

Wisconsin Public Water Systems 2021 Annual Drinking Water Report



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



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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 quality.

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.

Our *2021 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 2021, more than 98% of Wisconsin's public water systems provided water that met all the health-based standards.
- The COVID-19 pandemic continued to affect operations of public water systems statewide. The DNR and water system personnel collaborated to work through the new and continuing challenges.
- The DNR and its partners performed more than 2,600 sanitary surveys, 6,400 annual site inspections and 400 on-site assessments during 2021. Inspections measure compliance with requirements, detect changes over time and prevent future problems. Assessments help to “find and fix” possible sources of microbial contamination.
- In partnership with the DNR, county health departments provided monitoring and compliance assistance to small water systems in 54 counties around the state, while responding to the COVID pandemic at the same time. County staff performed more than 7,000 annual site inspections, sanitary surveys and on-site assessments during 2021.
- The DNR's partners provided training and technical assistance to public water system owners and operators throughout the state during 2021. In response to the COVID pandemic, the DNR and its partners expanded online options for training and continued using ‘on-site virtual visits’ to provide technical assistance safely.
- The DNR awarded more than \$45 million in financial assistance through the Safe Drinking Water Loan Program during 2021, helping 21 communities around Wisconsin to make needed infrastructure improvements to their drinking water systems.
- The DNR awarded more than \$33 million through the Private Lead Service Line Replacement Program, allowing 60 communities around the state to replace lead services last year.

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

Wisconsin manages its drinking water resources by relying on effective state and federal regulations combined with strong collaborative partnerships between the DNR, the US Environmental Protection Agency (the EPA), public water systems, county health

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

The COVID-19 pandemic continued to challenge our collective efforts through 2021. The pandemic did, however, focus attention on access to safe drinking water and its critical importance for maintaining public health.

This *2021 Annual Drinking Water Report* summarizes how Wisconsin’s public water supply systems complied with the drinking water requirements between January 1 and December 31, 2021. Publishing an annual report meets one of Wisconsin’s responsibilities under the federal Safe Drinking Water Act (SDWA). This report also highlights the DNR’s work and other initiatives that help to meet the goal of providing a safe and adequate supply of drinking water to the citizens and visitors in Wisconsin.

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. 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, EPA and the public. Testing or “monitoring” requirements vary depending on a water system’s size, the type of 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, what the water system is doing 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.



Drinking Water News on Tap **COVID-19 pandemic continues through 2021**

COVID-19 continued to affect Wisconsin’s water systems and the DNR during the second year of the pandemic. Everyone worked extra hard to find ways of meeting our responsibilities while working safely.

- Field work for DNR staff resumed midway through 2021. To adapt to changing conditions of the pandemic and situations at water systems around the state, staff also conducted ‘virtual’ and hybrid inspections as needed. Virtual sanitary survey inspections take advantage of technology for transmitting information and also can be combined with on-site components into a hybrid approach.
- Water system personnel continued catching up on required cross-connection inspections. Many inspections were suspended for part of the pandemic, so personnel could avoid entering homes and businesses.
- The DNR continued to communicate with water system operators around the state, discussing questions and devising strategies to maintain operations during the emergency.



The DNR’s drinking water program staff met these challenges throughout the year. More of our staff volunteered for COVID response duties as the pandemic wore on. When vaccines became available early in 2021, for example, DNR staff worked to distribute them around the state.

Wisconsin’s drinking water professionals have collaborated and communicated and kept on working to provide safe drinking water throughout the pandemic.

WISCONSIN’S PUBLIC WATER SYSTEMS

Wisconsin had 11,228 public water systems in 2021. This is the largest number of any state, but it has decreased – by several hundred – over the past two years. Many public water systems were closed during part or all of the COVID-19 pandemic.

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 1,038 community water systems that serve 69% of the state’s population (Figure 1). The remainder of the state’s 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 that are owned by counties or municipalities. Wisconsin has 610 municipal systems. Milwaukee

Waterworks is the state’s 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 residential consumers 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

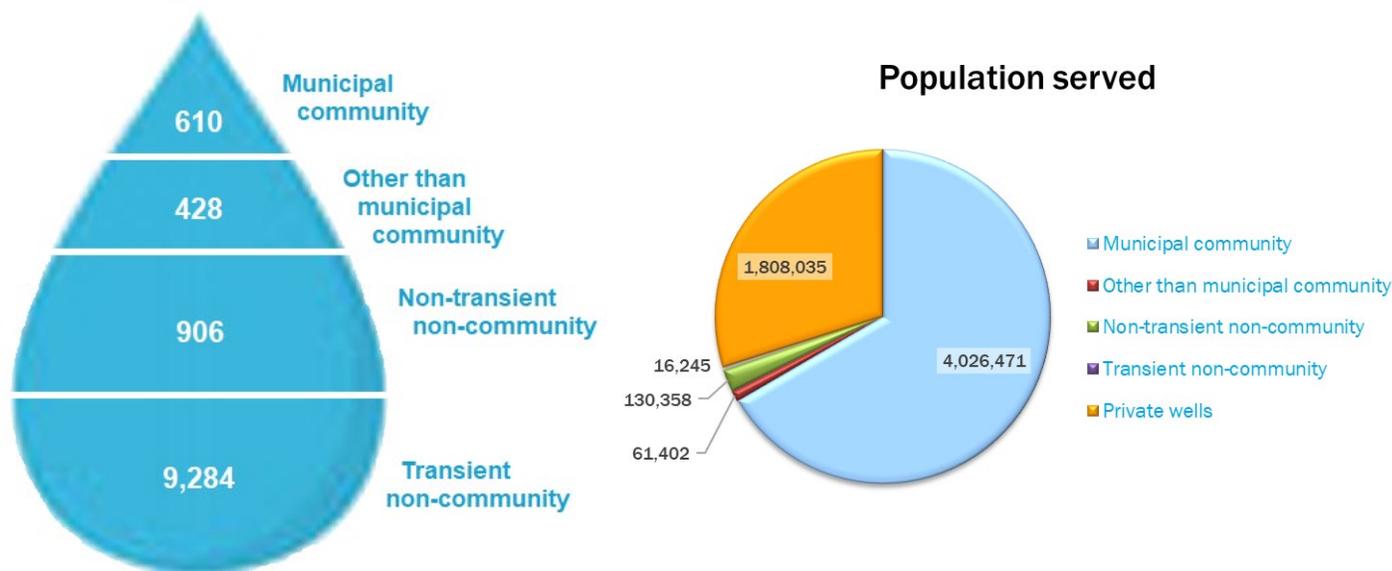


Figure 1. Wisconsin has more than 11,200 public water systems. The majority are very small transient non-community systems, but the state’s municipal water systems serve the largest share of the population.

- 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 10,190 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).

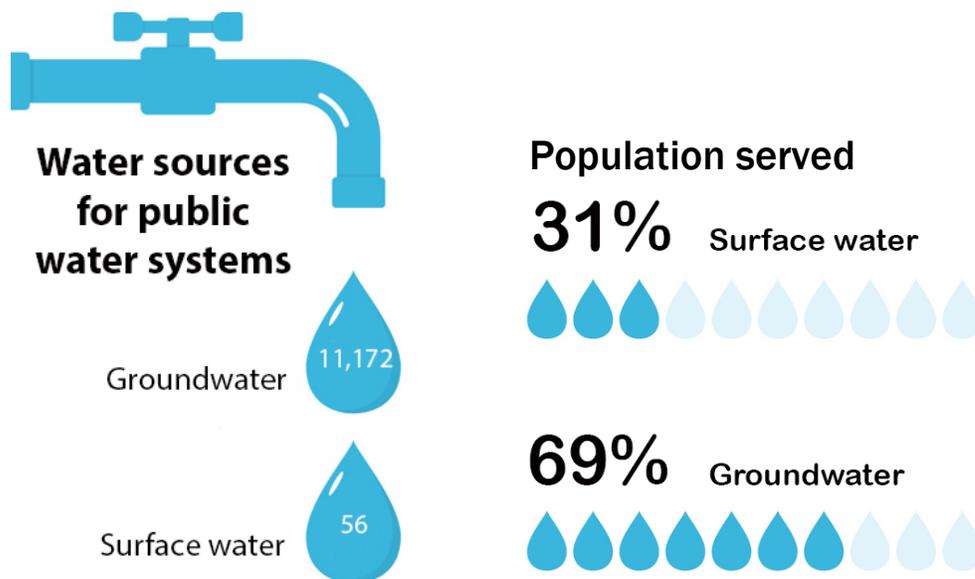


Figure 2. The majority of Wisconsin’s public water systems (more than 99%) rely on groundwater pumped from wells. However, the 56 systems that use surface water from lakes include most of the state’s largest public water systems.

MONITORING AND TESTING FOR CONTAMINANTS IN DRINKING WATER

Monitoring is critically important 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.

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.



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 and pesticides
 - 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 30 regulated chemicals (although there are many more synthetic organic substances 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 under the SDWA and their health-based standards or MCLs.



Secondary standards

The SDWA sets aesthetic or “secondary” standards for additional contaminants. These substances may cause an unpleasant smell, taste, appearance, stain sinks or discolor 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.

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 it 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.

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. Disinfection of 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 and prevent certain contaminants from leaching (being dissolved or extracted) into the water, like lead from lead pipes.

Drinking Water News on Tap

Nitrate contamination challenging to correct — collaboration can help

Every year, nitrate contamination challenges public water systems around Wisconsin. Although nitrate is more problematic in certain areas, it affects water systems in all parts of the state. Higher levels in groundwater indicate a human-made source of contamination such as agricultural or turf fertilizers, animal waste, septic systems or wastewater. Nitrate moves through groundwater readily, meaning that sources of contamination may not be located near a particular well and may even be outside a water system owner’s control.

When nitrate concentrations exceed the maximum contaminant level, corrective action is needed to resolve the problem. Finding the right corrective action for each individual system is a process—it involves searching for feasible options, comparing data, and comparing costs. And the solution is not identical in all cases.

During 2021, numerous water systems in Wisconsin confronted nitrate contamination, and several managed to resolve their problems. These are a few case studies in nitrate from last year:

- A tavern in a resort community in Chippewa County had used the “continuing operation” provision for nitrate for almost 18 years. (For more information about “continuing operation,” see the compliance section [nitrate and nitrite on page 13] of this report.) Midway through 2020, however, the nitrate level increased, and continuing to operate was not possible. The system owner initially thought treating the water to remove nitrate was the best option. DNR drinking water staff worked with the owner to provide information about requirements and costs for ongoing treatment. At the same time, The DNR’s hydrogeologist did an analysis and provided a casing recommendation for a new well. The focus shifted. A new well was drilled to a deeper depth and placed into service in June 2021. The nitrate level in the new well is not quite zero, but it is close.
- A golf course in Waupaca County had also been using the continuing operation provision, for more than a decade, until nitrate levels increased in the fall of 2020. Golf course members stepped in to help by contributing toward the cost of a new well. The DNR’s hydrogeologist provided an analysis and casing recommendation for a well. The new well was drilled on a different part of the property and to a greater depth, and it has a nitrate level of zero so far.
- Back in 2017, a campground in Fond du Lac County drilled a new well for an addition that would serve 76 RV sites, a shower house and a private residence. The project included installing a sewer system to serve the sites. This area has thin soils and high bedrock, and the bedrock had to be



blasted to lay the lines. Only three years later, nitrate in that well was above the drinking water standard. The DNR’s drinking water staff collected samples and performed source tracking, to determine whether the nitrate came from human wastewater or agricultural chemicals from the surrounding farm fields and large farms. Source tracking identified a human source for the nitrate contamination. The system owner tried sealing the sewer lines and collection sumps with some initial success. However, as campsites got occupied with RVs, nitrate levels increased again. DNR drinking water staff worked closely with the owner, and our hydrogeologist did an analysis to identify a potential location and construction specifications for a new well. A replacement well was drilled, and the new well has a nitrate level of zero. The system returned to compliance in spring 2021

- A small municipality in Buffalo County, with its office building located outside of town, exceeded the nitrate standard in the summer of 2020. Initially, the system owner thought treating the water would be the best option, and the DNR’s public water staff worked with the owner to understand the requirements for installing treatment and the potential costs involved. The DNR’s hydrogeologist also provided an analysis and casing recommendation for a new well, and replacing the well became the preferred corrective action. The new well is in the same location but is drilled deeper and protected by a deeper casing, and it was placed into service early in 2021. The system returned to compliance and now has nitrate levels far below the drinking water standard.

Whenever a compliant water source can be found, that is the highest priority option for corrective action. A well without nitrate contamination provides maximum public health protection and also minimizes future costs for the system owner.

COMPLIANCE WITH DRINKING WATER REQUIREMENTS

Compliance with drinking water requirements has multiple facets. The DNR and EPA track whether water samples are collected in a timely manner, tested for the correct contaminants, and whether contaminant concentrations exceed permissible limits. They also track whether water systems give public notice or provide notifications on time, post or deliver notices as required, and whether systems correct deficiencies by appropriate deadlines. Violations can occur when deadlines are not met, water samples are not collected, or public notices are not issued. They also occur when sample results exceed permissible limits for contaminants. Table 1 explains 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 all their regulatory requirements during 2021 – 88.1% 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. Compliance with water quality (i.e., maximum contaminant level) requirements was highest during 2021. Most violations that occurred were 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 2021, more than 99% of Wisconsin’s public water systems provided water that met all the health-based MCL standards for regulated contaminants. Only 88 systems (out of 11,228 statewide) experienced MCL exceedances. The contaminants encountered most frequently in Wisconsin were bacteria, arsenic, nitrate and radionuclides. Table B-1 in Appendix B summarizes the MCL violations during 2021.



• **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 sample of drinking water (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 conduct on-site assessments. These inspections follow the “find and fix” approach to ensure that bacteria do not persist in the drinking water at these facilities. Staff performed more than 400 assessments during 2021. These free inspections provide a valuable service to public water system owners and consumers.

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 the presence of *E. coli* is confirmed in a water supply (Table A-1 in Appendix A has more details about the MCL). During 2021, there were 18 public water systems in Wisconsin (only 0.16%) 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 agriculture 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 it can be fatal in extreme cases. In addition, there is evidence of an association between exposure during early pregnancy and certain birth defects. Consuming water with high nitrate levels has also been linked to chronic diseases in adults, including increased cancer risk, because nitrate is converted within the human body to compounds that are known carcinogens.

All of Wisconsin’s 11,228 public water systems are required to monitor for nitrate and nitrite in drinking water. During 2021, violations for exceeding the nitrate MCL occurred at 28 public water systems (0.25% of all systems). These water systems are located 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 MCL. 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 270 transient non-community water systems using the “continuing operation” provision during part or all of 2021 (Table 2). Some have been in that status for more than 25 years. In 2021, another 28 TN systems exceeded the nitrate

Table 2. Transient non-community water systems operating with nitrate levels above the MCL during 2021	
water system status	number of systems
operating since before 2021	214
continuing operation started during 2021	28
continuing operation ended during 2021	28
total number of systems on continuing operation in 2021	270

MCL and were allowed to use the continuing operation option (slightly fewer than the previous year), and 28 systems went off continuing operation after using it for part of the year. Although the overall number of water systems decreased slightly by the end of 2021, it has remained above 200 for years. Nitrate contamination is an ongoing challenge for water systems in Wisconsin.



- **Arsenic**

Arsenic is a naturally occurring element found in some rock formations in Wisconsin, and it is regularly detected as a contaminant of 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 (1,944 of Wisconsin’s water systems). During 2021, there were 15 systems (0.77%) with violations for exceeding the arsenic standard (0.01 mg/L). 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. For example, 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 1,038 community water systems in Wisconsin, 17 (or 1.64%) had violations for exceeding the MCL standards for radium, uranium and/or alpha particle emitters during 2021. Most of these systems are located in southern Wisconsin.



- **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 have health effects for 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 water 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 the 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 2021, fewer Wisconsin water systems had action level exceedances, for both lead and copper, compared with the previous year. Last year, 11 public water systems exceeded the lead action level, and 12 exceeded the action level for copper (Table 3).

contaminant	number of water systems			
	MC	OC	NN	total
copper	1	3	8	12
lead	2	2	7	11

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 continuing priorities for the DNR because of the common occurrence of these contaminants in Wisconsin.

Drinking Water News on Tap Get the lead out? Success stories!

Thanks to additional federal funding, the DNR’s Private Lead Service Line Replacement Program resumed—and expanded—during 2021. In total, 60 communities around the state replaced lead service lines (LSLs) using this funding. The “Financial assistance” section of this report has more information about all the communities that benefitted. Here, we highlight examples of what can be accomplished with dedication and determination. A lot of dedication and determination.

The impetus for a great accomplishment can sometimes come from a negative experience. In Mayville (Dodge County) and Stoughton (Dane County), both water systems exceeded the action level for lead (Stoughton in 2019 and Mayville in 2020). Both communities were faced with deciding how best to minimize exposure to lead in their drinking water.

Neither community wanted to treat the water. Corrosion control treatment (to prevent leaching of lead into drinking water) involves adding chemicals (corrosion inhibitors) that typically have to be removed later during wastewater treatment.



In Mayville, an impressive pile of LSLs removed. The happy crew celebrating the accomplishment includes (L to R) Courtney Steger, utilities director; Tim Gutjahr, waterworks operator; and Town and Country Underground staff Troy Hottenroth and Trevor Blake.



A Stoughton crew replaces a lead service line. The city successfully used directional drilling for most LSL replacements and only dug open trenches in situations where other methods were not feasible.

Mayville and Stoughton both made an ambitious decision: they would voluntarily replace all their lead service lines. And they would do it in a single year, even though it was a pandemic year. (In Wisconsin, the ‘year’ is really a 7-month construction season.)

Funding for replacing privately-owned parts of the service lines was a huge motivator. Both Mayville and Stoughton wanted to offer LSL replacement at no cost to their consumers. Both communities applied and received funding in 2021.

In Mayville (population 4,875), the project had enthusiastic community support. Children in town had been diagnosed with high blood lead levels, and the home of one child was the first house to have its LSL replaced. The city utility department fielded many calls, and neighbors spread the word to each other. The city worked with local contractors who

also live in the area, so they too got excited about completing the project.

Mayville’s project did take a few unexpected twists and turns. The city had to figure out how many lead service lines they had (and ended up replacing almost 220 LSLs). The location of a family burial plot from more than 100 years ago also factored into the project. Genealogy research is not typically part of a utilities director’s job description, but Courtney Steger rose to the challenge and solved the mystery so work could continue.

For Stoughton (population 13,146), communication with residents began in 2019, right after the action level exceedance. The city originally had a 15-year plan for replacing LSLs, but quickly decided to apply for funding and pursue a much more ambitious target. According to utilities director Jill Weiss, nobody wanted to disappoint some residents by making them wait longer for LSL replacement or risk that funding might not be available in future years.

Stoughton also found that some of its records were incomplete, and assumptions about private materials needed to be verified before mobilizing the contractor. City staff went door to door in some parts of town to compile accurate information. Residents also sent in photos and videos of their water meters and piping materials.

Stoughton used social media, local newspapers and the internet to maintain excellent communication with residents, including a web site where people could track progress of the project. Altogether, Stoughton replaced more than 700 LSLs in 2021—both publicly and privately-owned services—to reach the goal of zero lead service lines.

Reflecting on the accomplishments, both utility directors had similar recollections. Getting started is the hard part, because of hesitancy about taking on an ambitious task. After that...you deal with each challenge that comes along. Both communities will conduct two rounds of monitoring during 2022, to confirm lead levels.



Spritz, the DNR’s drinking water mascot, strikes a happy pose in Mayville.

Monitoring and reporting violations

Public water systems are required to monitor and test their water during specific time periods, to verify that contaminants do not exceed the MCL thresholds. Monitoring and reporting violations occur more frequently than MCL violations. During 2021, there were 1,224 MR violations at 788 of the state's 11,228 public water systems (7.0%). Most often, these violations resulted from failure to collect required samples, samples collected late, and failure to notify consumers of lead and copper results. Table B-2 in Appendix B summarizes the MR violations that occurred during the year.

MR violation numbers increased in 2021, mainly due to more violations of microbial contaminant monitoring requirements. This could result partly from continuing challenges of the COVID pandemic, since some contaminants are monitored at taps in consumers' homes.



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 procedures or actions that public water systems must follow to control or reduce levels of certain contaminants. Treatment technique requirements have been established for controlling viruses, some bacteria, lead and copper.

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 11,228 public water systems, 103 systems had treatment technique violations during 2021, meaning that 99.1% of the state's systems met these health-based requirements. Wisconsin's water systems have maintained a similar high rate of compliance with treatment technique requirements for several years running. Most TT violations resulted from failing to meet deadlines for correcting defects or deficiencies identified during inspections or failing to follow approved seasonal start-up procedures. Table B-3 in Appendix B summarizes the treatment technique violations during 2021.

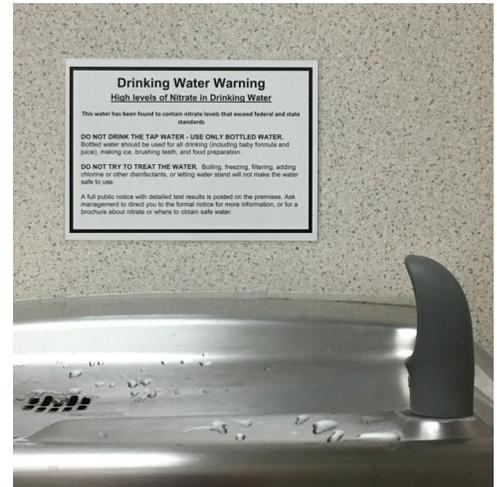
Notification and reporting violations

Communicating with consumers about their drinking water is an important aspect 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 2021.

- **Public notice violations**

To protect public health, water systems are required to notify consumers when violations occur or a situation poses 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 any 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.



Among all the violations summarized in this report, public notice violations were most numerous. They occurred at 679 of Wisconsin’s public water systems (5.7% of all systems) during 2021, a substantial improvement over the previous year. Most PN violations stemmed from monitoring 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 source 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 customers. Of Wisconsin’s 1,038 community water systems, 43 (4.1%) got violations in 2021 for not delivering their 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 properly notify the DNR can cause a violation. During 2021, only 7 water systems incurred violations for failing to provide these notifications.

Overall compliance with drinking water requirements

Even though the COVID pandemic presented ongoing challenges, most of Wisconsin’s public water systems met all their regulatory requirements in 2021 (88.1% overall), a slight improvement over the previous year. Compliance rates for each type of public water system are in Appendix B, Table B-5.

DNR EFFORTS TO PROTECT WISCONSIN'S DRINKING WATER

The DNR strives to achieve its mission of ensuring the safety and availability of Wisconsin's drinking water supplies and protecting 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 4). Despite having the largest number of public water systems nationwide, Wisconsin has fewer staff working to implement the SDWA than many other states do.

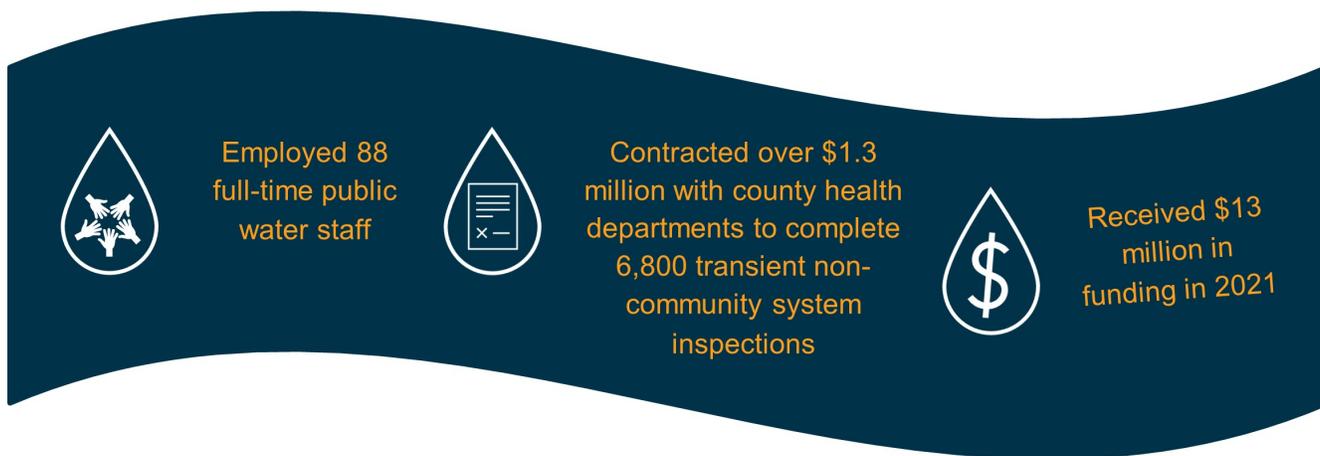


Figure 4. Funding for the DNR's public water supply program comes from both federal and state sources. During 2021, the program had 88 full-time staff.

Inspections & assessments

Inspecting public water systems is one of the DNR's fundamental responsibilities and a critically important tool. Inspections measure compliance with requirements and track changes over time. They also prevent future problems, because 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 performed during 2021

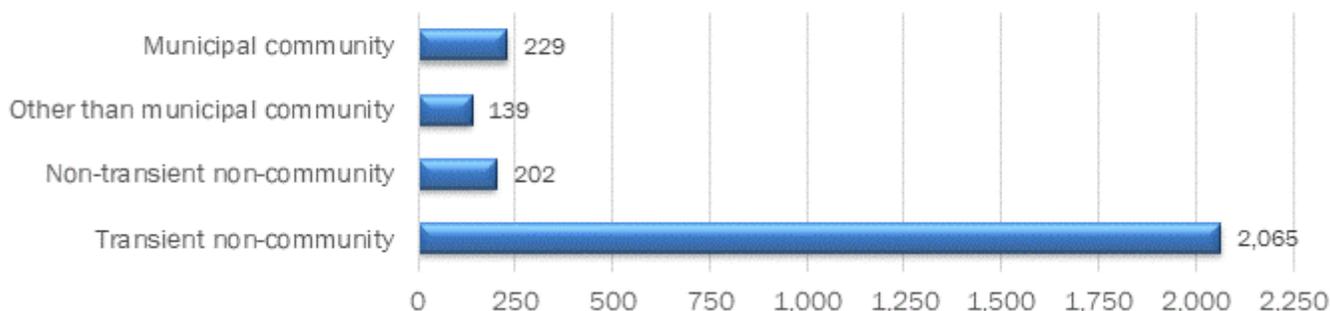


Figure 5. The DNR and its partners completed 2,635 sanitary surveys in 2021.

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 2,635 sanitary surveys throughout Wisconsin (Figure 5).

In addition to regularly-scheduled sanitary surveys, the DNR performs triggered inspections called “assessments” 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 2021, the DNR and its contracted partners performed 402 of these assessments. Last year was busier than 2020, partly because field work was suspended during the early stages of the COVID pandemic.

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 any sanitary defects are identified, the system owner is notified about corrective actions needed. The DNR and its contracted partners performed 6,491 annual site visits during 2021 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 for Wisconsin citizens and visitors. 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.

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 at the time of 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

DNR Drinking Water Program DG'S P.O. Box 7921 Madison, WI 53707		Public Water Supply BACTERIOLOGICAL ANALYSIS (ENCLOSE FORM WHEN SENDING SAMPLE TO LAB)		Rev. 10/17
Section I: System Information (to be completed by Department of Natural Resources/SAMPLER)				
System Name: _____		System Type: _____		MC ___ NN ___ OC ___ TN ___
System Address: _____		(Check one)		Region _____
City: _____		County: _____		Code: _____
PWS ID#: _____		DNR Contact: _____		
Sampler Phone/Name/Address (Notify DNR Contact of Corrections)		Sampler If the laboratory has the ability to fax or e-mail results to you and you would like the lab to do that, please provide the appropriate information (leave blank if you prefer a paper copy): Fax number: _____ E-mail: _____		
Sample Source (location): ___ D - Distribution System ___ W - Well/Source		Sample Type (check one only -- see instructions on back): ___ D - Routine Distribution ___ C* - Check: Same location as Positive "D" Sample ___ R* - Repeat: Within 5 connects of Positive "D" Sample ___ A - Additional Routine (month following positive "D") ___ N - New Construction ___ I - Investigation ___ W - (Raw) Water WI Unique Well No: _____ Entry Point ID: _____ *IF THE SAMPLE TYPE IS "C" or "R": "D" or "A" Positive Sample Date: ___/___/___ "D" or "A" Positive Sample ID: _____		
Special Instructions: _____				
Collect sample between: ___/___/___ and ___/___/___ SAMPLES MUST BE ANALYZED WITHIN 30 HOURS OF COLLECTION. SEE SAMPLING INSTRUCTIONS ON BACK.				

monitoring period, sample site location, sample instructions, sample collector and DNR representative.

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 an assessment 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. The DNR added a well inspector position to increase the number of well inspections staff can conduct and help to maintain a high level of customer service to well owners in the state.

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. Stepped enforcement includes a series of actions designed to resolve violations at the lowest level – of formality and severity – that is appropriate.

Many violations are resolved quickly and early in the process. 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 – or if a system does not take action after

receiving a NON, 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 process 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 EPA for further enforcement.

Table 4 summarizes the DNR’s enforcement activity during 2021. Last year, the DNR sent 1,804 Notice of Noncompliance letters but only 33 Notices of Violation. This illustrates that most water systems resolved violations promptly after being notified of problems and did not need additional enforcement.

Table 4. Drinking water enforcement during 2021		
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	1,804
Notice of Violation (NOV) sent	NOV notifies water system owner about a violation and schedules a meeting with DNR staff for more detailed discussion.	33
Enforcement conference held	Enforcement conferences are held to discuss the enforcement process, possible corrective actions and a timeline for returning to compliance.	23
Compliance agreement signed	Compliance agreement is a voluntary agreement describing corrective actions and the timeline for correcting violations. Agreements are typically used when return to compliance can be accomplished within a short time frame.	1
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).	22
Referred to WI Department of Justice	Referral occurs when further enforcement is needed.	4

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 2021, the DNR approved eight new wellhead protection plans covering 12 individual wells.

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. As of Sept. 30, 2021, 42% of the municipal water systems that rely on groundwater had achieved this level of wellhead protection.

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. WRWA also helped the city of Ashland develop a voluntary surface water-based source water protection plan, which will create new opportunities for collaboration to reduce pollutants within watershed-level areas.



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 develop transferable methods for reducing agricultural nutrient impacts in source water protection areas.

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, 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 providing experienced inspections and monitoring of transient non-community water systems across the state. Wisconsin has 9,284 of these systems, which include small businesses, churches, restaurants, campgrounds and parks. The DNR has contracts with 45 county health departments that cover 54 counties and 74% of the transient non-community systems in the state (Figure 6).

County agents are responsible for conducting inspections at these water systems, and they also perform all routine and triggered monitoring. When contaminants are detected, the inspectors assist these water systems with finding sources of problems and identifying corrective actions to fix them.

During 2021, the county health departments still faced challenges presented by working through, and responding to, the ongoing COVID pandemic. The county agents met these challenges and continued to provide experienced inspections, monitoring and valuable assistance at transient non-community water systems across the state.

County sanitarians conducted 5,319 annual site inspections, 1,516 sanitary surveys and 234 assessments during 2021. It was a busy year, with a higher number of assessments needed as compared to previous years. County health staff did not stop there – many also supported their counties’ private well monitoring programs. These efforts aim to improve assessments of groundwater quality and drinking water sources in their communities. Several county health departments have responded to the growing interest in protecting groundwater resources by starting their own water quality labs and collaborating with county conservation staff.

- **Technical assistance**

Wisconsin Rural Water Association (WRWA) helps small public water systems by giving them regular reminders about monitoring requirements and upcoming deadlines and providing specialized, on-site technical assistance. This assistance helps to train new operators and troubleshoot problems that



Figure 6. DNR contracts with county health departments that provide services to TN water systems in 54 counties around the state.

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, and technical assistance is provided at no cost to the water systems.

During 2021, 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 all 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 per quarter. This dramatic improvement saves time spent having to follow up on violations, for both DNR staff and water system operators.

The COVID-19 pandemic presented many special challenges over the past two years. Early in the pandemic, some water systems and businesses did not want to receive on-site technical assistance to avoid possible COVID transmission. The DNR and WRWA worked together and devised 'on-site virtual visits.' On-site virtual visits allow WRWA to provide technical assistance via video-conferencing apps and extended phone calls. These alternative means offer a safe and effective way for WRWA to provide in-depth technical assistance to water systems that need it. WRWA can complete its technical assistance work for the DNR and maintain a high level of service in a socially-distanced manner for water system personnel that prefer this. 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.

- ***Training***

Moraine Park Technical College (MPTC) and Wisconsin Rural Water Association 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. Under a long-standing contract with the DNR, MPTC provides both continuing education and exam preparation for Waterworks operators (for MC systems). MPTC also provides continuing education training for water system operators at the state's OC and NN water systems. Both organizations are essential to helping build and develop a robust and knowledgeable drinking water workforce for our state.

When the COVID pandemic started, the DNR immediately worked with both WRWA and MPTC to find alternatives to in-person learning. At that time, all DNR-sponsored continuing education training and classes converted to a virtual format. Both organizations now provide hybrid learning opportunities, offering both in-person and online (or virtual) classes. These new formats allow DNR-sponsored classes to have a greater reach across the state and better meet the needs of different operators who prefer one format over the other.

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 meet the goal of providing 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.



- **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 almost \$46 million in loan program funding during 2021. Since the Safe Drinking Water Loan Program began in 1998, 541 projects in Wisconsin have received more than \$880.9 million in funding.

Last year's funding was comprised of \$41.4 million in low interest loans and \$4.4 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 village of Nekoosa received \$1,318,380 to replace water mains on Wood Avenue.
- The village of Maiden Rock received \$400,719 to construct a new well, wellhouse and connecting main to resolve issues at an existing well with microbiological contamination.
- The city of Milwaukee received \$27,323,813 for water main replacements throughout the city.
- The village of Grantsburg received \$925,886 to install new pressure filters and other improvements at Well 3 to address iron and manganese exceedances.
- The village of Cambria received \$1,316,333 to construct a new well, wellhouse and connecting main to resolve issues at an existing well that has radium exceedances.
- The city of Menasha received \$997,383 to replace water mains.

Appendix C lists the 21 projects that were awarded loan program funding during 2021.

- **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 methods for preventing 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 innovative approach to funding LSL replacement began when the DNR created the Private Lead Service Line Replacement Program several years ago. Then, federal legislation passed during 2019 (the Water Infrastructure Financing Transfer Act) allowed states to transfer funds from the Clean Water Fund Program into the Safe Drinking Water Loan Program specifically for addressing threats to public health from exposure to lead in drinking water. For Wisconsin, this transfer has provided another \$63.8 million for LSL replacement.



The new Private Lead Service Line Replacement 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 new program has broader eligibility criteria, so all municipalities can now apply for this funding.

During 2021, a total of 60 communities received \$33.3 million in principal forgiveness funding for private LSL replacements. Elsewhere in this report, we highlight two communities that replaced all their lead service lines using this funding. Appendix D lists all the communities that received Private Lead Service Line Replacement Program funding last year.



Drinking Water News on Tap **New grants help small water systems make needed repairs**

For the first time, the DNR awarded grants to some non-municipal water systems during 2021. The federal Water Infrastructure Improvements for the Nation Act allowed EPA to make these grant funds available for water systems that do not get funding through the Safe Drinking Water Loan Program, because they are not owned by municipalities. The grants were targeted specifically at small, underserved, and disadvantaged communities.

Wisconsin received \$722,000 for these grants, which funded important repairs and improvements at several water systems around the state during 2021. Projects receiving grants included:

- **Anthony Acres School**, a rural charter school in Eau Claire County, had nitrate contamination in its water supply. The grant funded construction of a new well, drilled to greater depth, that provides low-nitrate water.
- **Pine Ridge** is a small apartment building in Dunn County that specializes in serving elderly and disabled residents. The system’s only well exceeded the drinking water standard for uranium. The grant funded construction of a new well, drilled into a deeper rock formation, a new wellhouse cover and improvements to the pump controls.
- **Hoffmanns Wissota Court** is a manufactured housing community in Chippewa County. The system’s only well exceeded the nitrate standard. Local geology and site conditions made treatment the most feasible option. The grant funded construction and installation of a treatment system along with a new wellhouse expansion.

- **Pine Edge** is a manufactured housing community near Eau Claire. The facility needs two wells to adequately supply all its residents, but one well was contaminated with nitrate. The grant funded construction of a new well that could meet the system's capacity needs and also supply low nitrate water. The project included a wellhouse cover over the new well and additional upgrades to the pumping controls. The old, contaminated well was also permanently filled and sealed.

Wisconsin has applied for additional WIIN funding (\$564,000) to allow more grants next year. EPA is currently reviewing our application.

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 most recent survey, from 2015, estimated that \$472.6 billion will be needed to meet the nation's drinking water infrastructure needs between 2015 and 2034. The price tag for the state of Wisconsin was estimated to be over \$8.5 billion.



EPA started the 7th Drinking Water Infrastructure Needs Survey and Assessment during 2021. Wisconsin submitted completed questionnaires for all the water systems in our state's sample. EPA is currently reviewing the questionnaires and, once finished, the data collection phase of the survey will be completed. We anticipate this assessment of nationwide drinking water needs will be published in 2023.

One monumental event in 2021 happened late in the year, when the federal Bipartisan Infrastructure Law (BIL) was passed. The BIL allocates more than \$35 billion toward safe drinking water and has been described as a once-in-a-lifetime investment in the nation's drinking water infrastructure. For 2022, Wisconsin's share of the funding will be a significant amount:

- 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 perfluoroalkyl and polyfluoroalkyl substances (PFAS) in drinking water

Funding from the BIL will begin in 2022 and continue for the next five years.

Physical infrastructure is not the only need, though. Drinking water programs nationwide are struggling to do more with less. 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, EPA revised the national requirements for controlling lead and copper in drinking water during 2021 but also announced more revisions to come. The new regulations should help to reduce exposure to lead and protect public health, but the requirements are becoming increasingly complex, and the size of the DNR's drinking water staff has not kept pace with these changes.

The drinking water field has also faced more widespread workforce challenges for years now. Certified water system operators are aging and retiring, creating a need for help from a new generation. Nationally, there is a 40% gap between current funding and staffing levels and what states need to address all the challenges facing public water systems.

The DNR is committed to protecting the state's drinking water and public health today 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—will 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 (30 contaminants in group)					
contaminant	MCL (mg/L)	contaminant	MCL (mg/L)	contaminant	MCL (mg/L)
2,4-D	0.07	Dibromochloropropane	0.0002	Hexachlorobenzene	0.001
2,4,5-TP	0.05	Dinoseb	0.007	Hexachlorocyclopentadiene	0.05
Alachlor	0.002	Dioxin	3 x 10 ⁻⁸	Lindane	0.0002
Atrazine	0.003	Diquat	0.02	Methoxychlor	0.04
Benzo(a)pyrene	0.0002	Endothall	0.1	Oxamy	0.2
Carbofuran	0.04	Endrin	0.002	PCBs	0.0005
Chlordane	0.002	Ethylene Dibromide	0.00005	Pentachlorophenol	0.001
Dalapon	0.2	Glyphosate	0.7	Picloram	0.001
Di(2-ethylhexyl)adipate	0.4	Heptachlor	0.0004	Simazine	0.004
Di(2-ethylhexyl)phthalate	0.006	Heptachlor epoxide	0.0002	Toxaphene	0.003
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 2021

The following tables summarize violations incurred by Wisconsin’s public water systems during 2021. 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 2021						
contaminant	number of water systems with violations					number of violations
	total systems*	MC	OC	NN	TN	
MICROBIAL CONTAMINANTS	23	0	2	0	21	26
Total coliform bacteria					5	5
<i>E. coli</i> bacteria			2		16	21
INORGANIC CONTAMINANTS	45	6	8	18	13	109
antimony				1	n/a	7
arsenic		1	4	10	n/a	69
nickel				1	n/a	2
nitrate		5	4	6	13 [†]	31
RADIONUCLIDES	17	15	2	n/a	n/a	354
combined radium 226+228		13	1			215
combined uranium			1			5
gross alpha particle activity		4	1			134
DISINFECTION BYPRODUCTS	2	2	0	0	n/a	3
total trihalomethanes		2				3
SYNTHETIC ORGANIC CONTAMINANTS	1	0	1	0	n/a	1
di(2-ethylhexyl) phthalate			1			
VOLATILE ORGANIC CONTAMINANTS	3	1	1	1	n/a	10
benzene		1				6
tetrachloroethylene			1			2
trichloroethylene				1		2
Overall totals	88	23	14	17	34	503
* Some water systems may have multiple violations within a contaminant group or violations in multiple categories.						
† During 2021, an additional 270 TN systems operated with nitrate levels above the MCL of 10 mg/L but below 20 mg/L.						

Table B-2. Monitoring and reporting violations during 2021

contaminant	number of water systems with violations					number of violations
	total systems*	MC	OC	NN	TN	
MICROBIAL CONTAMINANTS	510	3	46	42	419	636
Ground Water Rule			5	2	45	54
Total Coliform Rule					4	4
Revised Total Coliform Rule monitoring		3	43	41	379	564
Revised Total Coliform Rule reporting					14	14
INORGANIC CONTAMINANTS (18 contaminants in group)	318	99	44	55	120	429
arsenic		7	1	2	n/a	15
lead and copper		87	36	45	n/a	221
nitrate and nitrite		18	11	10	120	167 (201 individual contaminants)
other inorganic contaminants (13 contaminants in group)		11	5	2	n/a	26 (187 individual contaminants)
RADIONUCLIDES	43	16	27	n/a	n/a	80 (244 individual contaminants)
DISINFECTANTS & DISINFECTION BYPRODUCTS	41	33	3	5	n/a	55
residual disinfectants		10	2			15
disinfection byproducts		26	1	5		40 (74 individual contaminants)
SYNTHETIC ORGANIC CONTAMINANTS (30 contaminants in group)	5	4	0	1	n/a	6 (84 individual contaminants)
VOLATILE ORGANIC CONTAMINANTS (21 contaminants in group)	14	6	2	6	n/a	18 (360 individual contaminants)
Overall totals	788	135	98	96	459	1,224
*Some water systems may have multiple violations within a contaminant group or violations in multiple contaminant groups.						

Table B-3. Treatment technique violations during 2021

contaminant	number of water systems with violations					number of violations
	total systems*	MC	OC	NN	TN	
MICROBIAL CONTAMINANTS	72	8	9	2	53	90
Ground Water Rule	26	8	7	0	11	36
Revised Total Coliform Rule	46	0	2	2	42	54
INORGANIC CONTAMINANTS	17	9	3	5	n/a	18
Lead and Copper Rule						
DISINFECTANTS & DISINFECTION BYPRODUCTS	16	13	1	2	n/a	16
Overall totals	103	29	12	9	53	124

*Some water systems may have violations in multiple categories.

Table B-4. Notification and other violations during 2021

requirement	number of water systems with violations					number of violations
	total systems*	MC	OC	NN	TN	
Consumer Confidence Report	43	12	31	n/a	n/a	49
Ground Water Rule	7	3	0	0	4	8
Public Notice	645	56	43	39	507	1,103
Overall totals	679	63	66	39	511	1,160

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

Table B-5. Overall compliance with drinking water requirements during 2021

water system type	total number of systems	number of systems complying with all requirements	percent of systems complying
MC	610	421	69.02%
OC	428	276	64.49%
NN	906	763	84.22%
TN	9,284	8,439	90.90%
Overall totals	11,228	9,899	88.16%

APPENDIX C. Communities receiving Safe Drinking Water Loan Program funding for drinking water projects during 2021

The Safe Drinking Water Loan Program funded projects in 21 communities during 2021, for a total of \$45.8 million. Funding can be awarded as loans, principal forgiveness, or a combination to help communities throughout the state with needed infrastructure improvements.

community	principal forgiveness funding	loan funding	total funding	project description
Alma Center (village)		\$217,003	\$217,003	Elevated storage tank painting (interior and exterior), install sample tap and replace vent on top of tank.
Amery (city)		\$1,066,194	\$1,066,194	Water main replacement on Keller Ave.
Barron (city)	\$21,514	\$50,200	\$71,714	New elevated storage tank #2 and necessary piping to connect to distribution system.
Bruce (village)	\$500,000	\$356,312	\$856,312	Water main replacements on Railroad Ave, River Ave, Washington Ave, Main St and North First St.
Cambria (village)	\$394,900	\$921,433	\$1,316,333	New well #5, wellhouse, chemical feed system, and connecting mains.
Cassville (village)	\$263,162	\$321,641	\$584,803	Water main replacements on Bluff St and Fredrick St.
Grantsburg (village)	\$500,000	\$425,886	\$925,886	Modifications at well #3: new vertical pressure filters for removing iron and manganese; new chemical feed room; removal of existing polyphosphate chemical feed system; and pumphouse piping upgrades.
Iron River Sanitary District	\$216,505	\$264,616	\$481,121	Water main replacements on US Highway 2 and Front St.
Ladysmith (city)	\$393,161	\$480,529	\$873,690	Water main replacements on 1st St, East 2nd St, West 3rd St, West 4th St, and Lake Ave.
Lone Rock (village)	\$277,764	\$185,175	\$462,939	Water main replacements on multiple streets.
Maiden Rock (village)	\$120,216	\$280,503	\$400,719	Construction of new well #2, including test well; land purchase; chemical feed equipment; electrical, mechanical and generator; SCADA controls; and connecting mains.
Menasha (city)		\$997,383	\$997,383	Water main replacements on Appleton St, Eighth St, Lisbon Ave, Milwaukee St and Nicolet Blvd.
Milwaukee (city)		\$27,323,813	\$27,323,813	Water main replacements at various locations.

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community	principal forgiveness funding	loan funding	total funding	project description
Muscoda (village)	\$333,648	\$222,432	\$556,080	Construction of new well #4, including wellhouse, chemical treatment, motor control center and generator. Water main replacements at various locations.
Nekoosa (city)	\$500,000	\$818,380	\$1,318,380	Water main replacements on Wood Ave.
Reeseville (village)		\$318,651	\$318,651	Water main replacements on Pearl St.
Shelby Sanitary District #2 (Arbor Hills)		\$714,964	\$714,964	Well #1 improvements and pumphouse building addition, including new booster pumps, new piping, new chemical feed equipment, and new SCADA control panel.
Somers (village)		\$4,456,404	\$4,456,404	Water main replacements at various locations.
Thorp (city)		\$561,415	\$561,415	Water main replacements on North Boardman St and East Grant St.
Two Rivers (city)	\$405,891	\$947,076	\$1,352,967	Water main replacements along with 18 public side lateral spot replacements.
Wausaukee (village)	\$500,000	\$461,412	\$961,412	Construction of new well #4 and wellhouse, chemical feed equipment, auxiliary power, and connecting mains.
Total 2021 funding	\$4,426,761	\$41,391,422	\$45,818,183	

APPENDIX D. Communities receiving Private Lead Service Line Replacement Program funding during 2021

The Private Lead Service Line Replacement Program funded projects in 60 communities during 2021. 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 were replaced in 2021 through this program.

community	principal forgiveness funding	estimated number of lead service lines	community	principal forgiveness funding	estimated number of lead service lines
Antigo (city)	\$455,000	75	Menomonee Falls (village)	\$1,136,530	214
Ashland (city)	\$287,919	45	Milton (city)	\$550,000	100
Baraboo (city)	\$99,000	30	Milwaukee (city)	\$3,800,000	880
Beaver Dam (city)	\$243,038	75	Mosinee (city)	\$125,000	50
Berlin (city)	\$33,750	6	Nekoosa (city)	\$129,175	40
Bloomer (city)	\$85,049	16	New Holstein (city)	\$530,023	172
Bonduel (village)	\$45,000	9	New Lisbon (city)	\$8,827	1
Cadott (village)	\$65,000	11	North Fond du Lac (village)	\$90,000	30
Columbus (city)	\$145,000	40	Oconomowoc (city)	\$207,500	83
Eau Claire (city)	\$847,600	326	Oshkosh (city)	\$280,000	160
Edgerton (city)	\$373,410	96	Osseo (city)	\$90,896	10
Elmwood (village)	\$529,650	55	Platteville (city)	\$57,000	50
Fond du Lac (city)	\$312,000	156	Racine (city)	\$1,610,120	400
Fox Point (village)	\$31,994	7	Ripon (city)	\$100,000	20
Glendale (city)	\$198,692	40	Rothschild (village)	\$251,280	69
Green Bay (city)	\$1,411,635	319	Saint Francis (city)	\$50,000	10
Hartford (city)	\$100,000	20	Schofield (city)	\$25,000	10
Hurley (city)	\$220,000	40	Shawano (city)	\$1,250,950	300
Janesville (city)	\$1,950,000	321	Sheboygan (city)	\$285,000	114
Jefferson (city)	\$275,000	75	Stoughton (city)	\$3,561,281	670
Juneau (city)	\$75,000	13	Sun Prairie (city)	\$562,500	225
Kaukauna (city)	\$435,038	118	Thorp (city)	\$67,500	15
Kenosha (city)	\$1,950,000	410	Two Rivers (city)	\$310,338	118
Kiel (city)	\$176,453	54	Waterloo (city)	\$237,041	106
Kohler (village)	\$1,993,565	404	Watertown (city)	\$694,938	150
Lake Mills (city)	\$280,000	74	Waupaca (city)	\$160,090	54
Manitowoc (city)	\$1,568,445	516	Wausau (city)	\$320,000	71
Marshfield (city)	\$616,500	137	West Allis (city)	\$294,210	60
Mayville (city)	\$960,000	247	Wisconsin Rapids (city)	\$153,000	34
Menasha (city)	\$408,000	244	Whitefish Bay (village)	\$205,000	25
Total 2021 funding				\$33,314,937	8,220