2022 Annual Water Quality Report

(Left) Digging of our North Storage Reservoir, circa 1868.

(Bottom) Relining the same Reservoir in 2015. Note that both Reservoirs were covered in 1981 to protect your drinking water.

Burlington Water Resources

A Division of Burlington Public Works

WSID: VT0005053

PARTNERSHIP FOR SAFE WATER

21 year member

We are pleased to present to you our annual water quality report. Since 1867, we've been working hard to provide you with the best drinking water. This report is a snapshot of the quality of water that we provided in 2022. Included are the details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. We've also included notable projects plus news over the past year. We are committed to providing you clean, safe drinking water.

Where Does Your Water Come From?

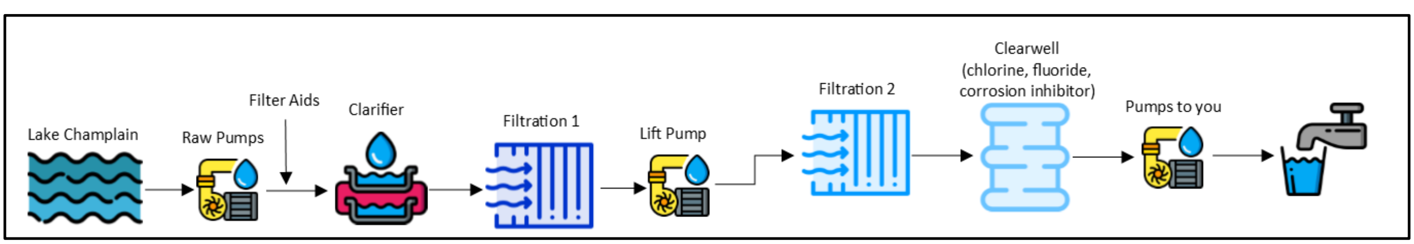
We are fortunate in Burlington to have Lake Champlain as a raw water source. This 12th largest lake in the continental United States provides drinking water for nearly 200,000 people – and recreational opportunities for many, many more. While the high quality of water in the lake makes our drinking water treatment process relatively easy, there are a variety of threats to water quality in the lake. One of the physical characteristics of Lake Champlain that automatically puts it at a disadvantage compared to the Great Lakes is the ratio of watershed size to surface area. Our lake has a Watershed-to-Water ratio of nearly 19 to 1 compared to the Great Lakes' 3 to 1 ratio. That means what we do on the land that drains to Lake Champlain has a potentially greater impact than similar land development in the Great Lakes watersheds. In 2020 we updated our Source Water Protection Plan (available for review upon request) that identifies actual or potential sources of contamination within the watershed plus includes a general plan to specifically address those threats.

LAKE CHAMPLAIN BY THE NUMBERS	
Water Surface Area	435 square miles
Length	120 miles
Width (at widest point)	12 miles
Average Depth	64 feet
Watershed Size	8,234 square miles

The City of Burlington faces a variety of challenges when it comes to the stewardship of our lake – including a number of State and Federal regulatory requirements. In late 2014, Burlington was one of only 5 communities across the country selected by the EPA to receive technical assistance and funding to develop an Integrated Water Quality Plan. Integrated Planning allows communities to examine all of their regulatory and environmental challenges, and prioritize improvements based on what will provide the most efficient benefits up front. To learn more about Burlington's Integrated Planning process, visit www.burlingtonvt.gov/water/integratedplan

How is Your Water Processed?

We filter water twice before sending it out to you. Raw lake water is pumped into our plant from an intake pipe 4200 feet off shore and 45 feet below the water surface. We then add filter aids to that enhance the removal of dissolved and particulate matter from lake water throughout the treatment steps. Large particles are then removed via gravity and settling in clarifiers, and the water is filtered once through anthracite coal and again through sand. We then add chlorine to inactivate any harmful bacteria or viruses that may have made it through our process and to act as a disinfectant throughout the distribution system. Fluoride is added to prevent tooth decay and we add a corrosion inhibitor to keep lead and copper in household plumbing from leaching into the water you drink.



In 2022 we processed and pumped 1.369 billion gallons of water out to you for an annual average daily flow of 3.751 MGD (million gals per day).

What Else Is On Tap?

Last year we had a number of successes:

- After discovering significantly high head losses in our Automatic Backwash Filter (Filtration 1 above), we took this filter offline in the spring and discovered the slotted underdrain pipes were getting progressively clogged with tiny fragments of sand and anthracite breaking off from our filter media over time. We constructed an inflatable plug system and blew out each of the 150+ underdrain pipes using high volumes of water from a connected fire hose. When we shared our solution to the equipment representative, they suggested presenting a paper at a future water trade show. Perhaps we will someday when we can find the time.
- After a search for an engineering firm with qualifications to complete design for capital work at our reservoir, most notably replacing our 1868 reservoir pump station, we selected the Dufresne Group out of Springfield VT to start a process that involves preliminary and then final engineering approval, permitting and bonding for the work. A new station will drastically increase the reliability of water supply to our high service customers, including the hospital and UVM, by allowing us to fully utilize our reservoir depth for pumping.
- We collaborated with VTrans on the Route 7 Shelburne Roundabout project to get 3,000 feet of old water mains replaced under the project scope.
- We replaced 900 and relined 1,050 feet of water mains in select areas of the City. This bond funded project continues in 2023.
- In December we submitted the first draft our latest Operations & Maintenance (O&M) Manual to the State of Vermont for review. Completed entirely in-house, this manual replaces a very old/outdated document and includes a number of plant/equipment modifications over the years plus includes Standard Operating Procedures (SOPs), troubleshooting guidelines and more. A second draft was completed in April 2023 and we expect to review and modify this manual if necessary at least annually moving forward.

In sad news, our Senior Mechanic Gary Lavigne retired in March after 45 years working for the City with the vast majority of his time spent at the Water Plant. He kept this place running 24/7, was always available for emergencies and experienced a number of them over the years. Unfortunately, Gary passed away on Halloween at the age of 69 doing what he loved to do in his spare time – operating heavy machinery. At his service a number of current and former employees showed up to pay their respect plus we heard from a number of family friends who also called him for help in times of need. We wish his wife Josephine and family the very best.

Drinking Water Contaminant Definitions and Data

The sources of drinking water (both tap water and bottled water) include surface water (streams, lakes) and ground water (wells, springs). As water travels over the land's surface or through the ground, it dissolves naturally-occurring minerals. It also picks up substances resulting from the presence of animals and human activity. Some "contaminants" may be harmful. Others, such as iron and sulfur, are not harmful. Public water systems treat water to remove contaminants, if any are present. In order to ensure that your water is safe to drink, we analyze it regularly according to regulations established by the U.S. Environmental Protection Agency and the State of Vermont. These regulations set allowable limits for the amounts of various contaminants in drinking water. Different types of contaminates include the following.

- **Microbial contaminants**, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- **Inorganic contaminants**, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

- **Pesticides and herbicides**, may come from a variety of sources such as storm water run-off, agriculture, and residential users.
- **Radioactive contaminants**, which can be naturally occurring or the result of mining activity
- **Organic contaminants**, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and also come from gas stations, urban storm water run-off, and septic systems.

Terms and Abbreviations

The following tables may include unfamiliar terms and to help you better understand we have provided the following definitions:

Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
Disinfection Byproduct (DBP) - Disinfection byproducts are chemical, organic and inorganic substances that may form during a reaction of a disinfectant with naturally present organic matter in the water.
Level 1 Assessment: A level 1 Assessment is a study of the water system to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system.
Level 2 Assessment: A Level 2 Assessment is a very detailed study of the water system to identify potential problems and determine (if possible) why an E. coli MCL violation has occurred and/or why total coliform bacteria have been found in our water system on multiple occasions.
Locational Running Annual Average (LRAA): The average of sample analytical results for samples taken at a particular monitoring location during four consecutive calendar quarters.
Maximum Contamination Level (MCL): The "Maximum Allowed" MCL is the highest level of a contaminant that is allowed in drinking water. MCL's are set as close to the MCLG's as feasible using the best available treatment technology.
Maximum Contamination Level Goal (MCLG): The "Goal" is the level of a contaminant in drinking water below which there is no known or expected risk to human health. MCLG's allow for a margin of safety.
Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. Addition of a disinfectant may help control microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of disinfectants in controlling microbial contaminants.
Nephelometric Turbidity Unit (NTU): NTU is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.
Parts per million (ppm) or Milligrams per liter (mg/l): (analogous to one penny in ten thousand dollars)
Parts per billion (ppb) or Micrograms per liter (ug/l): (analogous to one penny in ten million dollars)
Parts per trillion (ppt) or Nanograms per liter (ng/l): (analogous to one penny in ten billion dollars)
Picocuries per liter (pCi/L): a measure of radioactivity in water
Primary and Secondary Drinking Water Standards: Primary standards are established to protect the public against consumption of drinking water contaminants that present a risk to human health, while secondary standards are developed to assist public water systems in managing their drinking water for aesthetic considerations such as taste, color, and odor. Secondary standards have Secondary Maximum Contaminant Levels (SMCL) which are general guidelines that are not enforceable.
Running Annual Average (RAA): The average of 4 consecutive quarters (when on quarterly monitoring); values in table represent the highest RAA for the year.
Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.
90th Percentile: Ninety percent of the samples are below the action level. (Nine of ten sites sampled were at or below this level).
Per- and polyfluoroalkyl substances (PFAS): a group of over 4,000 human-made chemicals (they do not occur naturally) that have been used in industry and consumer products worldwide. More information on these compounds is given later in this report.

Water Quality Data

The following tables list all the drinking water contaminants that we detected during the past year. It also includes the date and results of any contaminants that we detected within the past five years if analyzed less than once a year. **The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk.**

Detected Primary Drinking Water Contaminants – Burlington Water

Disinfection Residual	RAA	RANGE	Unit	MRDL	MRDLG	Typical Source
Chlorine	0.882	0.010 – 1.820	mg/l	4	4	Water additive to control microbes

Chemical Contaminants	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
Fluoride	06/6/2022	0.7	0.4 - 0.7	ppm	4	4	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
Nitrate	01/20/2022	0.22	0.22 - 0.22	ppm	10	10	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits

Disinfection ByProducts	Collection Year	Highest LRAA	Range	Unit	MCL	MCLG	Typical Source
Total Trihalomethanes	2022	61	28 - 70	ppb	80	0	By-product of drinking water chlorination
Total Haloacetic Acids (HAA5)	2022	34	0 - 50	ppb	60	0	By-product of drinking water chlorination

Lead and Copper	Collection Year	90th Percentile	Range	Unit	AL*	Sites Over AL	Typical Source
Lead	2021	2.1	0 - 12.8	ppb	15	0	Corrosion of household plumbing systems; Erosion of natural deposits
Copper	2021	0.07	0 - 0.14	ppm	1.3	0	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives

The lead and copper AL (Action Level) exceedance is based on the 90th percentile concentration, not the highest detected result. This sampling occurs every three (3) years.

Detected Secondary Drinking Water Contaminants

Secondary standards were developed to assist public water systems in managing their drinking water for aesthetic considerations such as taste, color, and odor. Secondary standards have a Secondary Maximum Contaminant Level (SMCL) which are general guidelines that are not enforceable. All detected secondary contaminants were below the SMCLs. Samples collected 2/2/22.

Contaminant	Detected Value	SMCL	Comments
Alkalinity, Total	57 ppm	None	Alkalinity is the capacity of water to resist changes in ph.
Aluminum	0.048 ppm	0.2 ppm	Source is most likely from one of the filtration aids we need to use.
Calcium	18 ppm	None	Naturally occurring in surface and ground waters. See Hardness.
Chloride	21 ppm	250 ppm	Primary source in Lake Champlain is from salt used in the winter to keep our roads and sidewalks clear.
Conductivity @ 25C	200 µmhos/cm	None	Compounds like metals and chloride make water more conductive. A micromhos/cm is a unit of measure typically used to describe the conductivity of water.
Hardness as CaCo3	63 ppm or 3.7 grains per gal.	None	Composed of dissolved calcium and magnesium. "Hard" water is considered between 151 – 300 mg/l and can stain clothes and fixtures plus make soaps/detergents difficult to lather.
Iron	<0.020 ppm	0.3 ppm	Rusty water, sediment, metallic taste, reddish or orange staining
Magnesium	4.5 ppm	None	Naturally occurring in surface and ground waters. See Hardness.
Manganese	<0.010 ppm	None	Naturally occurring in surface and ground waters.
Sodium	13 ppm	None	Found in water disinfectant and may come from salt use on roads.
Solids, Total Dissolved	101 ppm	500 ppm	Hardness, deposits, colored water, staining, salty taste
Sulfate	13 ppm	250 ppm	Salty taste
Zinc	0.25 ppm	5 ppm	Found in corrosion inhibitor used to control lead & copper.

Monitoring Data for Microbial Contaminants

Throughout the year, over six hundred (600) water samples were analyzed for Total Coliform and *E. Coli* bacteria and no microbial contaminates were detected.

PFAS Contaminants

What are PFAS?
PFAS are a group of over 4,000 human-made chemicals (they do not occur naturally) that have been used in industry and consumer products worldwide since at least the 1950s. These chemicals are used to make household and commercial products that resist heat and chemical reactions and repel oil, stains, grease, and water. Some common products that may contain PFAS include non-stick cookware, water-resistant clothing and materials, cleaning products, cosmetics, food packaging materials, and some personal care products. Due to their resilient chemical nature, they don't readily degrade once they are released into the environment. In addition, the common use of these chemicals in industry and consumer products has led to their widespread impact on the environment. The impact of these chemicals on your drinking water continues to be studied.

Why are PFAS being tested in my drinking water?
In May 2019, Act 21 (S.49), an act relating to the regulation of per- and polyfluoroalkyl substances (PFAS) in drinking and surface waters, was signed by Governor Scott. This Act provides a comprehensive framework to identify PFAS contamination and to issue new rules to regulate PFAS levels in drinking water.

What if PFAS have been detected in my drinking water?
Act 21 set an interim standard for the detected concentration of five PFAS in drinking water, or the combined concentration of any of the 5 PFAS, which should not exceed **20 parts per trillion (ppt).** The interim standard is based on a Health Advisory established by the Vermont Department of Health.

If, as the result of testing, the **sum of any of the five PFAS listed above is confirmed to exceed 20 ppt**, a Do Not Drink notice would be issued informing you not to use your water for drinking or cooking, brushing teeth, making ice cubes, making baby formula, washing fruits and vegetables or any other consumptive use. You would be advised to use another source of water for consumption which may include bottled water.

Burlington's Act 21 PFAS Results: None Detected
The five PFAS below along with thirteen (13) more PFAS compounds listed below were not detected in our water when sampled on 10/3/2019 and again on 10/26/2020.

(PFNA): Perfluorononanoic Acid	**None Detected**
(PFOA): Perfluorooctanoic Acid	**None Detected**
(PFOS): Perfluorooctane Sulfonic Acid	**None Detected**
(PFHpA): Perfluoroheptanoic Acid	**None Detected**
(PFHxS): Perfluorohexane Sulfonic Acid	**None Detected**

An additional 13 PFAS were required to be tested for, per Act 21 in 2020. These additional 13 PFAS, listed below, currently do not have an established health-based standard and are not counted toward the combined standard of 20 ppt:

(11Cl-PF3OUdS): 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid	**None Detected**
(9Cl-PF3ONS): 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic Acid	**None Detected**
(DONA): 4,8-Dioxa-3H-perfluorononanoic Acid	**None Detected**
(HFPO-DA): Hexafluoropropylene Oxide Dimer Acid	**None Detected**
(NEtFOSAA): N-ethyl perfluorooctanesulfonamidoacetic Acid	**None Detected**
(NMeFOSAA): N-methyl perfluorooctanesulfonamidoacetic Acid	**None Detected**
(PFBS): Perfluorobutane Sulfonic Acid	**None Detected**
(PFDA): Perfluorodecanoic Acid	**None Detected**
(PFDoA): Perfluorododecanoic Acid	**None Detected**
(PFHxA): Perfluorohexanoic Acid	**None Detected**
(PFTA): Perfluorotetradecanoic Acid	**None Detected**
(PFTrDA): Perfluorotridecanoic Acid	**None Detected**

Adopted State monitoring requirements are as follows:

- If annual PFAS sample is non-detect (i.e. ND or < 2.0 ng/L) for all 5 regulated PFAS compounds, sampling may be decreased to once every 3 years. Furthermore, if 2 consecutive 3-year monitoring results indicate non-detects, sampling frequency may be decreased to once every 6 years.
- If regulated PFAS are detected at or above 2 ng/L but less than 15 ng/L, annual monitoring continues. If regulated PFAS are detected above 15 ng/L, quarterly monitoring will be required.
- If regulated PFAS are detected above 20 ng/L, quarterly monitoring and a confirmation sample is required.

Based on non-detect for any of these compounds another round of testing is scheduled for Fall of 2023.

Where can I learn more about PFAS in drinking water?
For information about the health effects of PFAS, please visit www.healthvermont.gov/water/pfas or call the Vermont Department of Health at 1-800-439-8550. If you have specific health concerns, contact your health care provider.

Cyanotoxin Monitoring

What are Cyanotoxins?
Cyanotoxins are compounds that are produced by cyanobacteria, also known as blue-green algae. Exposure to cyanotoxins may lead to adverse health effects ranging from mild skin rashes to more serious illness including respiratory and gastrointestinal distress. Exposure to drinking water contaminated with cyanotoxins may cause liver and kidney damage, neurological problems and in rare cases death. Currently the US Environmental Protection Agency does not require monitoring for cyanotoxins. However, the Burlington Water Department participates in a voluntary cyanotoxin monitoring program managed by the State. The program includes testing our raw and finished water for twelve weeks during the summer when cyanobacteria are most likely to be present in the environment and protocols and guidance to communities

and water systems for addressing suspected cyanobacteria blooms. Here in Burlington, we are also equipped to add powdered activated carbon (PAC) in our water treatment to remove cyanotoxins if they are suspected of being present in our raw water supply. More information about cyanobacteria and the State's monitoring program is available on the State of VT Department of Environmental Conservation website at Cyanobacteria Guidance & Training | Department of Environmental Conservation (vermont.gov)

Health Information Regarding Drinking Water

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants, can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from EPA's Safe Drinking Water Hotline (1-800-426-4791).

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Safe Drinking Water Hotline.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Burlington Department of Public Works, Water Division is responsible for providing high quality drinking water but cannot control the variety of materials used in home and business plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

There are no known lead water services left in Burlington, so lead from samples in homes can only come from historic lead/tin solder used to join copper pipe or plumbing fixtures until around 1985. Since we are required to test for lead and copper at residential and business taps but have no control over plumbing, we use a corrosion inhibitor called zinc orthophosphate that is very effective in preventing the leaching of these metals into your water. This report includes lead and copper data from testing that occurred in 2021. As our water system is required to test for lead and copper every three (3) years, another thirty (30) water samples will be collected and tested in 2024.

Resources

If you have any questions or comments about this report, or would like to request a hard copy, please contact us at (802) 863-4501 or via email at water-resources@burlingtonvt.gov. We encourage you to share and/or post this water quality report with other people who utilize our water, but do not receive the water bill directly (e.g., tenants, multi-unit residential or commercial buildings, etc.)

You can learn more about Burlington's Water Resources Division by visiting: www.burlingtonvt.gov/water. We also have a quarterly newsletter, which is inserted into your bill or available on our website at burlingtonvt.gov/water/ontap for those who go paperless.

If you want to receive notifications about critical, time sensitive events in Burlington, please sign up for a VT-Alert account by visiting: burlingtonvt.gov/BTV-Alerts. This page will guide you through creating an account, choosing categories of interest, and prioritizing contact options to ensure you are getting the most relevant information as soon as possible.