An illustration showing a two-story house with a porch and a well. The well is a vertical pipe with a cap, extending from the ground surface down into the ground. The ground is depicted with a cross-hatched pattern, and the well is surrounded by a circular area of ground. The house is in the background, with trees and a fence visible.

Well Chlorination in Arsenic Sensitive Areas

Too much of a good thing?

When private well owners experience recurring problems with bacteria, or when other circumstances (such as flooding) expose well components to unsanitary conditions, staff with the Wisconsin Department of Natural Resources (DNR) recommend the well and water system be chlorinated. It may be tempting to use larger or more concentrated batches of chlorine solution, or to chlorinate more frequently than would normally be recommended. However, using too much of a good thing may actually be less effective and it may also add unneeded costs to the well-chlorination process. Just as important, there may also be special concerns in areas where arsenic contamination is present.

Why is well chlorination of special concern in areas of Wisconsin with the potential for the presence of arsenic in groundwater?

Arsenic is an element that occurs naturally in some soil, bedrock, groundwater and ocean water. High levels of inorganic arsenic, the most toxic form, have been found in hundreds of private drinking water wells, primarily in Northeastern Wisconsin. Scientists think one way arsenic is released into the groundwater is due to increased water demands that have lowered the water table allowing oxygen to get into arsenic-rich zones of the aquifer. This exposure to oxygen causes chemical reactions that release arsenic into the groundwater.

There have been reports from private well owners, with levels of arsenic below the recommended maximum contaminant level (MCL) of 10 ppb (parts per billion), that indicate the concentration of arsenic in their drinking water increased after excessive chlorination was used to combat a bacteriological problem. While a direct link to well chlorination and increased incidences of high levels of arsenic in private drinking water wells has not been scientifically confirmed, preliminary information seems to point to that conclusion. Scientists are still studying this and other possible reasons arsenic contamination is on the rise.



Why would my well need to be disinfected with a chlorine solution?

DNR staff commonly recommend well chlorination, when a private well owner experiences recurring problems with bacteria, or when other circumstances (such as flooding) expose well components to unsanitary conditions. You can find a list at the end of this fact sheet with instructions and other information on resources for your specific situation.

Should I include chlorination as part of my regular well maintenance even if I have not had any problems?

Not Necessarily. It is not always necessary to open your well and expose its components, unless you are experiencing problems, such as a positive test for bacteria, or if the well has iron bacteria or sulfur reducing bacteria symptoms like odor or slime. When wells are installed by a licensed well driller or pump installer, the casing and other well components are required to be disinfected during the final installation process.

If you have been chlorinating your well more than once each year, or have needed to use more than double the recommended chlorine solution to maintain your water supply, contact a licensed well driller or pump installer to discuss alternatives. These alternatives may include mechanical (physical) cleaning methods and the use of acid and surfactant products to break up the biofilm (slime).

How much is too much?

In certain situations, the chlorine concentration can be doubled, however this should only be done if the pH of the chlorine solution is controlled. Chlorine solutions are most effective at a pH between 6 and 7, but chlorine products can quickly raise the pH of the water, especially in hard water, to a level where the chlorine solution becomes ineffective. To counteract this effect, the pH may be adjusted with an acid product that has been approved by Bureau of Drinking Water and Groundwater. A licensed professional should administer these acid products.



What is the recommended well chlorination procedure?

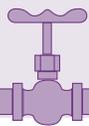


NOTE: There is an electrical shock hazard when working on a well. If you are not familiar with plumbing and electrical circuits, you may want to hire a licensed well driller or pump installer to chlorinate your well.

1. Have your well construction information ready. Well construction information can be found on your well construction report submitted by your well driller. Copies of this report are available from your well driller or go to dnr.wi.gov, search: groundwater data. This information is useful for regular well maintenance or drinking water testing, and may be helpful in preparing the chlorine solution. (For example: A six-inch diameter well holds about 1.5 gallons of water per foot of water within the well column.)
2. Prepare the chlorine solution. Multiple 30-gallon plastic garbage cans may make it easier to handle.

Use approximately 1 1/2 quarts (48 ounces) of 5.25% or 3/4 quart (24 ounces) of 10% approved chlorine bleach product having no additives. Mix the bleach with 100 gallons of water. You may also use other approved liquid chlorine products (sodium hypochlorite) as long as the concentration of the solution is not more than 100 mg/l (ppm).

3. Make sure the electrical power to the pump is "OFF."

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4. Pour or pump the solution into the well in one rapid, continuous flow, avoiding electrical connections.
 5. Bypass your water softener if you have one. Failure to do so could result in a breakdown of the softening media.
 6. Turn the power back "ON."
 7. Open each faucet in your house, one at a time, until you detect a chlorine smell, then close them.
 8. Attach a clean hose to a nearby faucet and place the other end of the hose into the top of the well. Open the faucet and recirculate the chlorinated water for one hour - washing down the entire inside of the well casing and the pump piping.
 9. Allow the chlorine solution to remain in the well and plumbing system for at least 30 minutes. Then flush the entire system until you can no longer smell chlorine. Run the chlorinated water outdoors, but be careful to avoid areas that drain into lakes or streams because it can kill fish and other aquatic life. Likewise, the solution can kill grass and shrubs, as well as disrupt septic systems. A good choice may be a backyard ditch or side area that will partially contain the solution while it is absorbed by the soil but make sure the ditch is not connected to a lake or stream.
 10. You may need to repeat this process if, subsequently, water sample results are positive for coliform or other nuisance bacteria.

Where can I get more information?

The Wisconsin Department of Natural Resources Bureau of Drinking Water and Groundwater has several publications available, which include information on private well testing, disinfection (chlorination) or specific contaminant information. Some of the most popular publications are:

Approved Chlorine Products for use in Disinfecting Wells & Water Systems (Contact the Department of Safety Professional Services or visit dnr.wi.gov to search for an electronic copy of the list.)

Arsenic in Drinking Water - PUB-DG-062 12

Iron Bacteria in Drinking Water - PUB-DG-004 01

Sulfur Bacteria in Drinking Water - PUB-DG-005 99

Tests for Drinking Water from Private Wells - PUB-DG-023 11

You & Your Well - PUB-DG-002 07

Wisconsin's Arsenic in Drinking Water & Groundwater Information Pages

As part of a cooperative effort involving Department of Natural Resources Bureau of Drinking Water & Groundwater staff, additional state and federal agencies, and interested research and higher learning institutions, we would like to introduce Wisconsin's Arsenic in Drinking Water & Groundwater Information Pages!

dnr.wi.gov
Search: Arsenic

Visit these pages to view:

- Brochures & Fact Sheets Online
- Data outlining where arsenic is occurring in Wisconsin
- Recommendations for well-drilling, treatment options and maintenance
- Recently published magazine articles on arsenic
- Summaries of studies from researchers worldwide

...and more!



Contact Us

Customer Service Staff are here to assist you 7 days a week, 7 a.m. to 10 p.m.

Call Toll Free 1-888-WDNRINFo
(1-888-936-7463)

How may we help you?

Chat available from 7 a.m. to 9:45 p.m.

Call a representative 7 a.m. to 10 p.m.

Email your question.

Toll free hotlines

Violation Hotline: 1-888-936-7463 phone

Emergency Spill Hotline:

1-800-943-0003 phone

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