Mike

Here is the Book ~~Bryan Or~~ Brian Oram sent me. It seems to be full of conflicting DEP and EPA maximum allowed levels for elements. Some are accurate some are way off. I don't know if these maximum levels keep changing or what. the Book is dated 2011.

Remember Brian Oram is the guy who never charges for his so called services. then he shows up at settlement trials in Susquehana County claims neutral statis (since he never charged anybody any money) and gives false testimony for the fracking companys. this is what a New York reporter told me and told me not to trust him. I already, befor I talked to reporter suspected him. Remember reporters don't report on anything without confirmed sources. She told me she had four confirmed sources.

Anyway take a look at this book and see if you think it's legit! I'm having trouble determining maximum legal levels of elements

I guess it doesn't really matter at this point it is really up to you EPA, and media legal team decision. Frankly, I'm poisoned and my brain works slowly and it's very frustrating. It all happened so quick. Hope I soon can forget all this chemistry and well!

Bullshit!

Donald R. Ludwig

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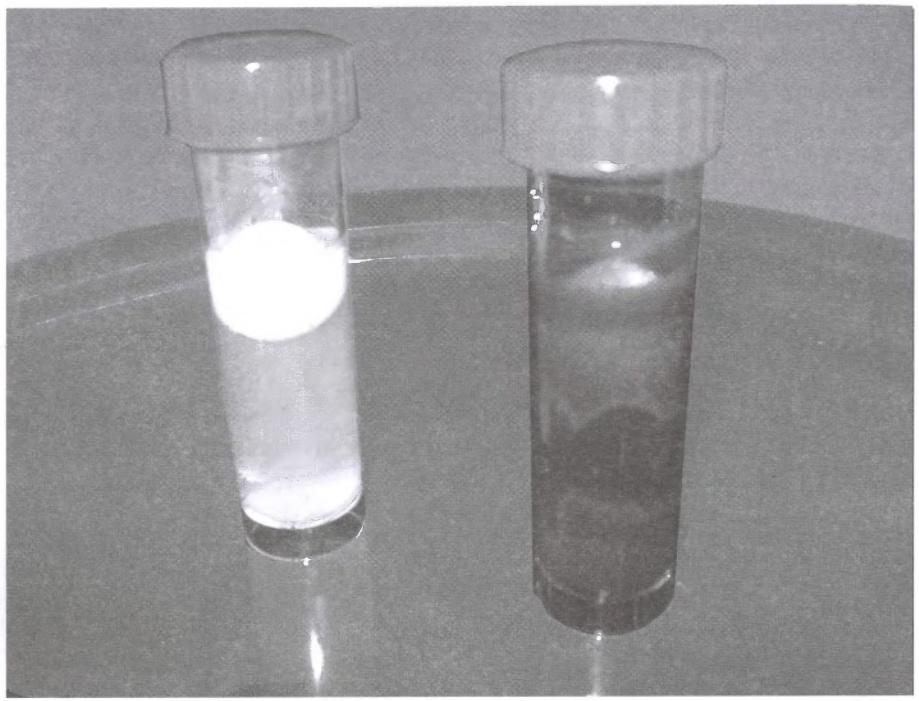
Pennsylvania Water Quality

Your Private Well: What do the results mean?

2nd Edition

By Mr. Brian Oram, PG,
with edits by
Dr. Sid Halsor, PG, and
Dr. Brian Redmond, PG

Figure 2



Examples of Positive Iron Bacteria Test
Within 5 days of testing, the water becomes discolored and creates a foam and an odor.

II. Inorganics (IOCs)

The following inorganic parameters are regulated under primary drinking water standards. These parameters are a combination of metals, salts, and mineral complexes that pose a health concern or risk. If your water is elevated for these contaminants, it is likely you will need to conduct some additional water testing and you may need to install a water treatment system. Since the selection of the most appropriate water treatment system requires a comprehensive evaluation of your water quality, your household use, and the configuration of the existing system, the type of water treatment mentioned in this section should be considered only as a guide. If your water system requires a modification or treatment, it is strongly recommended that you seek advice from a water treatment professional.

Note: While some of these elements are hazardous above certain levels, some, like selenium, copper and chromium, are essential nutrients at lower levels. Others, like lead and arsenic, are undesirable at any level.

Antimony
The drinking water MCL is 0.006 mg/L. The primary health concerns would include an increase in blood cholesterol, a decrease in blood sugar and irritation to eyes and skin. Also, it is a potential carcinogen.
Possible Treatment Actions: RO, IE, DIS

- **Arsenic**
The drinking water MCL is 0.010 mg/L. Arsenic can result in the formation of malignant tumors on skin and lungs and may cause nervous system disorders. If your test results for total arsenic exceed the standard, it may be advisable to test for dissolved arsenic. If you also have a high level of iron or manganese in the water, it is possible that most of the arsenic may be associated with the particles of iron and manganese. If this is the case, the system used to remove particles, iron, and manganese may remove or reduce the level of arsenic. From the available data, it appears that approximately 6 percent of private wells may have elevated levels of arsenic.
Possible Treatment Actions: Filtration, Oxidation, RO, IE, DIS

- **Barium**
The drinking water MCL is 2.0 mg/L. Barium can cause an increase in blood pressure which affects the nervous and circulatory system. In general, the background level of barium in water is typically "not detectable" or "less than 1 mg/L", but some waters that are influenced by naturally saline water may have barium levels that exceed 2 mg/L. From the available data, it appears that less than 3 percent of private wells may have elevated levels of barium.
Possible Treatment Actions: RO, IE, DIS, WS

- **Beryllium**
The drinking water MCL is 0.004 mg/L. Beryllium has been associated with intestinal lesions, it may affect skin and lung tissue, and is classified as a carcinogen.
Possible Treatment Actions: RO, IE, DIS

- **Cadmium**
The drinking water MCL is 0.005 mg/L. Cadmium has been linked to kidney disorders, bronchitis, and anemia.
Possible Treatment Actions: RO, IE, DIS

- **Chromium**
The drinking water MCL is 0.1 mg/L. Chromium is associated with liver and kidney disorders and it affects the skin and digestive system.
Possible Treatment Actions: RO, IE, DIS

Copper
The drinking water EPA Action Level is 1.3 mg/L, but the Federal Food and Drug Administrative Standard for Bottled water is 1.0 mg/L. Copper has been associated with liver and kidney damage and short-term exposure is associated with gastrointestinal disorders. At a level of 1.0 mg/L, copper can have a bitter to metallic taste and cause blue-green staining of piping, sinks, and basins. Elevated levels of copper in the water could mean there is a problem with the corrosiveness of your water, i.e., the water may be able to leach metals from piping and fixtures.
Possible Treatment Actions: RO, IE, DIS, NW

Cyanide
The EPA MCL is 0.2 mg/L. Cyanide has been shown to cause nerve damage, thyroid problems, and it affects the endocrine system.
Possible Treatment Actions: RO, IE, DIS

Fluoride
The EPA MCL for fluoride is 4 mg/L. Low levels of fluoride may help to prevent cavities in teeth and some municipal water supplies will add low levels of fluoride to the water for that reason. However, higher levels of fluoride may cause dental fluorosis, i.e., mottled or discolored teeth. For that reason, the EPA has set a secondary standard of 2 mg/L.
Possible Treatment Actions: RO, IE, DIS

Lead
The EPA MCL level is 0.015 mg/L if the water is coming from a community water distribution system and a level of 0.005 mg/L if the water is coming directly from the source into the home. Common sources of lead would include corrosion of household plumbing and industrial sources associated with textile mills, glass manufacturing, rubber processing, shooting/firing ranges, and paint/ink manufacturing. Elevated levels of lead in drinking water can result in delayed physical and mental development, attention deficits, kidney disorders, and high blood pressure. From the available data, it appears that approximately 20 percent of private wells may have elevated levels of lead.
Possible Treatment Actions: RO, IE, DIS, NW

Mercury
The EPA MCL is 0.002 mg/L. Mercury can affect the kidneys and the nervous system.
Possible Treatment Actions: RO, IE, DIS

Nitrate (NO_3^-) and Nitrite (NO_2^-)
The EPA MCL is 10 mg NO_3 (nitrate converted to nitrogen equivalent per liter) as N/L for nitrate and 1 mg NO_2 as N/L for nitrite. The primary concern for nitrate and nitrite is that infants less than 6 months are susceptible to blue-baby syndrome (nitrate can interfere with oxygen exchange in infant lungs, hence, a blue baby), which is potentially fatal if not treated. The primary source of nitrate and nitrite would be agricultural runoff, poorly maintained septic systems, sewage disposal, acid solutions in injection fluids, urban runoff, and natural deposits.
Possible Treatment Actions: RO, IE, DIS

Selenium
The EPA MCL is 0.05 mg/L. Elevated levels of selenium have been associated with hair and fingernail loss, numbness in fingers and toes, and circulatory disorders.
Possible Treatment Actions: RO, IE, DIS

Thallium
The EPA MCL is 0.002 mg/L. Thallium exposure can result in hair loss and can cause changes in blood chemistry and problems with the kidney, intestine, and liver.
Possible Treatment Actions: RO, IE, DIS

Turbidity (cloudiness of the water)
The EPA MCL ranges from 1 to 5 ntu. Elevated levels of turbidity may interfere with water treatment and disinfection and cause aesthetic problems. Because of the potential association of elevated particles with bacterial or microbiological contamination, the level of turbidity is used as a red flag for potential microbiological contamination or secondary water quality problems with the water.
The primary recommendation is that the turbidity levels not exceed 1 ntu.
Possible Treatment Actions: IW and Filtration

III. Secondary Contaminants

The secondary drinking water standards are known as Secondary Maximum Contaminant Levels (SMCL). The standards for these parameters are based on aesthetic problems with the water and not a specific acute or chronic health concern. The secondary drinking water standards can be divided into three broad categories: aesthetic effects – undesirable tastes or odors; cosmetic effects – effects which do not damage the body but are still undesirable, such as skin and tooth discoloration; and technical effects – can damage or reduce the efficiency of water equipment or a treatment process.

water to have a slippery feel and an alkali taste. The selection of a treatment process depends on other water quality parameters, such as the presence of trace metals, total hardness, alkalinity, and sodium content of the water (see-Corrosivity and Hardness).
Possible Treatment Actions: NW, WS, DIS, and IE.

Silver (Cosmetic)
The SMCL for silver is 0.1 mg/L. This standard was not set for health concerns, but because elevated levels of silver may cause skin discoloration, i.e., argyria, or graying of the white part of the eye. This is not a common water quality issue and the primary reason the standard was created was because some point-of-use water treatment systems use silver as a biocide.
Possible Treatment Actions: RO, DIS, and IE.

Sulfate (Aesthetic)
The SMCL for sulfate is 250 mg/L. At a level of 250 mg/L, sulfate can impart a bitter to salty taste to the water, but at a level of over 500 mg/L the sulfate can have a laxative effect.
Possible Treatment Actions: RO, DIS, and IE.

Total Dissolved Solids (Technical/ Aesthetic)
The SMCL for total dissolved solids (TDS) is 500 mg/L. This is a measure of the total amount of dissolved substances in the water sample. It is not a direct measure of a specific element or contaminant. An elevated TDS may be associated with an elevated water hardness, chemical deposits, corrosion by-products, staining, or salty bitter tastes. If the TDS content of the water is high, the primary recommendation would be to test the water for additional parameters, such as total hardness, iron, manganese, sodium, chloride, sulfate, alkalinity, and nitrate, to determine the nature of the water quality problem. The TDS test is an indicator of the potential for water quality problems.
Action – Conduct additional water testing to determine nature of the dissolved solids.

Because of the recent exploration into the Marcellus Shale and other oil and gas development, it is important to know the meaning of the terms associated with saline water, which is defined by the TDS concentration. The following is a summary of the classification for saline water.

Table 4. Saline Water Classification (Lehr, J. 1980)

Classification	Total Dissolved Solids (mg/L)
Freshwater	0 – 1000 mg/L
Slightly Saline (brackish)	1000 to 3000 mg/L
Moderately Saline	3000 to 10,000 mg/L
Very Saline	10,000 to 35,000 mg/L
Briny	> 35,000 mg/L

Zinc (Technical)
The SMCL for zinc is 5 mg/L. At a level at or above 5 mg/L, the water can have a metallic taste and the water could be corrosive. A common source of zinc can be galvanized pipe.
Possible Treatment Actions: NW, RO, DIS, and IE.

IV. Volatile Organic Chemicals (VOCs)

Volatile organic chemicals include a group of chemicals that have a high vapor pressure and low solubility in water, i.e., these chemicals would prefer to volatilize then stay dissolved in water. Since most VOCs consist of man-made chemicals, it is uncommon to find VOCs in uncontaminated water. VOCs are used in manufacturing, industrial, and petrochemicals, plus they can be found in many chemicals used in your home. VOCs can enter your body by direct consumption or breathing. The primary concern with VOCs is that at relatively low concentrations some VOCs can be carcinogenic, can cause damage to the circulatory and nervous system and other major organs, and may create a slight odor.

In 1996, the U.S. Geological Survey (USGS) conducted a survey of over 100 shallow wells in southern and eastern Pennsylvania. The results of the investigation found that 27 percent of the samples had at least one volatile organic compound detectable, but not at a level above the drinking water standard. Based on data compiled by the USGS and local cases of groundwater contamination, the following are the most common VOCs in the groundwater aquifer: methyl tert-butyl ether (MTBE), chloroform, benzene, xylenes, toluene, trichloroethylene, tetrachloroethylene, and carbon tetrachloride. The elevated levels of VOCs have been associated with contamination from industrial complexes, unapproved landfills or waste disposal sites, dry cleaning facilities, and gasoline stations.

VII. Common Water Quality Parameters with no Standards

A number of common water quality parameters have no specific drinking water standards, but the tests are great indicators for potential aesthetic problems or concerns or testing data that Is needed to help solve a water quality issue.

Alkalinity

Alkalinity is a measure of the ability of the water to resist a change in the pH of the water caused by the addition of an acid. Depending on the cations, i.e., positively charged multivalent ions like calcium, iron, manganese, and magnesium, present in the water, a high alkalinity can be associated with either a salty to chalky taste or the creation of chemical precipitates, scale on the piping, or scale on filters and heat exchange systems. If the alkalinity of the water is low, it is possible that the water could be corrosive. The alkalinity is one of the parameters used to calculate the Langelier Saturation Index (LSI).

Low Alkalinity	< 20 mg $CaCO_3$/L
Moderate Alkalinity	20 to 160 mg $CaCO_3$/L
High Alkalinity	> 160 mg $CaCO_3$/L

No specific treatment or action can be based on just a low or high alkalinity.

Bromide

Bromide is found in seawater, brine water and water that has been trapped in rock for millions of years (connate water). In addition, bromine is used as a disinfectant for cooling towers and swimming pools; ethylene bromide is found as an anti-knock chemical in gasoline, and bromide is a common disinfectant used during natural gas development. In freshwater, the concentration of bromide is typically < 0.05 mg/L. Because the bromide can react with ozone during water treatment to form bromates, the bromated limit for bottled water is 0.01 mg/L. Therefore, if you are considering an ozone treatment system, the bromide level of your water should be less than 0.0063 mg/L bromide.

Possible Treatment Actions: RO, DIS, IE.

Boron

Boron is a naturally occurring essential non-metallic element that is found in our soil and food, but it is also present in man-made materials. These man-made materials include fire retardants, ceramics, fertilizers, and cleaning products. Boron is also released to our atmosphere through the burning of coal. It is found in seawater, brine water, and water that has been trapped in rock for millions of years (connate water). Boron is not regulated by the EPA or PADEP, but the EPA has a long-term health advisory for drinking water of 2.0 mg/L. A number of states have established drinking water standards that range from 0.6 to 1 mg/L.

Possible Treatment Actions: RO, IE, DIS

Hardness

There is no specific drinking water standard for water hardness and it may be healthier if the drinking water is moderately hard rather than very soft. The hardness of the water is reported as the equivalent concentration of calcium carbonate per liter of water, i.e., mg $CaCO_3$/L, but the actual test measures the combined calcium, manganese, iron, and other multivalent positively charged ion concentrations. Total hardness is also reported as grains per gallon (gpg) (1 gpg is equivalent to 17.12 mg $CaCO_3$/L).

Individuals typically report aesthetic problems, such as soap scum, with the water when the total hardness is above 160 mg $CaCO_3$/L, but it is possible that corrosion problems could be associated with soft water. The total hardness test can not be used to accurately predict the trace metal content of your water. Groundwater in Northeastern Pennsylvania is not normally hard and water softening is not normally needed.

Table 6. Hard water Classification (Lehr, J. 1980)

CLASSIFICATION	TOTAL HARDNESS ($mgCaCO_3/L$)
Soft	0 – 17
Slightly Hard	17 – 60
Moderately Hard	60 – 120*
Hard	120 – 180
Very Hard	> 180

* Note: moderately hard water would probably be preferable.

Sodium (Na)

Sodium is currently not regulated by the drinking water standards. Sodium is naturally occurring, but elevated levels of sodium can be present in groundwater because of the use of deicing agents, brine water, saline water, domestic sewage, cleaning products, preservatives, and softener or treated water backwash. The human body requires small amounts of sodium to maintain normal blood pressure and proper function to nerves and muscles. The EPA has recommended a maximum sodium content of 20 mg/L for individuals on a low sodium diet. If your drinking water is above 20 mg/L and you are on a low sodium diet, the primary recommendation would be to provide your doctor with the water quality data and determine if there is a need to change or modify your diet or install or modify an existing water treatment system. When chloride (salt is sodium chloride) is present at a concentration of over 250 mg/L, the water can have an "off" taste. At 400+ mg/L chloride, the water will taste definitely salty.
Possible Treatment Actions: RO, DIS, IE.
Note: Beware that treating water with a water-softener system will raise the level of sodium or potassium content of the finished or treated water.

Strontium

Strontium is currently not regulated as a drinking water standard, but strontium is listed on the EPA list of parameters being evaluated and is a candidate for inclusion as a standard. Strontium is a naturally occurring element and naturally occurring strontium is not radioactive. Strontium is used in making glass, ceramics, paint pigments, medicines, and pyrotechnics. Strontium has been found in brine water, flowback water, and production wastewater at concentrations ranging from a few hundred to over 7000 mg/L. For one of the radioactive forms of strontium, i.e., strontium-90, the EPA has set a public drinking water limit of 8 pCi/L. The radioactive role of strontium-90 would be identified during a testing of the

water for beta particles, i.e., man-made radioactive particles. The Agency for Toxic Substances and Disease Registry reports that the amount of strontium in drinking water in the United States is less than 1 milligram for every liter of water, i.e., < 1 mg/L. Because strontium can replace calcium in bone, strontium may affect the growth and strength of bone. The EPA recommends that drinking water levels of nonradioactive strontium should not be more than 4 mg/L.
Possible Treatment Actions: CFiltration, RO, DIS, IE

Lithium

There are no current federal standards for lithium in drinking water. To protect human health, EPA estimated that a lithium concentration in a potable water supply should not exceed 700 µg/l or 0.7 mg/L. High concentrations of lithium in drinking water were previously discovered in the Andes Mountains and historically lithium has been used worldwide to treat depression and bipolar disorder. The primary side-effect is interference with the function of the thyroid. Flowback water from natural gas development may contain 0.04 to over 150 mg/L.
Possible Treatment Actions: RO, DIS, IE

Glycols

Because of the increased awareness and use of glycols for ground-water heating and cooling systems, deicing agents, and natural gas development, it is becoming more common to see baseline testing program include testing for ethylene glycol and propylene glycol in water. Glycols are not regulated or listed as a primary or secondary drinking water standard by the EPA or the PADEP, and there is no federal maximum contaminant level, but the EPA has established a federal guidance level of 7 mg/L (7000 ppb).
Possible Treatment Actions: CFiltration (Limited Effectiveness)

A number of states have established the following drinking water guidance levels for ethyl glycol:

New Jersey	0.300 mg/L (300 ppb)
Arizona	5.5 mg/L (5500 ppb)
New Hampshire	7.0 mg/L (7000 ppb)
Florida, Massachusetts, and Minnesota	14.0 mg/L (14,000 ppb)