



Environmental Health Information

VOCs in Private Drinking Water Wells

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What are VOCs?

Volatile Organic Chemicals (VOCs) are carbon-containing compounds that evaporate easily from water into air at normal air temperatures. This is why the distinctive odor of gasoline and many solvents can easily be detected. VOCs are contained in a wide variety of commercial, industrial and residential products including fuel oils, gasoline, solvents, cleaners and degreasers, paints, inks, dyes, refrigerants and pesticides.

People are most commonly exposed to VOCs through the air, in food, through skin contact, and potentially in drinking water supplies.

How do VOCs get into drinking water?

Most VOCs found in the environment result from human activity. When VOCs are spilled or improperly disposed of, a portion will evaporate, but some will soak into the ground. In soil, VOCs may be carried deeper by rain, water or snow melt and eventually reach the groundwater table. When VOCs migrate underground to nearby wells, they can eventually end up in drinking water supplies.

How extensively are VOCs found in drinking water wells?

The U.S. Environmental Protection Agency (EPA) estimates that Volatile Organic Chemicals are present in one-fifth of the nation's water supplies. Minnesota Department of Health (MDH) studies suggest that 3 - 6% of public water supplies and about 2 - 4% of all water supplies in Minnesota contain detectable amounts of VOCs.

What factors contribute to VOC contamination of well water?

Several factors increase the likelihood that a water supply will be contaminated. One factor is the distance between the well and a source of contamination. Many wells contaminated with VOCs are located near industrial or commercial areas, gas stations, landfills or railroad tracks.

A second factor is the amount of VOCs dumped or spilled. Some spills are small and localized. Others occur over a long period of time, or involve large quantities of contaminants. When a large quantity of chemicals has leaked or spilled, as may occur with leaking underground tanks or industrial spills, a large geographical area may be affected.

Third, the depth of a well can be a factor. Shallow wells are often affected sooner and more severely than deep wells when contaminants have been spilled on surface soils.

A fourth factor is local geology. Groundwater covered by thin, porous soil or sand layers is most vulnerable. Dense, thickly layered soils may slow down the movement of contaminants and may help to absorb them.



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The fifth factor affecting contamination of water is time. Groundwater typically moves very slowly. A spill may take years to reach nearby wells, so wells may not be contaminated until months or years after the spill is discovered.

What are the health risks associated with VOC contamination?

VOCs vary considerably in their toxic (or harmful) effects. Researchers have collected an extensive amount of information about the health effects of VOCs from animals studies, and from studies of human exposures to large quantities of chemicals in the workplace.

Safe drinking water levels called Health Risk Limits (HRLs) have been established by MDH for many VOCs. HRLs are levels of chemicals in drinking water that MDH considers to be safe for people to drink, including sensitive people such as the very young or the elderly.

VOCs at levels higher than the HRLs may be harmful to the central nervous system, the kidneys or the liver. VOCs may also cause irritation when they contact the skin, or may irritate mucous membranes if they are inhaled. Some VOCs are known or suspected carcinogens (or cancer-causers).

For VOCs that do not cause cancer, conservative methods are used to establish HRLs at levels considered safe, even if the water is used every day for drinking, cooking, bathing, and laundry.

For carcinogens, HRLs are established so that drinking water with levels above the HRL will cause no more than 1 additional cancer for every 100,000 persons exposed over a lifetime of use, a very small risk.

When more than one chemical is detected in a drinking water supply – even if levels are below the HRLs — additive effects should be considered when deciding whether a water supply is safe to drink. When compounds have similar effects, the HRLs for individual chemicals may not be sufficiently protective.

Water containing chemicals at levels lower than the HRLs is considered safe to drink. However, some individuals whose water has been found to contain chemical contaminants at low levels may make a personal choice to stop drinking their water or to investigate treatment options.

What can be done about private wells that are contaminated with VOCs?

Individuals who have received one report of the occurrence of VOCs in their private well may wish to have the well retested before taking action to treat or replace their water supply.

If chemical contamination is confirmed, construction of a safe, uncontaminated well, or connection to a safe well or public water system are the best options for private well owners whose water contains VOCs at or above health risk limits.

When VOCs are detected at low levels, steps may be taken to prevent further contamination by treating or removing the source. Removal of the source is not always possible, and groundwater treatment is costly and time consuming.

For some VOCs, temporary measures may include boiling the water while venting the steam outside, using bottled water, connecting to an uncontaminated neighboring well, or installing a home treatment system.

Home water treatment systems

Water treatment systems are available which can remove or reduce VOCs. Some home filter systems - such as activated carbon filters - can effectively remove VOCs if they are properly installed and maintained.

Filtration systems may be installed for point-of-use treatment at the faucet, or point-of-entry treatment where water enters the home. Point-of-entry systems are preferred for VOCs because they provide safe water for bathing and laundry, as well as for cooking and drinking.

It is important to determine exactly which contaminants are present in water before choosing a system. Then, treatment systems should be checked periodically to ensure that they are operating properly.

When should a private well be tested for VOCs?

Testing of private well water for VOCs and petroleum products is indicated if the water has the taste or odor of gasoline or solvents. Wells should also be tested if they are within one to two city blocks (500 to 1000 feet) of a former or existing gasoline service station, or other fuel tanks.

What can Minnesota residents do about the VOC problem?

Individuals can help to prevent future contamination by restricting use of toxic chemicals and by disposing of them properly. Underground fuel tanks should be regularly checked for leaks and removed when they are no longer secure. Spills and leaks should be reported immediately to the Minnesota Duty Officer at 1-800-422-0798.

Who can I contact to have my well water tested?

For a list of all laboratories certified by Minnesota to test drinking water for VOCs see Certified Environmental Laboratories at <http://www.health.state.mn.us/divs/phl/accreditation/index.html>.

If you have more questions about private drinking water wells:

If you have questions about your water supply or would like more information, contact MDH Well Management at (651)201-4600 or 1 (800)383-9808.

For more information contact:

MDH/Site Assessment and Consultation: (651) 201-4897 or 1 (800) 657-3908, press "4" and leave a message.
To request this document in another format, call (651) 201-5000 or TDD: (651) 201-5797.
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