

Water Quality Fact Sheet

In response to questions asked by community members:

Metals

Aluminum
Antimony
Barium
Beryllium
Cadmium
Copper
Iron
Lead
Nickel
Sodium
Zinc

Other Factors

pH
Conductivity
ORP
Sulfur Bacteria
Foam
Ammonia Like Odors
Noticeable Problems

Aluminum (Al)

Indications: Generally, aluminum in water has no taste, color or odor.

Potential Sources: drinking water treatment (Alum (aluminum sulphate) and polyaluminum chloride are the most widely used). Under some circumstances, or if not used properly, use can result in elevated levels of residual aluminum in finished drinking water. Aluminum salts and aluminum hydroxychloride are used in Industrial Pond Water Treatment.

Potential Health Impacts: Some studies point to aluminum as a potential neurotoxin but other studies contradict these findings. Some people with kidney disease store a lot of aluminum in their bodies and sometimes develop bone or brain diseases, which may be caused by the excess aluminum. Further studies are needed.

EPA Secondary Water Standards (nuisance but not health threatening to general population)

Aluminum	Standard	0.05 to 0.2 mg/L
----------	----------	------------------

Antimony (Sb)

Indications: Generally, Sb in water no taste, color or odor.

Potential Sources: natural deposits; Commercially - antimony trioxide, used as a flame retardant. It is also found in batteries, pigments, and ceramics/glass; Industrial releases are primarily from copper and lead smelting and refining industries.

Potential Health Impacts: Short-term: EPA has found antimony to potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: nausea, vomiting and diarrhea. Long-term: Antimony has the potential to cause the following effects from a lifetime exposure at levels above the MCL: AND/OR- Antimony is a (known/potential drinking water) human carcinogen. OR- No reliable data are available concerning health effects from long-term exposure to antimony in drinking water. (obviously more studies are needed.)

EPA Primary Drinking Water Standard

Inorganic Chemicals	MCLG ¹ (mg/L) ²	MCL or TT ¹ (mg/L) ²	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Antimony	0.006	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder

Barium (Ba)

Indications: Generally, Barium in water has no taste, color or odor.

Potential Sources: granite-like igneous rocks, alkaline igneous and volcanic rocks and manganese-rich sedimentary rocks; Industrial discharges and disposal of drilling wastes, in the oil and gas industry, smelting of copper, and the manufacture of motor vehicle parts, industrial organics, pigments, iron industries, steelworks, electrometallurgy and paper mills. In particular, it is used in well drilling operations where it is directly released into the ground.

Potential Health Impacts: Short-term: EPA has found barium to potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: gastrointestinal disturbances and muscular weakness. Long-term: Barium has the potential to cause the following effects from a lifetime exposure at levels above the MCL: high blood pressure.

EPA Primary Drinking Water Standard

Inorganic Chemicals	MCLG ¹ (mg/L) ²	MCL or TT ¹ (mg/L) ²	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Barium	2	2	Increase in blood pressure	Drilling wastes; from metal refineries; erosion deposits

Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

Beryllium (Be)

Indications: Generally, Beryllium in water has no taste, color or odor.

Potential Sources: bedrock geology (Be can dissolve into water and be present in the water from bedrock (artesian) wells).; Industrial discharge from metal refineries and coal-burning factories (released principally in the smoke stacks and ash wastes of power plants which burn coal) and it is used in the electrical, aerospace and defense industries.

Potential Health Impacts: Some people who drink water containing beryllium well in excess of the MCL for many years could develop intestinal lesions. Beryllium compounds have been associated with damage to the bones and lungs and induction of cancer in laboratory animals, such as rats and mice, when those animals are exposed at high levels over their lifetime.

There is limited evidence to suggest that beryllium may pose a cancer risk to humans via drinking water exposure. Therefore, EPA based the health assessment on non-cancer effects with an extra uncertainty factor to account for possible increased risk of cancer. The MCL for beryllium is 0.004 mg/L. The primary concern with beryllium exposure is the lung disease caused by inhaling beryllium. Inhalation of beryllium in drinking water can occur if it is used in a humidifier or vaporizer. Inhaling water mist during showering does not deposit beryllium in the lung. Water droplets are trapped in upper airways and swallowed.

EPA Primary Drinking Water Standard

Inorganic Chemicals	MCLG ¹ (mg/L) ²	MCL or TT ¹ (mg/L) ²	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Beryllium	0.004	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries

Cadmium (Cd)

Indications: Generally, Cadmium in water has no taste, color or odor.

Potential Sources: Cadmium occurs naturally in zinc, lead, copper and other ores which can serve as sources to ground and surface waters, especially when in contact with soft, acidic waters. Major industrial releases of cadmium are due to waste streams and leaching of landfills, and from a variety of operations that involve cadmium or zinc. In particular, cadmium can be released to drinking water from the corrosion of some galvanized plumbing and water main pipe materials. Cadmium is a metal found in natural deposits. The greatest use of cadmium is primarily for metal plating and coating operations, including transportation equipment, machinery and baking enamels, photography, television phosphors. It is also used in nickel-cadmium and solar batteries and in pigments.

Potential Health Impacts: Short-term: EPA has found cadmium to potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: nausea, vomiting, diarrhea, muscle cramps, salivation, sensory disturbances, liver injury, convulsions, shock and renal failure. Long-term: Cadmium has the potential to cause the following effects from a lifetime exposure at levels above the MCL: kidney, liver, bone and blood damage

Contaminant	MCLG¹ (mg/L)²	MCL or TT¹ (mg/L)²	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Cadmium	0.005	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints

Copper (Cu)

Indications: Copper can give water a metallic taste and a blue green tint but at low concentrations generally has no taste, color or odor.

Potential Sources: natural deposits as ores containing other elements; used in household plumbing materials. (Corrosivity toward copper is greatest in very acidic water.) Copper sulfate is used as a fungicide.

Potential Health Impacts: Short- and long-term effects: Short periods of exposure can cause gastrointestinal disturbance, including nausea and vomiting. Use of water that exceeds the Action Level over many years could cause liver or kidney damage. People with Wilsons disease may be more sensitive than others to the effect of copper contamination and should consult their health care provider.

Copper, Continued

EPA Secondary Water Standards (nuisance but not health threatening to general population)

Inorganic Chemicals	MCLG¹ (mg/L)²	MCL or TT¹ (mg/L)²	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Copper	1.3	TT ⁸ ; Action Level=1.3	Short term exposure: Gastrointestinal distress Long term exposure: Liver or kidney damage People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits

Iron (Fe) and Manganese (Mn)

Indications: Water from the tap may originally be clear, but iron and manganese in the water are oxidized when exposed to air. *Oxidized Iron can change to white, then yellow, and finally to red brown particles. Manganese can give a black colloidal appearance. Water may have a metallic taste.*

There are also bacteria that feed on iron and manganese. They form red-brown (iron) or black brown (manganese) slime in toilet tanks and can clog water systems. Signs of iron bacteria include yellow, red or orange colored water; rusty slime deposits in toilet tanks; strange smells resembling fuel oil, cucumbers or sewage. You may notice odor in the morning or after long periods of non-use.

Iron and Manganese can affect the flavor and color of food and water. They can react with the tannins in coffee, tea and some alcoholic drinks to produce a *black sludge*. Iron can cause reddish-brown staining of laundry, porcelain, and dishes. Manganese acts in a similar way but causes brownish black stains. (Soaps and detergents do not remove these stains and addition of bleach and alkaline builders such as sodium and carbonate may actually intensify stains.) Iron and Manganese can build up in pipes, pressure tanks, water heaters and water softeners.

Potential Sources: Iron and Manganese are common metals and are often found in high concentrations in mining areas. Some iron salts are used as flocculants in water treatment.

Potential Health Impacts: EPA Secondary Water Standards (nuisance but not health threatening to general population)

Iron	Standard: 0.3 mg/L	rusty color; sediment; metallic taste; reddish or orange staining
Manganese	Standard: 0.05 mg/L	black to brown color; black staining; bitter metallic taste

Lead (Pb)

Indications: Lead can give water a metallic taste but generally lead goes undetected and has no taste, color or odor.

Potential Sources: most likely pipe or solder in your home's own plumbing. Copper pipes have replaced lead pipes in most residential plumbing. However, the use of lead solder with copper pipes is widespread. Experts regard this lead solder as the major cause of lead contamination of household water in U.S. homes today. New brass faucets and fittings can also leach lead, even though they are "lead-free." Industrial releases are from lead smelting/refining, copper smelting, steelworks blast furnace, storage batteries, plumbing fixtures, iron foundries and copper mining.

Potential Health Impacts: Short- and Long-term effects: delays in normal physical and mental development in babies and young children, slight deficits in the attention span, hearing, and learning abilities of children, and slight increases in the blood pressure of some adults. Long-term effects: Lead has the potential to cause the following effects from a lifetime exposure at levels above the action level: stroke and kidney disease; cancer.

EPA Primary Drinking Water Standard

Inorganic Chemicals	MCLG ¹ (mg/L) ²	MCL or TT ¹ (mg/L) ²	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Lead	zero	TT ⁸ ; Action Level=0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits

Nickel (Ni)

Indications: Generally, Ni in water has no taste, color or odor.

Potential Sources: natural deposits; industrial processes that use nickel catalysts, such as coal gasification, petroleum refining, and hydrogenation of fats and oils. They have also been identified in residual fuel oil and in atmospheric emissions from nickel refineries. Industrial releases were primarily from nickel smelting/refining and steelworks industries

Potential Health Impacts: Short-term: Nickel is not known to cause any health problems when people are exposed to low levels for relatively short periods of time.

Nickel, Continued

Long-term: Nickel has the potential to cause the following effects from a lifetime exposure to at concentrations above 0.1 ppm: decreased body weight; heart and liver damage; skin irritation.

The MCL and MCLG for nickel were remanded on February 9, 1995. This means that while many water suppliers continue to monitor nickel levels in their water, there is currently no EPA legal limit on the amount of nickel in drinking water. EPA is reconsidering the limit on nickel. Presently 0.1 parts per million (ppm) is the suggested Nickel level because EPA believes this level of protection would not cause any of the potential health problems described above.

Sodium (Na)

Indications: High levels of sodium can give water a *salty or brackish taste*. If sodium chloride is the source, high concentrations of chloride can cause blackening and pitting of stainless steel sinks and stainless ware in commercial dishwashers.

Potential Sources: naturally occurring metal; water treatment (including industrial Pond Water Treatment) , powdered soaps and detergents, pesticide. Many sodium salts (sodium chloride, sodium hydroxide, sodium bicarbonate, and sodium carbonate) are used in oil and gas exploration, textile and dyeing industries, metal processing, pulp and paper production, tanning and leather treatment, and in the chemical industry.

Potential Health Impacts: High Sodium levels may be linked to high blood pressure although further studies are needed. Sodium is not regulated by the EPA. The Drinking Water Equivalent Level (DWEL) of 20 mg/L is a non-enforceable guidance level considered protective against non-carcinogenic adverse health effects and is based on an American Heart Association recommendation issued in 1965. Also, EPA has issued a non-enforceable guidance of 250 mg/L for salinity and dissolved solids in ambient waters (USEPA, 1997; 62 FR 52194).

Zinc (Zn)

Indications: Generally, Zn in water has no taste, color or odor.

Potential Sources: Although zinc occurs naturally, most zinc finds its way into the environment because of human activities. Mining, smelting metals (like zinc, lead and cadmium) and steel production, as well as burning coal and certain wastes can release zinc into the environment. High levels of zinc in soil may result from the improper disposal of zinc-containing wastes from metal manufacturing industries and electric utilities. Drinking water that flows through metal pipes coated with zinc also are sources of zinc exposure.

Potential Health Impacts: stomach cramps, nausea and vomiting; eating large amounts of zinc for longer periods may cause anemia, nervous system disorders, damage to the pancreas and lowered levels of “good” cholesterol. There is no evidence that zinc causes cancer in humans.

EPA Secondary Water Standards (nuisance but not health threatening to general population)

Zinc	Standard: 5 mg/L
------	------------------

Water Quality Information: Other Factors

pH

Water with a pH value less than 7 indicates acidity and tends to be corrosive, while water with a value greater than 7 indicates alkalinity and tends to affect the taste of the water. The Secondary Maximum Contaminant Level (SMCL) for pH of drinking water is 6.5 to 8.5 on pH scale as established by the EPA. Natural ground water typically has pH values ranging from 6.0 to 8.5 depending on the geology of an area. Acidic water is often present in certain "crystalline" rock types, such as quartzite, gneiss, and schist. In limestone or marble valleys, ground water is usually alkaline. Drinking water below a pH of 5.5 is undesirable in that it may damage pipes and fixtures due to its corrosive nature. Acidic water (low pH) can leach metals from plumbing. Symptoms of low pH are bluish green stains on fixtures with copper plumbing; reddish stains with galvanized iron plumbing; and water system corrosion problems and plumbing leaks. Metals and contaminants leached due to high or low acidity can result in health problems.

Conductivity

High Conductivity indicates that charge particles or ions are present. Pure Water has a very low or no conductivity. Most natural waters have electrical conductivity due to natural minerals and salts composed of ions. High conductivity can indicate high concentrations of metals (commonly occur in ionic compounds in nature.) Tap water ranges between 50 and 800 uS (depending on the source). Domestic wastewater can range from 800 to 1650 $\mu\text{S}/\text{cm}$ with 1250 $\mu\text{S}/\text{cm}$ about typical..

Water Type	Conductivity (uS/cm)
Distilled water	0.5 - 3.0
Melted snow	2 - 42
Potable water in U.S.	30 - 1500
Freshwater streams	100-2000

http://www.swrcb.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/3130fs.pdf

ORP

ORP (Oxidation Reduction Potential) measures the oxidizing potential of water. In general, the higher the ORP, the more oxidizing the environment and conversely, the lower the ORP, the more likely your water has a reducing environment where most metals stay dissolved and reducing bacteria can survive. (Biologically directed Research has shown that at an ORP value of 650 to 700 mV, spoilage bacteria and bacteria such as E. coli and Salmonella are killed within a few seconds.) <http://vric.ucdavis.edu/veginfo/foodsafety/orp.pdf>

Sulfur Bacteria

Indications: Sulfur oxidizing bacteria (effects similar to iron bacteria) produce a black slime that may build up inside the toilet tank, clog pipes and stain clothing. Sulfur reducing bacteria produce hydrogen sulfide gas (rotten egg smell and highly corrosive). Water softeners provide an ideal environment for these bacteria to grow. Hydrogen sulfide is corrosive to metals such as iron, steel, copper and brass. It can tarnish silverware, cause yellow or black stains on kitchen and bathroom fixtures. Coffee, tea and other beverages made with water containing hydrogen sulfide may be discolored. The taste and color of cooked foods can be affected. Other indications of sulfates are scale buildup in water pipes and/or a bitter taste in water.

(Scaly buildup in pipes and on water fixtures can also be the result of calcium and magnesium compounds from hard water sources.)

Potential Sources: Sulfur occurs naturally in minerals. Hydrogen Sulfide occurs naturally in some groundwater. It is often present in wells drilled in shale or sandstone, or near coal or peat deposits or oil fields. If the sulfide smell is noticeable when hot water is used, the sulfur bacteria may be building in your water heater. The magnesium anode in water heaters can chemically reduce naturally occurring sulfates to hydrogen sulfide. In rare cases, hydrogen sulfide odor may be from sewage contamination.

Potential Health Impacts: The bacteria alone pose no known human health threats. Sulfates may have a laxative effect on humans and young livestock. Hydrogen sulfide can cause eye irritation. Where workers are exposed to the gas in high concentrations and with little ventilation, acute conjunctivitis can develop. With concentrations 500-700 ppm in under an hour, the gas can be deadly. Generally, hydrogen sulfide concentrations in homes are low and the gas dissipates and does not reach threatening levels. Hydrogen sulfide is flammable and poisonous. Also, if the gas is from sewage contamination, further tests should be done to rule out accompanying coliform or other disease causing bacteria.

Foam from Surfactants and DOC

Often kitchen faucets are aerated and this results in “foaming” water. Foam that clears after a short period of time is *most likely just air that has been trapped in water.*

Foam that does not dissipate readily can be from both human and natural sources. Foaming is usually caused by *detergents, shampoos, toothpaste, cosmetics and similar surfactant substances when water has been agitated or aerated as in many faucets.* Common surfactants are sodium or ammonium laureth or lauryl sulfate. Surfactants and coagulants are commonly used in water treatment processes. Foam from synthetic sources will accumulate near the source and dissipate quickly once the source is removed. It will not cover large distances. The foam will be white and sweet smelling or scented.

Naturally produced organic surfactants are released *from algae and plants when they die and begin to decompose but also in a lesser amount when living.* These organic surfactants are part of a large variety of plant material that is referred to as *dissolved organic carbon (DOC).* In oceans, the foam can be a result of the breakdown of large algal blooms. The primary source of DOC in lakes and streams is from the surrounding watershed soils. Foam from naturally occurring processes is generally white at first but will turn brown over time with the buildup of sediment particles. Natural foam is often accumulates after rainstorms or windy conditions transporting the surfactants. Foam can also be produced in sewage/septic tanks and can seep into groundwater.

Ammonia Like Odors

Natural sources of ammonia like odors are organic decomposition products; commercial sources include Ammonium salts and anhydrous ammonia that are often used at coal prep plant sites and for industrial Pond Water Treatment.

Quick Reference List of Noticeable Problems

Visible

- Scale or scum from calcium or magnesium salts in water; possibly sulfates
- Unclear/turbid water from dirt, clay salts, silt or rust in water
- Green stains on sinks or faucets caused by high acidity and corrosion
- Brown-red stains on sinks, dishwasher, or clothes in wash points to dissolved iron in water
- Cloudy water that clears upon standing may have air bubbles from poorly working pump or filters.

Tastes

- Salty or brackish taste from high sodium content in water
- Alkali/soapy taste from dissolved alkaline minerals in water
- Metallic taste from acidity or high iron or other metals content in water
- Chemical taste from industrial chemicals or pesticides

Smell

- A rotten egg odor can be from dissolved hydrogen sulfide gas or certain bacteria in your water. If the smell only comes with hot water it is likely from a part in your hot water heater.
- A detergent odor and water that foams when drawn could be seepage from septic tanks into your ground water well.
- A gasoline or oil smell indicates fuel oil or gasoline likely seeping from a tank into the water supply
- Odorless musty/earthy smell from decaying organic matter in water
- Chlorine smell from excessive chlorination.

(Note: Many serious problems (bacteria, heavy metals, nitrates, radon, and many chemicals) can only be found by laboratory testing of water.)

How do I know if a film is from bacteria or petroleum?

The way to tell the difference is to break the film. If the oily film stays broken, it is a bacterial film. If it flows back into place, it is petroleum which indicates pollution. (USGS)

Important Consideration

The health impacts of different water constituents are still under study for many substances, especially chronic long term low concentration exposures.

Your water results are limited. No biological or organic testing was included. Not all inorganic or metal testing was included.