

Sulfate

Sulfate occurs naturally in most of Minnesota's groundwater. Higher levels of sulfate are common in the western part of the state. At high levels, sulfate can give water a bitter or medicinal taste and can have laxative effects.

You can find out the level of sulfate in your water by having the water tested at a laboratory.

Health Risks for Humans

People who are not used to water with high sulfate can get diarrhea and dehydration from drinking the water.

Infants are often more sensitive to sulfate than adults. To be safe, **only use water with a sulfate level lower than 500 milligrams per liter (mg/L) to make infant formula.** Older children and adults may get used to high sulfate levels after a few days.

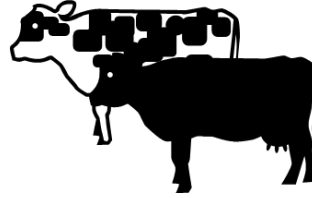


Other Problems Sulfate Can Cause

Sulfate levels above 250 mg/L may make the water taste bitter or like medicine. High sulfate levels may also corrode plumbing, particularly copper piping. In areas with high sulfate levels, plumbing materials more resistant to corrosion, such as plastic pipe, are commonly used.

Health Risks for Animals

Animals are also sensitive to high levels of sulfate. In young animals, high levels may be associated



with severe, chronic diarrhea and even death. Animals tend to get used to sulfate over time. Diluting water high in sulfate with water low in sulfate can help avoid problems of diarrhea and dehydration in young animals and animals not used to drinking high sulfate water. Contact a veterinarian or your county office of the Minnesota Extension Service for more information.

Ways to Treat Sulfate

Four types of treatment systems will remove sulfate from drinking water:

- **Reverse osmosis** pushes water through a membrane with tiny pores. The membrane stops many contaminants, including sulfate, while allowing water to pass through. Reverse osmosis usually removes between 93 and 99 percent of the sulfate in drinking water, depending on the type of treatment unit.
- **Distillation** is a process that boils water, making steam. The steam rises and leaves contaminants, such as sulfate behind. With proper operation, distillation units can remove nearly 100 percent of sulfate.

- **Anion exchange** is the most common method of removing large quantities of sulfate from water for commercial, livestock, and public supplies. It is not commonly used for individual household water treatment. It is a process that replaces negatively charged ions (such as sulfate) with sodium chloride or potassium chloride (salts).
- **Adsorptive media filtration** has a charged media bed that can force ions of the opposite charge (such as sulfate) to be pulled out of the water and attach to the media.

Learn more about these treatment options at the “Home Water Treatment” webpage.

Note that water softeners, carbon filters, and sediment filters **do not remove sulfate.**

How Sulfate Gets Into Groundwater

As water moves through soil and rock formations that contain sulfate minerals, some of the sulfate dissolves into the groundwater. Minerals that contain sulfate include magnesium sulfate (Epsom salt), sodium sulfate (Glauber's salt), and calcium sulfate (gypsum).

Sulfate in Minnesota Groundwater

The level of sulfate in most groundwater in Minnesota is low, less than 250 milligrams per liter (mg/L). High levels of sulfate (sometimes above 1000 mg/L) are more common in the southwestern areas of Minnesota and along the western boundary of the state. High levels of sulfate also occur, though less commonly, in some wells in the northeastern and southeastern parts of the state.

Resources

Home Water Treatment

(www.health.state.mn.us/communities/environment/water/factsheet/hometreatment.html).

Licensed Well and Boring Contractor Directory

(www.health.state.mn.us/lwcsearch).

Search for Accredited Laboratories

(www.health.state.mn.us/labsearch).

Water Quality, Well Testing, Well Disinfection

(www.health.state.mn.us/wellwater).

MDH District Offices

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P.O. Box 64975
St. Paul, Minnesota 55164-0975
651-201-4600 or 800-383-9808
health.wells@state.mn.us
www.health.state.mn.us/wells

705 Fifth Street Northwest
Bemidji, Minnesota 56601
218-308-2100

11 East Superior Street
Duluth, Minnesota 55802
218-302-6166

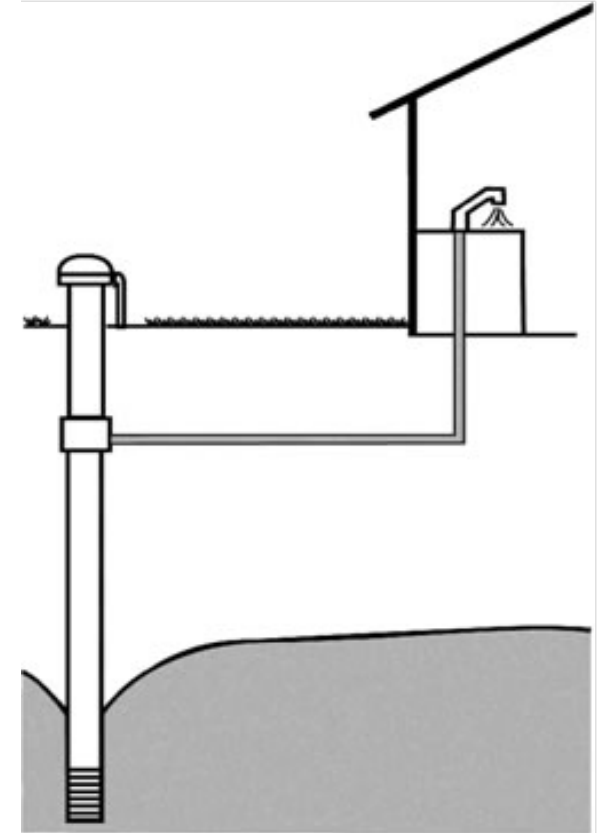
1505 Pebble Lake Road
Fergus Falls, Minnesota 56537
218-332-5150

3333 West Division Street
St. Cloud, Minnesota 56301
320-223-7300

1400 East Lyon Street
Marshall, Minnesota 56258
507-476-4220

18 Wood Lake Drive Southeast
Rochester, Minnesota 55904
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Sulfate in Well Water



**Well Management Section
Environmental Health Division**

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