

Iron & Manganese in Groundwater¹

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What are iron and manganese?

Iron and manganese are metallic elements present in many types of rock. Iron has the symbol “Fe” and manganese has the given symbol “Mn.” Both are commonly found in water and are essential elements required in small amounts by all living organisms. Concentrations of iron and manganese in groundwater are often higher than those measured in surface waters.

The Aesthetic Objective (AO) for iron in drinking water is less than or equal to 0.3 milligrams per litre (mg/L) while the Aesthetic Objective for manganese in drinking water is less than or equal to 0.05 mg/L. The taste and smell of manganese or iron at concentrations above the drinking water guidelines may be noted by some water users.

What are the known sources of iron and manganese?

The most common sources of iron and manganese in groundwater are naturally occurring, for example from weathering of iron and manganese bearing minerals and rocks. Industrial effluent, acid-mine drainage, sewage and landfill leachate may also contribute iron and manganese to local groundwater.

What are the environmental health concerns?

At concentrations found in most natural waters, and at concentrations below the aesthetic objective, iron and manganese are not considered a health risk. Water with a high concentration of iron or manganese may cause the staining of plumbing fixtures or laundry. Manganese solids may form deposits within pipes and break off as black particles that give water an unpleasant appearance and taste. Similarly, iron can collect and block pipes or fixtures and produce colour, taste and rust flakes in water. Both substances can increase the growth of unwanted bacteria that form a slimy coating in water pipes.

Other information sources:

Health Canada, Guidelines for Canadian Drinking Water Quality Supporting Documents. http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/index_e.html

Health Canada, *It's Your Health*. http://www.hc-sc.gc.ca/iyh-vsv/environ/index_e.html

B.C.'s Ground Water Protection Regulation: http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/index.html

B.C. Ministry of Health, “Safe Water Supply Vital to Your Health.” (1999) <http://www.healthservices.gov.bc.ca/protect/pdf/PHI052.pdf>

B.C. Ministry of Health, Health Files. <http://www.bchealthguide.org/healthfiles/index.stm>

Type “water” in the search section and look for various articles including:

- #45 “Should I Get My Well Water Tested?”



The Best Place on Earth



¹ Information in this fact sheet is generally intended for private wells. Please note that any water supply system or well serving anything other than one single family dwelling is defined as a water supply system under the *Drinking Water Protection Act* and Regulations and must be sampled according to the Act and Regulations. The person operating such a system is defined as a water supplier.

Where have high iron and manganese levels been found in B.C. well water?

Iron and manganese are found naturally in groundwater in all regions of British Columbia. In local areas, concentrations of iron and manganese can range up to several mg/L. The concentration of iron and manganese in well water can fluctuate seasonally and vary with the depth and location of the well and the geology of an area. Iron and manganese naturally occur in groundwater that has little or no oxygen, typically in deeper wells (but not always), in areas where groundwater flow is slow, and in areas where groundwater flows through soils rich in organic matter. Concentrations that exceed the drinking water guideline can occur locally anywhere in the province.

What can well owners and water suppliers do about high levels of iron and manganese within well water?

Pitcher-type carbon filtration units can remove some forms of iron and manganese. Boiling water is not recommended for removing iron and manganese as it will likely increase their concentration. Iron and manganese are often removed at the same time, by water treatment with chlorine, ozone or by adding chemicals that cause the metals to form a solid that will settle or be filtered out. Water treatment methods such as ion exchange, oxidizing filters, and reverse osmosis can also be used but these have variable effectiveness and may be expensive for small water systems or households.

When purchasing a treatment device, you should consider one that has been certified by an organization accredited by the Standards Council of Canada (SCC). The treatment device should meet the following standards: NSF/ANSI Standard 62 on drinking water distillation systems, or Standard 58 on reverse osmosis drinking water treatment systems, or Standards 53 on drinking water treatment units — with specific designation for the water quality parameters you are trying to remove (e.g. iron and manganese removal). Certification assures that a device works as the manufacturer or distributor claims. Devices can be certified for treating a range of water quality concerns, so make sure that the device you purchase is explicitly certified for iron and manganese removal. Find an up-to-date list of accredited organizations at www.scc.ca.

Well water testing and source protection

Well owners are encouraged to test their water periodically to make sure it is safe to drink. Consult Public Health at your local Health Authority for advice regarding the specific parameters to test for and how often testing should be done. For more information on protecting community well water sources, a *Well Protection Toolkit* is available from the Ministry of Environment on the internet: http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/wells/well_protection/wellprotect.html to help water suppliers and communities develop a well protection plan to minimize the threat of land use activities on groundwater quality.
