

wellcare® information for you about

WATER TREATMENT

First and foremost, it is important to note that not all well water needs to be treated. Most well water comes from groundwater and is a safe, reliable drinking water source for you and your family. Before considering any type of water treatment, you should have your water tested by a certified water testing laboratory. If you need help locating a water testing laboratory or determining what to test your water for, contact the wellcare® Hotline at 888-395-1033 or use our [interactive map](#).

If your water tests positive for a contaminant, the important question is whether the contaminant found poses a threat to your health at the level it was found. Many contaminants do not pose a threat to health, but can cause the water to change color, cause staining, have an odor or an unpleasant taste. Use our wellcare® information sheet [Understanding Your Well Water Test Results](#) or contact the wellcare® Hotline to help with interpreting your results.

Selecting Water Treatment

As a private well owner, you are responsible for taking the right steps to keep your water clean. The more you know about the quality of your water and what treatment may be needed, the more likely you will be able to avoid unnecessary, costly, or inappropriate equipment.

Only one water treatment – disinfection or shock chlorination – is managed easily at home. Most other treatments require the service of a certified water treatment professional. If you need water treatment, contact your licensed well contractor for recommendations for treating the problem or locate a water treatment professional in your area using the [Water Quality Association's website](#).

Well owners have four primary options for water treatment:

- Disinfection or shock chlorination of the well
- Point-of-Use (POU) - installed under the kitchen sink to filter contaminants from drinking and cooking water
- Point-of-Entry (POE) - installed at the point where well water enters the home plumbing system
- Multi-stage treatment - to filter multiple contaminants or improve water quality for all household uses

Before purchasing a water treatment device, ask if it has been approved by NSF International, a non-profit group that develops standards for equipment related to public health. NSF International certifies water treatment devices as effective in removing specific contaminants. You can search for certified water treatment devices on [NSF's website](#).

Types of Water Treatment

Below are several types of water treatment. You may hear your water treatment professional use some of these terms. It is a good idea to familiarize yourself with these treatment methods and ask a lot of questions before installing any of these systems.

Aeration

Water is mixed with air by spraying or cascading, then the air is vented from the water. Closed aeration uses pressure to remove molecules, while open aeration uses gravity to remove gases. Aeration is used to oxidize dissolved contaminants into suspended particles which may then be filtered from the water.

Activated Carbon Filter

A highly porous, absorbent material, usually made from coal or wood, is used to filter contaminants, such as excess chlorine, and to reduce soluble materials, such as organic chemicals and radon.

Activated Carbon Block Filter

Activated carbon is molded into a cartridge filter with a much greater absorption capacity and speed than a granular carbon filter. Specialized media may be added to target specific contaminants.

Chlorination

Chlorine is added to water to destroy bacteria and control microorganisms and to oxidize dissolved iron, manganese, and hydrogen sulfide. The oxidized particles may then be filtered from the water. Shock chlorination of a private well uses concentrations of chlorine that are 100 to 400 times the amount found in municipal water supplies. The highly chlorinated water is held in the pipes for 8 to 12 hours before it is flushed out and the system is ready for use again. (See also Disinfection).

Coagulation

Chemicals neutralize the electrical charges of fine particles (contaminants) in water, making it easier to remove the particles by settling, skimming, draining or filtering.

Disinfection

Chemicals such as chlorine, iodine, ozone or hydrogen peroxide are used to destroy disease-producing bacteria without eliminating all microorganisms. Treatment also may involve steps such as distillation, boiling, or the use of ultraviolet light. (See also Chlorination).

Distillation

Organic and inorganic contaminants are separated from water through a sequence of evaporation, cooling, and condensation.

Electrodialysis

An electric current is used to remove ions (an atom or group of atoms) from water through a semi-permeable membrane (which allows select molecules to pass and blocks others).

Ion Exchange

A water softening process in which ions (an atom or group of atoms) from a solid medium, usually a resin, are exchanged for ions in water. Positive charged ions are known as cations and are removed with cation resins. Negative charged ions are known as anions and are removed by anion resins. An undesired effect of ion exchange is the addition of sodium to the treated water, a consideration for those on a low-sodium diet.

Lime Softening

Slaked lime is added to water to oxidize hardness, which is subsequently filtered out.

Oxidizing Filter

A type of filter that changes the balanced state of dissolved molecules, making them insoluble and, therefore, filterable.

Oxidizing Chemical Injection

Agents such as oxygen, ozone, chlorine or peroxide are used to oxidize dissolved solids into suspended solids which can then be filtered from water.

Reverse Osmosis

Pressure is used to force water molecules through a semi-permeable membrane (it allows select molecules to pass and blocks others). The pressure forces the molecules to flow in the reverse direction, moving from a concentrated solution to a dilute solution, hence diluting their presence in the water. To make these devices effective, water may need to be pretreated to remove chlorine and to reduce suspended particles.

Recommended Treatment for Specific Contaminants

The costs for water treatment devices described in this section are minimal compared to the cost of hookup to a public water system, which can cost up to \$20,000 or more per household depending on location and distance to the water main. Plus, you will have monthly water payments and many public water customers find they also need water treatment to make sure they are getting safe water. When you have a private water well, you are the one that manages the safety of your drinking water.

The table on the following page shows recommended treatments for potential groundwater contaminants. For more information on any of these contaminants, please view our groundwater contaminants information sheets on our website at www.wellcarehotline.org or call the wellcare® Hotline at 888-395-1033. Many factors need to be considered in order to determine the best type of treatment for your situation. These factors include the type of contamination, the type of pump (jet or submersible), the size of your tank, the depth and yield of your well, static water level, location of the pressure switch, age of the well, temperature of the groundwater, presence of total dissolved solids in the water, household water needs and flow rates, and many more. A certified water treatment professional is the best person to advise you on treatment for your water quality concerns.

The U.S. Environmental Protection Agency (EPA) Primary and Secondary Treatment Levels included in the following charts are national guidelines for public drinking water systems. Well owners should also use these guidelines. Some state and local agencies set their own standards and guidelines for testing and treatment. If your state or local agency's guidelines differ from those in the chart provided, the state or local guidelines supersede those listed below. If you need help finding your state's guidelines, contact the wellcare® Hotline at 888-395-1033. Finally, any "Suggested Levels" on the chart are for single family residential dwellings only. They do not apply to commercial, multi-family, or shared wells.

Below is a list of abbreviations and their definitions that are used in the chart on the pages following:

Abbreviation	Definition
mg/L	Milligrams per liter
pCi/L	Picocuries per liter. A picocurie is a unit of radioactivity
pH level	pH stands for "potential of hydrogen" and is measured on a scale that runs from 0-14. Water with a pH of 7 is neutral, lower than 7 is acidic and higher than 7 is alkali
ppb	Parts per billion
ppm	Parts per million
µg/L	Micrograms per liter

Contaminant	EPA PDWR (MCL) ¹	EPA SDWR or Suggested Level ²	Treatment Suggestion		Approximate Cost Range for Treatment ³
			Point-of-Entry Device	Point-of-Use Device	
Arsenic ⁴	10 µg/L, .010 mg/L		Activated Alumina, Anion Exchange, Distillation, Oxidation/Filtration	Reverse Osmosis	\$800-\$3,000
Bacteria	zero		Disinfection to the entire well system is recommended prior to installing a treatment device. See WSC's information sheet, "Disinfecting Your Well," at wellcarehotline.org for this method and other treatment options		≤\$150
Copper	1.3 mg/L		Activated Alumina, Activated Carbon, Ion Exchange Resins For information on corrosion control, see WSC's information sheet on Copper at wellcarehotline.org	Reverse Osmosis	\$800-\$3000
Emerging	none	none	Activated Carbon	Reverse Osmosis	\$800-\$3000
Fluoride	4 mg/L	2 mg/L	Activated Alumina, Distillation, Electrodialysis	Reverse Osmosis	≥\$800
Hardness		These classifications are used to measure hardness in water: soft 0-17.1 ppm; slightly hard 17.1-60 ppm; moderately hard 60-120 ppm; hard 120-180 ppm; very hard 180 or more ppm	Ion-Exchange (water softener)		≤\$2000
Iron		300 µg/L, 0.3 mg/L	Shock Chlorination to the entire well system. If problem returns levels of 3.0 mg/L or less an Ion- Exchange system can be used. Levels above 3.0 mg/L consider using Activated Carbon Filtration or Oxidation/Filtration. IMPORTANT: SEE NOTE BELOW ⁵		≤\$3000

Contaminant	EPA PDWR (MCL) ¹	EPA SDWR or Suggested Level ²	Treatment Suggestion		Approximate Cost Range for Treatment ³
			Point-of-Entry Device	Point-of-Use Device	
Lead	15 ppb, 0.015 mg/L		Activated Alumina, Activated Carbon, Ion-exchange Resins See WSC's information sheet on Lead at wellcarehotline.org for information on corrosion control.	Reverse Osmosis	\$800-\$3,000
Manganese		50 ppb, 0.05 mg/L	Shock Chlorination to the entire well system. If problem returns, low levels of manganese can be removed with Ion-Exchange. For high levels of manganese, consider using Activated Carbon Filtration or Oxidation/Filtration. IMPORTANT: SEE NOTE BELOW ⁵		≤\$3000
Mercury	2 ppb		Inorganic mercury - recommended treatment includes distillation. Organic mercury - recommended treatment includes Granular Activated Carbon (GAC) system.	For inorganic mercury, you can also use Reverse Osmosis.	\$800-\$4000
Methane Gas		If concentrations are above 28 mg/L, the U.S. Department of the Interior, Office of Surface Mining suggests that you take immediate action to reduce this concentration. Concentrations of 10 mg/L or less are considered safe.	A well vent can remove methane from some wells. Contact a certified well contractor in your area to see if a well vent can be installed on your well. Aeration can also be used to remove methane.		\$100-\$4000
MTBE		20 ppb to control odor and 40 ppb to prevent adverse taste. Meeting these control levels will also protect against adverse taste.	Air stripping in packed tower aerators and Granular Activated Carbon (GAC) filters		\$3000-\$4000

Contaminant	EPA PDWR (MCL) ¹	EPA SDWR or Suggested Level ²	Treatment Suggestion		Approximate Cost Range for Treatment ³
			Point-of-Entry Device	Point-of-Use Device	
Nitrate	10 ppm, mg/L		Ion-Exchange, Electrodialysis, Distillation can be used for smaller quantities	Reverse Osmosis	≥\$800
Nitrite	1 ppm, mg/L		Ion-Exchange, Electrodialysis, Distillation can be used for smaller quantities	Reverse Osmosis	≥\$800
Pesticides		There are 50,000 different pesticides used within the U.S. It is recommended that you test for specific pesticide(s). Contact your local health department or USDA Office to determine which ones are used in your region.	Generally, Granular Activated Carbon (GAC) filters (but may depend on individual pesticide(s) present)	Reverse Osmosis (but may depend on individual pesticide(s) present)	\$800-\$4000
pH		A good guide for well owners is to maintain a pH level of 6.5 - 8.5	Low pH can be treated with a neutralizer. Contact a local water treatment professional to see which type of neutralizer is right for your water system.		\$600-\$2000
Radium	Combined Radium, 226 & 228, 5 pCi/L		Cation Exchange, Distillation, Electrodialysis	Reverse Osmosis	≥\$800
Radon		Some states have recommended action levels for radon in water. Check with your state radon or environmental office.	Levels below 10,000 pCi/L - Granular Activated Carbon (GAC) or Aeration systems. Levels above 10,000 pCi/L - Aeration only		\$3,000-\$6,000
Sodium		20 mg/L	Distillation	Reverse Osmosis	≥\$800

Contaminant	EPA PDWR (MCL) ¹	EPA SDWR or Suggested Level ²	Treatment Suggestion		Approximate Cost Range for Treatment ³
			Point-of-Entry Device	Point-of-Use Device	
Sulfur		Sulfate – 250 ppm, Hydrogen Sulfide – no limit is set because any concentration high enough to pose a health hazard will also make the water too unpalatable to drink.	Small quantities of sulfates can be removed using distillation; large quantities of sulfates may be removed using Ion Exchange. Hydrogen Sulfide can be reduced or removed by shock chlorination, water heater modification, catalytic carbon filtration, or oxidation/filtration.	Small quantities of sulfates can also be removed using Reverse Osmosis.	≤\$3000
Tannins		Harmless organics, creates yellow cast to water and yellow staining throughout home	Shock chlorination to entire well system; low levels of tannins can be removed using Anion Exchange resins. IMPORTANT: SEE NOTE BELOW ⁵		≤\$4000
Uranium	30 µg/L, ppb		Coagulation/Filtration, Submicron Filtration, Anion Exchange, Activated Alumina, Distillation, Electrodialysis	Reverse Osmosis	≥\$800

¹Environmental Protection Agency National Primary Drinking Water Regulations, Maximum Contaminant Levels. These are enforceable standards for public water systems.

²Environmental Protection Agency sets National Secondary Drinking Water Regulations, Suggested Maximum Contaminant Levels. These are non-enforceable public health goals.

³Cost is approximate, check with your local treatment professional for rates. Actual costs can vary widely, and these figures are provided as general information only.

⁴Testing for both forms of Arsenic (3 & 5) should be performed to determine the best treatment.

⁵Shock chlorination is not advised without first having an accurate water test done to determine the type and concentration of each contaminant.

Maintaining Water Treatment

It is important to monitor and carefully maintain all treatment systems to ensure water quality. Failure to maintain treatment systems can result in the growth of bacteria or ineffective filtering which may allow contaminants to enter or stay in your drinking water. Most filter cartridges, membranes, or ultraviolet lights must be replaced at least once a year. Ask your water treatment professional about maintenance needs and costs before water treatment is installed. Then, keep accurate maintenance records and test systems and the treated water regularly.

More Information on Water Treatment

For more information on water treatment contact your licensed well contractor, water treatment professional, or the **wellcare®** Hotline at 888-395-1033.



Information to help maintain and protect your water well system:

wellcare® is a program of the [Water Systems Council \(WSC\)](#). WSC is the only national organization solely focused on protecting the health and water supply of more than 13 million households nationwide who depend on private wells.

This publication is one of more than 100 **wellcare®** information sheets available FREE at www.watersystemscouncil.org.

Well owners and others with questions about wells and well water can contact the **wellcare®** Hotline at 1-888-395-1033 or visit www.wellcarehotline.org to fill out a contact form or chat with us live!

JOIN THE WELLCARE® WELL OWNERS NETWORK!

By joining the FREE **wellcare®** Well Owners Network, you will receive regular information on how to maintain your well and protect your well water.

Contact us at 1-888-395-1033 or visit www.wellcarehotline.org to join!