

# Understanding Ground Water

Frederick County Health Department  
Environmental Health  
301-600-1717

## Understanding Ground Water:

- Well water should be tested yearly
- Contaminants can be man-made or naturally occurring
- Wells and septs should be properly maintained

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## Ground Water

Ground water is a renewable resource that is obtained from an underground layer of porous rock known as aquifers. Wells are drilled or bored into these aquifers so that the water can be used for drinking.

Aquifers are replenished when rainwater and melted snow seep through the dirt and rock. The dirt and rocks act as a filter

when the water passes through. The type and amount of rock and the depth of the well will affect how much contamination can enter the aquifer and ultimately how clean the water will be.

There are two types of aquifers a well can be placed in. The first is confined, meaning it is surrounded by a rock layer that blocks harmful

pollutants. The second type is unconfined, meaning there is no continuous layer of rock surrounding the aquifer, thus making the water more prone to contamination. Since all aquifers in Frederick County are unconfined, it is important to understand the potential for contamination in private wells.

[Private Drinking Water Wells | US EPA](#)  
[Learn About Private Water Wells | US EPA](#)

## Potential Contaminants

Regardless of the depth of your well, there is always the potential for contamination. Ground water contamination can occur due to human activity or natural processes.

Water moving through underground rocks and soil can pick up naturally occurring elements such as magnesium, calcium, arsenic and radon.

Actions taken by humans can be a large source of

ground water contamination. Urban growth into once sparsely populated areas can have an effect on ground water quality.

The improper use of fertilizers poorly maintained septic systems and improper disposal of wastes are just a few human activities that can pollute ground water sources.

While a vast majority of ground water sources are

safe for human consumption, it is imperative for homeowners to be vigilant regarding their well water. Most property owners do not realize that at the time of purchase of the property the well was likely only tested for bacteria and not all possible contaminants. It is recommended that all drinking wells be tested yearly to ensure the quality of the water.

[Drinking Water Regulations | US EPA](#)

## Microorganisms



Viruses, bacteria and parasites are all microorganisms that can be found in ground water. Water flowing across the surface can pick up these organisms from soil and wildlife. Shallow wells with a water column near the surface are at most risk for this type of contamination.

Human and animal wastes are a source of

contamination. Improperly maintained septic systems and large animal farming operations can lead to fecal contamination by the bacteria *E. coli*.

Microorganisms can cause a variety of illnesses with the most common symptoms being nausea and diarrhea after ingestion of contaminated water.

Bacterial sampling of

ground water can be conducted to determine if your well is contaminated. If your well is found to be contaminated by either total coliform or *E. coli*, well disinfection is recommended. Additional options include the installation of a vermin proof well cap or a disinfection system, such as an ultraviolet light.

**“...Ground water contamination has been found in all 50 states...”**  
(EPA)

## Radionuclides

Groundwater can also contain radioactive elements known as radionuclides. The most common radionuclides found in ground water are uranium, radium and radon.

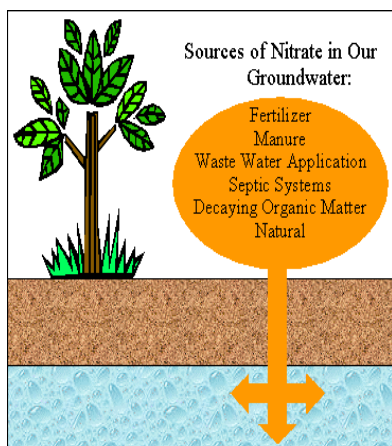
Radon is a tasteless, odorless gas that is produced by the radioactive breakdown of uranium in the ground. The largest threat from

radon is posed when inhaled; however, consumption of water containing radon can still pose a health risk.

There is currently no enforceable standard for radon in drinking water; however, the EPA recommends taking action if at home testing shows elevated radon levels at or above 4 pCi/L.

Water sampling can be conducted to determine if your well water contains elevated levels of radon. If elevated levels are found, point of entry treatment devices such as Granulated Activated Carbon (GAC) filters or aeration devices may be installed.

[Radionuclides Rule | US EPA](#)



## Nitrates

Nitrates in well water are caused by the breakdown of nitrogen, which can occur naturally or by man-made processes. Naturally occurring nitrogen in the soil can convert to nitrate and enter the ground water.

Nitrates from septic tanks or fertilizers can also leach into the ground water.

The EPA limit for nitrates in well water is 10 mg/l. High amounts of nitrate in drinking water are dangerous for infants and

can cause “blue baby” syndrome by disrupting the flow of oxygen in the blood.

Boiling will increase the nitrate concentration so high nitrates should be treated with a reverse osmosis system.

[Chemical Contaminant Rules | US EPA](#)

## Heavy Metals

Metals are elements which are good conductors of heat and electricity with a silvery luster. The metals group include lead (Pb), chromium (Cr), arsenic (As), cadmium (Cd), nickel (Ni), zinc (Zn), copper (Cu), mercury (Hg), silver (Ag), and selenium (Se).

These metals are naturally occurring in the ground and under normal circumstances don't contaminate well water at dangerous levels. The

metals are immobilized by interactions with other elements in the soil.

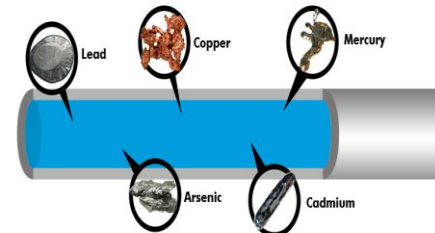
However, these metals can be mobilized by environmental changes in the soil, such as, "degradation of the organic waste matrix, changes in pH, redox potential, or soil solution composition, due to various remediation schemes or to natural weathering processes."

Mobilization of the metals can also be caused by

several human activities (like mining and construction) and can lead to the release of large amounts of metals into ground water.

The EPA has different standards for each metal and testing is always recommended if there are concerns.

Boiling water will not remove the metal and will actually increase the concentration.



Metals commonly found in household water.

[Metals | US EPA](#)

## Lead & Copper

Lead and Copper are two common metals that can be found in water supplies. The most common source for these metals is household plumbing. Water with a low pH can corrode piping and cause leaching of lead and copper into the water.

Lead and copper are also found naturally in the soil but in most cases, the metals bind to the soil and do not migrate into the groundwater unless disturbed.

Exposure to lead and copper in drinking water can lead to various health

issues. Lead exposure in infants and children can lead to developmental difficulties. Adults exposed to high lead levels run the risk of kidney problems and high blood pressure.

Short term exposure to copper can lead to gastrointestinal disorders while long term exposure may cause liver or kidney damage.

Water sampling can be conducted to determine if either metal is above the EPA limit. The most effective means of treatment for removing lead and copper from your

water supply is through corrosion control. Corrosion control can be accomplished through adjustments in water quality characteristics such as pH and alkalinity.

Any copper piping or fixtures/fittings that may contain lead solder should be removed. The use of cold tap water and flushing after hours of non-use is also recommended. Boiling of water before use will **not** decrease the concentration of the metals present.

**Let water run for several minutes before drinking it. The first draw in the morning (or after hours of non-use) contains higher lead levels**

**Children ages 6 and under are at the greatest risk for lead exposure.**

[Lead and Copper Rule Improvements | US EPA](#)  
[National Primary Drinking Water Regulations | US EPA](#)  
[Basic Information about Lead in Drinking Water | US EPA](#)

## Industrial Products and Wastes

*Questions about water quality can be answered by the local health department"*

Chemicals used by nearby businesses for industrial processes can cause contamination of ground water sources. Factories, gas stations and dry cleaners all use chemicals that could pollute local water sources.

Leaky underground tanks and pipelines can be a

major cause for concern. Petroleum storage tanks used at gas stations and farms can corrode and leak fuel into the soil which makes its way into the groundwater. Petroleum leaks can lead to high levels of volatile organic compounds (VOC's) in well water.

Landfills may also leach

liquids into the soil if liners are not properly installed.

If you suspect chemical contamination, a full suite of VOC's can be tested for. If high levels are detected, various treatments, including filters, can be installed on your water system to remove the compounds.

[Class I Industrial and Municipal Waste Disposal Wells | US EPA](#)

## Household Waste



Products used daily in our households can also be responsible for ground water contamination. Improper disposal of cleaning agents, motor oil, paint and detergents can lead to water quality issues.

Left over prescription and non-prescription drugs

can also harm water sources if not disposed of properly. Homeowners should participate in drug take back programs in their area to avoid this potential issue.

To dispose of paint, remove the lid and let the paint completely dry out.

Once completely dry, you can dispose of it in your regular trash.

Household wastes should never be disposed of in septic systems. The wastes could be leached into the ground and cause contamination.

[Water on Tap: What You Need to Know Private Drinking Water Wells | US EPA](#)

## Per- and Polyfluoroalkyl Substances (PFAS)

**Frederick County Landfill**  
Information: [Landfill Information](#)  
[| Frederick County MD - Official Website](#)

**Household Hazardous Waste:**  
[Household Hazardous Wastes](#)  
[Frederick County MD - Official Website](#)

PFAS are long lasting chemicals found in a variety of products and are known to break down very slowly over time. Their persistence and widespread use have led to PFAS being found in the blood of people and animals. PFAS can also be found in the air, water and soil across the globe.

Thousands of these PFAS chemicals exist and are found in a variety of consumer, commercial and industrial products. (PFOA, PFOS, PFHxS, etc).

These chemicals are found in fire extinguishing foam, food (fish contaminated by PFAS), household products

(stain/water-repellant products), clothing and much more.

Studies have shown that exposure to these chemicals may be linked to harmful health effects, such as decreased fertility, developmental delays in children, increased risk of some cancers, and reduced immune response.

[PFAS Explained | US EPA](#)  
[Per- and Polyfluoroalkyl Substances \(PFAS\) | US EPA](#)  
[Our Current Understanding of the Human Health and Environmental Risks of PFAS | US EPA](#)

## Well Maintenance

An important part of maintaining good well water is regular well maintenance.

Check the well for cracks, corrosion, broken or missing parts.

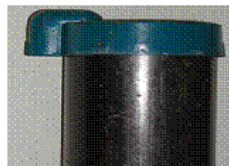
Install a vermin proof cap on the well so insects are unable to enter the well.

Test your well water yearly for bacteria, nitrates and other contaminants.

Never throw things into the well that don't belong there.

Always chlorinate your well if the well cap is removed.

**Non-Vermin Proof Cap**



**Vermin Proof Cap**



[Protect Your Home's Water | US EPA Well-Manual-large](#) (Well Maintenance Handbook)

### Reasons to Test Your Water

Conditions or Nearby Activities:	Test for:
Recurring gastro-intestinal illness	Coliform bacteria
Household plumbing contains lead	pH, lead, copper
Radon in indoor air or region is radon rich	Radon
Corrosion of pipes, plumbing	Corrosion, pH, lead
Nearby areas of intensive agriculture	Nitrate, pesticides, coliform bacteria
Coal or other mining operations nearby	Metals, pH, corrosion
Gas drilling operations nearby	Chloride, sodium, barium, strontium
Dump, junkyard, landfill, factory, gas station, or dry-cleaning operation nearby	Volatile organic compounds, total dissolved solids, pH, sulfate, chloride, metals
Odor of gasoline or fuel oil, and near gas station or buried fuel tanks	Volatile organic compounds
Objectionable taste or smell	Hydrogen sulfide, corrosion, metals
Stained plumbing fixtures, laundry	Iron, copper, manganese
Salty taste and seawater, or a heavily salted roadway nearby	Chloride, total dissolved solids, sodium
Scaly residues, soaps don't lather	Hardness
Rapid wear of water treatment equipment	pH, corrosion
Water softener needed to treat hardness	Manganese, iron
Water appears cloudy, frothy, or colored	Color, detergents

(EPA)

## Frederick County Health Department

### Environmental Health

350 Montevue Lane  
Frederick, MD 21702

PHONE:  
(301) 600-1717

FAX:  
(301) 600-3180

E-MAIL:  
CommunityServicesOffice  
@FrederickCountyMD.gov

We're on the Web!

See us at:

[Environmental Health |  
Frederick County Health  
Department, MD](#)

## Well Questions

If you have any questions or concerns about well construction, water quality, or test results, you may contact Environmental Health for information. A licensed well driller may also be able to answer questions that you may have.

The Frederick County Health Department has the capability to test the water quality of your well. Tests that the Health Department can perform are bacteria (total coliform and *E. coli.*), nitrate and turbidity. Once test results are received, an

Environmental Health Specialist will contact you with the results and can answer any questions.

## Laboratories

There are two Maryland State Certified Water Laboratories in Frederick County. For additional information concerning pricing and types of testing, please contact each laboratory at the following:

Certified Water Testing  
15009 N. Franklinville Rd.  
Thurmont, MD 21788  
301-663-5323

Fredericktowne Labs, Inc.  
3020C Ventrone Ct.  
Myersville, MD 21773  
301-293-3340

For a list of all the MDE certified labs in Maryland check out the list at:  
[LOCAL-CERTIFIED-PRIVATE-LABORATORIES-](#)



**Public Health**  
Prevent. Promote. Protect.

**Frederick County Health Department**



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