PARACEL LABORATORIES LTD.

Ontario Drinking Water Parameter Limits and Descriptions

Notes on tables:

Limits, where listed, taken from Ontario Drinking Water Quality Standards.

MAC = Maximum Allowable Concentration
OG = Operational Guideline
AO = Aesthetic Objective

Microbiology

Parameter	Limit	Units	Type	Description
Total Coliform	0	CFU/100mL	MAC	Total Coliforms are a group of bacteria commonly found in the environment including soil and vegetation as well as the intestines of warm blooded animals and humans. While Total coliforms are not likely to cause illness, their presence in a water supply indicates that it may be vulnerable to contamination by other more harmful organisms.
Escherichia coli	0	CFU/100mL	MAC	Escherichia coli (E. coli) is the only member of the total coliform group found in the intestines of humans and mammals. The presence of E.coli indicates recent contamination due to fecal material and may indicate the possible presence of other disease causing pathogens such as bacteria, viruses and parasites. Although most strains of E.coli are harmless, certain strains such as E.coli O157:H7 may cause serious illness.
Heterotrophic Plate Count		CFU/1mL		Heterotrophic plate count (HPC) results give an indication of overall water quality in drinking-water systems. HPC results should be used as a tool for monitoring the overall quality of the water and should not be used as an indicator of potential

				adverse human health effects. Sudden increases in HPC above normal baseline levels can indicate a change in raw water quality or a problem such as bacterial growth in the plumbing. Steady increases in HPC over time indicate a gradual decline in raw water quality or in the condition of the system.

Chemistry

Parameter	**Limit**	**Units**	**Type**	**Description**
Alkalinity (as CaCO3)	30-500	mg/L	OG	Alkalinity is a measure of the resistance of the water to the effects of acids added to water. Water with low alkalinity may tend to accelerate natural corrosion whereas high alkalinity waters may produce scale incrustations on utensils, service pipes and water heaters.
Aluminum	0.1	mg/L	OG	Aluminum is the most abundant metal on Earth, comprising about 8% of the Earth's crust. It is found in a variety of minerals, such as feldspars and micas, which, with time, weather to clays. Varying amounts of aluminum are present naturally in groundwater and surface water, including those used as sources of drinking water.
Antimony	0.006	mg/L	MAC	Antimony may enter the aquatic environment by way of natural weathering of rocks, runoff from soils, effluents from mining and manufacturing operations, and industrial and municipal leachate discharges. Household piping constructed with non-leaded solders are potential sources of antimony in tap water, as soft water may leach antimony from the pipes with solder joints made from Tin/antimony. The Ontario Drinking Water standard has been set to protect against increased blood cholesterol and decreased blood glucose, as well as prevention of nausea, vomiting and diarrhea upon short-term exposure.
Arsenic	0.025	mg/L	MAC	Arsenic is a known carcinogen and must therefore be removed by treatment where present at levels over this concentration. Arsenic is sometimes found at higher levels in ground water in hard rock areas (e.g. Canadian Shield) in Ontario through the natural dissolution of arsenic containing minerals. Certified residential treatment devices are commercially available to remove arsenic to well below this concentration. Every effort should be made to maintain arsenic levels in drinking water as low as reasonably achievable.
Barium	1.0	mg/L	MAC	Barium is a common constituent in sedimentary rocks such as limestone and dolomite

				where it is accompanied by strontium and much larger amounts of calcium. As a result, hard water contains small amounts of barium but seldom at concentrations greater than 1 mg/L.
Boron	5.0	mg/L	MAC	Boron in water is most commonly found as borate. Acute boron poisonings have resulted from the use of borates as antiseptic agents and from accidental ingestion, however, the amount consumed was much higher than would be encountered through drinking water. Infants, the elderly and individuals with kidney diseases are most susceptible to the toxic effects of boron compounds.
Cadmium	0.005	mg/L	MAC	Cadmium is a relatively rare element that is extremely unlikely to be present as a significant natural contaminant in drinking water. Cadmium compounds used in electroplated materials and electroplating wastes may be a significant source of drinking water contamination. Other than occupational exposure and inhalation from cigarette smoke, food is the main source of cadmium intake.
Calcium	N/L	mg/L	MAC	Calcium is the fifth most abundant natural element. It enters the freshwater system through the weathering of rocks, especially limestone, and from the soil through seepage, leaching and runoff. Calcium is the largest contributing element to water hardness and is used in its calculation.
Chloride	250	mg/L	AO	Chloride is a common non-toxic material present in small amounts in drinking water and produces a detectable salty taste at the aesthetic objective level of 250 mg/L. Chloride is widely distributed in nature, generally as the sodium (NaCl), potassium (KCl) and calcium (CaCl2) salts.
Chromium	0.05	mg/L	MAC	Trivalent chromium, the most common and naturally occurring state of chromium, is not considered to be toxic. However, if chromium is present in raw water, it may be oxidized to a more harmful hexavalent form during chlorination.
Conductivity				Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum Cations (ions that carry a positive

				charge). Conductivity can be used to estimate the total dissolved solids in water.
Copper	1.0	mg/L	AO	Copper occurs naturally in the environment but is rarely present in raw water. Copper is used extensively in domestic plumbing in tubing and fittings and is an essential trace component in food. Drinking water has the potential to be corrosive and to cause copper to dissolve in water. At levels above 1.0 mg/L, copper may impart an objectionable taste to the water. Although the intake of large doses of copper has resulted in adverse health effects such as stomach upsets, the levels at which this occurs are much higher than the aesthetic objective.
Fluoride	1.5	mg/L	MAC	Low levels of fluoride occur naturally in most sources of drinking water in Canada. Consuming water with high levels of fluoride may lead to dental fluorosis, a mottling or discoloration of tooth enamel during tooth development.
Hardness (as CaCO3)	80-100	mg/L	OG	Water hardness is a traditional measure of the capacity of water to react with soap. Hard water requires a considerable amount of soap to produce a lather, and it also leads to scaling of hot water pipes, boilers and other household appliances. Water hardness is caused by primarily by dissolved calcium and magnesium ions but iron, manganese, barium and strontium ions also contribute. The degree of hardness of drinking water may be classified in terms of its calcium carbonate concentration as follows: soft, 0 to <60 mg/L; medium hard, 60 to <120 mg/L; hard, 120 to < 180 mg/L; and very hard, 180 mg/L and above.
Iron	0.3	mg/L	AO	Iron may be present in ground water as a result of mineral deposits and chemically reducing underground conditions. It may also be present in surface waters as a result of anaerobic decay in sediments and complex formation. The aesthetic objective for iron, set by appearance effects, in drinking water is 0.3 mg/L. Excessive levels of iron in drinking water supplies may impart a brownish colour to laundered goods, plumbing fixtures and the water itself; it may produce a bitter, astringent taste in water and beverages; and the precipitation of iron can also promote the growth of iron bacteria.
Lead	0.010	mg/L	MAC	The maximum acceptable concentration for lead in drinking water is 0.01 mg/L. This applies to water at the point of consumption since lead is only present as a result of corrosion of lead solder, lead containing brass fittings or lead pipes which are found

				close to or in domestic plumbing and the service connection to buildings. The amount of lead from the plumbing system that may be dissolved depends upon several factors, including the acidity (pH), water softness and standing time of the water. Lead ingestion should be avoided particularly by pregnant women and young children, who are most susceptible. It is recommended that only the cold water supply be used for drinking/consumption and only after five minutes of flushing to rid the system of standing water.
Magnesium				Magnesium is the eighth most abundant natural element. It enters the freshwater system through the weathering of rocks, especially limestone, and from the soil through seepage, leaching and runoff. Magnesium is the second largest contributing element to water hardness and is used in its calculation.
Manganese	0.05	mg/L	AO	Like iron, manganese is objectionable in water supplies because it stains laundry and fixtures black, and at excessive concentrations causes undesirable tastes in beverages. Manganese is present in some ground waters because of chemically reducing underground conditions coupled with presence of manganese mineral deposits.
Mercury	0.001	mg/L	MAC	Possible sources of mercury in drinking water include air pollution from coal combustion, waste incineration and from metal refining operations and from natural mineral deposits in some hard rock areas. Food is the major source of human exposure to mercury, with freshwater fish being the most significant local source.
Nitrate as Nitrogen	10.0	mg/L	MAC	Nitrates are present in water (particularly ground water) as a result of decay of plant or animal material, the use of agricultural fertilizers, domestic sewage or treated wastewater contamination, or geological formations containing soluble nitrogen compounds. There is a risk that babies and small children may suffer blood related problems (methaemoglobinaemia – blue baby syndrome) with excess nitrate intake. The nitrate ion is not directly responsible for this condition, but must first be reduced to the nitrite ion by intestinal bacteria. The nitrite reacts with the iron of haemoglobin in red blood cells which are then prevented from carrying oxygen to the body tissues.
Nitrite as Nitrogen	1.0	mg/L	MAC	The maximum acceptable concentration of nitrite in drinking water, 1.0 mg/L as nitrogen, is based, as with nitrate, primarily on the relationship between nitrite in water

				and the incidence of infantile methaemoglobinaemia. Nitrite is fairly rapidly oxidized to nitrate and is therefore seldom present in surface waters in significant concentrations. Where Nitrate and Nitrate are both present in the water the total should not exceed 10.0 mg/L as nitrogen.
pH	6.5-8.5	no units	OG	pH is a parameter that indicates the acidity of a water sample. The operational guideline recommended in drinking water is to maintain a pH between 6.5 and 8.5. The principal objective in controlling pH is to produce a water that is neither corrosive nor produces incrustation. At pH levels above 8.5, mineral incrustations and bitter tastes can occur. Corrosion is commonly associated with pH levels below 6.5 and elevated levels of certain undesirable chemical parameters may result from corrosion of specific types of pipe.
Potassium	N/L			Potassium is an essential element in humans, and is not normally found in drinking water at levels that could be a concern to human health. However, the consumption of drinking water treated by water softeners using potassium chloride may significantly increase exposure to potassium. This is not a concern for the general population. However, increased exposure to potassium could result in significant health effects in people with kidney disease or other conditions, such as heart disease, coronary artery disease, hypertension, diabetes, and who are taking medication that interfere with normal body potassium handling.
Selenium	0.01	mg/L	MAC	Selenium occurs naturally in waters at trace levels as a result of geochemical processes such as weathering of rocks. It is difficult to establish levels of selenium that can be considered toxic because of the complex inter-relationships between selenium and dietary constituents such as protein, vitamin E and other trace elements. Food is the main source of selenium intake other than occupational exposure. Selenium is an essential trace element in the human diet.
Sodium	200	mg/L	AO	The aesthetic objective for sodium in drinking water is 200 mg/L at which it can be detected by a salty taste. Persons suffering from hypertension or congestive heart disease may require a sodium-restricted diet, in which case, the intake of sodium from drinking water could become significant. It is recommended that persons on sodium restricted diets consult their physician before consuming water with levels above 20

				mg/L. Water softening using a domestic water softener significantly increases the sodium level in drinking water.
Sulphate	500	mg/L	AO	The aesthetic objective for sulfate in drinking water is 500 mg/L. At levels above this concentration, sulfate can have a laxative effect, however, regular users adapt to high levels of sulfate in drinking water and problems are usually only experienced by visitors and new consumers. The presence of sulfate in drinking water above 150 mg/L may result in noticeable taste. The taste threshold concentration, however, depends on the associated metals present in the water. High levels of sulfate may be associated with calcium, which is a major component of scale in boilers and heat exchangers. In addition, sulfate can be converted into sulfide by some anaerobic bacteria creating odour problems and potentially greatly accelerating corrosion.
Sulphide	0.05	mg/L	AO	The odour related aesthetic objective for sulfide in drinking water is 0.05 mg/L as H2S (Hydrogen Sulphide). Although ingestion of large quantities of hydrogen sulfide gas can produce toxic effects on humans, it is unlikely that an individual would consume a harmful dose in drinking water because of the associated unpleasant taste and odour. Sulfide is also undesirable in water supplies because, in association with iron, it produces black stains on laundered items and black deposits on pipes and fixtures. Lower levels of sulfide can be removed effectively from most well water by aeration.
Tannin and Lignin				Tannin and lignin are part of a natural group of organic substances in soil, produced by decaying vegetation. Tannin and lignin can impart a yellow or light brown colour, bitter taste, and unpleasant odour in drinking water. The characteristics of iron, iron bacteria, and humic substances can be very similar in drinking water. It is important to determine which of these is causing water problems, because the treatment options are very different. Chlorine can be used to treat iron and iron bacteria, but chlorine added to water containing humic substances may contribute to the formation of Trihalomethanes (THMs).
Total Dissolved Solids	500	mg/L	AO	The term "total dissolved solids" (TDS) refers mainly to the inorganic substances dissolved in water. The principal constituents of TDS are chloride, sulphates, calcium, magnesium and bicarbonates. The effects of TDS on drinking water quality depend on

				the levels of the individual components. Excessive hardness, taste, mineral deposition or corrosion are common properties of highly mineralized water. The palatability of drinking water with a TDS level less than 500 mg/L is generally considered to be good.
Uranium	0.02	mg/L	MAC	Uranium is normally present in biological systems and aqueous media as the uranyl ion (UO22+). Ingestion of large quantities of uranyl ion may result in damage to the kidneys. The uranyl ion may also be responsible for objectionable taste and colour in water, at much higher levels than the concentrations which may cause kidney damage.
Zinc	5.0	mg/L	AO	The concentration of naturally occurring zinc in drinking water is normally very low, however it may be considerably higher at the consumer's tap in standing water because of corrosion taking place in galvanized pipes, hot water tanks and plumbing fixtures, but this can be cleared easily by brief flushing.

Volatile Organic Compounds (VOCs)

Parameter	Limit	Units	Type	Description
Benzene	0.005	mg/L	MAC	Benzene is present in small amounts in gasoline and other refined petroleum products. Long term exposure to high levels of benzene has been shown to increase cancer risk. Benzene is reported to occur in vehicle emissions and cigarette smoke. Drinking water is not considered a significant source of benzene because objectionable taste and odour discourages consumption
Bromodichloromethane				A component of the group Trihalomethanes. Refer to Trihalomethanes.
Bromoform				A component of the group Trihalomethanes. Refer to Trihalomethanes.
Chloroform				A component of the group Trihalomethanes. Refer to Trihalomethanes.
Dibromochloromethane				A component of the group Trihalomethanes. Refer to Trihalomethanes.
Trihalomethanes	0.100	mg/L	MAC	Trihalomethanes are a group of compounds that can form when the chlorine used to disinfect drinking water reacts with naturally occurring organic matter (e.g., decaying leaves and vegetation).The maximum acceptable concentration (MAC) for

				Trihalomethanes (THMs) in drinking water is 0.10 mg/L based on a four quarter moving annual average of test results. Trihalomethanes are the most widely occurring synthetic organics found in chlorinated drinking water. The four most commonly detected Trihalomethanes in drinking water are chloroform, Bromodichloromethane, Dibromochloromethane and Bromoform.
Carbon Tetrachloride	0.005	mg/L	MAC	Historically carbon tetrachloride was used in chemical production, cleaning fluids, degreasers, fire extinguishers and as a solvent for many materials. Its use in Canada was phased out in 1996. Its occurrence in ground water is due to soil contamination and leaching into the water.
Chlorobenzene	0.080	mg/L	MAC	Chlorobenzene is used in the production of chloronitrobenzene and diphenyl ether, as a rubber intermediate, and as a solvent in adhesives, paints, waxes, polishes and inert solvents. It is also used in metal cleaning operations and may be present in industrial discharges. Chlorobenzene is classed as possibly carcinogen.
1,2-Dichlorobenzene	0.200	mg/L	MAC	Although health effects from 1,2-dichlorobenzene are negligible below 0.2 mg/L, it does impart an unpleasant taste to water if present above 0.003 mg/L. It is used in a variety of specialty chemical blends (degreasing agents, imported dye carriers).
1,4-Dichlorobenzene	0.005	mg/L	MAC	Dichlorobenzene is a persistent synthetic material with a strong “medicinal” smell. It has been used widely in toilet pucks and mothballs. At levels above the aesthetic objective of 0.001 mg/L, 1,4-dichlorobenzene imparts an unpleasant taste to the water.
1,2-Dichloroethane	0.005	mg/L	MAC	It is principally used as a starting material in the production of vinyl chloride, as a solvent and a fumigant. It is released into the environment via atmospheric emissions and the discharge of industrial waste waters. 1,2-dichlroethane is listed as probably carcinogenic.
1,1-Dichloroethylene	0.014	mg/L	MAC	This chemical is not produced in Canada, however it is imported for use in the food packaging industry and the textile industry for furniture and automotive upholstery, drapery fabric and outdoor furniture. It is fairly soluble in water and can be present in water due to the breakdown of other organic chemicals.
Ethylbenzene	0.0024	mg/L	AO	Ethylbenzene is a component of the BTEX gasoline additive used for octane rating boosting and its presence is typically due to gasoline or fuel contamination. It is also

				used in solvent based paint formulations.
Methylene Chloride (Dichloromethane)	0.050	mg/L	MAC	Methylene chloride is an alternative name for dichloromethane. It is used extensively as an industrial solvent for paint-stripping and as a degreasing agent.
Tetrachloroethylene	0.030	mg/L	MAC	Tetrachloroethylene is no longer produced in Canada but continues to be imported primarily as a solvent for the dry cleaning and metal cleaning industries. It has been found in ground water, primarily after improper disposal or dumping of cleaning solvents.
Toluene	0.024	mg/L	AO	Toluene is used in gasoline and other petroleum products and in the manufacture of benzene derived medicines, dyes, paints, coating gums, resins and rubber. It may be found in industrial effluents.
Trichloroethylene	0.005	mg/L	MAC	Most trichloroethylene use is in dry cleaning. Some is used in metal degreasing operations and in Tetrachloroethylene production. Trichloroethylene may be introduced into surface and ground water through industrial spills and illegal disposal of effluents.
Vinyl Chloride	0.002	mg/L	MAC	Vinyl chloride is a synthetic chemical with no known natural sources. It is classified as a human carcinogen. It is used in making PVC (polyvinyl chloride) plastic items such as water main pipe, siding and many other common plastic items all of which are now made in such a way that there is no trace of vinyl chloride present in them.
m,p-Xylenes				Refer to Xylenes, Total
o-Xylene				Refer to Xylenes, Total
Xylenes, Total	0.300	mg/L	AO	There are three isomers of dimethyl benzene, which are almost identical chemically and are collectively called xylenes. The odour related aesthetic objective for total xylenes in drinking water is 0.3 mg/L. Xylenes are used as industrial solvents and as an intermediate for dyes and organic synthesis. They are a component of household paints and paint cleaners and gasoline and other petroleum products.