ANNUAL WATER QUALITY REPORT

Reporting Year 2021

Presented By

Manchester Water Works

PWS ID#: NH1471010

We've Come a Long Way

Once again, we are proud to present our annual water quality report covering the period between January 1 and December 31, 2021. In a matter of only a few decades, drinking water has become exponentially safer and more reliable than at any other point in human history. Our exceptional staff continues to work hard every day—at all hours—to deliver the highest-quality drinking water without interruption. Although the challenges ahead are many, we feel that by relentlessly investing in customer outreach and education, new treatment technologies, system upgrades, and training, the payoff will be reliable, high-quality tap water delivered to you and your family.

Where Does My Water Come From?

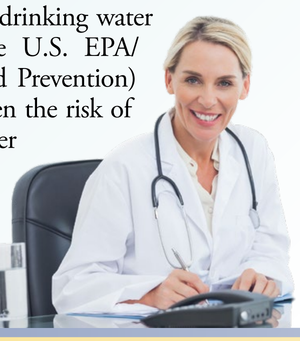
Since 1874, Lake Massabesic has served as the water supply for Manchester and portions of six surrounding communities. Recently, we began serving communities to the south and east of Manchester including portions of Salem, Hampstead, and Atkinson. In order to satisfy stringent state and federal drinking water regulations, the lake water is purified at Manchester's Water Treatment Plant. This facility was completed in 1974 and has since been routinely updated with state-of-the-art equipment to improve quality control and operational efficiency and was significantly upgraded in 2003-06. Located adjacent to Lake Massabesic, the plant treats all of the city's water before it is pumped into a 500-mile piping network for distribution to homes and industries.

In the near future (approximately 2023), water from the Merrimack River will provide a much needed additional supply for our customers. We began construction of a new water treatment facility located in Hooksett, NH in 2021 to produce water that meets or exceeds the high level of quality leaving our Lake Massabesic plant.

> "When the well is dry, we know the worth of water."
>
> *—Benjamin Franklin*

Important Health Information

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised 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 may be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The U.S. EPA/CDC (Centers for Disease Control and Prevention) guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791 or online at: http://water.epa.gov/drink/hotline.



Substances That Could Be in Water

To ensure that tap water is safe to drink, the U.S. EPA prescribes regulations limiting the amount of certain contaminants in water provided by public water systems. U.S. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, in some cases, radioactive material, and substances resulting from the presence of animals or from human activity. Substances that may be present in source water include:

Microbial Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, or wildlife;

Inorganic Contaminants, such as salts and metals, which can be naturally occurring or may result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming;

Pesticides and Herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses;

Organic Chemical Contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production and may also come from gas stations, urban stormwater runoff, and septic systems;

Radioactive Contaminants, which can be naturally occurring or may be the result of oil and gas production and mining activities.

For more information about contaminants and potential health effects, call the U.S. EPA's Safe Drinking Water Hotline at (800) 426-4791.

Questions?

For more information about this report, or for any questions relating to your drinking water, please call David G. Miller, P.E., Deputy Director, Water Supply, at (603) 792-2851 or by email at: dmiller@manchesternh.gov.

Water Treatment Process

Raw Water Pumping

Raw water from Lake Massabesic is conveyed through a 60-inch high density polyethylene pipeline intake that extends 430 feet from the shoreline into a low lift pump station constructed in 1997. The original intake and pump station, built in 1906 and renovated for raw water service in 1974, is maintained for redundancy. A combination of four variable-speed pumps delivers raw water through a 48-inch pipeline to the rapid mix chambers. This pipeline is equipped with a soda ash feed point where pH and alkalinity are adjusted prior to coagulation.

Rapid Mixing/Coagulation

In the rapid mix chamber, the primary treatment chemical aluminum sulfate, is added to begin the process of coagulation. Two rapid mix chambers are configured in series with the capability of adding the coagulants into either or both chambers. High-speed mixers ensure complete dispersion of these chemicals enabling them to react with the natural dissolved and particulate matter in the water, causing them to collide and form larger particles.

Flocculation

Flow from the rapid mix chambers is distributed evenly into each of the four flocculation basins. The flocculation basins are configured in two stages separated by a baffle wall, with the second stage mixers set at a slightly slower speed than the first stage mixers.

Sedimentation

The sedimentation process is achieved by allowing the water to flow slowly through a long, deep, quiescent basin that allows sufficient time for the floc particles to settle to the bottom forming sludge, a treatment process by-product. Sludge is periodically removed by isolating one of the four parallel basins each week, decanting, and pumping the sludge layer to a lagoon where it is eventually dried and moved to a permitted landfill.

Intermediate Ozone

Settled water flows into an intermediate pump station where it is lifted into the ozone contact chambers. Ozone is a powerful oxidant and disinfectant that removes color, taste, and odor, along with killing or inactivating harmful organisms in the water. Ozone is generated on-site by passing a high-voltage electric current across a dielectric discharge gap through a pure oxygen stream. A combination of three, 500-pound-per-day ozone generators produces the required ozone gaseous stream that is injected into each of four ozone contact chambers through fine bubble diffusers. The contact chambers provide the necessary time for completion of the ozone reaction. Residual (excess) ozone is removed from the water by applying sodium bisulfite prior to exiting the contact chambers and continuing on to the filters. Excess ozone gas that accumulates above the ozone contact chambers is removed under vacuum through a thermal-catalytic ozone destruct process and vented to atmosphere.

Granular Activated Carbon Filtration

Following intermediate ozone, the water passes through one of eight deep-bed granular activated carbon (GAC) filters. Each filter contains six feet of biologically active media that completes the physical removal process.

Chemical Addition

After filtration, sodium hypochlorite is added before, and aqueous ammonia is added into the hydraulic control structure in a closely controlled ratio (approximately 4.5 parts chlorine to 1 part ammonia) to form monochloramine. Monochloramine is a residual disinfectant that prevents bacterial growth as water travels throughout the distribution system. Soda ash is added once again to raise the pH to prevent pipe corrosion and provide additional alkalinity. Phosphoric acid is also added for corrosion control. Finally, fluorosilicic acid is added for dental protection.

Clearwell and Finished Water Pumping

From the hydraulic control structure, water flows into a 700,000 gallon clearwell and finished water pumping station. A series of seven vertical turbine pumps (three for the Low Service pressure zone and four for the High Service pressure zone) lifts finished water into the distribution system.

Partnership for Safe Water

Manchester Water Works (MWW) became a charter member of the Partnership for Safe Water in 1995, and through volunteer efforts, helped shape the framework for how self-assessment and optimization guidance could be promoted and embraced nationally by utilities in the wake of the 1993 Milwaukee *cryptosporidium* crisis. As an active utility member, the importance and significance of the Partnership was embraced as a natural fit for MWW as we continued striving to provide the safest and highest water quality possible for our customers. A focus on achieving, maintaining, and/or exceeding Partnership goals became a critical measuring stick for ongoing improvements and utility growth going forward.

Manchester's Phase III Self-Assessment report was submitted to the Partnership in late 2001 and we received the Phase III Director's Award in August 2002. MWW continued to collect and report annual Partnership data over the next decade with an eye on Phase IV - Excellence in Water Treatment. In July 2011, our team submitted the Phase IV – Excellence in Water Treatment application demonstrating and detailing our path to optimization. MWW received notice in January 2012 that the Lake Massabesic Water Treatment Plant would be recognized as just the eleventh facility in the nation to achieve Phase IV status, a status we proudly maintain today.

David G. Miller, P.E.

Deputy Director, Manchester Water Works

Community Participation

You are invited to attend our Water Board meetings and participate in discussions about your drinking water. A schedule of meeting times is posted on our website at: www.manchesternh.gov/wtr. Please call our office at (603) 792-2803 to confirm your intent to attend.

What are PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a group of manufactured chemicals that have been used worldwide since the 1950s to make fluoropolymer coatings and products that resist heat, oil, stains, grease, and water. During production and use, PFAS can migrate into the soil, water, and air. Most PFAS do not break down; they remain in the environment, ultimately finding their way into drinking water. Because of their widespread use and their persistence in the environment, PFAS are found all over the world at low levels. Some PFAS can build up in people and animals with repeated exposure over time.

The most commonly studied PFAS are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). PFOA and PFOS have been phased out of production and use in the United States, but other countries may still manufacture and use them.

Some products that may contain PFAS include:

- Some grease-resistant paper, fast food containers/wrappers, microwave popcorn bags, pizza boxes
- Nonstick cookware
- Stain-resistant coatings used on carpets, upholstery, and other fabrics
- Water-resistant clothing
- Personal care products (shampoo, dental floss) and cosmetics (nail polish, eye makeup)
- Cleaning products
- Paints, varnishes, and sealants

Even though recent efforts to remove PFAS have reduced the likelihood of exposure, some products may still contain them. If you have questions or concerns about products you use in your home, contact the Consumer Product Safety Commission at (800) 638-2772. For a more detailed discussion on PFAS, please visit: https://www.atsdr.cdc.gov/pfas/index.html.

Lead in Home Plumbing

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. We are responsible for providing high-quality drinking water, but we cannot control the variety of materials used in 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 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 at (800) 426-4791, or online at: www.epa.gov/safewater/lead.

Source Water Assessment

In compliance with a federal mandate, the NH Department of Environmental Services performed a Source Water Assessment of Lake Massabesic in September of 2002. The assessment looked at the drainage area for the lake and ranked its vulnerability to contamination. Lake Massabesic received four "high" and four "medium" vulnerability ratings, while it ranked at "low" vulnerability for five additional categories. Concern was raised over the detection of MTBE, now prohibited, which came from reformulated gasoline. Concern was also raised over Potential Contamination Sources (PCSs) on the watershed, such as highways. Overall, the report presents a positive picture of Manchester's water source and its condition. While Manchester Water Works has done its best to protect Lake Massabesic, we understand more than ever that we rely heavily upon the standards and practices of each citizen and each community on the watershed for their continued efforts to preserve this precious resource.

The complete Assessment Report is available for review at our website or at the NH DES Drinking Water Source Water Assessment page at: https://des.nh.gov/sites/g/files/ehbemt341/files/documents/manchester.pdf.

Safeguard Your Drinking Water

Protection of drinking water is everyone's responsibility. You can help protect your community's drinking water source in several ways:

- Eliminate excess use of lawn and garden fertilizers and pesticides – they contain hazardous chemicals that can reach your drinking water source.
- Pick up after your pets.
- If you have your own septic system, properly maintain it to reduce leaching to water sources, or consider connecting to a public water system.
- Dispose of chemicals properly; take used motor oil to a recycling center.
- Volunteer in your community. Find a watershed or wellhead protection organization in your community and volunteer to help. If there are no active groups, consider starting one. Use U.S. EPA's Adopt Your Watershed to locate groups in your community.
- Organize a storm drain stenciling project with others in your neighborhood. Stencil a message next to the street drain reminding people: "Dump No Waste – Drains to River" or "Protect Your Water." Produce and distribute a flyer for households to remind residents that storm drains dump directly into your local water body.

BY THE NUMBERS

300 MILLION The number of Americans who receive water from a public water system.

1 MILLION The number of miles of drinking water distribution mains in the U.S.

34 BILLION The number of gallons of water produced daily by public water systems in the U.S.

135 BILLION The amount of money spent annually on maintaining the public water infrastructure in the U.S.

151 THOUSAND The number of active public water systems in the U.S.

199 THOUSAND The number of highly trained and licensed water professionals serving in the U.S.

2 BILLION The age in years of the world's oldest water, found in a mine at a depth of nearly two miles.

Test Results

We are pleased to report that your drinking water meets or exceeds all federal and state requirements.

Our water is monitored for many different kinds of substances on a very strict sampling schedule. And, the water we deliver must meet specific health standards. Here, we only show those substances that were detected in our water (a complete list of all our analytical results is available upon request). Remember that detecting a substance does not mean the water is unsafe to drink; our goal is to keep all detects below their respective maximum allowed levels.

The State recommends monitoring for certain substances less than once per year because the concentrations of these substances do not change frequently. In these cases, the most recent sample data are included, along with the year in which the sample was taken.

Your public water supply is fluoridated. According to the Centers for Disease Control and Prevention, if your child under the age of 6 months is exclusively consuming infant formula reconstituted with fluoridated water, there may be an increased chance of dental fluorosis. Consult your child's health care provider for more information.

REGULATED SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	MCL [MRDL]	MCLG [MRDLG]	AMOUNT DETECTED	RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Barium (ppm)	2021	2	2	0.012	0.009–0.016	No	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
Bromate (ppb)	2021	10	0	0.5	0–1.1	No	By-product of drinking water disinfection
Chloramines (ppm)	2021	[4]	[4]	2.65	2.44–2.83	No	Water additive used to control microbes
Chlorine (ppm)	2021	[4]	[4]	1.4	1.18–1.67	No	Water additive used to control microbes
Fluoride (ppm)	2021	4	4	0.69	0.55–0.78	No	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
Haloacetic Acids [HAAs]–Stage 2 (ppb)	2021	60	NA	3.67	1.5–10.8	No	By-product of drinking water disinfection
Nitrite (ppm)	2021	1	1	0.046	0–0.437	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
TTHMs [Total Trihalomethanes]–Stage 2 (ppb)	2021	80	NA	2.93	1.6–4.2	No	By-product of drinking water disinfection
Total Organic Carbon[1] (ppm)	2021	TT	NA	1.67	1.44–2.14	No	Naturally present in the environment
Turbidity[2] (NTU)	2021	TT	NA	0.046	0.02–0.046	No	Soil runoff
Turbidity (Lowest monthly percent of samples meeting limit)	2021	TT = 95% of samples meet the limit	NA	100	NA	No	Soil runoff

Tap water samples were collected for lead and copper analyses from sample sites throughout the community

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AL	MCLG	AMOUNT DETECTED (90TH %ILE)	SITES ABOVE AL/TOTAL SITES	VIOLATION	TYPICAL SOURCE
Copper (ppm)	2021	1.3	1.3	0.051	0/44	No	Corrosion of household plumbing systems; Erosion of natural deposits
Lead (ppb)	2021	15	0	0.001	0/44	No	Corrosion of household plumbing systems; Erosion of natural deposits

SECONDARY SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	SMCL	MCLG	AMOUNT DETECTED	RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Aluminum (ppb)	2021	200	NA	25.5	21–50	No	Erosion of natural deposits; Residual from some surface water treatment processes
Chloride (ppm)	2021	250	NA	53.25	51–55	No	Runoff/leaching from natural deposits
Color (Units)	2021	15	NA	0	0–1	No	Naturally-occurring organic materials
Fluoride (ppm)	2021	2.0	NA	0.69	0.55–0.78	No	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
Manganese (ppb)	2021	50	NA	8	2–11	No	Naturally present in the environment
pH (Units)	2021	6.5-8.5	NA	7.96	7.59–8.16	No	Naturally occurring
Silver (ppb)	2021	100	NA	1.8	0–1.8	No	Industrial discharges
Sulfate (ppm)	2021	250	NA	18.5	16–23	No	Runoff/leaching from natural deposits; Industrial wastes
Zinc (ppm)	2021	5	NA	0.0011	0.001–0.0013	No	Runoff/leaching from natural deposits; Industrial wastes

UNREGULATED SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AMOUNT DETECTED	RANGE LOW-HIGH	TYPICAL SOURCE
Sodium (ppm)	2021	45.9	41.1–49.6	Winter deicing of roadways

OTHER SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AMOUNT DETECTED	RANGE LOW-HIGH	TYPICAL SOURCE
Alkalinity (ppm)	2021	29.5	27–34	Drinking water treatment additive
Ammonia as Nitrogen (ppm)	2021	0.56	0.54–0.57	By-product of drinking water disinfection
Ammonia, Free (ppm)	2021	0.093	0.07–0.11	By-product of drinking water disinfection
Calcium (ppm)	2021	5.05	4.5–5.5	Erosion of natural deposits
Magnesium (ppm)	2021	1.2	1.1–1.3	Erosion of natural deposits
PFOA (ppt)	2021	4.95	4.63–5.26	Industrial pollutant
Perfluorobutanoic Acid (ppt)	2021	3.165	2.1–3.9	Manufacturing by-product
Phosphate (ppm)	2021	0.423	0.24–0.55	Corrosion control additive
Silica (ppm)	2021	2.42	2.03–3.32	Naturally present in the environment
Total Hardness (ppm)	2021	15.8	16.3–19.1	A measure of dissolved minerals, primarily calcium and magnesium

[1] The value reported under Amount Detected for TOC is the lowest ratio between percentage of TOC actually removed to the percentage of TOC required to be removed. A value of greater than one indicates that the water system is in compliance with TOC removal requirements. A value of less than one indicates a violation of the TOC removal requirements.

[2] Turbidity is a measure of the cloudiness of the water. It is monitored by surface water systems because it is a good indicator of water quality and thus helps measure the effectiveness of the treatment process. High turbidity can hinder the effectiveness of disinfectants.

Think Before You Flush!

Flushing unused or expired medicines can be harmful to your drinking water. Properly disposing of unused or expired medication helps protect you and the environment. Keep medications out of our waterways by disposing responsibly. To find a convenient drop-off location near you, please visit: https://bit.ly/3IeRyXy.

Definitions

90th %ile: The levels reported for lead and copper represent the 90th percentile of the total number of sites tested. The 90th percentile is equal to or greater than 90% of our lead and copper detections.

AL (Action Level): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

MCL (Maximum Contaminant Level): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG (Maximum Contaminant Level Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

MRDL (Maximum Residual Disinfectant Level): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG (Maximum Residual Disinfectant Level Goal): 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 the use of disinfectants to control microbial contaminants.

NA: Not applicable

ND (Not detected): Indicates that the substance was not found by laboratory analysis.

NTU (Nephelometric Turbidity Units): Measurement of the clarity, or turbidity, of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

ppb (parts per billion): One part substance per billion parts water (or micrograms per liter).

ppm (parts per million): One part substance per million parts water (or milligrams per liter).

ppt (parts per trillion): One part substance per trillion parts water (or nanograms per liter).

SMCL (Secondary Maximum Contaminant Level): These standards are developed to protect aesthetic qualities of drinking water and are not health based.

TT (Treatment Technique): A required process intended to reduce the level of a contaminant in drinking water.