

Complementary Information

About the Reported Detection Limit (RDL):

The values in this column represent the minimum amount required for the detection of a parameter, according to CARO Analytical Services, Kelowna.

The symbol "<" (*less than*) is used when a parameter is in too weak concentration to be detected.

About the Maximum Accepted Concentration (MAC):

The MAC values in this column are health-based guidelines, as reported by Health Canada in the document *Guidelines for Canadian Drinking Water*, May 2008.

The AO values are based on aesthetic considerations (Aesthetic Objectives).

The minimum limit for "Oxygen, Dissolved" is from the Ministry of Environment of British Columbia.

About the general parameters analyzed:

Nitrogen (N)

Nitrogen forms 78% (volume in dry air) of the atmosphere. It is a mostly inert gas, and is colorless, odorless and tasteless. In water, it is mainly found in the form of these mineral compounds:

Ammonia (NH₃): is a toxic waste product of the metabolism in animals, but also an important source of nitrogen for some living systems. Some plants rely on ammonia and other nitrogenous wastes incorporated into the soil by decaying matter, as other crop species will be harmed by it. It is used in fertilizers, cleaners, refrigeration, fuel, etc. Its toxicity does not usually cause problems to humans and other mammals, as a specific mechanism exists to prevent its build-up in the bloodstream (the liver converts it to urea). However, fish and amphibians lack this mechanism. Ammonia is, therefore, highly toxic to aquatic animals.

Nitrate and Nitrite (NO₃ and NO₂): Nitrate is a naturally occurring chemical nutrient that is left after the breakdown or decomposition of animal or human waste (nitrite is a result of nitrate's thermal decomposition). Even though nitrate isn't as toxic as nitrite or ammonium, high levels can cause *methemoglobinemia* in humans (atoms in hemoglobin are unable to carry oxygen molecules) and death for fish. As a rule, 30ppm (parts per million, corresponding to 30 mg/L) can inhibit growth, impair immune system and cause stress in some aquatic species. When found in water, it is an indicator of the presence of a broad array of chemical contaminants like agricultural and residential runoff (fertilizers and sewage), soil contamination, industrial waste, etc.

According to Health Canada, these are the guidelines for Nitrogen (N):

Water Use	Nitrate as N mg\L	Nitrite as N mg\L	Ammonia as N mg\L
Drinking Water	10 maximum	1 max	None proposed
Fresh Aquatic Life	31.3 max	0.06 max	Depends on the Temperature and Ph of the water*
Livestock Watering	100 maximum	10 maximum	None proposed
Wildlife	100 maximum	10 maximum	None proposed

*U.S. EPA is planning to re-evaluate ammonia criteria based on new studies with freshwater mussels.

Phosphorus (P):

Phosphorus is a very reactive, highly flammable substance, generally found in minerals. It is a component of DNA and is part of what forms all cell membranes. It is therefore an essential nutrient for all living beings. It is used in fertilizers, explosives, matches, fireworks, pesticides, toothpaste and detergents. But when it is found in water in too high concentrations, it can lead to algae blooms.

Turbidity:

Turbidity refers to the cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye, similar to smoke in the air. Turbidity levels should be as low as possible in drinking water (see the document *Guidelines for Canadian Drinking Water*, May 2008, for appropriate guidelines when testing a personal well or filtered water).

Coliforms:

Coliforms are, mostly, organisms of fecal origin. Their presence indicates other pathogenic organisms like bacteria, viruses, protozoa (micro-organisms like algae) and many multi-cellular parasites.

Escherichia coli (E. coli): is a member of the coliform group, almost exclusively of fecal origin. Typically, E. coli forms 11% of the coliforms in human feces. Most E. coli strains are harmless, but some can cause serious food poisoning. These coliforms are not always confined to the intestine, but their ability to survive for brief periods outside the body makes them an ideal indicator to test for recent fecal contamination. All virulent forms of E. coli are found in human feces, and some of them also in warm-blooded animals like pigs, goats, deer, cattle, horses, dogs and cats, etc. Ideally, none should be detected in drinking water. Boiling the water for at least a minute is advised if the test is positive.

Dissolved Oxygen:

Oxygen is the single most important component of surface water for self-purification processes and the maintenance of aquatic organisms that utilize aerobic respiration. According to the Ministry of Environment of British Columbia, in order to sustain the aquatic life of all stages other than buried, a minimum concentration of 5 mg\L should be maintained.

About the chemical and physical parameters analyzed:

1. health based and listed as a maximum acceptable concentrations (MAC);
2. based on aesthetic considerations and listed as an aesthetic objectives (AO); or
3. established based on operational considerations and listed as an operational guidance values (OG).

In general, the highest priority guidelines are those dealing with microbiological contaminants. Any measure taken to reduce concentrations of chemical contaminants should not compromise the effectiveness of disinfection.

Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
T	Aluminum (1998)		OG: < 0.1 (conventional treatment); < 0.2 (other treatment types)	Aluminum salts used as coagulants in drinking water treatment; naturally occurring		Current weight of evidence does not indicate adverse health effects at levels found in drinking water.
I	Ammonia (1987)	None required		Naturally occurring; released from agricultural or industrial wastes; added as part of chloramination for drinking water disinfection		Guideline value not necessary as it is produced in the body and efficiently metabolized in healthy people; no adverse effects at levels found in drinking water.
I	Antimony (1997)	0.006		Naturally occurring (erosion); soil runoff; industrial effluents; leaching from plumbing materials and solder	Health basis of MAC: Microscopic changes in organs and tissues (thymus, kidney, liver, spleen, thyroid)	MAC takes into consideration analytical achievability; plumbing should be thoroughly flushed before water is used for consumption.
I	Arsenic (2006)	0.010 ALARA		Naturally occurring (erosion and weathering of soils, minerals, ores)	Health basis of MAC: Cancer (lung, bladder, liver, skin) (classified as human carcinogen) Other: Skin, vascular and neurological effects (numbness and tingling of extremities)	MAC based on treatment achievability; elevated levels associated with certain groundwaters; levels should be kept as low as reasonably achievable.
I	Asbestos (1989, 2005)	None required		Naturally occurring (erosion of asbestos minerals and ores); decay of asbestos-cement pipes		Guideline value not necessary; no evidence of adverse health effects from exposure through drinking water.
P	Atrazine (1993)	0.005		Leaching and/or runoff from agricultural use	Health basis of MAC: Developmental effects (reduced body weight of offspring) Other: Potential increased risk of ovarian cancer or lymphomas (classified as possible carcinogen)	MAC applicable to the sum of atrazine and its <i>N</i> -dealkylated metabolites; persistent in source waters.
P	Azinphos-methyl (1989, 2005)	0.02		Leaching and/or runoff from	Health basis of MAC: Neurological effects	All uses to be phased out by 2012.

Table 2. Chemical and Physical Parameters

Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
				agricultural use	(plasma cholinesterase)	
I	Barium (1990)	1.0		Naturally occurring; releases or spills from industrial uses	Health basis of MAC: Increases in blood pressure, cardiovascular disease	
O	Benzene (2009)	0.005		Releases or spills from industrial uses	Health basis of MAC: Bone marrow (red and white blood cell) changes and cancer (classified as human carcinogen) Other: Blood system and immunological responses	MAC considers additional exposure through showering and bathing; drinking water is generally a minor source of exposure.
O	Benzo[a]pyrene (1988, 2005)	0.000 01		Leaching from liners in water distribution systems	Health basis of MAC: Stomach tumours (classified as probable carcinogen)	
I	Boron (1990)	5		Naturally occurring; leaching or runoff from industrial use	Health basis of MAC: Reproductive effects (testicular atrophy, spermatogenesis) Other: Limited evidence of reduced sexual function in men	MAC based on treatment achievability.
DBP	Bromate (1998)	0.01		By-product of drinking water disinfection with ozone; possible contaminant in hypochlorite solution	Health basis of MAC: Renal cell tumours (classified as probable carcinogen)	MAC based on analytical and treatment achievability
P	Bromoxynil (1989, 2005)	0.005		Leaching or runoff from agricultural use	Health basis of MAC: Reduced liver to body weight ratios	
I	Cadmium (1986, 2005)	0.005		Leaching from galvanized pipes, solders or black polyethylene pipes; industrial and municipal waste	Health basis of MAC: Kidney damage and softening of bone	
I	Calcium (1987, 2005)	None required		Naturally occurring (erosion and weathering of soils, minerals, ores)		Guideline value not necessary, as there is no evidence of adverse health effects from calcium in drinking water; calcium contributes to hardness
P	Carbaryl (1991, 2005)	0.09		Leaching or runoff from agricultural use	Health basis of MAC: Decreased kidney function (may be rapidly reversible after exposure ceases)	
P	Carbofuran (1991, 2005)	0.09		Leaching or runoff from agricultural use	Health basis of MAC: Nervous system effects (cholinesterase inhibition) and growth suppression	
O	Carbon tetrachloride (2010)	0.002		Industrial effluents and leaching from hazardous waste sites	Health basis of MAC: Liver toxicity Other: Kidney damage; liver tumours (classified as	MAC considers additional exposure through showering and bathing

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Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
					probable carcinogen)	
D	Chloramines (1995)	3.0		Monochloramine is used as a secondary disinfectant; formed in presence of both chlorine and ammonia	Health basis of MAC: Reduced body weight gain Other: immunotoxicity effects	MAC is for total chloramines based on health effects associated with monochloramine and analytical achievability
DBP	Chlorate (2008)	1		By-product of drinking water disinfection with chlorine dioxide; possible contaminant in hypochlorite solution	Health basis of MAC: Thyroid gland effects (colloid depletion)	Formation of chlorate ion should be prevented, as it is difficult to remove once formed; chlorate formation should be controlled by respecting the maximum feed dose of 1.2 mg/L of chlorine dioxide and managing /monitoring formation in hypochlorite solutions.
I	Chloride (1979, 2005)		AO: ≤ 250	Naturally occurring (seawater intrusion); dissolved salt deposits, highway salt, industrial effluents, oil well operations, sewage, irrigation drainage, refuse leachates		Based on taste and potential for corrosion in the distribution system
D	Chlorine (2009)	None required		Used as drinking water disinfectant	Guideline value not necessary due to low toxicity at concentrations found in drinking water	Free chlorine concentrations in most Canadian drinking water distribution systems range from 0.04 to 2.0 mg/L
D	Chlorine dioxide (2008)	None required		Used as drinking water disinfectant	A guideline for chlorine dioxide is not required because of its rapid reduction to chlorite in drinking water	A maximum feed dose of 1.2 mg/L of chlorine dioxide should not be exceeded to control the formation of chlorite and chlorate
DBP	Chlorite (2008)	1		By-product of drinking water disinfection with chlorine dioxide	Health basis of MAC: Neurobehavioural effects (lowered auditory startle amplitude, decreased exploratory activity), decreased absolute brain weight, altered liver weights	Chlorite formation should be controlled by respecting the maximum feed dose of 1.2 mg/L of chlorine dioxide and managing /monitoring formation in hypochlorite solutions.
P	Chlorpyrifos (1986)	0.09		Leaching and/or runoff from agricultural or other uses	Health basis of MAC: Nervous system effects (cholinesterase inhibition)	Not expected to leach significantly into groundwater
I	Chromium (1986)	0.05		Naturally occurring (erosion of minerals); releases or spills from	Health basis of MAC: Enlarged liver, irritation of the skin, respiratory and	Chromium (III) is an essential element; MAC is protective of health effects from chromium

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Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
				industrial uses	gastrointestinal tracts from chromium (VI)	(VI)
T	Colour (1979, 2005)		AO: ≤ 15 TCU	Naturally occurring organic substances, metals; industrial wastes		May interfere with disinfection; removal is important to ensure effective treatment
I	Copper (1992)		AO: ≤ 1.0	Naturally occurring; leaching from copper piping	Copper is an essential element in human metabolism. Adverse health effects occur at levels much higher than the aesthetic objective	Based on taste, staining of laundry and plumbing fixtures; plumbing should be thoroughly flushed before water is used for consumption
I	Cyanide (1991)	0.2		Industrial and mining effluents; release from organic compounds	Health basis of MAC: No clinical or other changes at the highest dose tested	Health effects from cyanide are acute; at low levels of exposure, it can be detoxified to a certain extent in the human body
O	Cyanobacterial toxins--Microcystin-LR (2002)	0.0015		Naturally occurring (released from blooms of blue-green algae)	Health basis of MAC: Liver effects (enzyme inhibitor) Other: Classified as possible carcinogen	MAC is protective of total microcystins; avoid algicides like copper sulphate, as they may cause toxin release into water
P	Diazinon (1986, 2005)	0.02		Runoff from agricultural or other uses	Health basis of MAC: Nervous system effects (cholinesterase inhibition)	Not expected to leach significantly into groundwater
P	Dicamba (1987, 2005)	0.12		Leaching or runoff from agricultural or other uses	Health basis of MAC: Liver effects (vacuolization, necrosis, fatty deposits and liver weight changes)	Readily leaches into groundwater
O	1,2-Dichlorobenzene ^{Table 2 footnote 2} (1987)	0.2	AO: ≤ 0.003	Releases or spills from industrial effluents	Health basis of MAC: Increased blood cholesterol, protein and glucose levels	AO based on odour; levels above the AO would render drinking water unpalatable
O	1,4-Dichlorobenzene ^{Table 2 footnote 2} (1987)	0.005	AO: ≤ 0.001	Releases or spills from industrial effluents; use of urinal deodorants	Health basis of MAC: Benign liver tumours and adrenal gland tumours (classified as probable carcinogen)	AO based on odour; levels above the AO would render drinking water unpalatable
O	1,2-Dichloroethane (1987)	0.005		Releases or spills from industrial effluents; waste disposal	Health basis of MAC: Cancer of the circulatory system (classified as probable carcinogen)	MAC based on treatment and analytical achievability
O	1,1-Dichloroethylene (1994)	0.014		Releases or spills from industrial effluents	Health basis of MAC: Liver effects (fatty changes)	
O	Dichloromethane (2011)	0.05		Industrial and municipal wastewater discharges	Health basis of MAC: Liver effects (liver foci and areas of cellular alteration). Other: Classified as probable carcinogen	MAC is protective of carcinogenic effects and considers additional exposure through showering and bathing
O	2,4-Dichlorophenol (1987, 2005)	0.9	AO: ≤ 0.0003	By-product of drinking water disinfection with	Health basis of MAC: Liver effects (cellular changes)	AO based on odour; levels above the AO would render drinking

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Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
				chlorine; releases from industrial effluents		water unpalatable
P	2,4-Dichlorophenoxy acetic acid (2,4-D) (1991)	0.1		Leaching and/or runoff from use as a weed controller; releases from industrial effluents	Health basis of MAC: Kidney effects (tubular cell pigmentation)	
P	Diclofop-methyl (1987, 2005)	0.009		Leaching and/or runoff from use as a weed controller; added directly to water to control aquatic weeds	Health basis of MAC: Liver effects (enlargement and enzyme changes)	Low potential for groundwater contamination
P	Dimethoate (1986, 2005)	0.02		Leaching and/or runoff from residential, agricultural and forestry use	Health basis of MAC: Nervous system effects (cholinesterase inhibition)	
P	Diquat (1986, 2005)	0.07		Leaching and/or runoff from agricultural use; added directly to water to control aquatic weeds	Health basis of MAC: Cataract formation	Unlikely to leach into groundwater
P	Diuron (1987, 2005)	0.15		Leaching and/or runoff from use in controlling vegetation	Health basis of MAC: Weight loss, increased liver weight and blood effects	High potential to leach into groundwater
O	Ethylbenzene (1986, 2005)		AO: ≤ 0.0024	Emissions, effluents or spills from petroleum and chemical industries		Based on odour
I	Fluoride (2010)	1.5		Naturally occurring (rock and soil erosion); may be added to promote dental health	Health basis of MAC: Moderate dental fluorosis (based on cosmetic effect, not health)	Beneficial in preventing dental caries
DBP	Formaldehyde (1997)	None required		By-product of disinfection with ozone; releases from industrial effluents		Guideline value not necessary, as levels in drinking water are below the level at which adverse health effects may occur
O	Gasoline and its organic constituents (1986, 2005)	None required		Spill or leaking storage tank		No MAC due to complex composition of gasoline; strong taste and odour at concentrations well below those potentially eliciting adverse health effects (see benzene, ethylbenzene, toluene and xylenes for more information)
P	Glyphosate (1987, 2005)	0.28		Leaching and/or runoff from various uses in weed control	Health basis of MAC: Reduced body weight gain	Not expected to migrate to groundwater
DBP	Haloacetic acids -	0.08		By-product of	Health basis of MAC: Liver	Refers to the total of

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Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
	Total (HAAs) ^{Table 2 footnote 3} (2008)	ALARA		drinking water disinfection with chlorine	cancer (DCA); DCA is classified as probably carcinogenic to humans Other: Other organ cancers (DCA, DBA, TCA); liver and other organ effects (body, kidney and testes weights) (MCA)	monochloroacetic acid (MCA), dichloroacetic acid (DCA), trichloroacetic acid (TCA), monobromoacetic acid (MBA) and dibromoacetic acid (DBA); MAC is based on ability to achieve HAA levels in distribution systems without compromising disinfection; precursor removal limits formation
T	Hardness (1979)	None required		Naturally occurring (sedimentary rock erosion and seepage, runoff from soils); levels generally higher in groundwater	Although hardness may have significant aesthetic effects, a guideline has not been established because public acceptance of hardness may vary considerably according to the local conditions; major contributors to hardness -- calcium and magnesium -- are not of direct public health concern	Hardness levels between 80 and 100 mg/L (as CaCO ₃) provide acceptable balance between corrosion and incrustation; where a water softener is used, a separate unsoftened supply for cooking and drinking purposes is recommended
I	Iron (1978, 2005)		AO: ≤ 0.3	Naturally occurring (erosion and weathering of rocks and minerals); acidic mine water drainage, landfill leachates, sewage effluents and iron-related industries		Based on taste and staining of laundry and plumbing fixtures; no evidence exists of dietary iron toxicity in the general population
I	Lead (1992)	0.010		Leaching from plumbing (pipes, solder, brass fittings and lead service lines)	Health basis of MAC: Biochemical and neurobehavioural effects (intellectual development, behaviour) in infants and young children (under 6 years) Other: Anaemia, central nervous system effects; in pregnant women, can affect the unborn child; in infants and children under 6 years, can affect intellectual development, behaviour, size and hearing; classified as probably carcinogenic to humans	Because the MAC is based on chronic effects, it is intended to apply to average concentrations in water consumed for extended periods. Exposure to lead should nevertheless be kept to a minimum; plumbing should be thoroughly flushed before water is used for consumption; most significant contribution is generally from lead service line entering the building
I	Magnesium (1978)	None required		Naturally occurring (erosion and weathering of rocks and minerals)		Guideline value not necessary, as there is no evidence of adverse health effects from magnesium in drinking water
P	Malathion (1986, 2005)	0.19		Leaching and/or runoff from	Health basis of MAC: Nervous system	Not expected to leach into groundwater

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Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
				agricultural and other uses	effects (cholinesterase inhibition)	
I	Manganese (1987)		AO: ≤ 0.05	Naturally occurring (erosion and weathering of rocks and minerals)		Based on taste and staining of laundry and plumbing fixtures
I	Mercury (1986)	0.001		Releases or spills from industrial effluents; waste disposal; irrigation or drainage of areas where agricultural pesticides are used	Health basis of MAC: Irreversible neurological symptoms	Applies to all forms of mercury; mercury generally not found in drinking water, as it binds to sediments and soil
P	2-Methyl-4-chlorophenoxyacetic acid (MCPA) (2010)	0.1		Leaching and/or runoff from agricultural and other uses	Health basis of MAC: Kidney effects (increased absolute and relative weights, urinary bilirubin, crystals and pH) Other: Systemic, liver, testicular, reproductive/developmental and nervous system effects	Can potentially leach into groundwater
O	Methyl tertiary-butyl ether (MTBE) (2006)		AO: ≤ 0.015	Spills from gasoline refineries, filling stations and gasoline-powered boats; seepage into groundwater from leaking storage tanks	There exist too many uncertainties and limitations in the MTBE database to develop a health based guideline.	AO based on odour; levels above the AO would render water unpalatable; as the AO is lower than levels associated with potential toxicological effects, it is considered protective of human health.
P	Metolachlor (1986)	0.05		Leaching and/or runoff from agricultural or other uses	Health basis of MAC: Liver lesions and nasal cavity tumours	Readily binds to organic matter in soil; little leaching expected in soils with high organic and clay content
P	Metribuzin (1986, 2005)	0.08		Leaching and/or runoff from agricultural use	Health basis of MAC: Liver effects (increased incidence and severity of mucopolysaccharide droplets)	Leaching into groundwater depends on the organic matter content of the soil
O	Monochlorobenzene (1987)	0.08	AO: ≤ 0.03	Releases or spills from industrial effluents	Health basis of MAC: Reduced survival and body weight gain	AO based on odour; levels above the AO would render water unpalatable
I	Nitrate/nitrite (1987)	<i>Nitrate:</i> 45 as nitrate; 10 as nitrate-nitrogen	<i>Nitrite (if measured separately):</i> 3.2 as nitrite; 1.0 as nitrite-nitrogen	Naturally occurring; leaching or runoff from agricultural fertilizer use, manure and domestic sewage; may be produced from excess ammonia or from microbial activity in distribution systems	Health basis of MAC: Methaemoglobinaemia (blue baby syndrome) in infants less than 3 months old (short term) Other: Classified as possible carcinogen	MACs are protective of children and adults; systems using chloramine disinfection or that have naturally occurring ammonia should monitor nitrite and nitrate in distribution system

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Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I	Nitrilotriacetic acid (NTA) (1990)	0.4		Sewage contamination	Health basis of MAC: Kidney effects (nephritis and nephrosis) Other: Classified as possible carcinogen	
DBP	<i>N</i> -Nitroso dimethylamine (NDMA) (2010)	0.000 04		By-product of drinking water disinfection with chlorine or chloramines; industrial and sewage treatment plant effluents	Health basis of MAC: Liver cancer (classified as probable carcinogen)	MAC considers additional exposure through showering and bathing; levels should be kept low by preventing formation during treatment
A	Odour (1979, 2005)		Inoffensive	Biological or industrial sources		Important to provide drinking water with no offensive odour, as consumers may seek alternative sources that are less safe
P	Paraquat (1986, 2005)	0.01 as paraquat dichloride; 0.007 as paraquat ion		Leaching and/or runoff from agricultural and other uses; added directly to water to control aquatic weeds	Health basis of MAC: Various effects on body weight, spleen, testes, liver, lungs, kidney, thyroid, heart and adrenal gland	Entry into drinking water unlikely from crop applications (clay binding); however, may persist in water for several days if directly applied to water
O	Pentachlorophenol (1987, 2005)	0.06	AO: ≤ 0.03	By-product of drinking water disinfection with chlorine; industrial effluents	Health basis of MAC: Reduced body weight, changes in clinical parameters, histological changes in kidney and liver, reproductive effects (decreased neonatal survival and growth)	AO based on odour; levels above the AO would render drinking water unpalatable
T	pH (1979)		6.5-8.5 ^{Table 2 footnote 4}	Not applicable		pH can influence the formation of disinfection by-products and effectiveness of treatment
P	Phorate (1986, 2005)	0.002		Leaching and/or runoff from agricultural and other uses	Health basis of MAC: Nervous system effects (cholinesterase inhibition)	Some potential to leach into groundwater
P	Picloram (1988, 2005)	0.19		Leaching and/or runoff from agricultural and other uses	Health basis of MAC: Changes in body and liver weights and clinical chemistry parameters Other: Kidney effects (liver to body weight ratios and histopathology)	Significant potential to leach into groundwater
I	Selenium (1992)	0.01		Naturally occurring (erosion and weathering of rocks and soils)	Health basis of MAC: Essential nutritional element Other: Hair loss and weakened nails at extremely high levels of exposure	Most exposure from food; little information on toxicity of selenium from drinking water
I	Silver (1986, 2005)	None required		Naturally occurring (erosion and weathering of		Guideline value not required as drinking water contributes

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Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
				rocks and soils)		negligibly to an individual's daily intake
P	Simazine (1986)	0.01		Leaching and/or runoff from agricultural and other uses	Health basis of MAC: Body weight changes and effects on serum and thyroid gland	Extent of leaching decreases with increasing organic matter and clay content
I	Sodium (1979)		AO: ≤ 200	Naturally occurring (erosion and weathering of salt deposits and contact with igneous rock, seawater intrusion); sewage and industrial effluents; sodium-based water softeners		Based on taste; where a sodium-based water softener is used, a separate unsoftened supply for cooking and drinking purposes is recommended
I	Sulphate (1994)		AO: ≤ 500	Industrial wastes	High levels (above 500 mg/L) can cause physiological effects such as diarrhoea or dehydration	Based on taste; health authorities should be notified of drinking water sources containing above 500 mg/L
I	Sulphide (1992)		AO: ≤ 0.05	Can occur in the distribution system from the reduction of sulphates by sulphate-reducing bacteria; industrial wastes		Based on taste and odour; levels above the AO would render water unpalatable
A	Taste (1979, 2005)		Inoffensive	Biological or industrial sources		Important to provide drinking water with no offensive taste, as consumers may seek alternative sources that are less safe
T	Temperature (1979, 2005)		AO: ≤ 15°C	Not applicable		Temperature indirectly affects health and aesthetics through impacts on disinfection, corrosion control and formation of biofilms in the distribution system
P	Terbufos (1987, 2005)	0.001		Leaching and/or runoff from agricultural and other uses	Health basis of MAC: Nervous system effects (cholinesterase inhibition)	Based on analytical achievability
O	Tetrachloroethylene (1995)	0.03		Industrial effluents or spills	Health basis of MAC: Increased liver and kidney weights Other: Classified as possible carcinogen; limited evidence of an increased risk of spontaneous abortion	Readily leaches into groundwater; MAC considers additional exposure through showering and bathing
O	2,3,4,6-Tetrachlorophenol (1986, 2005)	0.1	AO: ≤ 0.001	By-product of drinking water disinfection with chlorine; industrial effluents and use	Health basis of MAC: Developmental effects (embryotoxicity)	AO based on odour; levels above the AO would render drinking water unpalatable

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Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
				of pesticides		
O	Toluene (1986, 2005)		AO: ≤ 0.024	Release of effluents or spills from petroleum and chemical industries		AO based on odour; levels above the AO would render drinking water unpalatable
A	Total dissolved solids (TDS) (1991)		AO: ≤ 500	Naturally occurring; sewage, urban and agricultural runoff, industrial wastewater		Based on taste; TDS above 500 mg/L results in excessive scaling in water pipes, water heaters, boilers and appliances; TDS is composed of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, chloride, sulphate and nitrate
O	Trichloroethylene (2005)	0.005		Industrial effluents and spills from improper disposal	Health basis of MAC: Developmental effects (heart malformations) Other: Classified as probable carcinogen	MAC considers additional exposure through showering and bathing
O	2,4,6-Trichlorophenol (1987, 2005)	0.005	AO: ≤ 0.002	By-product of drinking water disinfection with chlorine; industrial effluents and spills	Health basis of MAC: Liver cancer (classified as probable carcinogen)	AO based on odour; levels above the AO would render drinking water unpalatable
P	Trifluralin (1989, 2005)	0.045		Runoff from agricultural uses	Health basis of MAC: Changes in liver and spleen weights and in serum chemistry	Unlikely to leach into groundwater
DBP	Trihalomethanes ^{Table 2 footnote 3} (THMs) (2006)	0.1		By-product of drinking water disinfection with chlorine; industrial effluents	Health basis of MAC: Liver effects (fatty cysts) (chloroform classified as possible carcinogen) Other: Kidney and colorectal cancers	Considers the most commonly found THMs, namely chlorodibromomethane, chloroform, bromodichloromethane and bromoform; MAC based on health effects of chloroform and considers additional exposure through showering and bathing; precursor removal limits formation
I	Uranium (1999)	0.02		Naturally occurring (erosion and weathering of rocks and soils); mill tailings; emissions from nuclear industry and combustion of coal and other fuels; phosphate fertilizers	Health basis of MAC: Kidney effects (various lesions); may be rapidly reversible after exposure ceases	Based on treatment achievability; MAC based on chemical effects, as uranium is only weakly radioactive; uranium is rapidly eliminated from the body
O	Vinyl chloride (1992)	0.002		Industrial effluents; degradation product from trichloroethylene and	Health basis of MAC: Liver cancer (classified as human carcinogen) Other: Raynaud's disease, effects on bone, circulatory system, thyroid, spleen,	Based on treatment and analytical achievability; leaching from polyvinyl chloride pipe is not expected to be significant

Table 2. Chemical and Physical Parameters

Type ^{Table 2 footnote 1}	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
				tetrachloroethylene in groundwater; leaching from polyvinyl chloride pipes	central nervous system	
O	Xylene (1986, 2005)		AO: ≤ 0.3	Industrial effluents and spills		AO based on taste and odour; levels above the AO would render water unpalatable
I	Zinc (1979, 2005)		AO: ≤ 5.0	Naturally occurring; industrial and domestic emissions; leaching may occur from galvanized pipes, hot water tanks and brass fittings		AO based on taste; water with zinc levels above the AO tends to be opalescent and develops a greasy film when boiled; plumbing should be thoroughly flushed before water is consumed

Table 3. Radiological Parameters

Guidelines for radiological parameters focus on routine operational conditions of existing and new water supplies and do not apply in the event of contamination during an emergency involving a large release of radionuclides into the environment. Maximum acceptable concentrations (MACs) have been established for the most commonly detected natural and artificial radionuclides in Canadian drinking water sources, using internationally accepted equations and principles and based solely on health considerations.

The MACs are based on exposure solely to a specific radionuclide. The radiological effects of two or more radionuclides in the same drinking water source are considered to be additive. Thus, the sum of the ratios of the observed concentration to the MAC for each contributing radionuclide should not exceed 1.

Water samples may be initially analysed for the presence of radioactivity using gross alpha and gross beta screening rather than measurements of individual radionuclides. If screening levels are exceeded (0.5 Bq/L for gross alpha and 1.0 Bq/L for gross beta), then concentrations of specific radionuclides should be analysed. A guideline for radon is not deemed necessary and has not been established. Information on radon is presented because of its significance for indoor air quality in certain situations.

Table 3. Radiological Parameters

Parameter (approval)	MAC (mg/L)	Common sources	Health basis of MAC	Comments
Cesium-137 (2009)	10	Nuclear weapons fallout and emissions from nuclear reactors	Cancer of the lung, breast, thyroid, bone, digestive organs and	

Table 3. Radiological Parameters

Parameter (approval)	MAC (mg/L)	Common sources	Health basis of MAC	Comments
			skin; leukaemia	
Iodine-131 (2009)	6	Sewage effluent	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	
Lead-210 (2009)	0.2	Naturally occurring (decay product of radon)	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	Corresponds to total lead concentration of 7×10^{-8} µg/L
Radium-226 (2009)	0.5	Naturally occurring	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	
Radon (2009)	None required	Naturally occurring (leaching from radium-bearing rocks and soils; decay product of radium-226)	Health risk from ingestion considered negligible due to high volatility	Mainly a groundwater concern; if concentrations in drinking water exceed 2000 Bq/L actions should be taken to reduce release into indoor air (e.g. proper venting of drinking water supply)
Strontium-90 (2009)	5	Nuclear weapons fallout	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	
Tritium (2009)	7000	Naturally occurring (cosmogenic radiation); releases from nuclear reactors	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	Not removed by drinking water treatment