2023 BROOKHAVEN NATIONAL LABORATORY Water Quality Consumer Confidence Report

BNL publishes an annual water quality report to provide on-site drinking water consumers with an overview of the Lab's water quality during the previous calendar year. The purpose of this report is to inform you about where your water comes from; what analytical tests are conducted; what they reveal; how the results compare to New York State standards; and to educate you about the importance of preventative measures. Educated consumers are more likely to help protect their drinking water sources.

BNL's drinking water supply and distribution system were in full compliance with all county, state, and federal regulations regarding drinking water quality, monitoring, operations, and reporting in 2022.

BNL's Energy & Utilities (EU) Division is committed to providing over 3,000 employees, facility users, contractors, and guests annually with safe drinking water.

BNL's drinking water is regularly tested using an independent laboratory approved by the New York State Department of Health (NYSDOH). Analytical data are reviewed by the Lab's Environmental Protection Division (EPD) to ensure that testing results comply with all applicable regulatory standards. In addition, EU and EPD work with BNL's Groundwater Protection Group to make sure our potable water supply is not adversely impacted by possible groundwater contamination or remediation operations.

Water Treatment Facility Staff (L-R) Ryan Greener, Nick Krupski, Joe Stanisci, Warren Jensen, Steve Kelvas, Bob Kelley, Nick Risi.

Where Does Our Water Come From?

The Long Island aquifer system is made up of three primary formations. From the surface to approximately 150 feet below is the Upper Glacial aquifer, from 150 to 1,000 feet below is the Magothy aquifer, and from 1,000 to about 1,600 feet below is the Lloyd aquifer. As designated by the U.S. Environmental Protection Agency (EPA), Long Island's aquifer system is one of 78 "sole source" aquifers in the nation recognized under the aquifer protection program authorized by the U.S. Safe Drinking Water Act (SDWA).

The Lab's four in-service drinking-water wells draw up to 1,000 gallons per minute, or about 1.34 million gallons of water per day from the Upper Glacial aquifer to supply drinking water, process cooling water, and fire protection. The water from Well 7 is processed at BNL's on-site Water Treatment Plant. Well 10, Well 11, and Well 12 are treated with a granular activated carbon (GAC) filter, then treated for pH adjustment and disinfection prior to entering the distribution system. Last year, BNL pumped approximately 349 million gallons of water.

For questions about this report, or to speak with someone regarding your drinking water, please contact:

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- **Jason Remien**
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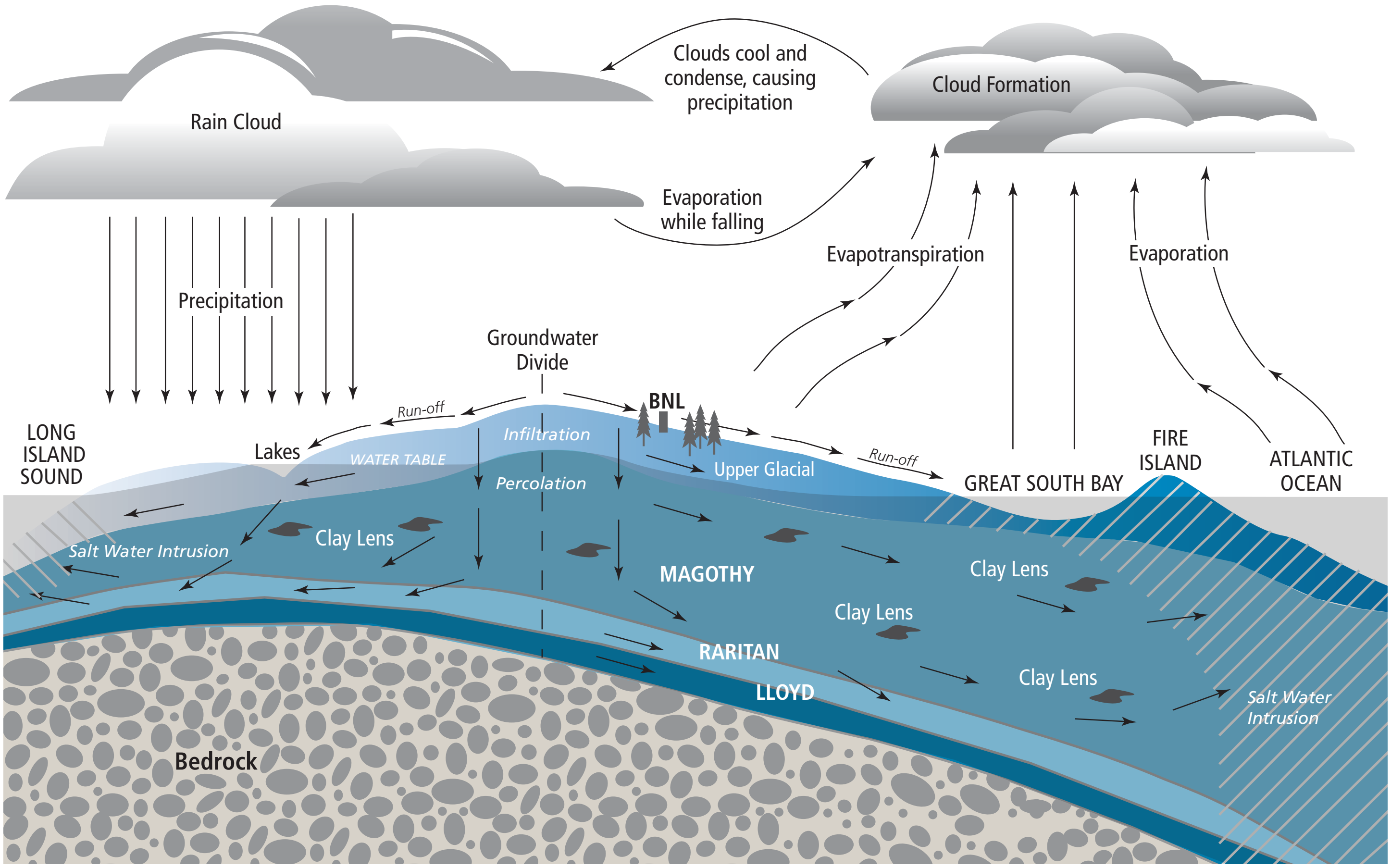

Long Island Aquifer System

What's in Our Drinking Water?

Although rivers, lakes, streams, ponds, and reservoirs are all sources of tap and bottled drinking water, most Long Island residents get their water from groundwater wells that are drilled into the underlying aquifer system. As water travels over land surfaces or through the ground, it dissolves naturally occurring minerals and radioactive material. Water can also pick up substances resulting from the presence of animals or from human activities. Contaminants that may be present in source water include: microbiological contaminants; inorganic contaminants; pesticides and herbicides; organic chemical contaminants; and radioactive contaminants.

In order to ensure that tap water is safe to drink, New York State and the EPA prescribe regulations which limit the amount of certain contaminants in water provided by public water systems. In addition, regulations from NYSDOH and the Food and Drug Administration establish limits for contaminants in bottled water, which must provide the same protection for public health.

Source water is treated to remove substances or reduce their concentration before the water is fit for human consumption. Regardless, drinking water, including bottled water, may reasonably be expected to contain at least small amounts of contaminants; however, that does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling EPA's Safe Drinking Water Hotline at (800) 426-4791.

Some people may be more vulnerable to disease-causing microorganisms or pathogens in drinking water than others. Immunocompromised persons such as those with cancer undergoing chemotherapy, who have undergone organ transplants, with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice from their health care provider about their drinking water.

Guidelines from EPA and the Centers for Disease Control on appropriate means to reduce the risk of illness from Cryptosporidium, Giardia, and other microbial pathogens are also available at EPA's Safe Drinking Water Hotline.

BNL's Source Water Assessment

As required by the 1996 Safe Drinking Water Act, in 2003 the NYSDOH completed an assessment of the source water used by the Lab's public water system to evaluate known and possible contamination sources. The assessment includes a susceptibility rating for each well based on the risk posed by the presence of potential sources of contamination within the well's contributing area and the likelihood that the contaminants will travel through the environment to reach the well.

Although the susceptibility rating is an estimate of the potential for source water contamination, it does not mean that the water delivered to consumers is or will become contaminated. If a contaminant is present, it does not necessarily mean that there is a health risk.

The assessment concluded that three of BNL's water supply wells were very highly susceptible to industrial solvents. Recently, BNL also determined that its six supply wells are susceptible to Per- and Polyfluoroalkyl Substances (PFAS). In August 2020, NYS established drinking water standards of 10 ng/L (parts per trillion) for PFAS compounds perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). PFOS has been detected in three wells at concentrations above 10 ng/L. To address this contamination, BNL ended the operation of two supply wells (which had previously been identified during the NYSDOH assessment as vulnerable to industrial solvents) and has added GAC filtration systems at three wells to remove PFAS before the water is released into the distribution system. A GAC system on Well 11 was placed back in service in late 2020 and the GAC system for Well 10 went into service in 2021. Well 12 and its associated GAC system went into in service in 2022. All in service potable supply wells and water leaving the Water Treatment Plant are now tested for PFAS on a quarterly basis.

A copy of the complete assessment may be reviewed by contacting Doug Paquette (631) 344-7046 or Jason Remien (631) 344-3477.

Water Conservation Measures

BNL's water conservation program has achieved dramatic reductions in water use since the mid-1990's. The Lab continually evaluates water conservation as part of facility upgrades, such as replacing existing conventional plumbing fixtures with low-flow devices, or new construction.

For more information on BNL's water use efficiency and management, please see BNL's Site Sustainability Plan for fiscal year 2023 at *https://www.bnl.gov/about/sustainability/reports.php*

To help the Lab conserve water, start by being conscious of your personal use, e.g., reduce faucet flow, decrease running water while not in use, and report any drips, leaks, or other plumbing problems promptly to your Facility Project Manager. Regarding process and research use, make sure temperature controls operate properly to minimize flow and specify recirculating water or air-cooled systems for new devices.

While it is important to conserve water, the EPA encourages that you run your tap water for 30 seconds to two minutes and only use cold water for drinking or cooking. Due to the aging infrastructure at BNL, iron and lead may leach into the water from the pipes. Flushing the water will help to remove any contaminants that may have built up while the water was sitting in the pipes.

New elevated water storage tank on Upton Rd.

Water Treatment Process

BNL's Water Treatment Plant can treat up to two million gallons of "raw" water per day to remove naturally occurring iron and manganese from the groundwater.

Of the four in-service drinking water wells, Well 7 provides high-in-iron source water which must be passed through the Water Treatment Plant before being distributed around the site. This water is chlorinated and the pH is adjusted before it enters the distribution system. Chlorine is a disinfection agent and prevents the spread of water borne diseases.

Water from Well 7 is aerated to reduce carbon dioxide gas and aid in iron oxidation. Lime is added to raise the pH to provide for proper corrosion control. A polymer is added to aid in flocculation in the filtration process. Flocculation, or the formation of particle aggregates which settle out of the water as sediment, begins in the retention tank. To help form "floc," water is sent from the retention tank to a slow-mix tank.

Filtration is performed using a rapid sand filter made up of sand and anthracite coal to remove all particles. Filtered water is stored in the "wet well" before it is pumped into air-stripping towers, which remove volatile organic compounds, if present, from the water being treated.

Up to 250,000 gallons of treated water is stored at the clear well before its final chlorination and distribution. Pumps send finished water from the Water Treatment Plant to the two elevated storage tanks.

Wells 10, 11, and 12 pump water that is low in iron, and does not require treatment for iron. Water from Well 10, 11, and 12 pass through GAC systems to remove PFAS before being treated with chlorine for disinfection and sodium hydroxide or calcium hydroxide for pH correction prior to being sent to the two elevated storage tanks. The water from the two storage tanks is delivered on site at 55 to 70 pounds of pressure per square inch via 45 miles of distribution pipe.

For more information on the Lab's water treatment process, visit the Water Quality website at *https://www.bnl.gov/water/*.

Plant Upgrades & Distribution System Improvements

There were several improvements made to BNL's potable water infrastructure over the past year. Below are some highlights:

- Two hydrants were replaced, two were repaired, and one distribution valve was replaced.
- Rehabilitation of Supply Well 7 was completed in February 2022. This well had lost capacity over time due to iron fouling in the well screen and aquifer. High-pressure jetting and chemical treatment of the well was performed, which restored approximately 50% of the lost capacity.
- In April 2022, BNL completed reconstruction of the well house at Supply Well 12, including new chemical systems, modernized controls, and overall improved safety and reliability. This project returns a potable water supply well to BNL's system that has been out of service for over a decade, adding up to 1,200 gallons per minute. The granular activated carbon system for this well was also renovated and returned to service to proactively address low-level PFAS contamination.
- At BNL's main Water Treatment Facility, a new pH and chlorine residual analyzer station was installed in December 2022, which helps improve monitoring and reporting of water quality.
- Construction was completed on the new 500,000 gallon elevated hydrospheroid tank which will replace the 1940's era 300,000 gallon storage tank on Upton Rd. The new tank is currently awaiting painting.

More recently, approximately 1,800 feet of new 12-inch and 8-inch ductile iron water main with nine valves and five hydrants were installed around the new Science and User Support Center (SUSC). In addition, water services for Buildings 321, 326, 339, 412 and 423 were extended and reconnected to the new water main along the north side of Princeton Avenue. As part of the work, over two miles of water mains and service lines (most of which are well over 80 years old) were properly abandoned and replaced by the new infrastructure. This water main work completes the multi-phase, multi-year project of extending and replacing water mains along Princeton Avenue and around the SUSC to the Apartment Area, providing improved flows, water quality, resiliency, and reliability of the water system in the southwestern area of BNL.

BNL's 2022 Drinking Water Sampling Results

BNL's drinking water and the supply and distribution system were in full compliance with all applicable county, state, and federal regulations regarding drinking water quality, monitoring, operations, and reporting in 2022. Through water sampling and testing, results show that the compounds listed below were **not detected or below the minimum detection limit (MDL).** Twenty-seven out of the total 171 contaminants tested were detected and are summarized in the table starting on Page 6.

- 11-Cl-PF3
- 1,1-dichloroethane
- 1,1-dichloroethene
- 1,1-dichloropropene
- 1,1,1-trichloroethane
- 1,1,1,2-tetrachloroethane
- 1,1,2-trichloroethane
- 1,1,2,2-tetrachloroethane
- 1,2-dichlorobenzene
- 1,2-dichloroethane
- 1,2-dichloropropane
- 1,2,3-trichlorobenzene
- 1,2,3-trichloropropane
- 1,2,4-trichlorobenzene
- 1,2,4-trimethylbenzene
- 1,3-dichlorobenzene
- 1,3-dichloropropane
- 1,3,5-trimethylbenzene
- 1,4-dichlorobenzene
- 2,2-dichloropropane
- 2,4,-D
- 2,4,5,-TP (silvex)
- 2-chlorotoluene
- 3-hydroxycardofuran
- 4-chlorotoluene
- 4-isopropyl toluene
- 4:2 FTS
- 6:2 FTS
- 8:2 FTS
- 9-Cl-PF30
- alachlor
- aldicarb
- aldicarb sulfone
- aldicarb sulfoxide
- aldrin
- ammonia
- antimony
- arsenic
- asbestos
- atrazine
- benzene
- benzo (A) pyrene
- beryllium
- bromobenzene
- bromochloromethane
- bromomethane
- butachlor
- cadmium
- carbaryl
- carbofuran
- carbon tetrachloride
- cesium-137
- chlordane
- chlorobenzene
- chlorodifluoromethane
- chloroethane
- chloromethane
- chromium
- cis-1,2-dichloroethene
- color
- cyanide (as free cyanide)
- dalapon
- di(2-ethylhexyl) adipate
- di(2-ethylhexyl) phthalate
- dibromomethane
- dicamba
- dichlorodifluoromethane
- dieldrin
- dinoseb
- diquat
- DONA
- e. coli
- endothall
- endrin
- ethylbenzene
- fluoride
- freon-113
- gross alpha
- glyphosate
- haloacetic acid (HAA5)
- heptachlor
- heptachlor epoxide
- hexachlorobenzene
- hexachloro-1,3-butadiene
- hexachlorocyclopentadiene
- hexavalent chromium
- isopropylbenzene
- lindane
- m,p-xylene
- manganese
- mercury
- methomyl
- methoxychlor
- methyl tert-butyl ether
- methylene blue active substances (MBAS)
- methylene chloride
- metolachlor
- metribuzin
- n-butylbenzene
- n-propylbenzene
- NFDHA
- NEtFOSAA
- NMeFOSAA
- nitrite
- oxamyl
- o-xylene
- pentachlorophenol
- PFEESA
- PFMPA
- PFMBA
- PFDS
- PFDA
- PFDOA
- PFHpS
- PFNS
- PFNA
- PFOSAm
- PFPeS
- PFTDA
- PFTrDA
- PFUnDA
- picloram
- propachlor
- sec-butylbenzene
- selenium
- silver
- simazine
- strontium-90
- styrene
- tert-butylbenzene
- tetrachloroethene
- thalium
- toluene
- total coliform bacteria
- total polychlorinated biphenals (PCBs)
- total xylenes
- toxaphene
- trans-1,2-dichloroethene
- trans-1,3-dichloropropene
- trichloroethene
- trichlorofluoromethane
- tritium
- vinyl cloride
- zinc

Contaminants on this list include results from BNL compliance and surveillance samples.

Types of Contaminants

- **disinfectant and disinfection by-products:** formed when disinfectants used in water treatment plants react with bromide and/or natural organic matter (i.e., decaying vegetation) present in the source water. Different disinfectants produce different types or amounts of disinfection by-products. Disinfection by-products for which regulations have been established have been identified in drinking water, including trihalomethanes, haloacetic acids, bromate, and chlorite.
- **inorganics:** dissolved salts and metals, which can occur naturally or result from stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, farming, etc.
- **microbiological:** bacteria and viruses, which may come from sewage, livestock operations, wildlife, etc.
- **organic:** natural and synthetic compounds, including volatile organic compounds (VOCs). These chemicals are by-products of industrial processes, residential uses and petroleum production, and they can also come from gas stations, stormwater runoff, septic systems, etc.
- **perfluorinated:** man-made compounds used in firefighting foams and stain proof coatings.
- **pesticides & herbicides:** substances for, respectively, eliminating problem insects and plants, which may come from a variety of sources, such as agricultural operations, stormwater runoff, residential uses, etc.
- **radioactive:** naturally occurring, or from oil and gas production, mining activities, nuclear facilities, etc.
- **synthetic organic:** man-made compounds used for a variety of industrial and agricultural purposes.
- **volatile organic:** emitted by products including contaminants: paints and lacquer; paint strippers; cleaning supplies; pesticides, building materials and furnishings; office equipment such as copiers and printers; correction fluids and carbonless copy paper; graphics and craft materials including glues and adhesives; permanent markers; and photographic solutions.

CONTAMINANT	UNIT OF MEASUREMENT	DATE OF DETECTION	VIOLATION (YES/NO)	LEVEL DETECTED	RANGE OF RESULTS	MCLG	REGULATORY LIMIT (MCL)	LIKELY SOURCE OF CONTAMINATION
Chlorine Residual, Free	mg/L	6/6/22	No	1.4	0.3 – 1.4	NS	4	Water additive to control microbes.
DISINFECTION BY-PRODUCTS								
Total Trihalomethanes	µg/L	4/4/22	No	9	<0.05 – 9	NS	80	By-product of drinking water chlorination needed to kill harmful organisms; formed when source water contains large amounts of organic matter.
INORGANIC CONTAMINANTS								
Barium	mg/L	6/6/22	No	0.05	0.036 – 0.05	2	2	Erosion of natural deposits.
Chloride	mg/L	6/6/22	No	76.4	47.6 – 76.4	NS	250	Naturally occurring; indicative of road-salt contamination.
Iron	µg/L	11/7/22	No	50	< 20 – 50	NS	300	Naturally occurring; corrosion of plumbing.
Nickel	µg/L	6/6/22	No	0.002	< 0.0005 - 0.002	NS	100	Nickel enters groundwater and surface water by dissolution of rocks and soils, from atmospheric fallout, or from biological decays.
Nitrates	mg/L	6/6/22	No	0.66	0.35 – 0.66	10	10	Erosion of natural deposits; runoff from fertilizer use; leaching from septic tanks and sewage.
Sodium*	mg/L	1/10/22	No	60	24.7 – 60	NS	NS*	Naturally occurring; road salt; water softeners.
Sulfates	mg/L	6/6/22	No	11	8.8 – 11	NS	250	Naturally occurring.

CONTAMINANT	UNIT OF MEASUREMENT	DATE OF DETECTION	VIOLATION (YES/NO)	LEVEL DETECTED	RANGE OF RESULTS	MCLG	REGULATORY LIMIT (MCL)	LIKELY SOURCE OF CONTAMINATION
PERFLUORINATED CONTAMINANTS								
PFOS (Perfluorooctanesulfonic Acid)	ng/L	6/23/22	No	1.45	<2 – 1.45	NS	10	Released into the environment from widespread use in commercial and industrial applications.
PFOA (Perfluorooctanoic Acid)	ng/L	8/1/22	No	1.02	< 2 – 1.02	NS	10	Released into the environment from widespread use in commercial and industrial applications.
RADIOACTIVE CONTAMINANTS								
Gross Beta Activity (a)	pCi/L	4/4/22	No	3.76	<1.85 – 3.76	0	4	Decay of natural deposits and atmospheric fallout.
Radium-228	pCi/L	4/17/20	No	0.77	<0.53 – 0.77	0	5	Decay of natural deposits.
SYNTHETIC ORGANIC CONTAMINANTS								
1,4 Dioxane	µg/L	11/7/22	No	0.085	<0.023 – 0.085	NS	1	Released into the environment from commercial and industrial sources and is associated with inactive and hazardous waste sites.
VOLATILE ORGANIC CONTAMINANTS								
Bromodichloromethane	µg/L	4/4/22	No	2.4	<0.05 – 2.4	NS	80**	By-product of drinking water chlorination needed to kill harmful organisms.
Bromoform	µg/L	4/4/22	No	1.7	<0.05 – 1.7	NS	80**	By-product of drinking water chlorination needed to kill harmful organisms.
Chloroform	µg/L	4/4/22	No	1.2	<0.05 – 1.2	NS	80**	By-product of drinking water chlorination needed to kill harmful organisms.
Dibromochloromethane	µg/L	4/4/22	No	3.7	<0.05 – 3.7	NS	80**	By-product of drinking water chlorination needed to kill harmful organisms.
SAMPLING AT THE CONSUMER'S TAP (Tap water samples were collected throughout the Laboratory site) (b)								
CONTAMINANT	**UNIT OF MEAS.**	**DATE OF SAMPLING (MO./YR.)**	**AL EXCEEDANCE (YES/NO)**	**90th PERCENTILE RESULT**	**RANGE OF RESULTS**	**MCLG**	**REGULATORY LIMIT (AL)**	**LIKELY SOURCE OF CONTAMINATION**
Copper	mg/L	8/3/22	No	0.012	<0.002 – 0.017	1.3	1.3	Corrosion of plumbing.
Lead	µg/L	8/3/22	No	1.4	<1.0 – 2.8	0	15	Corrosion of plumbing.

Table Notes:

*No MCL has been established for sodium. However, water containing more than 20 mg/l of sodium should not be used for drinking by people on severely restricted sodium diets. Water containing more than 270 mg/l of sodium should not be used for drinking by people on moderately restricted sodium diets.
**MCL is the sum of the four compounds (Bromodichloromethane, Bromoform, Chloroform, and Dibromochloromethane).
NS = drinking-water standard not specified
(a) The State considers 50 pCi/L to be the level of concern for beta particles.
(b) Sampling at the consumer's tap for lead and copper is performed every year; next sampling is scheduled for 2023. Please see article on Page 11 for health advisory information.

UNREGULATED PERFLUOROALKYL SUBSTANCES							
CONTAMINANT	UNIT OF MEASUREMENT	DATE OF DETECTION	VIOLATION (YES/NO)	LEVEL DETECTED	RANGE OF RESULTS	MCLG OR HEALTH ADVISORY LEVEL	LIKELY SOURCE OF CONTAMINATION
Hexafluoropropylene oxide dimer acid (HFPO-DA)	mg/L	8/1/2022	No	0.000005	<0.000002 - 0.000005	0.00001	Released into the environment from widespread use in commercial and industrial applications.
Perfluorobutane sulfonate acid (PFBS)	mg/L	2/7/22	No	0.000002	<0.000002 - 0.000002	0.002	Released into the environment from widespread use in commercial and industrial applications.
Perfluorobutanoic acid (PFBA)	mg/L	6/23/22	No	0.000059	<0.000002 - 0.000059	NA	Released into the environment from widespread use in commercial and industrial applications.
Perfluoroheptanoic acid (PFHpA)	mg/L	11/7/22	No	0.000002	<0.000002 - 0.000002	NA	Released into the environment from widespread use in commercial and industrial applications.
Perfluorohexanesulfonic acid (PFHxS)	mg/L	2/7/22	No	0.0000007	<0.000002 - 0.0000007	NA	Released into the environment from widespread use in commercial and industrial applications.
Perfluorohexanoic acid (PFHxA)	mg/L	8/1/22	No	0.000003	<0.000002 - 0.000003	NA	Released into the environment from widespread use in commercial and industrial applications.
Perfluoropentanoic acid (PFPeA)	mg/L	8/1/22	No	0.000004	<0.000002 - 0.000004	NA	Released into the environment from widespread use in commercial and industrial applications.

1 USEPA Health Advisory Levels identify the concentration of a contaminant in drinking water at which adverse health effects and/or aesthetic effects are not anticipated to occur over specific exposure durations. Health Advisory Levels are not to be construed as legally enforceable federal standards and are subject to change as new information becomes available.
2 All perfluoroalkyl substances, besides PFOA and PFOS, are considered Unspecified Organic Contaminants (UOC) which have an MCL = 0.05 mg/L.
NA - Not Available

Unregulated Perfluoroalkyl Substances

The New York State Department of Health (NYSDOH) requires testing for some contaminants even though health advisory limits and/or maximum contaminant levels have not been established. EPA and NYS are currently reviewing some of these compounds for future regulations.

Water Bottle Filling Stations

Have you noticed the water bottle filling stations onsite? In an effort to promote the use of tap water and to limit the use of plastics and the generation of single use plastic waste, water bottle filling stations have been installed by the Lab's Integrated Facilities Management (IFM) in a number of buildings onsite.

These stations are retrofitted to existing water fountains and in some cases, even track the number of single use bottles saved. They also contain point of use filters that help remove iron or chlorine, which many employees say they find improves the taste of the water. Bottle filling stations can be found in buildings 400, 438, 461, 462, 463, 464, 480, 488, 490, 815, and 860. More stations will be installed as locations are identified and funds permit. Please contact your Facility Project Manager for installation options in your building

Brookhaven Lab produces high quality water that meets all state and federal requirements. In addition, most sinks and water fountains onsite also have point of use filters. The lab encourages you to run the water in sinks and regular fountains (without a filling station) for up to 30 seconds before you drink it. This allows any water that has been sitting in the pipes to be flushed out.

Water coolers are a common site around the Lab. These coolers present different risks than tap water. Bottled water is not subject to the same regulations and many contaminants sampled for in tap water are not sampled for in bottled water. Coolers must also be maintained and cleaned properly to limit bacteria growth. Unused bottles should be stored in a cool place, away from sunlight. Most information about water cooler safety can be found on the ESH website at: *https://www.bnl.gov/water/water-cooler-cleaning.php.*

Martin Schoonen, associate laboratory director for Environment, Biology, Nuclear Science & Nonproliferation, using the water bottle filling station in Bldg. 490.

BNL’s Water Main Flush Program

In accordance with American Water Works Association recommendations, unidirectional flushing of water mains using fire hydrants within a water distribution system is the most effective and economical way to cleanse and improve water quality.

Iron can get into drinking water from corrosion of cast iron, steel, and galvanized iron pipes that are used throughout the site for water distribution. The Lab’s water mains are flushed twice per year to improve the quality of the water delivered to facilities by the Lab’s on-site taps, and to help eliminate rusty water.

Visit the Water Quality website at *http://www.bnl.gov/water/* for some tap-water recommendations to be sure your on-site drinking water is the best possible quality.

Group Leader Joe Stanisci (right) reviewing operational details at Well #12 with Water Treatment staff, Ryan Greener (left) & Nick Krupski (middle).

Chlorine Disinfectant and Its By-Products

Each day, more than 200 million people in the U.S. consume water that has been disinfected to kill unwanted microorganisms found in source water. Worldwide, one of the most commonly used and effective disinfectants is chlorine. A form of chlorine known as sodium hypochlorite is used by BNL for disinfection of its potable water.

Although disinfectants are effective in killing unwanted microorganisms in source water, they can react with naturally occurring organic matter and inorganics to form disinfectant by-products which may pose health risks. Under the SDWA, disinfectants and their by-products are regulated. The Lab had no violations in 2022; annual averages for chlorine residual and by-products are based on results from finished tap water.

Disinfection Residual	2022 Annual Running Average	MRDLG
chlorine*	0.9 mg/L	4 mg/L
Disinfection By-product	**2022 Annual Average**	**MCL**
total trihalo-methanes[1]	0.5 µg/L	80 µg/L
haloacetic acids (five)[2]	< 2 µg/L	60 µg/L

Notes:
* BNL range of results for chlorine is 0.3 - 1.4 mg/L; maximum found in Bldg. 1005
[1] Total trihalomethanes is the sum of the concentration of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.
[2] Haloacetic acids (five) is the sum of the concentration of mono-, di-, and trichloroacetic acids, and mono- and dibromoacetic acids.
NS = drinking-water standard not specified
† = measure of water hardness or dissolved salts

Other Water Quality Indicators

The following maximum values were measured in samples of well water or finished water at the BNL Water Treatment Plant in 2022. Although the Lab is required to test these indicators, there are no MCLs set for these parameters. Other indicators tested, but not detected, include cyanide and methylene blue active substances.

Indicator	BNL Sample	MCL
alkalinity†	60.8 mg/L	NS
calcium†	18.4 mg/L	NS
conductivity†	425 µmhos/cm	NS
pH	8.9 standard units	NS

Lead and Copper Testing

Lead and copper sampling at the required locations in August 2022 revealed BNL was in compliance with regulatory requirements.

In accordance with regulations, lead and copper samples were taken in 2022. All samples were below the action level limit for lead and copper.

Lead and copper enters drinking water primarily through plumbing materials. In 1991, the EPA established a "lead and copper rule" to limit the concentration of lead and copper in public water. BNL is required to sample for lead and copper at 20 consumer taps every year and to notify those occupants of the buildings tested with the results. Results from testing performed in 2022 are shown in the table to the right. While lead was detected in some samples, the action limit was not exceeded. Testing will be performed again in 2023. If present, elevated levels of lead can cause serious health problems, especially for pregnant women, infants, and young children. It is possible that lead levels in your building may be higher than at other buildings at the Laboratory as a result of materials used in your building's plumbing. Brookhaven Lab is responsible for providing high quality drinking water. When your water has been sitting in the pipes for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to two minutes before using 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 (1-800-426-4791) or at *http://www.epa.gov/safewater/lead.*

2022 Lead and Copper Sampling Results

8/1/22			
Location	Faucet	Lead (µg/L)	Copper (mg/L)
Apt. 1A	kitchen	< MDL	0.005
Apt. 11A	kitchen	< MDL	0.005
Apt. 13C	kitchen	< MDL	< MDL
Apt. 28D	kitchen	1.4	0.009
Apt. 30A	kitchen	< MDL	0.002
Apt. 34A	kitchen	< MDL	0.006
Apt. 36A	kitchen	< MDL	< MDL
Apt. 40F	kitchen	< MDL	< MDL
Apt. 41DM	kitchen	< MDL	0.003
Apt. 5A	kitchen	1.6	0.015
Apt. 6C	kitchen	<MDL	< MDL
Apt. 7B	kitchen	< MDL	0.017
Apt. 8C	kitchen	< MDL	0.004
Bldg. 153	bathroom	< MDL	0.006
Bldg. 170	kitchen	< MDL	< MDL
Bldg. 257	bathroom	< MDL	0.004
Bldg. 258	kitchen	< MDL	0.002
Bldg. 371	bathroom	< MDL	0.008
Bldg. 388	kitchen	2.8	0.07
Bldg. 599	kitchen	< MDL	0.012

Notes:
Action Level for Lead is 15 µg/L.
Action Level for Copper is 1.3 mg/L.

Water treatment operators in the BNL control room reviewing SCADA trend graphs. L-R- R. Kelley, N. Risi, and S. Kelvas

Definitions Used in this Report

- **90th percentile value:** The reported copper and lead values represent the 90th percentile. A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below it. The 90th percentile is equal to or greater than 90 percent of the lead and copper values detected in the water system.
- **action level (AL):** The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a drinking water supplier must follow.
- **granular activated carbon (GAC):** A system used to remove volatile organic compounds from ground water.
- **maximum contaminant level (MCL):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLG as possible.
- **maximum contaminant level goal (MCLG):** 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.
- **maximum residual disinfectant level (MRDL):** The highest level of a disinfectant allowed in drinking water. There is convincing evidence that the addition of disinfectants is necessary for control of microbial contaminants.
- **maximum residual disinfectant level goal (MRDLG):** The concentration of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of using disinfectants to control microbial contamination.
- **micrograms per liter (µg/L):** Equals one part of liquid in one billion parts of liquid or parts per billion (ppb).
- **micromhos per centimeter (µmhos/cm):** A measure of the ability of water to conduct electricity. Conductivity effectively measures the concentration of ions, such as dissolved salts.
- **milligrams per liter (mg/L):** Equals one part of liquid per million parts of liquid, or parts per million (ppm).
- **minimum detection limit (MDL):** The lowest level to which an analytical parameter can be measured with certainty by the analytical lab performing the measurement. While results below the MDL are sometimes measureable, they represent values that have a reduced statistical confidence associated with them (less than 95 percent confidence).
- **picocuries per liter (pCi/L):** Picocuries per liter is a measure of radioactivity in water equal to one trillionth of a curie.
- **nanograms per liter (ng/L):** Equals one part of liquid in one trillion parts of liquid or parts per trillion (ppt).
- **volatile organic contaminants (VOCs):** Organic chemicals that have a high vapor pressure at ordinary room temperature. Their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublimate from the liquid or solid form of the compound and enter the surrounding air. VOCs include both man-made and naturally occurring chemical compounds.

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