PHFpA*	3.66	6.06
PFHxS*	ND	ND
PFOA*	11.4	13.0
PFNA*	2.12	1.91
PFOS*	5.35	6.72
PFBA	19.2	12.6
PFPeA	41.1	53.6
PFBS	6.82	4.38
PFHxA	30.1	31.5
PFDA	4.75	4.24
NMeFOSAA	4.22	3.5

*One of the five Vermont Regulated PFAS

Fish Tissue Sampling

Fish tissue sampling was conducted on August 16 and 17, 2021 at four sites within the Lake Memphremagog watershed by the Vermont Department of Fish & Wildlife. Two of the sites were on the Main Lake, one on South Bay and one on the Clyde River near the mouth below the Newport City WWTF. Fish species collected from each site included Yellow Perch (*Perca flavescens*), Largemouth Bass (*Micropterus salmoides*) and Brown Bullhead (*Ameiurus nebulosus*). Thirty fish tissue samples were analyzed for 36 PFAS compounds to provide baseline data for evaluation.

Of the 36 PFAS analyzed, there were only three PFAS detected above the RL in the fish tissue (PFOS, PFDA, PFUnA). PFOS which is the most bioaccumulative PFAS was detected in all fish tissue samples at very low concentrations, the average fish tissue PFOS concentration was 1.47 µg/kg (ppb). PFDA and PFUnA were detected in five and two fish tissue samples respectively, also at very low concentrations (< 1 µg/kg). Preliminary results from this analysis are presented in Table 4. Complete analysis and detailed interpretation of findings will be included in the final report produced by VTDEC.

Table 4. PFAS Fish Tissue detections and concentrations (µg/kg) for the 36 PFAS compounds analyzed at four sites, collected August 16 and August 17, 2021.

Analytes	No. fish tissue samples detected	Average Concentration µg/kg (ppb)	Range µg/kg (ppb)
PFOS*	30	1.47	0.34 – 4.93
PFDA	5	0.36	0.23 – 0.71
PFUnA	2	0.75	0.68 -0.82

*One of the five Vermont Regulated PFAS

Upcoming Sampling Activities

The third and final PFAS surface water sampling event for 2021 at the Lake Memphremagog sites is scheduled for the second week of October.