

# Common Ground Water Problems and Remedies

## Discoloured (Turbid) Water and Staining

| Symptom or Complaint   | Probable Impurity, or Contaminant   | Common Cause or Source  | Health / Aesthetic Effect(s)  | Usual Treatment   |
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| <b>Abrasive texture to water when washing or residue left in the sink and tub.</b> | Excessively fine sand or silt   | Fine silt suspended in water, passing through the well screen.  | <b>Aesthetic:</b><br>Usually no related health effects.   | Install a sand trap or ultra filtration with pore size matched to contaminant size.   |
| <b>Blackish staining of fixtures and laundry.</b>                                  | Manganese   | Interaction of carbon dioxide or organic matter with the manganese-bearing (above 0.05 ppm) soils. Usually found in combination with iron.      | <b>Aesthetic:</b><br>Black to brown colour, black staining, bitter metallic taste.  | Processes used for iron removal (oxidation / filtration) will usually handle manganese.   |
| <b>Brownish cast; does not precipitate.</b>  | Iron pickup from old pipe where pH is below 6.6.  | Low pH (acidic water)   | <b>Aesthetic:</b><br>Rusty colour, sediment, metallic taste, reddish or orange staining.  | Calcite filter to raise pH to 7.0 or better. Additional filtration to remove precipitated iron.   |
| <b>Brownish cast; slime forms in toilet tanks and other standing water.</b>        | Microorganisms (i.e.: Crenothrix, Sphaerotilus, Gallionella, and Siderocapsa bacterial) that utilize oxidation of ferrous iron to ferric iron in their metabolic process. | Bacterial growth (environmental microorganisms that live naturally in all water and moist environments) infecting the well and plumbing system. | <b>Aesthetic:</b><br>Biofilm (slime) forms in plumbing and water appliances, plugs filters and produces a foul taste and odour, most noticeable in hot water. | Destroy iron bacteria with solution of hydrochloric acid (HCl), then constant disinfection (chlorine or hydrogen peroxide), followed by appropriate filtration. |
| <b>Brownish cast to water.</b>   | Spent and broken down carbon filter media, sometimes referred to as "carbon mud".   | Activated carbon breakdown due to excessive chlorine.   | <b>Aesthetic</b>  | 1. Replace activated carbon medium bed.<br>2. Replace activated carbon element in cartridge filter.   |

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| <p><b>Brown-red stains</b> on fixtures, dishes and laundry. Water turns brown-red in cooking or upon heating. Clothing becomes discoloured when laundered. Usually darkens coffee, tea, and other beverages.</p> | <p>Iron (Fe<sup>2+</sup>)</p>  | <p>Dissolved iron (<b>Ferrous Fe<sup>2+</sup></b>) in influent (more than 0.3 ppm.). <i>Water appears clear when first drawn at cold water faucet and discolours after sitting for a short period.</i></p> | <p><b>Aesthetic:</b><br/>Rusty colour, sediment, metallic taste, reddish or orange staining.</p> | <p>1. Water softener can remove 0.5 ppm of iron for every grain/gal. Of hardness up to 10 ppm at a minimum pH of 6.7 (un-aerated water).<br/>2. Over 10 ppm Fe: chlorination with sufficient retention tank time for full oxidation followed by iron filtration and de-chlorination.</p> |
| <p><b>Cloudy water, clears after a brief sitting.</b></p>  | <p>1. Methane gas (CH<sub>4</sub>) in water, Common in marsh water where petrification takes place also quite common in deep-water aquifers.</p> | <p>1. Naturally occurring; caused by decaying organics in ground water.<br/>2. Decaying matter from old dump sites entering aquifer/well source.<br/>3. Presence also common in oilfield waters.</p>       | <p><b>Note: Methane is very volatile / explosive.</b></p>  | <p>Open-gravity aeration with proper venting of this volatile gas. Re-pump product water.</p>  |
|  | <p>2. Air</p>  | <p>2. High degree of air in water from poorly functioning well pump, usually disappears quickly.</p>   | <p><b>Aesthetic:</b><br/>No related health effects.</p>  | <p>Inspect and service well pump and related equipment.</p>  |
| <p><b>Cloudy Water does not settle out.</b></p>  | <p>Milky water / very fine precipitant sludge suspended in the water.</p>  | <p>Some minute precipitant sludge is created during heating of hard water.</p>   | <p><b>Aesthetic:</b><br/>No related health effects.</p>  | <p>1. Blow down hot water heater periodically to rid tank of precipitated calcium sludge.<br/>2. Install water softener to remove mineral contaminants prior to heating.</p>   |

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| <b>Green and red staining</b> on sinks, taps and other bathroom fixtures. Blue-green cast to water. | 1. Low pH (acidic water)   | 1. Water that has high carbon dioxide (CO <sub>2</sub> ) content (pH below 6.8) reacts with brass and copper pipes and fittings.  | <b>Aesthetic:</b> Metallic taste, fixture staining, corrosion, leaking plumbing.  | 1. Use calcite filter to neutralize pH.  |
|   | 2. Very low pH (Highly acidic water)   | 2. Mineral acids H <sub>2</sub> SO <sub>4</sub> and HCl from mine water getting into well supply; pH below 4.3 indicates presence of free mineral acidity (FMA).                                | <b>Aesthetic:</b> Severe fixture staining, corrosion, leaking plumbing.   | 2. Caustic soda or soda ash chemical feed to raise pH, followed by filtration.   |
| <b>Grey string-like fibre in water.</b>   | 1. Organic material in raw water – algae, etc. Usually occurs in surface water sources.    | Plants and other naturally occurring organic matter as well as bacterial contaminants in the water supply.  | <b>Aesthetic:</b> 1. Harmless organics, usually no related health effects.  | Constant chlorination followed by appropriate filter, and / or activated carbon filter to de-chlorinate.                                       |
|   | 2. Sulfur, iron or other slime-producing bacteria (bio-fouling) more common in deep wells. |   | 2. Bio film build up in plumbing and water treatment equipment are slow killers of resin beds and other filtration devices. |  |
| <b>Reddish-coloured water with red particles settling to bottom of a glass upon brief standing.</b> | Precipitated iron Fe <sup>3+</sup> .   | Precipitated iron (Ferric Fe <sup>3+</sup> ). Water not clear when first drawn at cold water faucet.<br>Acid water causes iron “pickup” in water system, often following repairs to water main. | <b>Aesthetic:</b> Rusty colour, sediment, metallic taste, reddish or orange staining.                                       | 1. Most quality water softeners with good backwash will remove up to 3 ppm Fe.<br>2. Up to 10 ppm iron removed by oxidation / iron filtration. |
| <b>Reddish colour in water sample after standing 24 hours.</b>                                      | Colloidal iron.  | Substances such as silica or tannins present in water that interfere with the crystal growths of ferric iron precipitates.  | <b>Aesthetic:</b> Produces a foul taste, odour and staining.  | Constant chlorination and retention followed by activated carbon filter for de-chlorination.   |
| <b>Sand, grit, silt, or clay substances.</b>  | Sand from new well or defective well screen spreads through system                         | Fine particulate suspended in water, passing through the well screen, settles out while standing in a sink or tub.  | <b>Aesthetic:</b> Usually no related health effects.  | Use hydro-cyclone, sand trap, and/or install new well screen or other filtration devices.  |

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| <b>Turbidity:<br/>Mud, silt, clay, and sediment in water.</b>                                    | Suspended matter in surface waters, ponds, streams, and lakes.   | Usually soil runoff.  | <b>Aesthetic:</b><br>Turbidity has no health effects, but can interfere with disinfection processes and can provide a medium for microbial growth. It may also indicate the presence of microbes.        | <ol style="list-style-type: none"> <li>1. Cartridge filtration matched to turbidity particle size.</li> <li>2. Sub micron filtration.</li> <li>3. Reverse Osmosis</li> <li>4. Home Distillation.</li> </ol>  |
| <b>Whitish scale deposits in pipes, water heater, and tea kettle.</b>                            | Hard Water<br>Calcium (limestone) and magnesium salts in raw water measuring 3.0 or more grains per gal (50 ppm.). | As water moves through the ground, calcium and magnesium salts are dissolved and carried along with the water.          | <b>Aesthetic:</b><br>Consumes soap, makes cleaning more difficult. Scum forms in washbasins and toilet bowl. Whitish scale in pipes, kettle and water heater increasing time and costs of heating water. | Remove all calcium and magnesium salts with cation exchange water softener (general limit 70 gpg total hardness). In extreme cases, install two softeners in (tandem) series.  |
| <b>Yellowish cast to water. Yellow stains on washable fabrics, china, and bathroom fixtures.</b> | Tannins & Lignins (humic and fulvic acids)   | Water passes through peaty soil and decaying vegetation, picking up tannins (humic acids), which are harmless organics. | <b>Aesthetic:</b><br>Harmless organics, usually no related health effects.   | <ol style="list-style-type: none"> <li>1. For drinking water, colour removed with ultra filtration-type membrane element / reverse osmosis.</li> <li>2. For whole-house system, remove by adsorption via special macro-porous Type I anion exchange resin regenerated with NaCl, up to 3 ppm,</li> <li>3. Above 3 ppm, constant chlorination with full retention time, followed by filtration and/or de-chlorination.</li> </ol> |

## Taste and Odour Problems

| Symptom or Complaint                           | Probable Impurity, or Contaminant                                       | Common Cause or Source   | Health / Aesthetic Effect(s)   | Usual Treatment  |
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| <b>Aromatic fishy, earthy, or woody smell.</b> | Generally harmless organic matter often found in surface water sources. | Plants and other naturally occurring organic matter dissolved in the water supply. | <b>Aesthetic:</b><br>Harmless organics, usually no related health effects.   | <ol style="list-style-type: none"> <li>1. Activated carbon-type filter.</li> <li>2. Reverse osmosis or distillation for drinking and cooking uses.</li> </ol>  |
| <b>Bleach smell / Chlorine.</b>                | Residual Chlorine disinfectant.   | Excessive chlorination in public or private well source water.                     | <p><b>Health:</b><br/>Naturally occurring organic matter combines with chlorine to produce disinfection by-products (DBPs), mainly trihalomethanes (THMs) most of which are known carcinogens. Other increased health risks; bladder and rectal cancer, adverse birth outcomes, liver, kidney and central nervous system problems.</p> <p><b>Main path of exposure:</b></p> <ol style="list-style-type: none"> <li>1. Bathing / skin absorption</li> <li>2. Ingestion</li> </ol> | <ol style="list-style-type: none"> <li>1. De-chlorinate with activated carbon-type whole house filter.</li> <li>2. Cartridge-activated carbon filter for drinking and cooking water only.</li> </ol> |

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| <b>Detergent Odour,</b><br>water foams when drawn; septic Odour.   | Possible Nitrate impurity indicating a malfunctioning septic system or commercial fertilizer seepage into water supply. | 1. Seepage of septic system into underground water source.<br>2. Detergent accidentally put in water supply system or well. | <b>Health:</b><br>Nitrates above 10.0 mg/L as N are considered a health hazard for infants, Methaemoglobinaemia more commonly known as “blue baby syndrome”, a condition that interferes with the bloods ability to carry oxygen to the body tissues. | 1. Locate and eliminate source of seepage, then heavily chlorinate well followed by activated carbon filtration.<br>2. Reverse osmosis for drinking and cooking water.<br>3. Activated carbon filter will absorb limited amounts of detergent.<br><br><b>Continue to monitor for recontamination.</b> |
| <b>Gasoline or oil</b><br>(hydrocarbon) smell. Iridescent slick and tacky taste. Very fine oil film forms on surface of a standing glass of water. | Kerosene, gasoline, or fuel oil.  | Leak in fuel oil or gasoline tank allows seepage into water supply or aquifer.  | <b>Aesthetic:</b><br>Considered a taste and odour issue, but in high concentrations could be a fire hazard.   | 1. Short-term: activated carbon adsorption filter, or use of ultra filtration membrane cartridge for drinking water.<br>2. Longer term: Locate and eliminate leaking petroleum product tank and/or seek new water supply.   |
| <b>Medicinal taste and odour</b>   | Phenol or other industrial chemicals.   | Industrial wastes seep into surface or ground water supplies resulting from careless storage or disposal.                   | <b>Health:</b><br>Many chemical contaminants are carcinogenic and their presence in a water supply should be thoroughly investigated at first sign.   | Activated carbon filter will absorb phenol compounds and numerous other chemical contaminants short-term. Long term, locate and eliminate contaminant source or seek new water supply.  |
| <b>Metallic taste, bitter or sour.</b>   | 1. Low pH; sour and metallic taste.   | 1. Very low-pH water in the 4.5-5.5 range.  | <b>Aesthetic:</b><br>Usually no related Health effects.<br>Corrosion of plumbing and fixtures.  | 1. Correct with calcite medium-type filter or soda ash to raise pH.   |
|  | 2. High pH; slippery feel, bitter and soda taste.   | 2. Heavily alkaline water, pH ranging 9.5 and higher.   |   | 2. Controlled acid feed to lower pH   |
| <b>Rotten egg “sulphur water” Odour</b> and/or tarnished silverware. Yellow, black stains on bathroom  | 1. Dissolved hydrogen sulphide (H <sub>2</sub> S). Often present in high iron content water as well as low-pH waters.   | 1. Sulfur-reducing bacteria present in ground water use sulfur as an energy source to chemically change sulphates to        | <b>Aesthetic / Can be a</b>   | 1. Up to 6ppm H <sub>2</sub> S, constant chlorination followed by appropriate filtration/ de-chlorination.<br>2. Open aeration and repump, followed by  |

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| fixtures.  |  | produce hydrogen sulfide.   | <b>health concern, but</b> its strong odour usually allows for detection long before it reaches toxic levels.<br>Hydrogen sulfide is flammable and poisonous. Such concentrations are not common, but if the gas is released in a confined area it can cause nausea, illness, and in extreme cases, even death. | oxidizing-catalyst filter.  |
|  | 2. Sulfate-reducing bacteria, slime forms in toilet tank and other standing water.                               | 2. Sulfate-reducing bacteria in raw water feed on sulphates in water, creating a biofilm (slime) that will contaminate plumbing and water appliances as well as a trace H <sub>2</sub> S smell usually most noticeable on hot water side. |   | 1. Disinfect all plumbing with household bleach and pre-treat water supply with chlorination to eliminate bacteria, follow with activated carbon filter.  |
|  |  | 3. Magnesium anode rod reacts in hot water heater (electric or gas-fired heaters).  |   | 1. Remove magnesium rod from heater.<br>2. Use alternate anode, such as aluminum.   |
| <b>Salty or brackish taste, with laxative effect in some situations.</b> | 1. High sodium chloride or magnesium content – i.e., NaCl, Na <sub>2</sub> SO <sub>4</sub> , MgSO <sub>4</sub> . | Naturally occurring elements found in most water supplies in varying amounts.   | <b>Aesthetic / Can be a health concern:</b><br><br><b>Aesthetic</b> guideline is 200 mg/L.<br><br>As a <b>health</b> related issue, most guidelines recommend a maximum of 20 mg/L for those on a sodium-restricted diet.   | 1. De-ionize drinking water only with disposable mixed bed-anion/cation resins; or<br>2. Reverse osmosis for drinking and cooking water only; or<br>3. Home distillation system for drinking water.                       |
|  | 2. Malfunction of water softener leaves regenerant brine in water service lines.                                 | Salt used as a water softener regenerant.   |   | Open cold-water tap and flush out plumbing and water softener. Service water softener to correct problem.   |
| <b>Sewage or rotten egg smell / water foams.</b>                         | Human or animal waste pollution containing ammonia leaches into water supply.                                    | Improper sewage disposal, malfunctioning septic system.   | <b>Health:</b><br>Total coliform bacteria, including fecal coliform and E. Coli. Presence can cause severe illness and death.   | 1. Eliminate the source of pollution, sterilize the well for a minimum 24 hours.<br>2. Constant chlorination followed by activated carbon filtration to de-chlorinate.<br><b>Continue to monitor for recontamination.</b> |
| <b>Sharp chemical taste or odour.</b>                                    | Pesticides / herbicides (DDT, 2,4D, Chlordane, etc.)   | Excessive agricultural use gets into water supply, primarily through surface runoff.  | <b>Health:</b><br>Most popular pesticides and herbicides are associated with a range of health problems. Among them; liver,   | 1. Activated carbon will absorb limited amounts of most chemicals,<br>2. Reverse osmosis.<br>3. Home distillation   |

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kidney, adrenal gland,  
reproductive problems  
and various cancers.

**Continue to monitor for  
recontamination.**

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**Soda taste / Bitter.**  
Blackened, stained  
aluminum cookware.

High alkalinity, over  
300 mg/L in raw  
water – i.e., SO<sub>4</sub>, Cl,  
HCO<sub>3</sub><sup>-</sup>.

High dissolved  
mineral content /  
high pH usually  
above 8.5

**Health:**  
Drying effect on the skin  
when bathing and drying  
effect on the hair when  
shampooing.

1 Controlled acid feed to  
lower pH  
2. Reduce TDS to lower  
limits by RO for cooking  
and drinking water.

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