

Wisconsin Public Water Systems 2022 Annual Drinking Water Report



Wisconsin Department of Natural Resources
Bureau of Drinking Water and Groundwater
dnr.wi.gov



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The *2022 Annual Drinking Water Report* is available to the public. To obtain copies, contact the Bureau of Drinking Water and Groundwater DG/5, Wisconsin Department of Natural Resources, PO Box 7921, Madison WI 53707, 608-266-1054. The report is also available on DNR’s web site, dnr.wi.gov, search “drinking water annual report.”

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Abbreviations

ALE	action level exceedance (lead and copper)
ARPA	American Rescue Plan Act
BIL	Bipartisan Infrastructure Law
CCR	Consumer Confidence Report
DNR	Wisconsin Department of Natural Resources
EPA	US Environmental Protection Agency
IOC	inorganic contaminant
LSL	lead service line
MC	municipal community water system
MCL	maximum contaminant level
mg/L	milligrams per liter
MPTC	Moraine Park Technical College
MR	monitoring & reporting
ng/L	nanograms per liter
NN	non-transient non-community water system
NON	Notice of Noncompliance
NOV	Notice of Violation
OC	other-than-municipal community water system
PFAS	perfluoroalkyl and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonic acid
PN	public notice
RCAP	Rural Community Assistance Program
SDWA	Safe Drinking Water Act
SDWLP	Safe Drinking Water Loan Program
SOC	synthetic organic contaminant
TN	transient non-community water system
TT	treatment technique
VOC	volatile organic contaminant
WHP	wellhead protection
WRWA	Wisconsin Rural Water Association

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EXECUTIVE SUMMARY

The Wisconsin Department of Natural Resources (DNR) works to protect the quality and quantity of the state's water resources and is responsible for implementing and enforcing the Safe Drinking Water Act to safeguard Wisconsin's drinking water.

Strong state and federal regulations combined with the collaborative efforts and hard work of many people—including the DNR, the U.S. Environmental Protection Agency (EPA), individual owners and operators of public water systems, county health officials, professional associations, water quality organizations and water consumers—have allowed Wisconsin to manage its drinking water resources successfully.

DNR's *2022 Annual Drinking Water Report* summarizes compliance with the drinking water requirements for the year and highlights efforts that help public water systems provide a safe and adequate supply of drinking water in the state. Some of these include:

- During 2022, more than 99% of Wisconsin's public water systems provided water that met all health-based contaminant standards.
- Wisconsin established a drinking water standard for PFAS contaminants during 2022. About 1,950 of the state's public water systems are now required to test for PFAS and take corrective action if they exceed the maximum contaminant level in the Safe Drinking Water rule.
- The DNR awarded more than \$105 million in financial assistance through the Safe Drinking Water Loan Program during 2022, helping 31 communities around Wisconsin make needed infrastructure improvements to their drinking water systems.
- The DNR awarded almost \$35 million through the Private Lead Service Line Replacement Program, allowing 57 communities around the state to replace lead services last year.
- The DNR and its partners performed more than 2,600 sanitary surveys, 6,400 annual site inspections and 380 on-site assessments during 2022. Inspections measure compliance with requirements, detect changes over time and prevent future problems. Assessments help to "find and fix" possible sources of microbial contamination.
- The DNR created a \$10 million Well Compensation Grant Program to help private well owners address drinking water contamination in their wells.
- In partnership with the DNR, county health departments provided monitoring and compliance assistance to small water systems in 54 counties around the state. County sanitarians performed more than 6,800 annual site inspections, sanitary surveys and on-site assessments during 2022.
- The DNR's partners provided training and technical assistance to public water system owners and operators throughout the state during 2022 and added new trainings to help utilities with financial planning and asset management.

The DNR works to protect the state's water resources and ensure that everyone in Wisconsin has access to safe and sustainable water supplies.

INTRODUCTION

The Wisconsin Department of Natural Resources (DNR) works to ensure that everyone in the state has access to safe and sustainable water supplies and the state's water resources are protected.

Wisconsin manages its drinking water resources through effective state and federal regulations combined with strong collaborative partnerships between the DNR, the U.S. Environmental Protection Agency (EPA), public water

systems, county health officials, professional associations, individual operators, other water quality organizations and water consumers.



Photo credit: iStock/laflor

This *2022 Annual Drinking Water Report* summarizes how Wisconsin's public water supply systems complied with the drinking water requirements between January 1 and December 31, 2022. This report also highlights the DNR's efforts to meet the goal of providing a safe and adequate supply of drinking water to the citizens and visitors in Wisconsin. Publishing an annual report meets one of Wisconsin's responsibilities under the federal Safe Drinking Water Act (SDWA).

WISCONSIN'S DRINKING WATER PROGRAM: THE BASICS

Requirements for public water systems come from the federal SDWA, first passed in 1974 and amended several times since then, as well as Wisconsin's state drinking water requirements. The SDWA establishes national limits for contaminants in drinking water to protect public health. These limits, known as Maximum Contaminant Levels (MCLs), are health-based standards specific to each contaminant.

The SDWA also specifies how often public water systems must test their water for contaminants and report the results to the state, the EPA and the public. Testing or "monitoring" requirements vary depending on a water system's size, the population served and the vulnerability of the water source to contamination. In general, water systems serving residential consumers and larger populations have more extensive monitoring and reporting requirements.

Finally, the SDWA requires public water systems to notify their consumers when contaminants are detected or requirements have not been met. Consumer notification must include a clear and understandable explanation of the violation that occurred, its potential health effects, the water system's efforts to correct the problem and the availability of alternative water supplies during the violation.

Most states have obtained approval from EPA to administer their own public water supply programs. This primary enforcement authority means a state has adopted drinking water regulations that meet SDWA requirements and can enforce them. In Wisconsin, the DNR implements the drinking water program.



Photo credit: iStock/wildpixel

Environmental justice and ensuring safe water for all in Wisconsin

Greater emphasis on environmental justice is helping raise awareness to the fact that contaminants in water and environmental pollution do not affect all communities equally. Just as historically marginalized and excluded communities experience disproportionate negative outcomes in education, housing and access to food, clean air and water is no exception. In Wisconsin, lead poisoning rates for African American children are four times higher than for white children, according to the Wisconsin Department of Health Services. Recent studies have shown that communities of color also are more likely to be exposed to harmful levels of PFAS in their drinking water.

On Earth Day 2022, Governor Evers created the Office of Environmental Justice at Wisconsin’s Department of Administration, saying “Every Wisconsinite should have access to clean, safe drinking water, our state’s natural resources, and great places to live, learn, and work.”

What does it mean to achieve environmental justice? It means taking a holistic approach to the principles of equity and recognizing that the systemic barriers that limit certain communities from thriving in education, housing, work, health and well-being are all interrelated. Achieving environmental justice means that all people should have not just equal, but equitable access to full and meaningful participation in the decisions that affect them, so people are fully protected from adverse health and environmental effects.

The DNR is furthering these efforts here in Wisconsin. Projects during 2022 focused on enhanced public engagement and new approaches to ensuring that communities affected by the DNR’s programs have a seat at the table to provide input and meaningfully participate in decision-making.

- The DNR revised the criteria for a “disadvantaged community” used for funding drinking water projects. The criteria more effectively identify communities in need and help to determine eligibility for principal forgiveness funding. The DNR made the revisions with input from community stakeholders like the Coalition on Lead Emergency.
- The Bipartisan Infrastructure Law (BIL) specifically directs funding to disadvantaged communities, especially for lead service line replacement and emerging contaminants in drinking water, including PFAS.
- The DNR’s Environmental Management Division created an environmental justice team that helped to improve the agency’s public participation resources and guidance for communication with communities who speak languages other than English.
- The DNR added an environmental justice policy advisor to its leadership team to help integrate environmental justice principles agency-wide. Collaboration will help the public water program enhance community engagement in water quality education and outreach.

All of this is a start. The DNR’s efforts continue and are expanding in the coming year.

WISCONSIN’S PUBLIC WATER SYSTEMS

Wisconsin had 11,231 public water systems in 2022, the largest number of any state. Public water systems provide water for human consumption to at least 15 service connections or regularly serve at least 25 people for 60 days or longer per year. Wisconsin has four types of public water systems:

- Community water systems serve water to people where they live. Wisconsin has 1,040 community water systems that serve 69.5% of the state’s residential population (Figure 1). The remaining Wisconsin residents receive their water from private domestic wells.
 - **Municipal community (MC) water systems** are owned by cities, villages, towns or sanitary districts. This group also includes care and correctional facilities owned by counties or municipalities. Wisconsin has 609 municipal systems. Milwaukee Waterworks is the largest, serving almost 600,000 people. In contrast, Wisconsin’s smallest municipal water systems serve fewer than 50 people each.
 - **Other-than-municipal community (OC) water systems** serve residents in areas supplied by privately-owned wells. The state’s OC water systems include mobile home parks, apartment buildings, condominium complexes and long-term care facilities.

Wisconsin public water systems

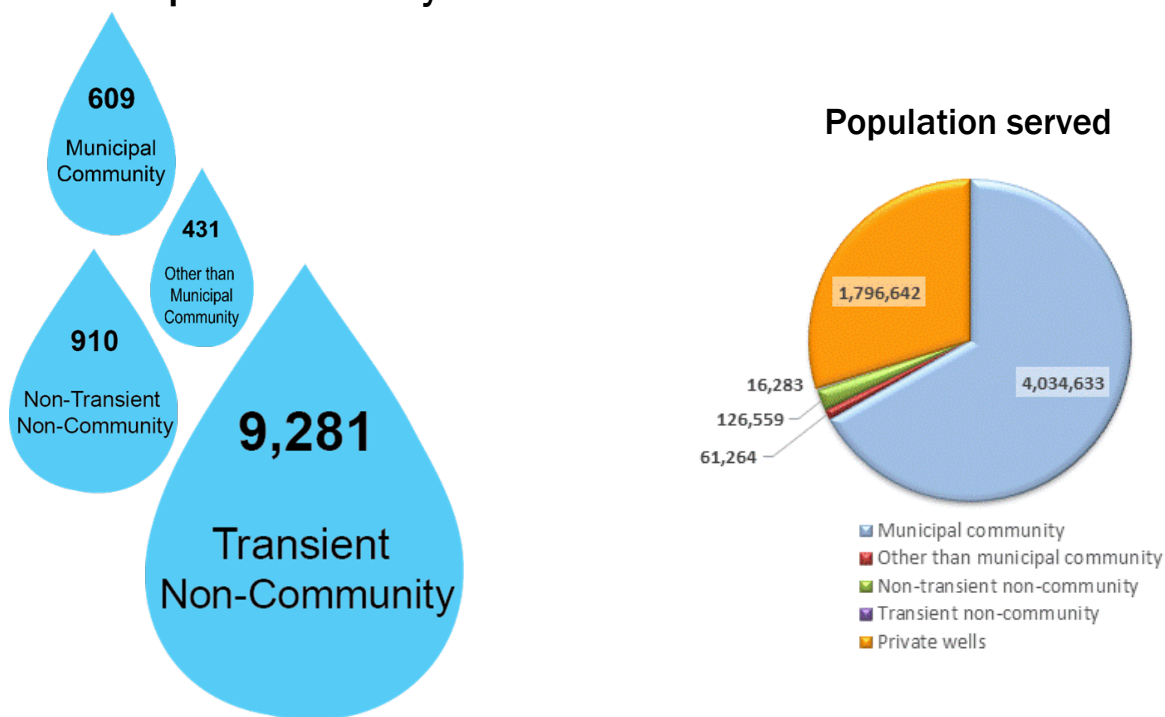


Figure 1. Wisconsin has more than 11,200 public water systems. The majority are very small transient non-community systems that serve non-residential consumers. The state’s municipal water systems serve the largest share of the population.

- Non-community water systems serve water to people where they work, attend school or gather for food or entertainment. The wells supplying these systems are privately owned. Wisconsin has 10,191 non-community systems (see Figure 1).
 - **Non-transient non-community (NN) water systems** regularly serve at least 25 of the same people for six months or more per year. They include schools, day care centers, office buildings, industrial facilities, dairies and many other businesses.
 - **Transient non-community (TN) water systems** serve at least 25 people (though not necessarily the same people) for 60 days or longer per year. They include campgrounds, parks, motels, restaurants, taverns and churches. Wisconsin has more than 9,200 transient non-community water systems.

The vast majority of Wisconsin’s public water systems rely on groundwater pumped from wells. However, 56 systems use Wisconsin lakes to provide drinking water to their consumers. These surface water systems serve some of the state’s largest communities, including Milwaukee and Green Bay. So, while more than 99% of the state’s public water systems use groundwater sources, surface water systems serve almost one-third of the state’s population (Figure 2).

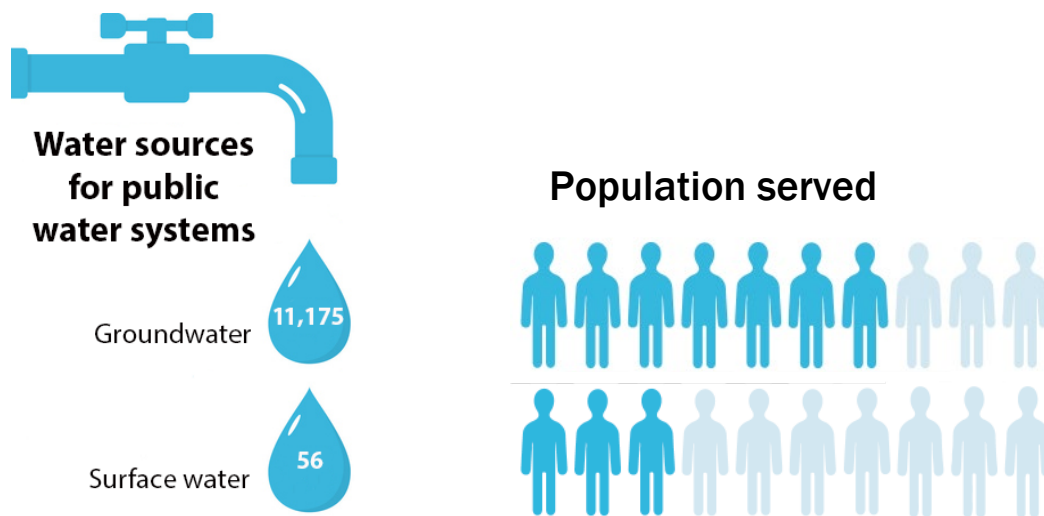


Figure 2. Most of Wisconsin’s public water systems (more than 99%) rely on groundwater pumped from wells. However, the 56 systems that use surface water from lakes include most of the state’s largest public water systems.

MONITORING AND TESTING FOR CONTAMINANTS IN DRINKING WATER

Monitoring is critical for protecting drinking water supplies. All public water systems are required to test their water for contaminants. Monitoring involves collecting water samples, analyzing them for potential contaminants and reporting the results to the DNR and consumers.

The frequency of monitoring and the number of contaminants measured depend on the type of water system and population served. The largest systems collect hundreds of water samples each month, while the smallest systems may collect only two samples per year.

Contaminants can have either acute or chronic health effects. Acute contaminants pose an immediate risk to human health—people can become ill within days or even hours of exposure. Maximum contaminant levels in drinking water are risk-based, set to prevent occurrences of acute or fatal illness. Chronic contaminants cause long-term health risks. Their maximum permissible levels are typically set so that only one in 1,000,000 people would face an increased risk of developing cancer by drinking two liters of water a day for 70 years.



Photo credit: iStock/Mariya Palkina

All public water systems monitor for acute contaminants. The state’s smallest systems, transient non-community systems, are not required to test for chronic contaminants.



PFAS in drinking water? DNR helps communities test and learn

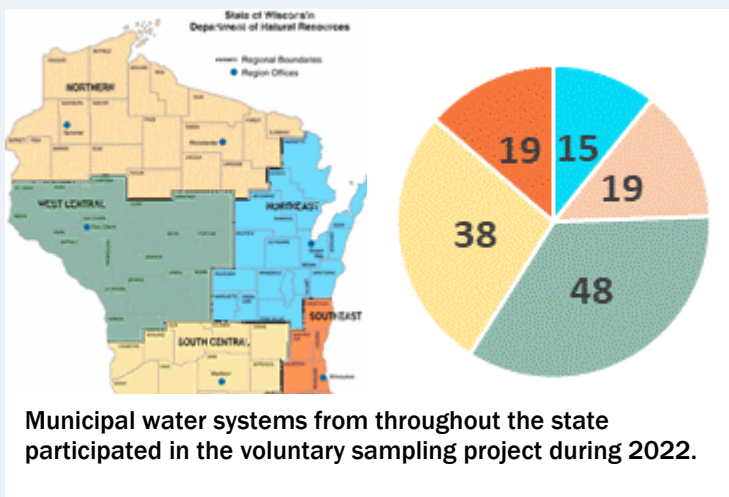
During 2022, the DNR sponsored an initiative to help communities learn whether their municipal water supplies might contain PFAS contaminants (per- and polyfluoroalkyl substances). Using funding from the EPA, the DNR offered PFAS sampling to all municipal water systems statewide. Participation was voluntary and cost-free for the water systems.

The Wisconsin Department of Health Services (DHS) has recommended groundwater standards for 18 PFAS chemicals. The DHS recommended standards for PFOA (perfluorooctanoic acid) and PFOS (perfluorooctane sulfonic acid) are 20 nanograms per liter (ng/L), which is lower than the state’s MCL of 70 ng/L. Water samples were analyzed for 18 different PFAS compounds, including 12 for which DHS has recommended standards.

Many communities from across Wisconsin took advantage of the opportunity. A total of 139 municipal water systems participated in this project—almost 23% of the state’s 609 municipal systems—and they submitted samples from more than 380 wells.

Results from this project showed that PFAS compounds of some type were detected at 34% of the participating water systems. PFOA and PFOS were detected at 24% of the systems. Only 3% of the participating systems had detects above the DHS-recommended standards.

The voluntary PFAS sampling project allowed many communities to increase their knowledge and, where needed, jump-start their efforts to manage PFAS in drinking water. The project was a successful collaboration between the DNR, the DHS and the Wisconsin State Lab of Hygiene. Northern Lake Service provided additional capacity for sample analysis.

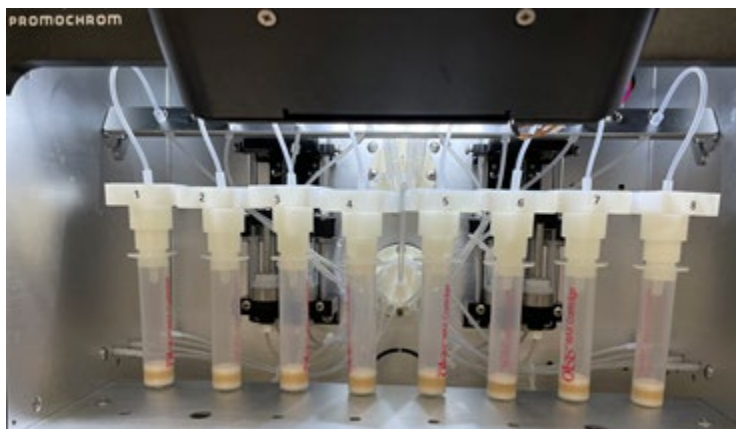


Types of regulated contaminants

Regulated contaminants fall into several groups based on their characteristics and health effects:

- Acute contaminants
 - *Escherichia coli* (or *E. coli*) bacteria
 - Nitrate and nitrite
- Chronic contaminants
 - Inorganic chemicals (IOCs) — arsenic, copper, lead, mercury and other chemicals
 - Synthetic organic chemicals (SOCs) — herbicides, pesticides and PFAS
 - Volatile organic chemicals (VOCs) — benzene, toluene, xylene and other chemicals
 - Radionuclides — radioactive chemicals like radium and uranium
 - Disinfectants and disinfection byproducts — chlorine and byproducts like haloacetic acids and trihalomethanes

Most chemical groups contain multiple contaminants. For example, the synthetic organic contaminants comprise 31 regulated chemicals (although many more synthetic organic substances are used in commerce). Municipal water systems, which have the most comprehensive monitoring requirements, test drinking water for more than 90 regulated contaminants to protect public health. Appendix A lists all the contaminants regulated in Wisconsin and their health-based standards or MCLs.



The Wisconsin State Lab of Hygiene analyzed PFAS contaminants during the voluntary sampling project in 2022. Photo credit: DNR.

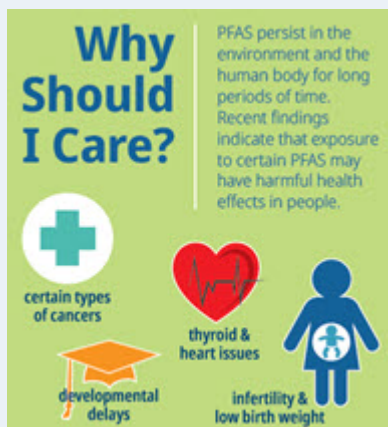


Wisconsin establishes drinking water standard for PFAS contaminants

In August 2022, Wisconsin added two PFAS compounds to its list of regulated drinking water contaminants to protect public health. The DNR established a drinking water standard, or MCL, of 70 ng/L (parts per trillion) for PFOA and PFOS, either individually or combined. In drinking water, PFOA and PFOS are part of the synthetic organic contaminants group that also includes herbicide and pesticide chemicals.

The PFAS standard applies to all municipal, other-than-municipal and non-transient non-community public water systems in the state (1,950 systems). These water systems are now required to test their water for PFOA and PFOS on a regular schedule. Monitoring requirements are being phased in based on size of the population served, and all systems will collect their initial samples by late 2023.

Systems that exceed the MCL for PFOA and/or PFOS will be required to give public notice to all their consumers and implement corrective actions to reduce contaminant levels.



PFAS are a large group of human-made chemicals widely used in commerce, industry and consumer products since the 1950s. They have been used in stain-resistant carpet, water-resistant fabrics, non-stick coatings for cookware, fast food packaging, firefighting foam and household products. PFAS do not break down readily in the environment, so even though their use has been phased out, the chemicals persist and can get into drinking water supplies.

Exposure to high levels of PFAS chemicals has been linked to numerous health effects including increased cholesterol levels, decreased vaccine response, risk of thyroid disease, lower birth weights and reduced fertility in women. A limited number of PFAS chemicals has been studied so far, however, so we are still learning about the effects of exposure to these contaminants.

Action levels for certain contaminants

The SDWA establishes “action levels” rather than MCL standards for two contaminants: lead and copper. Exceeding an action level does not cause a violation, but does require a water system to conduct additional monitoring and follow certain procedures to control levels of the contaminant in the drinking water supply. The action levels for lead and copper are listed in Table A-2 of Appendix A.

Secondary standards





The SDWA sets aesthetic or “secondary” standards for additional contaminants. These substances may cause an unpleasant smell, taste, appearance, stained sinks or discolored clothes when they exceed certain levels. This group of chemicals includes iron, manganese and sulfate, among others. Public water systems may be required to perform additional monitoring or take corrective action if they exceed secondary standards. Table A-6 in Appendix A lists the secondary standards.

Treatment for contaminants

Public water systems may treat their water to meet regulatory MCL limits. Most treatments reduce or inactivate contaminants that may be present in the water. One common treatment is disinfection, which inactivates microbial contaminants so they cannot make us sick. Disinfecting drinking water has revolutionized our lives. Diseases that used to cause many deaths, like typhoid fever, have been almost eliminated thanks to disinfection. Other treatments—like filtration, oxidation and ion exchange—remove or reduce contaminants present in the water. Corrosion control treatment involves adding compounds to adjust the chemistry of water to prevent certain contaminants from leaching (being dissolved or extracted) into the water, like lead from lead pipes.

COMPLIANCE WITH DRINKING WATER REQUIREMENTS

Compliance with drinking water requirements has many facets. The DNR and EPA track whether water samples are collected on time and tested for the correct contaminants, and then measure contaminant concentrations against permissible limits. They also track whether water systems correct deficiencies by established deadlines and give public notice or provide notifications on time as required. Violations can occur when deadlines are not met, water samples are not collected, or public notices are not delivered. They also occur when sample results exceed permissible limits for contaminants. Table 1 is a quick reference for the basic types of drinking water violations.

Table 1. What do drinking water violations mean?		
	Maximum contaminant level (MCL) violations	MCL violations occur when contaminants are detected at levels above what is permissible for protecting public health (i.e., the MCL standard).
	Monitoring and reporting (MR) violations	MR violations occur when water samples are not collected on time or analyzed using approved methods, or when consumers are not notified of lead and copper results from samples collected in their homes.
	Treatment technique (TT) violations	TT violations occur when water systems do not employ the required processes or treatments to reduce exposure to contaminants. They include failure to correct “significant deficiencies” or “sanitary defects” and failure to follow approved start-up procedures for seasonal operation.
	Notification violations	Notification violations occur when water systems do not provide required public notices, deliver Consumer Confidence Reports or notify the DNR when significant deficiencies are corrected.

The majority of Wisconsin’s public water systems met their regulatory requirements during 2022—88.6% of all systems. Most violations that did occur were for failing to meet monitoring, reporting and notification requirements (Figure 3). This section of the report summarizes compliance data for last year.

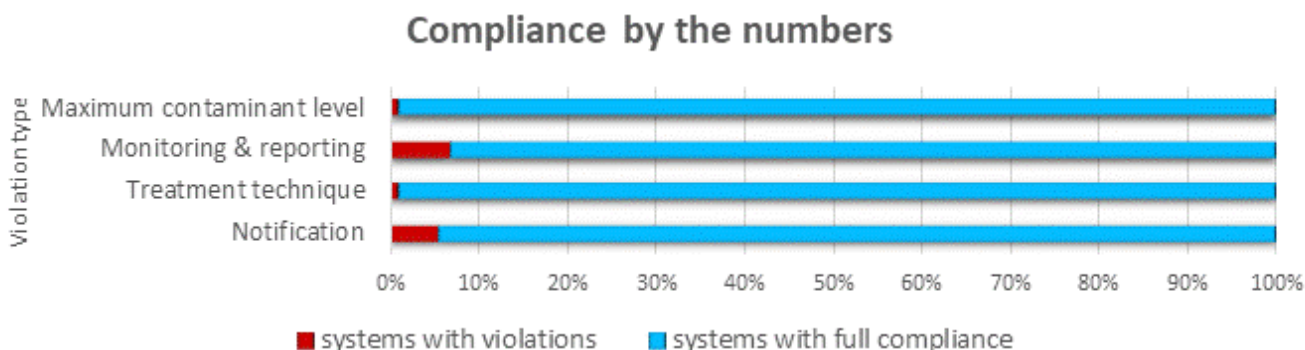


Figure 3. Water systems had the highest rates of compliance with water quality (i.e., maximum contaminant level) and treatment technique requirements during 2022. More systems received violations related to monitoring, reporting and notification requirements.

Maximum Contaminant Level violations

Some of the most serious violations at public water systems result from contaminants in the drinking water. A violation for exceeding a maximum contaminant level does not necessarily mean that consumers experienced adverse health effects from drinking the water, but it does require a water system to notify consumers and take action to correct the problem.

During 2022, more than 99% of Wisconsin’s public water systems provided water that met all the health-based MCL standards for regulated contaminants. Only 90 systems (out of 11,231 statewide) experienced MCL exceedances. The contaminants encountered most frequently in Wisconsin were bacteria, nitrate, arsenic and radionuclides. Table B-1 in Appendix B summarizes the MCL violations during 2022.



- **Microbial contaminants**

Microbes, especially coliform bacteria, are common contaminants of drinking water supplies. Coliform bacteria occur widely in soil, plants and water; their presence in drinking water indicates a possible pathway for contamination. *Escherichia coli* (or *E. coli*) is a species of bacteria that indicates contamination from human or animal wastes in drinking water.

E. coli is an acute contaminant because people can become ill after a single exposure to the viruses that may be present when *E. coli* is detected. Exposure can cause short-term health effects like diarrhea, nausea, cramps and headaches but may have more serious effects on vulnerable populations, including infants, young children and people with compromised immune systems.

All of Wisconsin's public water systems are required to monitor for coliform bacteria. When these bacteria are detected in a drinking water sample (called a total coliform-positive result), additional actions are required to "find" sources of contamination and "fix" the issues allowing contaminants to enter the water system.

First, follow-up samples are collected to confirm the presence of coliform bacteria and specifically verify whether *E. coli* are detected. When bacterial contamination is confirmed, trained inspectors from the DNR and county health departments throughout the state perform on-site assessments. The inspections follow the "find and fix" approach to ensure that bacteria do not persist in the drinking water and provide a valuable service to public water system owners and consumers. Staff performed more than 380 assessments during 2022.

Often, inspectors discover simple corrections that will eliminate pathways for contamination and help water systems get back on track. Problems like cracked electrical conduits at a wellhead or unnoticed cross connections to non-potable water sources often can be corrected quickly and inexpensively. Shock-chlorinating wells that have biofilms growing in them is another common corrective strategy.

The MCL for microbial contaminants is exceeded when *E. coli* is confirmed in a water supply (Table A-1 in Appendix A has more details about the MCL). During 2022, Wisconsin had 26 public water systems (only 0.23%) with MCL violations for *E. coli*. Follow-up work at these systems has included identifying the sources of contamination, correcting defects and, in some cases, switching to a new water source.

- **Nitrate and nitrite**

Nitrate is the most widespread inorganic chemical that occurs as a contaminant of drinking water here in Wisconsin. Because it is water-soluble and leaches readily through soil, nitrate can move easily into the groundwater. Sources of nitrate and nitrite include agricultural fertilizers and animal wastes, according to the Wisconsin Groundwater Coordinating Council.





Nitrate and nitrite are acute contaminants because they can cause serious illness in infants younger than six months old. The condition, called methemoglobinemia or "blue baby syndrome," causes infants' blood to be deprived of oxygen and can be fatal in extreme cases. There is also evidence of a link between exposure during early pregnancy and certain birth defects. Consuming water with high nitrate levels has been linked to chronic diseases in adults also, including increased cancer risk, because nitrate gets converted within the human body to compounds that are known carcinogens.

All of Wisconsin's 11,231 public water systems are required to monitor for nitrate and nitrite in drinking water. During 2022, violations for exceeding the nitrate MCL occurred at 31 public water systems (0.28% of all systems). Water systems throughout Wisconsin can be affected by nitrate, although most MCL violations occur in the northeast, south central and western parts of the state.

Federal and state regulations offer some flexibility for very small water systems that exceed the nitrate standard. The provision allows transient non-community systems to continue operating with water that has nitrate above the MCL of 10 milligrams per liter (mg/L) but below 20 mg/L, providing certain conditions are met. Water systems must notify the public about the nitrate contamination,

ensure that the water will not be consumed by infants or women of childbearing age, and provide an alternate water source.

Wisconsin had 229 transient non-community water systems using this “continuing operation” provision during part or all of 2022 (Table 2). Some have operated with high nitrate for more than 25 years. The overall number of water systems decreased slightly by the end of 2022, though almost 200 water systems are still affected. Nitrate contamination is a continuing challenge for water systems in Wisconsin.

 203	More than 200 TN water systems were operating with nitrate levels above the MCL before 2022.
 26	Another 26 systems exceeded the nitrate MCL and started on continuing operation during 2022.
 30	30 TN systems stopped using continuing operation during 2022, either because they returned to compliance or because nitrate levels increased, requiring corrective action.
 199	At the end of 2022, a net 199 TN systems were operating with nitrate above the MCL.



- **Arsenic**

Arsenic occurs naturally in some rock formations in Wisconsin and also is found in drinking water supplies here. Arsenic has no taste or odor, so the only way to detect it in drinking water is by testing. Health effects come from long-term exposure and include increased risk of skin cancer; arsenic has also been linked to cancers of the lungs, bladder, liver, kidney and colon. Exposure to arsenic can cause skin damage, circulatory system problems and nervous system effects (like tremors). Arsenic exposure during pregnancy and early childhood may also affect learning, IQ scores and risk of certain cancers later in life.

Community and non-transient non-community water systems are required to monitor for the presence of arsenic (1,950 of Wisconsin’s water systems). During 2022, there were 12 systems (0.62%) with violations for exceeding the arsenic standard (0.01 mg/L), slightly fewer than the year before. These water systems are located throughout most of Wisconsin except the far western parts of the state.

- **Radionuclides**

Radium and uranium occur naturally in rock formations in Wisconsin and are detected as contaminants of some drinking water supplies here. Health risks come from long-term exposure. Exposure over a lifetime could result in an elevated risk for cancer and kidney toxicity. All community water systems (serving residential consumers) are required to monitor for radionuclides. Of the 1,040 community water systems in Wisconsin, 14 (or 1.35%) had violations for exceeding the MCL standards for radium and/or alpha particle emitters during 2022. These systems are located in southern, western and northeastern Wisconsin.

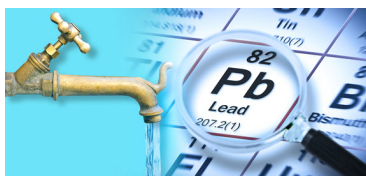


Photo credit: iStock/Francesco Scatena

- **Lead and copper**

Lead and copper typically do not occur naturally in source water. Instead, through the process of corrosion, they can leach into the water as it flows through piping and fixtures containing these elements. Water system dynamics such as water use, water temperature and physical and hydraulic disturbances can also contribute to lead and copper in drinking water. Lead pipe, brass, chrome-plated brass, copper plumbing and lead-based solder are

all potential sources. Lead can have serious health effects because it interferes with the red blood cells that carry oxygen in our bodies. It primarily affects brain development in infants and children but can affect adults also. Copper is an essential nutrient, but long-term exposure to high levels can cause kidney and liver damage.

All community and non-transient non-community water systems are required to monitor for lead and copper. When an action level is exceeded, systems conduct additional sampling to determine how overall water quality may be contributing to lead and copper levels. In addition, systems must provide special information to their consumers about health effects and steps people can take to reduce exposure. Finally, systems with action level exceedances also need to recommend and implement corrosion control to reduce concentrations of lead and copper in their drinking water.

During 2022, more Wisconsin water systems exceeded the action levels for both lead and copper. Last year, 24 public water systems exceeded the lead action level, and 17 exceeded the action level for copper (Table 3). The increase happened because a large group of non-transient non-community water systems was required to monitor during 2022.

contaminant	number of water systems			
	MC	OC	NN	total
copper	0	0	17	17
lead	2	2	20	24

The DNR works with public water systems that have violations for MCL exceedances to help them correct problems and return to compliance as soon as possible. Corrective actions can include disinfection, reconstructing an existing well, drilling a new well to obtain an alternate water source or installing a treatment system. Microbes, nitrate, arsenic and radionuclides are all priorities for the DNR because of the common occurrence of these contaminants in Wisconsin.



Get the lead out? It takes a village

Altogether in 2022, 57 Wisconsin communities received funding through the DNR’s Private Lead Service Line Replacement Program for removing and replacing lead service lines. This important funding helped both large and small communities alike. (See the “Financial assistance” section of this report for more information about funding awarded in 2022.)



Photo credit: DNR

The village of New Glarus, in southwestern Wisconsin, received \$165,500 from the DNR’s Private Lead Service Line Replacement Program. The entire project spanned two years, removing five private-side lead service lines (LSLs) in 2022 and an additional 16 early in 2023, for a total of 21.

New Glarus is exceeding its goal. One thoughtful property owner declined the award and paid for the LSL replacement at her home herself. She wanted her share of the award to go to someone else or be put toward remaining work that needed to get done. The work at this homeowner’s property will raise the final total to 22 LSLs replaced when the project is finished in 2023.

New Glarus is small, with a population of 2,172, but they still take water quality seriously. Almost a decade ago, New Glarus exceeded the lead action level. This exceedance only happened once. Jason Borth of New Glarus Waterworks explained that the high results came from an older house that had been unoccupied for months and faulty sampling methods in another location.



Basement in New Glarus after completing LSL replacement. Photo credit: New Glarus Waterworks

However, New Glarus wanted to be proactive and replace its lead service lines because they knew what other communities had experienced with outdated infrastructure. Several years ago, the village replaced its publicly-owned LSLs but, at the time, encountered resistance to replacing the private portions. Property owners were concerned about the costs they would incur as well as potential effects on their landscaping.

While New Glarus residents wanted drinking water free of lead, they also had questions about the project. Residents wondered about costs of replacing LSLs and the “unknowns.” To respond to concerns, New Glarus Waterworks sent out information packets in 2022 with details about what to expect as well as the likely outcomes. In addition to safer water, property owners could also look forward to increased water flow and pressure. Also, residents recognized that their property values might increase because of the updated infrastructure.

“Getting the funding was HUGE! The residents needed a lot of reassurance that they would not receive a bill for the work,,” Borth said. These projects can be challenging for small communities: sometimes budgeting has to be done before getting solid cost estimates. New Glarus also experienced vacancies in key city positions that normally help guide and oversee these projects, another challenge for which it was difficult to plan.

The village received a lot of valuable technical assistance from Nick Bubolz of Town and Country Engineering and funding guidance from the DNR’s Kate Leja-Brennan. Five Star Energy Services did the construction work. They used directional drilling to minimize disruption, so there was no need to dig open trenches. Borth said, “We could not have done it without their incredible help – getting everything pulled together.”

Like New Glarus, communities throughout the state are applying and obtaining funding to “get the lead out!”



New Glarus used directional drilling to replace LSLs without disturbing homeowners’ yards. Photo credit: New Glarus Waterworks

Monitoring and reporting violations

To measure contaminant levels, public water systems are required to monitor and test their water during specific time periods. Monitoring and reporting violations occur more frequently than MCL violations and, among all the violations summarized in this report, were the most numerous. During 2022, there were 1,186 MR violations at 749 of the state’s 11,231 public water systems (6.7%). Most often, these violations resulted from failure to collect required samples, samples collected late, and failure to notify consumers of lead and copper results. MR violation numbers were slightly lower in 2022 compared with the previous year. Table B-2 in Appendix B summarizes the MR violations that occurred during the year.

Treatment technique violations

Some parts of the SDWA establish “treatment technique” requirements instead of MCL standards for controlling levels of contaminants in water. Treatment techniques are actions or procedures that public water systems must follow to control or reduce levels of some contaminants. Treatment technique requirements have been established for controlling viruses, some bacteria, lead and copper.



Photo credit: DNR

Treatment technique (TT) violations occur when water systems fail to follow required procedures or complete required actions. TT violations signal the potential for health risks, since consumers cannot be certain whether their drinking water was adequately treated or protected to reduce exposure to contaminants.

Among Wisconsin’s 11,231 public water systems, 113 systems had treatment technique violations during 2022, meaning that 99.2% of the

state’s systems met these health-based requirements. Wisconsin’s water systems have maintained a high rate of compliance with treatment technique requirements for several years running. Most TT violations resulted from not meeting deadlines for correcting defects or deficiencies identified during inspections. Some systems failed to submit information and studies required after action level exceedances. Table B-3 in Appendix B summarizes the treatment technique violations during 2022.

Notification and reporting violations

Communicating with consumers about their drinking water is an important part of water system operation. Water systems are required to notify consumers and the DNR about multiple issues, including water quality, violations, operational problems and emergencies. Violations can occur if systems fail to provide required notifications. Table B-4 in Appendix B summarizes all the notification violations that occurred during 2022.

- **Public notice violations**

To protect public health, water systems are required to notify consumers about violations or situations posing risks to human health. Exceeding a contaminant MCL, failing to monitor drinking water supplies and failing to properly treat the water are all violations that require public notification.

Public notices must inform consumers about the nature of violations, potential health effects, corrective actions that the water system is undertaking and any preventive measures that consumers should take. If a water system fails to notify consumers as required, public notice (PN) violations can occur.

Public notice violations were some of the most common drinking water violations during 2022. They occurred at 559 of Wisconsin’s public water systems last year (5% of all systems). This continues an improving trend over the past several years. Most PN violations stemmed from public notices required due to monitoring violations for microbial contaminants and nitrate (missed or late samples).

- **Consumer Confidence Report violations**

All community water systems (those serving residential consumers) are required to prepare and deliver a water quality report each year. This is called the Consumer Confidence Report (or CCR),

and it provides information about the sources of a system’s water, levels of any contaminants detected in the water and violations incurred by the water system during the previous year. CCR violations occur whenever water systems fail to deliver this annual report to their consumers. Of Wisconsin’s 1,040 community water systems, only 31 (or 3%) received violations in 2022 for not delivering CCRs on time.

- **Notification violations**

Correcting significant deficiencies at public water systems protects public health. When significant deficiencies are identified during inspections, water systems are required to correct them by specified deadlines and then notify the DNR when the corrective actions are completed. These requirements apply to all of Wisconsin’s public water systems, and failure to notify the DNR can cause a violation. During 2022, only 13 water systems (or 2.1%) incurred violations for failing to provide these notifications.

Overall compliance with drinking water requirements

Most of Wisconsin’s public water systems met all their regulatory requirements in 2022 (88.6% overall), a slight improvement over the previous year. Compliance rates for the four types of public water systems are shown in Figure 4 and Appendix B, Table B-5.

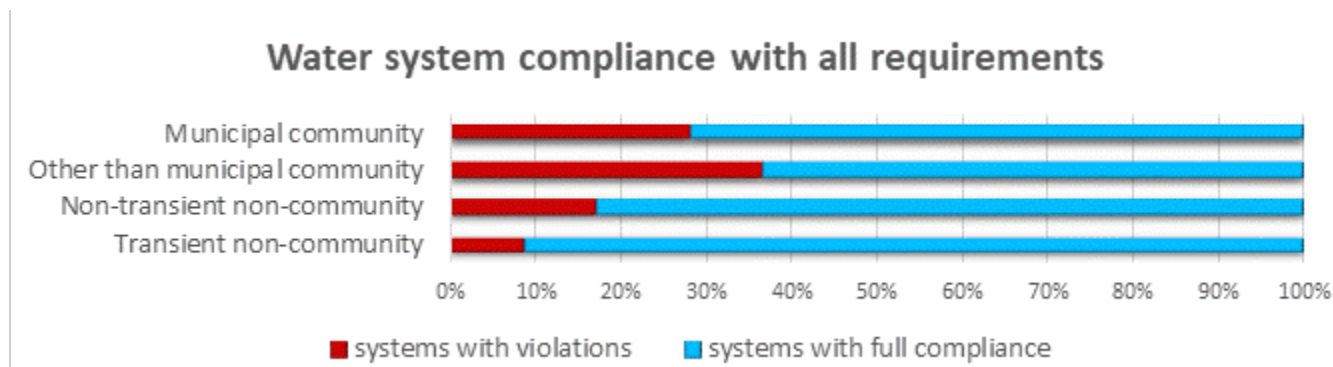


Figure 4. Compliance with all drinking water requirements varied from a high of 91% for transient non-community water systems to 64% for other-than-municipal community systems. Community water systems have more numerous and frequent requirements than non-community systems.

DNR EFFORTS TO PROTECT WISCONSIN’S DRINKING WATER

DNR strives to achieve its mission to ensure the safety and availability of Wisconsin's drinking water supplies and protect the health of the state's water resources. To meet its responsibilities for implementing the SDWA, the DNR works in multiple ways to help Wisconsin’s public water systems provide safe drinking water.

Drinking water program funding & staff

Wisconsin’s public water supply program receives funding from federal and state government sources (Figure 5). Despite having the largest number of public water systems nationwide, Wisconsin has fewer staff working to implement the SDWA than many other states do.

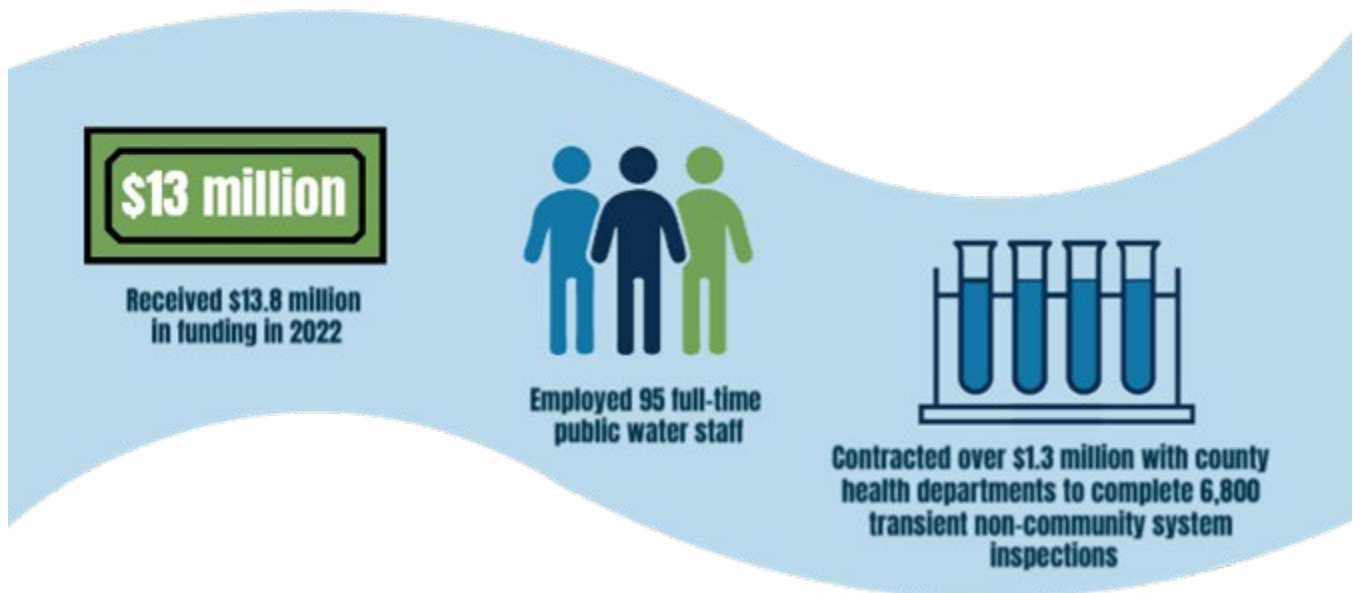


Figure 5. Funding for the DNR’s public water supply program comes from both federal and state sources. During 2022, the program had 95 full-time staff.

The federal Bipartisan Infrastructure Law (BIL), passed in late 2021, is a once-in-a-lifetime investment in the nation’s drinking water infrastructure. The BIL allocates more than \$35 billion toward safe drinking water nationwide over five years. For 2022, Wisconsin’s share of the funding is more than \$91 million:

- almost \$30.7 million for the Safe Drinking Water Loan Program and implementation of the SDWA
- \$48.3 million for lead service line replacement
- almost \$12.9 million to address emerging contaminants, including PFAS

To provide adequate support for this monumental federal investment for drinking water infrastructure, the DNR’s Community Financial Assistance and drinking water programs have temporarily increased the number of staff doing loan management, engineering plan review, technical assistance, outreach and budgeting.

The program made more changes during 2022 to meet new challenges. A new Lead and Copper Section was created. Its creation was prompted by new requirements for controlling lead and copper in drinking water. Water systems have a 2024 deadline to meet the initial lead service line inventory requirements. Systems also need to prepare for more rule changes that the EPA will add in the near future. At the same time, systems have new funding opportunities through the BIL. Lead and Copper Section staff assist public water systems with understanding and meeting the drinking water requirements and also help water systems take advantage of federal infrastructure funding available specifically to address these issues.

Inspections & assessments

Inspecting public water systems is one of the DNR’s fundamental responsibilities and an essential tool. Inspections measure compliance with requirements and track changes over time. They also can prevent future problems, since defects can be identified before violations or health risks occur. Compliance

inspections, called “sanitary surveys,” are comprehensive reviews of the water sources, pumps and piping, treatment facilities and operation and maintenance practices at public water systems.

Sanitary surveys are performed regularly, every three years at community water systems and every five years at non-community systems. Last year, the DNR and its contracted partners conducted 2,628 sanitary surveys throughout Wisconsin (Figure 6).

Sanitary surveys performed during 2022

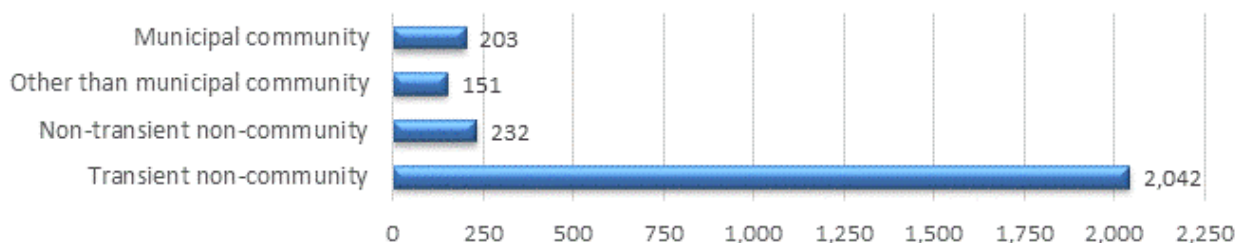


Figure 6. The DNR and its partners completed 2,628 sanitary surveys in 2022.

In addition to regularly-scheduled sanitary surveys, the DNR performs triggered inspections at some water systems. When coliform bacteria are confirmed at a public water system, the DNR responds by conducting an on-site assessment of the facility. The assessment aims to identify potential pathways for microbial contamination and the corrective actions needed to remedy any sanitary defects. During 2022, the DNR and its contracted partners performed 381 of these assessments.

In Wisconsin, some transient non-community systems can qualify for less frequent monitoring of microbial contaminants if they receive an annual site visit each year and correct all sanitary defects identified. During an annual site visit, the inspector checks the basic elements of the water system—wells, pumps, water storage—and looks for any changes or problems. If sanitary defects are identified, the system owner is notified about corrective actions needed. The DNR and its contracted partners performed 6,414 annual site visits during 2022 to help water systems meet their requirements and qualify for reduced monitoring schedules.

Monitoring assistance

Compliance with monitoring requirements is essential to protecting drinking water quality in Wisconsin. Water systems collect and analyze samples throughout the year to measure the quality of drinking water, and the DNR provides monitoring assistance to all operating systems in the state.

The DNR provides monitoring assistance to public water systems to meet both state and federal drinking water requirements. Drinking water monitoring requirements are in accordance with EPA’s Safe Drinking Water Act, in addition to other state regulations.

Last year was especially busy because new monitoring requirements took effect. The DNR set drinking water standards (MCLs) for two PFAS chemicals and, as a result, created PFAS monitoring requirements. All public water systems (except for transient non-community systems) are required to monitor for PFAS contaminants. Some water systems began monitoring in the fourth quarter of 2022, and the remainder will do their initial monitoring during 2023.

In 2022, the DNR also conducted a voluntary PFAS monitoring program for municipal water systems. The program was created to better understand the potential statewide impact of PFAS contaminants in drinking water. The DNR funded all analytical costs with assistance from the EPA. This voluntary PFAS monitoring program was successful, with 140 municipal water systems participating and measuring PFAS levels at more than 380 entry points (wells) around the state.

Monitoring assistance for water systems has multiple facets. The DNR sends monitoring schedules twice yearly to community and non-transient non-community water systems to help ensure that sampling requirements are met. Preliminary schedules are sent four months before the start of a calendar year (which is helpful for logistic and economic planning purposes), and final schedules are delivered at the start of each year.

Public water systems also receive all of their laboratory submission forms from the DNR. The forms are used to document sample collection procedures, sample data, shipping and holding times, and sample condition upon receipt by the laboratory. This ensures that water systems have the documentation necessary to comply with their monitoring requirements. The laboratory submission forms include information to notify laboratories about the contaminant(s) being monitored, the monitoring period, sample site location, sample instructions, sample collector and DNR representative.

Dept. of Natural Resources Bureau of Drinking Water P.O. Box 7921 Madison WI 53707		BACTERIOLOGICAL ANALYSIS (ENCLOSE FORM WHEN SENDING SAMPLE TO LAB)	Public Water Supply Form Number: 5744 Revision: 20230517 Generated: 6/8/2023
Section I: System Information (to be completed by Department of Natural Resources/SAMPLER)			
System Name:		PWS ID:	
DNR Contact:	Region:	System Type:	<input type="checkbox"/> MC <input type="checkbox"/> CN <input type="checkbox"/> OC <input type="checkbox"/> TN
System Address:		City:	County:
Entry Point ID:	WI Unique Well No:	Note:	
Sampler Contact Info: (Notify DNR Contact of Corrections)		Sampler: (Leave Blank If You Don't Use These Services) Provide information to have results faxed or emailed or to change a billing address, if your lab offers these services Fax Number: _____ Email: _____ Billing Address: _____	
Sample Source: (Location) <input type="checkbox"/> W - Well Source <input type="checkbox"/> E - Entry Point <input type="checkbox"/> D - Distribution System	Sample Type: (Check Only One) <input type="checkbox"/> D - Routine Distribution <input type="checkbox"/> C* - Check: Same location as Positive "D" Sample <input type="checkbox"/> R* - Repeat: Within 5 connects of Positive "D" Sample <input type="checkbox"/> A - Additional Routine (month following positive "D") *IF THE SAMPLE TYPE IS "C" or "R": "D" or "A" Positive Sample Date: / /	<input type="checkbox"/> N - New Construction <input type="checkbox"/> I - Investigation <input type="checkbox"/> W - (Raw) Water	Sample ID: _____
Special Instructions: _____ Collect Sample between: _____ and _____ SAMPLES MUST BE ANALYZED WITHIN 30 HOURS OF COLLECTION. SEE SAMPLING INSTRUCTIONS ON BACK.			

The DNR provides updated monitoring site location plans to all community and non-transient non-community systems annually. These plans ensure that systems have current information about their approved monitoring site locations. Monitoring at approved locations is necessary for proper and consistent assessment of drinking water quality.

The DNR also distributes supplemental information annually to water systems that monitor for lead and copper. The information includes laboratory submission forms, instructions for sample collection, explanations of compliance determinations, forms for notifying consumers of sample results and certification forms for submitting information to the DNR. This helps ensure that water systems collect lead and copper samples properly, understand compliance determinations and inform residents of analytical results when samples are collected from their homes.

Community and non-transient non-community water systems are eligible for monitoring waivers, or reduced monitoring frequencies, based on assessments of potential contaminant sources and well vulnerability. During the vulnerability evaluation, the DNR reviews previous water quality results, groundwater proximity to potential contaminant sources, local geology and well construction.

Assessments for monitoring waivers are conducted and reviewed on a three-year cycle, and each year the DNR distributes monitoring assessment information to the systems eligible for waivers. The evaluations are used to determine the proper monitoring frequency for all regulated contaminants. This

monitoring assessment process enables systems to reduce monitoring costs by approximately \$3 million annually statewide.

Assisting private well owners

Some DNR staff specialize in assisting individual well owners, since almost one-third of the state’s population obtains their drinking water from private wells. Staff inspect new non-community wells during construction and pump installation whenever possible. Inspecting wells under construction can identify issues and allow them to be corrected before a well is placed into service. Inspections also ensure compliance with regulatory standards and protect the drinking water resource.

In October 2022, the DNR established a grant program to help private well owners address drinking water contamination that exceeds MCLs. The DNR is utilizing \$10,000,000 in America Rescue Plan Act (ARPA) funding for this grant program. The program pays the cost to either drill a new well or install treatment on a contaminated well, and it also pays for filling and sealing contaminated or unused wells.



Well compensation grants help spell success for water system owners

Many of Wisconsin’s public water systems are businesses that get their water from privately-owned wells. This is true for most of the non-transient and transient non-community water systems statewide (almost 10,200 water systems). Contaminants in the drinking water present a daunting challenge at these very small systems.

In 2022, Governor Evers, along with the DNR made \$10 million available through the Well Compensation and Well Abandonment Grant Programs specifically for financial assistance to private well owners. The grants support replacing, reconstructing, abandoning or installing treatment for contaminated private wells. Applications opened in October 2022 and will remain open until December 2024 or until the funds are awarded, whichever occurs sooner.

Some water system owners, who were already dealing with exceedances of contaminant MCLs, acted right away. Here are the stories of two who used the grants to help resolve their contaminant issues.

Mother Goose Family Daycare Center in Clintonville opened its doors in September 2020 with a newly-constructed well. Within the first year after sampling and testing began, arsenic was discovered in the water supply at levels just above the MCL.

The owner started working on a plan of action and, after consulting with three different well drillers in the area, got the discouraging news that constructing a new well or reconstructing the existing well would be unlikely to solve the arsenic problem. (Some parts of Wisconsin have naturally-occurring arsenic in the bedrock.) The center is located in a rural area, so there also was no option for connecting to a nearby water system. The only remaining approach was to install treatment for arsenic removal.

The center’s owner struggled with how to afford the cost of treatment. She was afraid the financial burden could cause the center to close. Mother Goose was relatively new but already had a year-long waiting list of families needing child care. The need for a licensed childcare center in the Clintonville community was substantial. Many families were traveling to outside communities to find care, while others simply could not work outside the home.



Staff from the DNR's drinking water program informed her about the new grant opportunity. She promptly applied and was awarded a grant to cover the cost of the treatment system. In the owner's words, "With this grant the center can not only provide the safest water to the most delicate population in this community, but the center is able to remain open, providing care to 45 children in the Clintonville community."



Photo credits: DNR

Lauer Farms grows potatoes, corn and pickles in Waushara County. For many years, the Lauers have provided migrant housing for their workers, and in 2022, they built a new, expanded facility that can house more than 100 migrant workers.

Unfortunately, testing during 2022 revealed high levels of nitrate in the drinking water. At the same time, *E. coli* bacteria were also detected in the water supply.

The interim solution -- hauling in bottled water -- was both cumbersome and very expensive, but the Lauers wanted to care for their workers while making a corrective action plan.

The Lauers heard about the Well Compensation Grant Program from their DNR staff specialist, who provided lots of hands-on help with submitting the application. They applied and were awarded a grant to cover part of the cost of drilling a replacement well. Initial samples from the new well are both low in nitrate and free of coliform bacteria.

Both water system owners found DNR staff, both in the drinking water and groundwater program and the grants program, to be very helpful. Both had their applications processed right away and learned in short order that they would receive grants.

Enforcing drinking water regulations

Whenever water systems are not meeting the drinking water requirements, the DNR works to resolve issues quickly to protect public health. The DNR follows a "stepped" enforcement process to help water systems return to compliance, using a series of actions designed to resolve violations at the lowest level—of formality and severity—that is appropriate.

Many violations are resolved quickly. The DNR initially responds to most violations by sending a written Notice of Noncompliance (NON) to public water systems. Most often, action is taken immediately to return to compliance.

When health-based violations occur—either because contaminants exceed the MCL standards or because deficiencies and defects are not corrected as required—the enforcement process is formalized to resolve problems. Subsequent enforcement steps include a Notice of Violation and enforcement conference, which may be followed by written consent orders, administrative orders or penalty orders.

Whenever possible, the DNR's enforcement emphasizes voluntary agreements to take corrective action and establish a timeline for returning to compliance. On rare occasions when the DNR cannot resolve violations by collaborating with a water system, a case may be referred to the Wisconsin Department of Justice or the EPA for further enforcement.

Table 4 summarizes the DNR's enforcement activity during 2022. Last year, the DNR sent 1,656 Notice of Noncompliance letters but only 34 Notices of Violation. This illustrates that most water systems acted promptly after being notified of violations, and additional enforcement was not needed.

Table 4. Drinking water enforcement during 2022		
enforcement action	purpose	number
Notice of Noncompliance (NON) sent	NON informs public water system owner about failure to collect samples, report results, or distribute required information or notices and actions needed for returning to compliance.	1,656
Notice of Violation (NOV) sent	NOV notifies water system owner about a violation and schedules a meeting with DNR staff for more detailed discussion.	34
Enforcement conference held	Enforcement conferences are held to discuss the enforcement process, possible corrective actions and a timeline for returning to compliance.	18
Consent order signed or administrative order issued	Consent or administrative order describes corrective actions and establishes a timeline and deadline for returning to compliance. Orders are usually used when returning to compliance will take longer than six months. Some administrative orders can include forfeitures (penalties).	17
Judgment by WI Department of Justice or court	Judgment is a formal agreement, filed in court, describing the actions required for a water system to return to compliance. Judgments are issued in cases that have been referred to WI DOJ for enforcement.	3
Case concluded by WI Department of Justice	A case that was referred to the WI DOJ is resolved, and the case is closed.	1

Protecting water sources

Preventing contamination is one of the best ways to safeguard drinking water supplies. Wellhead protection (WHP) is a preventive program designed to protect public water supply sources and reduce infrastructure costs, treatment costs and public health risk. It represents a “first line of defense” approach to protecting our drinking water.

Wellhead protection helps to prevent contaminants from entering public water supplies by managing the land use that contributes water to wells. Wisconsin’s wellhead protection program incorporates both regulatory and voluntary approaches, and the DNR encourages the development and implementation of wellhead protection plans for all public water systems to protect wells from potential contamination. During 2022, the DNR approved 16 new wellhead protection plans covering 45 individual wells. This represents a substantial increase over recent years.

For communities with approved plans, source water protection also involves wellhead protection ordinances. The DNR provides examples of ordinances and also encourages adoption of county-wide ordinances and wellhead protection zoning districts, which can limit potential contamination sources within a wellhead protection area. At the end of 2022, 48.5% of the municipal water systems that rely on groundwater had achieved this level of wellhead protection. This also represents an improvement over the previous year.

The DNR uses partnerships and collaboration to provide strategic and technical assistance to communities to enhance their wellhead protection efforts. Using DNR funding, the Wisconsin Rural Water Association (WRWA) assists communities with development of their plans.

The DNR also worked with technical partners to use groundwater flow modeling in new ways that will assist communities in source water protection efforts and develop new source water assessment and decision support tools that will help implement pollutant reductions in critical areas contributing recharge to wells. Some of the DNR's source water protection efforts include:

- Establishing well construction standards, well filling and sealing standards and requirements that prevent cross-aquifer contamination.
- Utilizing extensive groundwater quality and well construction databases to analyze conditions statewide and create tools, such as aquifer nitrate penetration graphs, to help well owners obtain safe water.
- Funding research to address priority water resource concerns.
- Reviewing and permitting new high capacity wells, including siting and impacts to water quantity and quality.
- Providing hydrogeologic analyses to assist with siting, permitting and design of Concentrated Animal Feeding Operations.
- Mapping watersheds for nutrient impact areas of concern, to be incorporated into pollution reduction strategies.
- Implementing the Nitrate Demonstration Initiative to help specific communities in Wisconsin implement source water intervention strategies to stem rising contaminant levels.
- Using demonstration projects to develop transferable methods for reducing agricultural nutrient impacts in source water protection areas.
- Developing the Nitrogen Decision Support Tools to meet technical needs for estimating agricultural nitrate leaching and transport to public wells.



Photo credit: DNR

Maintaining strong partnerships

In Wisconsin, working toward the goal of safe drinking water is a cooperative effort involving public water systems, professional associations, individual operators, the DNR, local agencies, the EPA, water consumers and many others. As part of this effort, the DNR contracts with numerous organizations to provide technical assistance, training and compliance support to the state's water system owners and operators.

- ***Compliance support***

The DNR's partnerships with county health departments are crucial to helping transient non-community water systems across the state. Wisconsin has 9,281 of these small systems—which

include small businesses, churches, restaurants, campgrounds and parks—more than any other state. The systems are tested annually for coliform bacteria and nitrate.

Overseeing so many facilities is a big job and, since the mid-1990s, the DNR has contracted with county health departments for water quality monitoring and inspections of TN systems. The program started with eight county health departments and now covers 54 counties and about 75% of the transient non-community water systems statewide (Figure 7).

County environmental health sanitarians inspect these water systems, and they also perform all routine and triggered monitoring. When contaminants are detected, the inspectors provide technical support and assist the water systems with finding sources of problems and identifying corrective actions to fix them.

During 2022, county sanitarians conducted 5,132 annual site inspections, 1,450 sanitary surveys and 225 assessments (triggered when bacterial contaminants are detected).

The program's success is reflected in much lower numbers of monitoring violations. The rate of routine bacteria monitoring violations was only 0.5% at transient non-community systems working with county agents, compared with 11% for systems not covered by a county program.

Many county health departments are also expanding their environmental services to private well owners by opening their own labs for bacteria and nitrate analysis. Contracting with local health departments has been valuable for transient non-community public water systems and for providing safe drinking water to the broader local communities in those areas.

- **Technical assistance**

Wisconsin Rural Water Association (WRWA) helps small public water systems by giving them regular reminders about monitoring requirements and deadlines and providing specialized, on-site technical assistance. This assistance helps to train new operators and troubleshoot problems that occur. WRWA helps with a wide variety of topics, including new and seasonal water system start-up, water loss, reporting and completing compliance documents, sampling and monitoring, contaminant tracing and investigation, monitoring site assessments, and winter operations. This program is funded through a contract with the DNR, so technical assistance is provided at no cost to the water systems.

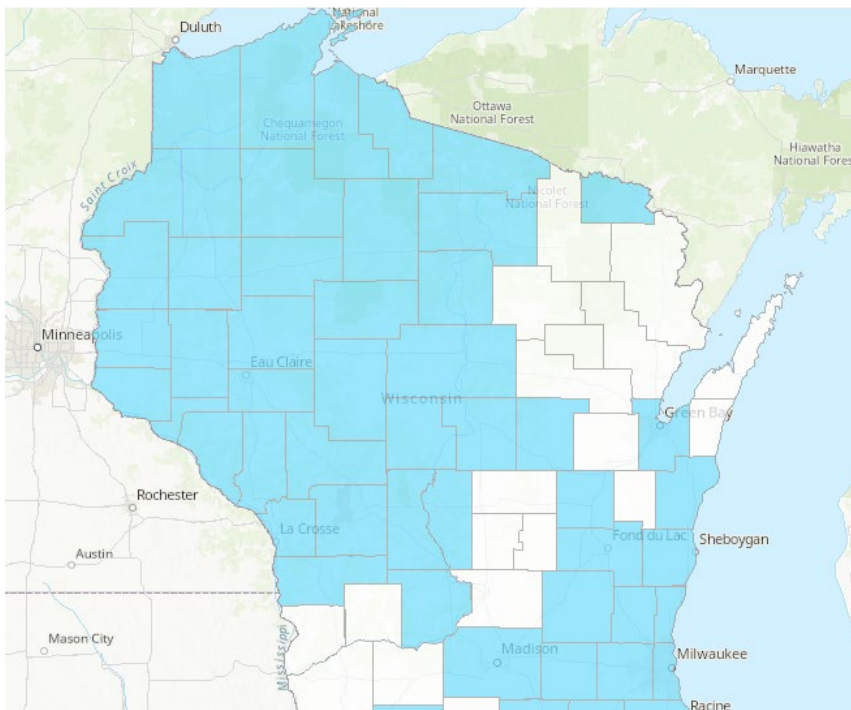


Figure 7. The DNR contracts with county health departments that provide services to TN water systems in 54 counties around the state (shown shaded in blue).

During 2022, WRWA delivered more than 5,300 monitoring reminders and performed more than 600 on-site and 'on-site virtual' visits at other-than-municipal community and non-transient non-community water systems around the state. The DNR has a long-running partnership with WRWA, and both organizations regularly share feedback on how to improve their assistance to the state's small water systems. This technical assistance has helped reduce violations at OC and NN systems from over 2,000 to about 120, or even fewer, per quarter. This dramatic improvement saves time spent having to follow up on violations, for both DNR staff and water system operators.

Challenges presented by the COVID-19 pandemic have produced long term improvements. Early in the pandemic, the DNR and WRWA worked together to create on-site virtual visits. On-site virtual visits allow WRWA to provide technical assistance via video-conferencing apps and extended phone calls. Although the worst of the pandemic has apparently passed, some system owners and operators still prefer on-site virtual visits, because they are more convenient and can save time. The on-site virtual visits offer additional flexibility for the DNR's technical assistance program, and the DNR's Technical Assistance Coordinator continues to evaluate novel ways to improve the program.

Another technical assistance partner, the Wisconsin Rural Community Assistance Program (RCAP), assists small communities throughout the state with utility, financial, asset management and other needs. RCAP works with the DNR to prioritize small water systems that need assistance as well as to identify priority training topics for RCAP's utility training courses.

The DNR's Technical Assistance Coordinator attends multiple water industry conferences throughout the year to maintain an open dialogue with operators, utility managers, engineers, consultants and training providers. Communicating about compliance issues, regulations, capacity building, funding and certification has helped the DNR to develop a solid rapport with its customers and regulated community.

- ***Training***

Moraine Park Technical College (MPTC) and WRWA both provide training for water system operators to obtain certification and required continuing education. The DNR contracts with WRWA to provide hopeful Water System operators (for OC and NN systems) with exam preparation training and help them pass the certification exam; and MPTC provides similar exam preparation training for Municipal Waterworks operators under another contract. MPTC also provides continuing education training for municipal and small water system operators. Both organizations are essential to building and developing a robust and knowledgeable drinking water workforce for our state.

MPTC also provides online training modules for asset management, financial management and capacity development. These trainings were developed through a collaboration with the DNR, and they have seen attendees from utilities, utility boards and water systems around the state.

One outcome of the COVID pandemic is that both organizations now offer hybrid learning opportunities, with in-person and online classes. These formats allow DNR-sponsored classes to have a greater reach across the state and better meet the needs of different operators. The DNR plans to continue offering hybrid trainings in the future.

Financial assistance

Wisconsin receives federal funding to implement the SDWA, and the DNR uses most of it to provide low-interest loans and principal forgiveness awards for infrastructure improvements at eligible municipal water systems. This financial assistance funds projects that help Wisconsin communities provide safe drinking water for consumers at affordable prices. The DNR's community financial assistance program and public water staff work together to manage the funding.



Photo credit: DNR

- **Safe Drinking Water Loan Program**

Wisconsin's Safe Drinking Water Loan Program provides affordable financial assistance to municipalities, helping them undertake infrastructure projects to protect public health and achieve or maintain compliance with drinking water regulations. The DNR awarded more than \$105 million in loan program funding during 2022. Since the Safe Drinking Water Loan Program began in 1998, 572 projects in Wisconsin have received more than \$985.0 million in funding.

Last year's funding consisted of \$99.2 million in low interest loans and almost \$6 million in principal forgiveness. Depending on prevailing interest rates, communities can save 20-30% from a lower interest rate loan compared with a market rate loan. Wisconsin communities are using loan program funds for a variety of infrastructure improvements.

- The city of Sheboygan received \$39,430,018 to construct a new primary intake pipeline, a new shore well and a new low-lift pumping station to replace structures that have reached the end of their useful life and meet current design standards.
- The village of Kendall received \$981,557 to construct upgrades to wells 2 and 4 to meet current code requirements.
- The city of Milwaukee received \$24,022,175 to replace water mains.
- The village of Arlington received \$2,036,114 to construct a new well 4 to replace an existing well with nitrate contamination.
- The village of Cumberland received \$1,911,257 to replace water mains.
- The city of Augusta received \$3,138,981 to construct a new well 11 to replace an existing well with nitrate contamination.

Appendix C lists the 31 projects that were awarded loan program funding during 2022.

- **Private Lead Service Line Replacement Program**

Wisconsin has pioneered innovative approaches to funding lead service line (LSL) replacement in communities around the state. Replacing lead service lines is one of the most effective ways to prevent exposure to lead in drinking water. It is critically important to replace the entire service—both the publicly-owned and privately-owned parts—because research shows that partial LSL replacement can actually increase short-term exposure to lead.

Wisconsin's innovations began several years ago when the DNR created the Private Lead Service Line Replacement Program. The program awards all funding as principal forgiveness, allowing communities to replace their privately-owned LSLs without incurring any debt. (Replacement of publicly-owned LSLs is eligible for regular Safe Drinking Water Loan Program funding.) The program now has broader eligibility criteria that allow all municipalities to apply for funding.

During 2022, a total of 57 communities received \$34.9 million in principal forgiveness funding for private LSL replacements. Communities around the state are taking advantage of this funding, and Appendix D lists all the communities that received Private Lead Service Line Replacement Program funding last year.



MEETING FUTURE CHALLENGES

Wisconsin's water supply infrastructure—like the rest of the nation's—is aging. Communities and their citizens face steep costs to maintain and upgrade the wells, pumps, pipes and treatment facilities needed to bring drinking water to our homes and businesses every day.

EPA quantifies the nationwide need using a Drinking Water Infrastructure Needs Survey and Assessment. The price tag has increased over time. The most recent survey, from 2021, estimated that \$625 billion will be needed to meet the nation's drinking water infrastructure needs between 2021 and 2040. The cost for the state of Wisconsin was estimated to be over \$11.8 billion.

Physical infrastructure is not the only need, though. Drinking water programs nationwide are struggling to do more. The DNR and other state agencies have taken on more work to meet expanding responsibilities for implementing the SDWA and to address new issues like emerging contaminants. For example, the EPA revised the national requirements for controlling lead and copper in drinking water during 2021 but also announced more revisions to come in 2023. The new regulations should help to reduce exposure to lead and protect public health, but the requirements are becoming increasingly complex, and staff are needed to keep pace with these changes.

The drinking water field also faces widespread workforce challenges. Certified water system operators are aging and retiring, creating a need for help from a new generation. Nationally, there is a substantial gap between current funding and staffing levels and states' needs for addressing all the challenges facing public water systems.

The DNR is committed to protecting public health and the state's drinking water every day and into the future. Although the future holds numerous challenges, many partners working together—including public water system owners and operators, water industry professionals, training and technical assistance providers and other agencies—strive to meet the goal of providing a safe and adequate supply of drinking water to everyone in Wisconsin.

APPENDIX A. Maximum permissible levels of contaminants in drinking water

The tables in this appendix show the Maximum Contaminant Levels (MCLs) for the various types of regulated drinking water contaminants.

Table A-1. MCLs for microbial contaminants	
contaminant	MCL
<i>Escherichia coli</i> bacteria	MCL exceedance can occur in several ways: <ul style="list-style-type: none"> • <i>E. coli</i>-positive repeat sample following a total coliform-positive routine sample. • Total coliform-positive repeat sample following an <i>E. coli</i>-positive routine sample. • Failure to collect all required repeat samples following an <i>E. coli</i>-positive routine sample. • Failure to test for <i>E. coli</i> after a total coliform-positive repeat sample.

Table A-2. MCLs for inorganic contaminants					
contaminant	MCL (mg/L)	contaminant	MCL (mg/L)	contaminant	MCL (mg/L)
Antimony	0.006	Chromium	0.1	Nickel	0.1
Arsenic	0.01	Copper	1.3 is Action Level*	Nitrate	10
Asbestos (fiber length >10 microns)	7 million fibers/L	Cyanide	0.2	Nitrite	1
Barium	2	Fluoride	4	Total Nitrate & Nitrite	10
Beryllium	0.004	Lead	0.015 is Action Level*	Selenium	0.05
Cadmium	0.005	Mercury	0.002	Thallium	0.002

* Exceeding an action level is not a violation; it requires water systems to take additional steps and employ techniques to control the corrosiveness of water.

Table A-3. MCLs for radionuclides	
contaminant	MCL
Gross alpha particle activity	15 picocuries per liter
Radium-226 and Radium-228	5 picocuries per liter
Uranium	30 micrograms per liter

Table A-4. MCLs for disinfectants and disinfection byproducts			
DISINFECTION BYPRODUCTS		RESIDUAL DISINFECTANTS	
contaminant	MCL (mg/L)	disinfectant	MRDL * (mg/L)
Bromate	0.01	Chloramines (as Cl ₂)	4
Chlorite	1	Chlorine (as Cl ₂)	4
Haloacetic Acids	0.06	Chlorine dioxide (as ClO ₂)	0.8
Total Trihalomethanes	0.08	* MRDL = maximum residual disinfectant level	

Table A-5. MCLs for organic contaminants					
SYNTHETIC ORGANIC CONTAMINANTS (31 contaminants in group)					
contaminant	MCL (mg/L)	contaminant	MCL (mg/L)	contaminant	MCL (mg/L)
2,4-D	0.07	Dinoseb	0.007	Lindane	0.0002
2,4,5-TP	0.05	Dioxin	3 x 10 ⁻⁸	Methoxychlor	0.04
Alachlor	0.002	Diquat	0.02	Oxamyl	0.2
Atrazine	0.003	Endothall	0.1	Pentachlorophenol	0.001
Benzo[a]pyrene	0.0002	Endrin	0.002	PFOS and PFOA	0.000070
Carbofuran	0.04	Ethylene Dibromide	0.00005	Polychlorinated biphenyls (PCBs)	0.0005
Chlordane	0.002	Glyphosate	0.7	Picloram	0.001
Dalapon	0.2	Heptachlor	0.0004	Simazine	0.004
Di(2-ethylhexyl)adipate	0.4	Heptachlor epoxide	0.0002	Toxaphene	0.003
Di(2-ethylhexyl)phthalate	0.006	Hexachlorobenzene	0.001		
Dibromochloropropane	0.0002	Hexachlorocyclopentadiene	0.05		
VOLATILE ORGANIC CONTAMINANTS (21 contaminants in group)					
contaminant	MCL (mg/L)	contaminant	MCL (mg/L)	contaminant	MCL (mg/L)
Benzene	0.005	1,2-Dichloroethylene,trans	0.1	Toluene	1
Carbon Tetrachloride	0.005	Dichloromethane	0.005	1,2,4 Trichlorobenzene	0.07
o-Dichlorobenzene	0.6	1,2-Dichloropropane	0.005	1,1,1-Trichloroethane	0.2
p-Dichlorobenzene	0.075	Ethylbenzene	0.7	1,1,2 Trichloroethane	0.005
1,2-Dichloroethane	0.005	Chlorobenzene	0.1	Trichloroethylene	0.005
1,1-Dichloroethylene	0.007	Styrene	0.1	Vinyl Chloride	0.0002
1,2-Dichloroethylene,cis	0.07	Tetrachloroethylene	0.005	Xylenes (Total)	10

Table A-6. Secondary drinking water standards

Water containing inorganic chemicals in quantities above these limits is not hazardous to health but may be objectionable.

chemical	standard (mg/L)	chemical	standard (mg/L)
Aluminum	0.05 to 0.2	Iron	0.3
Chloride	250	Manganese	0.05
Color	15 units	Odor	3 (threshold number)
Copper	1	Silver	0.1
Corrosivity	Noncorrosive	Sulfate	250
Fluoride	2	Total Dissolved Solids (TDS)	500
Foaming agents	0.5	Zinc	5
Hydrogen Sulfide	Not detectable		

APPENDIX B. Summary of violations of drinking water requirements during 2022

The following tables summarize violations at Wisconsin’s public water systems during 2022. The tables show violations of contaminant standards, monitoring and reporting requirements, treatment technique requirements, and notification requirements.

Table B-1. Maximum Contaminant Level violations during 2022						
contaminant	number of water systems with violations					number of violations
	total systems*	MC	OC	NN	TN	
MICROBIAL CONTAMINANTS	29	0	2	1	26	34
Total coliform bacteria					3	3
<i>E. coli</i> bacteria			2	1	23	31
INORGANIC CONTAMINANTS	44	6	6	14	18	115
arsenic	12	1	4	7	n/a	64
nickel				1	n/a	6
nitrate	31	5	2	6	18†	45
RADIONUCLIDES	14	12	2	n/a	n/a	325
combined radium-226 and radium-228		10	2			172
gross alpha particle activity		3	1			153
SYNTHETIC ORGANIC CONTAMINANTS	2	0	1	1	n/a	2
di(2-ethylhexyl) phthalate			1	1		
VOLATILE ORGANIC CONTAMINANTS	2	1	1	0	n/a	12
benzene		1				6
tetrachloroethylene			1			6
DISINFECTION BYPRODUCTS	1	1	0	0	n/a	2
total trihalomethanes		1				2
Overall totals	90	19	12	16	43	490
* Some water systems have multiple violations within a contaminant group or violations in multiple categories.						
† An additional 229 TN systems operated with nitrate levels above the MCL of 10 mg/L but below 20 mg/L during 2022.						

Table B-2. Monitoring and reporting violations during 2022

contaminant	number of water systems with violations					number of violations
	total systems*	MC	OC	NN	TN	
MICROBIAL CONTAMINANTS	503	8	47	59	389	661
Ground Water Rule		4	5	3	37	56
Total Coliform Rule					6	7
Revised Total Coliform Rule monitoring		5	45	57	364	591
Revised Total Coliform Rule reporting			1		4	7
INORGANIC CONTAMINANTS (18 contaminants in group)	335	63	88	52	132	425
arsenic		3	1	5	n/a	12
lead and copper		52	84	39	n/a	216
nitrate and nitrite		11	7	13	132	183 (201 individual contaminants)
other inorganic contaminants (13 contaminants)		3	3	5	n/a	14 (148 individual contaminants)
RADIONUCLIDES	12	8	4	n/a	n/a	30 (89 individual contaminants)
SYNTHETIC ORGANIC CONTAMINANTS (31 contaminants in group)	5	2	0	3	n/a	6 (59 individual contaminants)
VOLATILE ORGANIC CONTAMINANTS (21 contaminants in group)	11	2	3	6	n/a	14 (294 individual contaminants)
DISINFECTANTS & DISINFECTION BYPRODUCTS	40	34	3	3	n/a	50
residual disinfectants		7	2			11
disinfection byproducts		29	1	3		39 (70 individual contaminants)
Overall totals	749	101	115	106	427	1,186
*Some water systems may have multiple violations within a contaminant group or violations in multiple contaminant groups.						

Table B-3. Treatment technique violations during 2022

contaminant	number of water systems with violations					number of violations
	total systems*	MC	OC	NN	TN	
MICROBIAL CONTAMINANTS	53	11	11	2	29	72
Ground Water Rule	24	10	8		6	35
Revised Total Coliform Rule	30	2	3	2	23	37
CHEMICALS—LEAD AND COPPER RULE	20	7	2	11	n/a	27
DISINFECTANTS & DISINFECTION BYPRODUCTS	14	11	2	1	n/a	14
Overall totals	87	29	15	14	29	113

*Some water systems may have violations in multiple categories.

Table B-4. Notification violations during 2022

requirement	number of water systems with violations					number of violations
	total systems*	MC	OC	NN	TN	
Consumer Confidence Report	31	18	13	n/a	n/a	35
Ground Water Rule	13		2	2	9	14
Public Notice	559	50	40	38	431	940
Overall totals	597	64	53	40	440	989

*Some water systems may have multiple violations within this group.

Table B-5. Overall compliance with drinking water requirements during 2022

water system type	number of water systems	systems with violations	systems with full compliance	percent of systems complying
Municipal community	609	171	438	71.9%
Other-than-municipal community	431	157	274	63.6%
Non-transient non-community	910	155	755	83.0%
Transient community	9,281	795	8,486	91.4%
Overall totals	11,231	1,278	9,953	88.6%

APPENDIX C. Communities receiving Safe Drinking Water Loan Program funding for drinking water projects during 2022

The Safe Drinking Water Loan Program funded projects in 31 communities during 2022, for a total of \$105.2 million. Funding can be awarded as loans, principal forgiveness or a combination to help communities throughout the state make needed infrastructure improvements.

community	principal forgiveness funding	loan funding	total funding	project description
Arlington (city)		\$2,036,114	\$2,036,114	Construct well #4; abandon well #2
Augusta (city)	\$500,000	\$2,638,981	\$3,138,981	Replace well #7 with new well #11
Bangor (village)		\$2,325,404	\$2,325,404	Replace water mains
Campbellsport (village)		\$795,076	\$795,076	Replace water mains on STH 67
Cross Plains (village)		\$4,324,964	\$4,324,964	Construct new well #3 and pumphouse; rehabilitate/upgrade well #2
Cumberland (city)		\$1,911,257	\$1,911,257	Replace water mains
Dorchester (village)	\$267,258	\$326,648	\$593,906	Replace water mains along N and S 3rd St and N Front St
Green Lake (city)		\$969,991	\$969,991	Replace water main on Illinois Ave
Greenwood (city)	\$398,537	\$487,099	\$885,636	River crossing transmission and distribution
Gresham (village)	\$492,587	\$328,391	\$820,978	Replace water mains on Main and Fischer streets
Hurley (city)	\$208,426	\$138,950	\$347,376	Replace water meters, antenna installation
Kendall (village)	\$500,000	\$481,557	\$981,557	Rehabilitate wells #2 and #4 including wellhouse and treatment upgrades
La Farge (village)	\$296,360	\$197,572	\$493,932	Replace water mains along Main St
Ladysmith (city)		\$399,301	\$399,301	Replace water mains along East 10th St N and Summit Ave
Markesan (city)	\$320,183	\$996,528	\$1,316,711	Replace water mains and lead service lines across city, and S Main St and Sunrise Ln
Menasha (city)		\$971,263	\$971,263	Replace water mains
Milwaukee (city)		\$24,022,175	\$24,022,175	Replace water mains
Oakfield (village)		\$460,340	\$460,340	Replace water mains on Main, Church, and Filby streets
Osseo (city)	\$500,000	\$5,760,622	\$6,260,622	Construct new water treatment plant, upgrade wellhead, demolish existing water treatment plant
Prairie du Chien (city)		\$423,900	\$423,900	Replace water main along Villa Louis Rd
Rice Lake (city)	\$500,000	\$1,255,863	\$1,755,863	Water tower and system pressure improvements
Ridgeway (village)		\$553,294	\$553,294	Replace water mains on Weaver, Kirby, Keane, Hughitt and E Main Alley

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community	principal forgiveness funding	loan funding	total funding	project description
Ripon (city)		\$743,324	\$743,324	Replace water mains on Vermont St and Parkway Terr
Shawano (city)	\$425,963	\$1,091,372	\$1,517,335	Replace water mains and lead service lines
Sheboygan (city)		\$39,430,018	\$39,430,018	New water intake pipe, shore well, and low-lift pump station
South Wayne (village)	\$398,317	\$265,544	\$663,861	Replace water mains along Center, Galena, and Verley streets
Stoughton (city)		\$1,659,096	\$1,659,096	Remove public lead service lines
Two Rivers (city)	\$152,562	\$355,975	\$508,537	Replace water mains and lead service lines on Roosevelt, Wilson, 17th, 26th, 35th and Jackson streets
Weyauwega (city)	\$500,000	\$1,868,246	\$2,368,246	Construct new elevated tank, water mains, booster pump; demolish existing tank
Whitehall (city)		\$1,376,852	\$1,376,852	Replace water main along Hobson St
Winter (village)	\$500,000	\$648,780	\$1,148,780	Rehabilitate water tank
Total 2022 projects	\$5,960,193	\$99,244,497	\$105,204,690	

APPENDIX D. Communities receiving Private Lead Service Line Replacement Program funding during 2022

The Private Lead Service Line Replacement Program funded projects in 57 communities during 2022. All funding in this program is awarded as principal forgiveness, allowing communities to replace the private portions of lead service lines without incurring any debt. According to estimates, more than 8,000 lead service lines are being replaced with the 2022 funding.

community	principal forgiveness funding	estimated number of lead service lines	community	principal forgiveness funding	estimated number of lead service lines
Antigo (city)	\$357,500	55	Mount Horeb (village)	\$1,566,000	261
Ashland (city)	\$211,505	50	New Holstein (city)	\$919,890	180
Beaver Dam (city)	\$300,000	80	New Richmond (city)	\$122,500	35
Beloit (city)	\$450,000	75	North Fond Du Lac (village)	\$90,000	30
Cedarburg (city)	\$600,000	100	Oconomowoc (city)	\$600,000	200
Columbus (city)	\$160,000	40	Omro (city)	\$78,000	12
Eau Claire (city)	\$650,000	300	Oregon (village)	\$286,908	71
Elkhorn (city)	\$560,000	100	Oshkosh (city)	\$382,500	170
Elmwood (village)	\$250,000	37	Platteville (city)	\$94,102	50
Fond du Lac (city)	\$312,000	156	Prairie du Chien (city)	\$52,500	15
Green Bay (city)	\$1,586,950	420	Racine (city)	\$1,104,000	400
Hartford (city)	\$786,000	113	Ripon (city)	\$150,000	30
Hurley (city)	\$250,000	70	Saint Francis (city)	\$50,000	10
Janesville (city)	\$3,240,000	581	Sauk City (village)	\$185,000	31
Juneau (city)	\$555,000	150	Schofield (city)	\$67,500	25
Kenosha (city)	\$2,154,125	500	Shawano (city)	\$488,400	125
Kewaunee (city)	\$78,000	26	Sheboygan (city)	\$405,000	175
Kiel (city)	\$448,245	144	Shorewood (village)	\$405,000	50
Kimberly (village)	\$931,000	29	Sturgeon Bay (city)	\$750,000	150
Lake Mills (city)	\$190,860	50	Sun Prairie (city)	\$572,694	65
Manitowoc (city)	\$1,200,000	400	Thorp (city)	\$72,500	15
Markesan (city)	\$160,000	30	Two Rivers (city)	\$207,500	79
Marshfield (city)	\$675,000	188	Viroqua (city)	\$202,500	45
Mayville (city)	\$712,801	247	Waterloo (city)	\$194,982	63
Menasha (city)	\$285,000	170	Watertown (city)	\$2,500,000	430
Milton (city)	\$300,000	60	Waupaca (city)	\$280,000	40
Milwaukee (city)	\$4,517,063	900	Wausau (city)	\$577,718	100
Montreal (city)	\$180,000	35	West Allis (city)	\$346,300	70
Mosinee (city)	\$62,500	25			
Total 2022 projects				\$34,915,043	8,058