

WELL WATER TREATMENT

When a new well is drilled in Greenwich, the Department of Health is required to test the well water prior to giving final approval to consume the water. The well water is tested for the following parameters:

Bacteria

pH

Color

Turbidity

Odor

Nitrates

Nitrites

Hardness

Sodium

Iron

Manganese

Chloride

If any of these parameters exceed acceptable limits, measures must be taken to correct the problem.

There are several methods, techniques, and equipment available to treat well water, making it potable and safe for consumption. The following is a list of the most common treatments:

Water Softener:

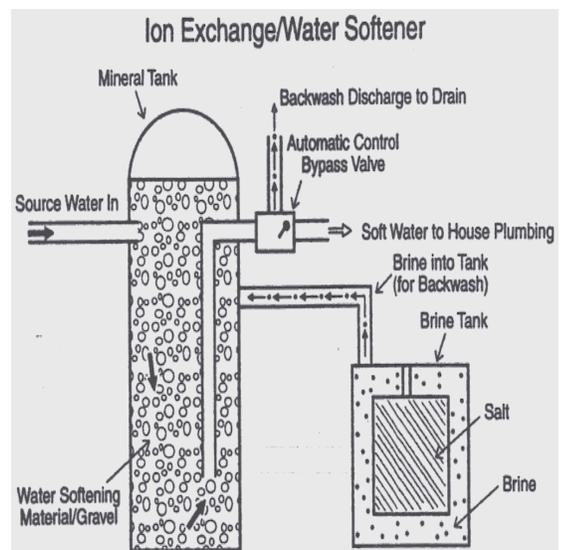
This method of water treatment is very common in the Town of Greenwich. It is used to treat hard water (water with excess amounts of calcium (Ca^{++}) and magnesium (Mg^{+}) ions), a common condition with well water. Water softening is based on a chemical process known as *ion exchange*, as shown in Figure 4.

The water softening material (known as resin) has a negative (-) charge, with positive (+) sodium (Na^{+}) ions attached to it. Resin has a stronger attraction for calcium (Ca^{++}) and magnesium (Mg^{+}) ions than for sodium (Na^{+}) ions. When water is passed through the resin, the resin exchanges the sodium ions for the calcium/magnesium ions, thus reducing the hardness. Although the water is softened, the sodium ion concentration is increased.

When all of the sodium ions are removed from the resin, they can be recharged back onto the resin with a strong solution of sodium chloride (brine) backwash. The sodium ions are placed on the resin, while the hardness ions are washed away and discarded.

It must be noted that individuals restricted to a sodium-free diet should consult a physician before regularly consuming softened water. While the sodium concentration in the water may be low compared with sodium concentrations in some foods, it is still advisable to seek medical advice.

Figure 4



Manganese Greensand Filter:

Two of the most common problems with well water in Greenwich are excessive levels of iron and manganese. The most effective method of treatment, aside from a softening system, is the use of a greensand filter.

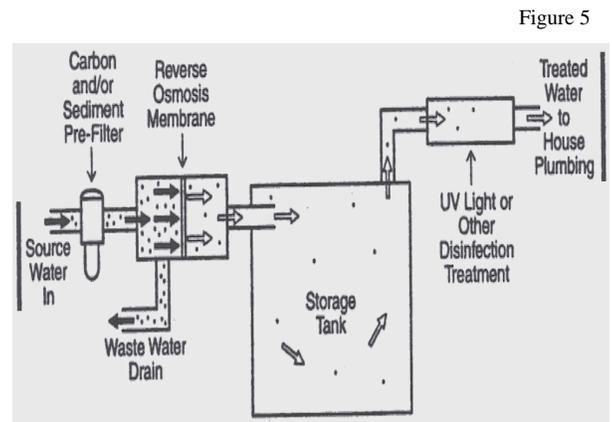
The manganese greensand filter consists of a manganese dioxide-coated greensand filter bed, through which the untreated water passes. As water passes through the filter bed, the iron and manganese is oxidized into a “filterable” state and retained by the filter media. Water leaving the filter is then free of iron and manganese. The filter is then backwashed with a solution of potassium permanganate, thus “recharging” the greensand with manganese dioxide.

Note: A treatment system that requires backwashing should be discarded into a dry well, not into the septic system that services the building. Excessive backwashing to a septic system could lead to a septic system failure.

Reverse Osmosis:

This water treatment method is commonly used for the removal of nitrates, sulfate, and chloride. Reverse Osmosis, or “RO”, is a treatment method that takes raw “untreated” water and forces it through a semi-permeable membrane into a chamber of “treated” water (See Figure 5).

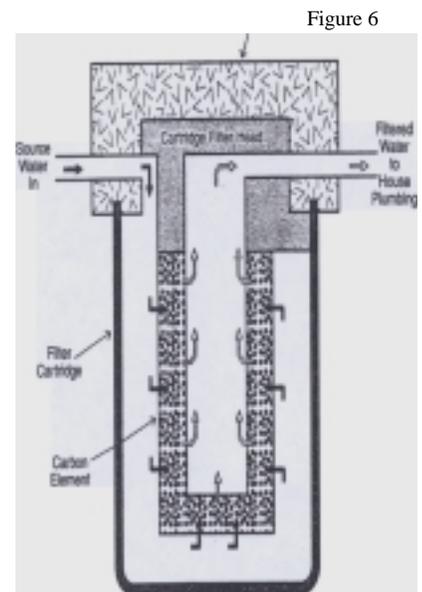
The membrane filters water on a molecular scale, leaving unwanted minerals behind. The membrane is then periodically rinsed and the unwanted materials are washed away. This process works best when water is initially passed through a carbon/sediment filter before Reverse Osmosis, removing any particles in the water. This procedure aids in sustaining the effectiveness of the filter.



Activated Carbon Filtration:

This method of water treatment is one of the most commonly used in the Town of Greenwich. Filtration, simply stated, removes suspended matter from water by mechanical “screening”. Filtration via activated carbon involves the adsorption or adhesion of one material on the surface of a second solid substance. (See Figure 6).

These filters are widely used to eliminate hazardous compounds related to industrial wastes, chemicals, and pesticides. It is also commonly used to remove unpleasant tastes and odors from gases, organic matter, and chlorine. After the process is complete the water is odor-free and tasteless.



Chlorination and UV Irradiation:

Treatment by chlorination is one of the most common methods of disinfection for well water. It is also a popular technique for treating taste and odor causing substances. Chlorination primarily controls the growth of algae and microorganisms in well water and within the water distribution system. Chlorinating the distribution system provides continual anti-bacterial protection.

Chlorine is available in 2 forms: sodium hypochlorite (liquid form) and calcium hypochlorite (solid form).

As water enters the home, chlorine is injected into the system, disinfecting the bacteria. Because chlorine tends to require large amounts for treatment, an activated carbon filter is usually installed after a chlorination system to remove any excess chlorine.

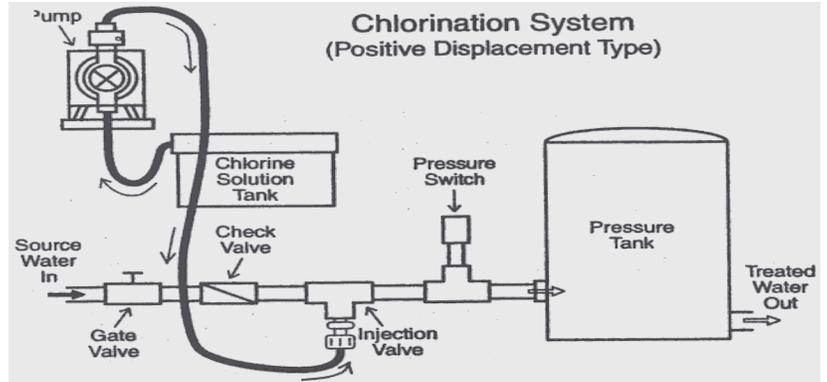


Figure 7

UV irradiation is another treatment option that eliminates bacteria. The UV light kills the bacteria in the same way that sunlight kills bacteria. The units consist of UV lamps enclosed in a quartz sleeve, around which water flows. The effectiveness of the unit depends on the lamp intensity and the flow of water – the slower the movement of water the more exposure to the UV light.

UV irradiation units are automatic and require very little maintenance. It is a good idea to filter the water before any UV treatment because turbidity or cloudiness in the water can reduce the effectiveness of the UV treatment.

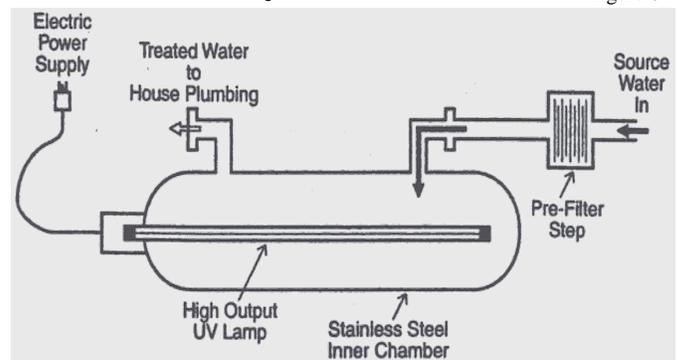


Figure 8

Note: If the initial water analysis result indicates bacteria is present, homeowners should re-chlorinate the actual well before installing an entire treatment system. The well should also be inspected for cracks and leaks. Problems associated with bacteria are often solved when well casings are repaired or the source of the infiltration is found. Applying a disinfection treatment system to your drinking water supply should be considered only when other measures cannot provide bacteria-free water to a home.

Well water is a vital resource for the Town of Greenwich community, providing residents with a safe and abundant source of drinking water.

The location, construction, and maintenance of a potable well all contribute to the quality of the well water and are important in protecting the natural ground water aquifers.

Most water quality issues and concerns of well water can be addressed and remedied through the use of treatment methods which are constantly being updated and improved through the use of emerging water treatment technologies.

It is important for well owners to understand where well water comes from, how it can be protected, and how to maintain the quality of their potable water.