Section IV

Water treatment

The first and most important step we can take to maintain good water quality is to protect our water source. Once groundwater is contaminated, it is very expensive and time consuming to remediate. In some cases, treatment systems will not be sufficient to address the contamination and it may be necessary to drill a new well.

Although residents of Pound Ridge have very few reasons to be concerned about industrial pollution, we should still test our water regularly. Septic tanks, underground heating oil tanks, improperly applied pesticides/herbicides, and runoff from driveways are all potential sources of contamination. We also live in an area with naturally hard water, high natural mineral and iron content. These are considered aesthetic issues not health related issues, nevertheless, they require some form of treatment to protect plumbing and household appliances, make laundry softer, shampoo sudsier, and remove specks from wine glasses.

A well owner is responsible for its maintenance, which includes making sure the well caps and seals are tight and working as well as checking for sources of contamination such as a leaking septic system or visible sources of contamination on the surface. Section III - well maintenance.

A well owner also has to test the well water and obtain treatment if required. Several tables are included to help organize primary and secondary contaminants and common sources, Table 1 treatment methods recommended to address select problems Table 2.

There is no one method that will treat all possible problems. Frequently, more than one treatment method is used for any one well. The lab test results will direct the water treatment professional to recommend treatment methodology(ies).Table 2 presents a list of common treatment systems, briefly explains how they work and what kind of contaminants each is designed to address.Table 3 provides troubleshooting information for common problems.

Treatment systems can be either Point of Entry or Point of Use. Point of Entry systems are installed to treat the water where it enters a residence. This way all the water used in the home will be treated. Point of Use systems are installed on the faucet where the water is used and may only treat water used for cooking and drinking leaving water used in the bathroom or laundry untreated.

Common water treatment options are described below:

Ion Exchange (Water Softener)

Used for:

- Hard water (high levels of calcium and manganese)
- Removal of some bad odors and colors

- Removal of barium, radium, dissolved iron, manganese
- Note: An added anion exchange unit can remove nitrate and fluoride

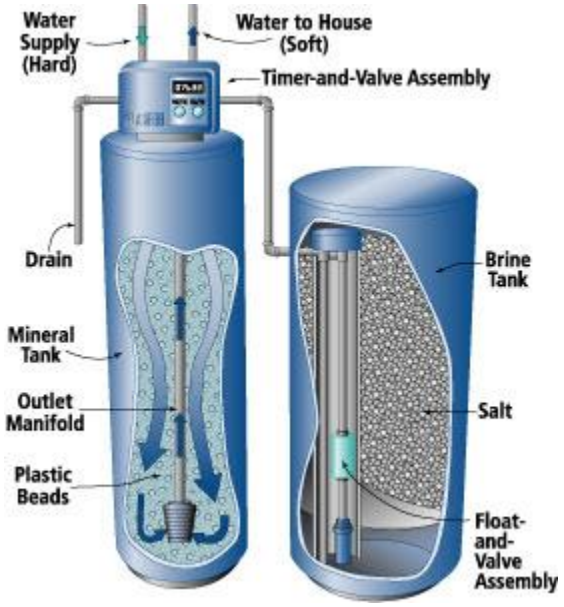

Figure 4.1: water softener system (www.appleplumbing.com)

How it works:

The ion exchange water softener is a common water treatment system. In an ion exchange system the water passes through resin beads. The beads are coated with positively charged sodium ions. The sodium ions change place with calcium or magnesium-- the hard ions.

People with hypertension should be aware that water treated in an ion exchange system may contain elevated levels of sodium. .

Reverse Osmosis

Used for:

- Radium, sulfate, calcium, magnesium, potassium, nitrate, fluoride, phosphorous
- Removal of some pesticides and other organic compounds

How it works:

In a reverse osmosis unit, water is passed through a semi-permeable membrane. The membrane will remove radium sulfate, magnesium, potassium, nitrate, fluoride, phosphorous and other inorganic compounds. The membrane will also remove some organic compounds

such as pesticides. Figure 4.2 is a schematic of a reverse osmosis membrane that only lets water through.

The reverse osmosis unit is frequently used with other treatment technologies such as an activated carbon filter or a mechanical filter (see discussion below). The activated carbon or mechanical filter will remove large particles of silt and sand and then pass through the reverse osmosis membrane to remove pesticides or inorganic compounds.

The reverse osmosis unit requires maintenance. It is recommended that water is tested regularly after the unit is installed to make sure the membrane is functioning properly.

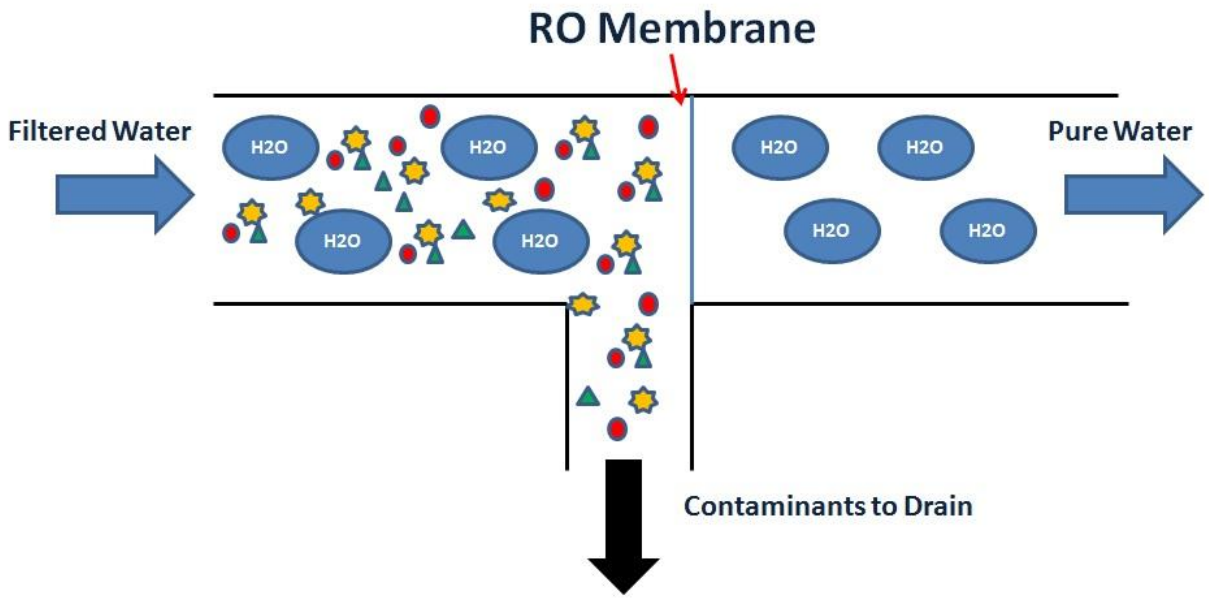

Figure 4.2: How a reverse osmosis water filter works (www.h2oavenue.com)

Disinfection Methods

Chlorination

Used for:

- Bacteria and some viruses
- Removal of some bad odors, tastes, and color

How it works:

Chlorination is done one of two ways: (1) Shock chlorination. Chlorine is pumped through the plumbing system on a one time basis to kill bacteria. (2) Continual chlorination. Chlorine is added continually through a small pump to kill bacteria. Chlorination will continue to work for some time after treatment stops. Chlorination is often combined with other treatment methods such as a mechanical filter or activated carbon.

UV Radiation

Used for:

- Bacteria and some viruses

How it works:

The UV radiation system uses a mercury lamp to kill most bacteria and viruses. It will not work on cysts such as giardia or worms.

The lamp will have to be replaced according to the manufacturer's suggestions probably annually to remain effective.

Ozonation

Used for:

- Bacteria and some viruses
- Removal of some pesticides as well as iron, sulfur, and manganese

How it works:

Ozone is generated electrically and kills the pathogens: bacteria as well as some pesticides. Ozonation is often combined with activated carbon or a mechanical filter and can remove iron, sulfur and manganese.

Filtration Methods

Activated Carbon

Used for:

- Removal of organic compounds, radon gas and pesticides
- Hydrogen sulfide, mercury and chlorine
- Some types of activated carbon can remove chryptosporidium and giardia cysts

How it works:

Activated carbon filters absorb organic contaminants from the water by one of the following methods:

Granular activated carbon (GAC) use loose granules of carbon to absorb the contaminants. The filters can become saturated with impurities and bacteria and lose some of their effectiveness. Solid block activated carbon (SBAC) is, as the name indicates, a solid block of activated carbon. Because the carbon is compressed, it can absorb some of the cysts such as cryptosporidium which other treatment systems cannot address. The SBAC can become easily plugged with organic matter and has to be replaced.

Mechanical Filtration

Used for:

- Removal of sand, silt, clay, organic matter

How it works:

Mechanical filters are made of fabric, fiber, or other kind of screening material that removes material suspended in the water such as sand, silt, or organic matter. The mechanical filter cannot remove fine particles or dissolved contaminants. Mechanical filters are often used along with other methods.

Figure 4.3: Three parts of a mechanical filter (www.diyfishkeepers.com)

Pound Ridge water – Section I

Well testing – Section II and Table 1

Well maintenance – Section III

References – Section V