Drinking Water Quality Standards and Objectives

Standards and objectives can be applied to water for both hygienic use and human consumption. In general, standards are mandatory for systems that supply water for human consumption. For systems that supply water for hygienic use, only bacteriological standards apply. Both systems should strive to achieve the water quality objectives.

Standards

Standards are legally enforceable requirements for drinking water quality and are set out in *The Waterworks and Sewage Works Regulations*.

Bacteriological:

Bacteriological water quality is an important indicator of potential contamination; these standards are very stringent as potential health effects can be severe.

- total coliform levels of zero organisms detectable per 100 millilitres (mL);
- *Escherichia coli* levels of zero organisms detectable per 100 mL; and
- background bacteria levels of less than 200 colonies per 100 mL or no overgrowth.

Terms

- Aesthetic Objective (AO)
- Becquerels per Litre (Bq/L)
- Interim Maximum Acceptable Concentration (IMAC)
- Maximum Acceptable Concentration (MAC)
- Milligrams per Litre (mg/L)
- Nephelometric Turbidity Unit (NTU)
- True Colour Unit (TCU)

Turbidity:

Turbidity is a measurement of the clarity of the water. Turbidity is an important indicator of water treatment process efficiency from both a health and aesthetic perspective. Depending on the type of source water used and treatment, the required turbidity levels are different and measured from different locations. Standards for all waterworks producing water for human consumption are indicated in Table 1 below.

Table 1

Source/Treatment	Routine Standard[4]	Maximum Exceedance Time[5]	Never to Exceed
Surface water[1,2]: Chemically Assisted Filtration - Monthly source water average ≥1.5 NTU	≤0.3 NTU, 95% of the time	Not to exceed 0.3 NTU for more than 12 consecutive hours	1.0 NTU
Surface water[1,2]: Chemically Assisted Filtration - Monthly source water average <1.5 NTU	≤0.2 NTU, 95% of the time	Not to exceed 0.2 NTU for more than 12 consecutive hours	1.0 NTU
Surface water[1,2]: Membrane Filtration	≤0.1 NTU, 99% of the time	No stated standard	0.1 NTU for greater than 15 minutes
Surface water[1,2]: Slow Sand or Diatomaceous Earth Filtration	≤1.0 NTU, 95% of the time	Not to exceed 1.0 NTU for more than 12 consecutive hours	3.0 NTU
Groundwater[3]	≤1.0 NTU, 95% of the time	No stated standard	No stated standard

Table 1 Notes

[1] Includes surface water and groundwater under the influence of surface water.
[2] Turbidity value measured from each filter effluent.
[3] Turbidity value for water entering the distribution system.
[4] Measurements made in each calendar month utilizing either discrete measurements or continuous monitoring.
[5] Only applies for continuous monitoring.

Other requirements apply for novel surface water treatment technologies.

Chemical - Health/Pesticides/Radiological:

These include a range of substances that are known or suspected to cause adverse effects on health. These values have been derived to safeguard health on the basis of lifelong consumption. Waterworks producing water for human consumption must comply with the standards in Table 2, 3 and 4 below.

Table 2

Chemical - Health		
Parameter	MAC (mg/L)	IMAC (mg/L)
Arsenic	0.01	
Barium	1	
Benzene	0.005	
Benzo(a)pyrene	0.00001	
Boron		5
Bromate	0.01	
Cadmium	0.005	
Carbon tetrachloride	0.005	
Chlorate	1	
Chlorite	1	
Chromium	0.05	
Cyanide	0.2	
Dichlorobenzene, 1,2	0.2	
Dichlorobenzene, 1,4	0.005	
Dichloroethane, 1,2		0.005
Dichloroethylene, 1,1	0.014	
Dichloromethane	0.05	
Dichlorophenol, 2,4	0.9	
Fluoride[1]	1.5	
Haloacetic Acids[2]	0.08	
Lead[3]	0.01	
Mercury	0.001	
Microcystin-LR	0.0015	
Monochlorobenzene	0.08	
Nitrate[4] as NO_3	45	
Selenium	0.01	
Tetrachlorophenol, 2,3,4,6	0.1	
Trichloroethylene	0.05	
Trichlorophenol, 2,4,6	0.005	
Trihalomethanes[5]	0.1	
Uranium	0.02	
Vinyl Chloride	0.002	

Table 2 Notes

[1] Maximum allowable concentration of naturally occurring fluoride in treated drinking water intended or used for human consumption.

[2] Total of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid and dibromoacetic acid and is based on a locational running average of quarterly samples taken from water mains within the distribution system.

[3] Faucets should be thoroughly flushed before sample is collected.

[4] Nitrate levels in excess of 45 mg/L (10 mg/L as nitrate-nitrogen) may cause adverse health effects in infants less than six months old. Where nitrate and nitrite are determined separately, levels of nitrite should not exceed 3 mg/L (1 mg/L as nitrite-nitrogen).

[5] Based on an annual average of 4 seasonal samples collected from water mains within the distribution system.

Table 3

Chemical - Pesticides		
Parameter	MAC (mg/L)	IMAC (mg/L)
Atrazine		0.005
Bromoxynil		0.005
Carbofuran	0.09	
Chlorpyrifos	0.09	
Dicamba	0.12	
2,4-D[1]		0.1
Diclofop-methyl	0.009	
Dimethoate		0.02
Malathion	0.19	
MCPA[2]	0.1	
Pentachlorophenol	0.06	
Picloram		0.19
Trifluralin		0.045

Table 3 Notes

[1] 2,4 Dichorophenoxyacetic Acid

[2] 2-Methyl-4-Chlorophenoxyacetic Acid

Table 4

Radiological[1]	
Screening Parameter	MAC (Bq/L)
Gross alpha	0.5
Gross beta	1
Lead-210 (^{210}Pb)	0.2
Radium-226 (^{226}Ra)	0.5
Tritium (^{3}H)	7000
Strontium-90 (^{90}Sr)	5
Iodine (^{131}I)	6
Cesium-137 (^{137}Cs)	10

Table 4 Notes

[1] Radiological - Water samples may be initially screened for radioactivity using gross alpha and gross beta activity determinations. Compliance with the standards may be inferred if the measurements for gross alpha and gross beta activity are less than 0.5 Bq/L (becquerels per litre) and 1.0 Bq/L, respectively, as these are lower than the strictest maximum acceptable concentrations. If these values are exceeded, then Table 3 of the current *Guidelines for Canadian Drinking Water Quality—Summary Table, Health Canada* applies.

Objectives

Objectives apply to certain substances in the water, or certain characteristics of the water, that affect the acceptance of water by consumers (such as taste, odour and colour). Compliance with drinking water objectives is not mandatory as at these levels, these parameters are in the range where they do not constitute a health hazard. However, these substances may represent a health risk to certain consumers if found in excessive concentrations, or if consumers are subject to reduced exposure limits (due to specific health considerations). The aesthetic objectives for several parameters (such as hardness, magnesium, sodium and total dissolved solids) consider regional differences in drinking water quality.

Table 5

Chemical	
Parameter	AO (mg/L)
Alkalinity (as $CaCO_3$)	500
Chloride	250
Copper	1
Ethylbenzene	0.0016
Hardness	800
Iron	0.3
Magnesium	200
Manganese[1]	0.05
Sodium[2]	300
Sulphate[3]	500
Sulphide	0.06
Total dissolved solids[4]	1500
Toluene	0.024
Xylenes	0.02
Zinc	5

Table 6

Physical	
Parameter	AO
Colour	15 TCU
Odour	Inoffensive
pH	7.0 to 10.5
Taste	Inoffensive
Temperature	<15 ° C

Table 5 Notes

[1] Manganese: Health Canada has implemented a MAC for manganese in drinking water. This has not been adopted by Saskatchewan; however, it is encouraged to remove manganese to levels as low as reasonably achievable.

[2] Sodium: reduced sodium levels may be important for individuals with sodium-restricted diets.

[3] Sulphate: there may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.

[4] Total Dissolved Solids (TDS): TDS is based on summation of ions.
Summation of Ions: $Cl + SO_4 + Ca + Mg + K + Na + NO_3 + CO_3 + HCO_3$

Explanation of Terms

Aesthetic Objectives (AO) – levels of substances or characteristics of water that can affect its acceptance by consumers, cause problems with water distribution systems and fixtures, or interfere with practices for supplying good quality water. They are not health related standards but are related to aesthetic aspects of the water.

Becquerels per Litre (Bq/L) – concentration of radionuclide activity.

Interim Maximum Acceptable Concentration (IMAC) – level that has been established for parameters that are suspected to cause adverse health effects but have insufficient data.

Maximum Acceptable Concentration (MAC) – level that has been established for parameters that are known or suspected to cause adverse health effects.

Milligrams per Litre (mg/L) – measure of the concentration of a dissolved substance in solution.

Nephelometric Turbidity Unit (NTU) – unit used to measure the water's clarity or the presence of suspended particles.

True Colour Unit (TCU) – corresponds to the amount of colour exhibited after suspended particles have been removed.

Guidelines for Canadian Drinking Water Quality

Drinking Water - wsask.ca

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