



Water Resources
Management
Division

Department of
Municipal Affairs
and Environment

Guidelines for Canadian Drinking Water Quality Update

Department of Municipal Affairs
and Environment

Water Resources Management Division

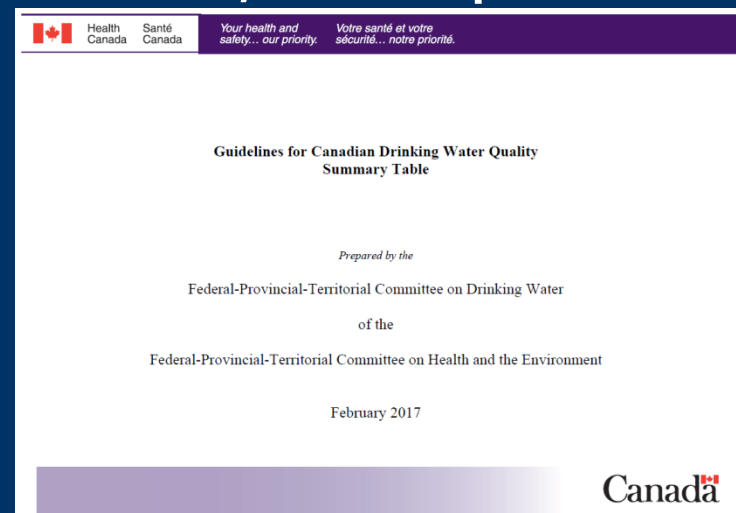
March 26, 2019

Guidelines for Drinking Water Quality

- Established by the Federal-Provincial-Territorial Committee on Drinking Water and published by Health Canada
- Established based on current, published scientific research related to health effects, aesthetic effects, and operational considerations.

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Types of Drinking Water Guidelines

- Maximum Acceptable Concentration (MAC)
 - Substances that are known or suspected to cause adverse effects on the health of some people when present in concentrations greater than the established MAC. Each MAC has been derived to safeguard health assuming lifelong consumption of drinking water containing the substance at that concentration.

Types of Drinking Water Guidelines

- Aesthetic Objectives (AO)
 - substances or characteristics of drinking water that can affect its acceptance by consumers but which usually do not pose any health effects.
- Operation Guidance Value (OG)
 - For use by water operators to assist in the effective use of treatment systems.
 - The only OG is aluminum and is only applicable to system with water treatment plants.

When are Guidelines Established?

Sample Date	Ammonia	DOC	Nitrate(ite)	Kjeldahl Nitrogen	Total Phosphorus	Aluminum	Antimony	Arsenic	Barium	Cadmium
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality			10				0.005	0.01	1.0	0.005
Aesthetic(A) Parameter or Contaminant (C)			C				C	C	C	C

- Exposure to the contaminant could lead to adverse health effects in humans
- The contaminant is frequently detected or could be expected to be found in a large number of drinking water supplies throughout Canada
- The contaminant is detected, or could be expected to be detected, in drinking water at a level that is possible human health significance

Development of Guidelines

- **MAC:** established on the basis of comprehensive review of the known health effects associated with each contaminant, on exposure levels and on the availability of treatment and analytical techniques.
- **AO:** established when they play a role in determining whether consumers will consider the water drinkable.
- **OG:** established when the presence of a substance may interfere with or impair a treatment process of technology or adversely affect drinking water infrastructure.

Why Update Guidelines?

- New information
- New studies

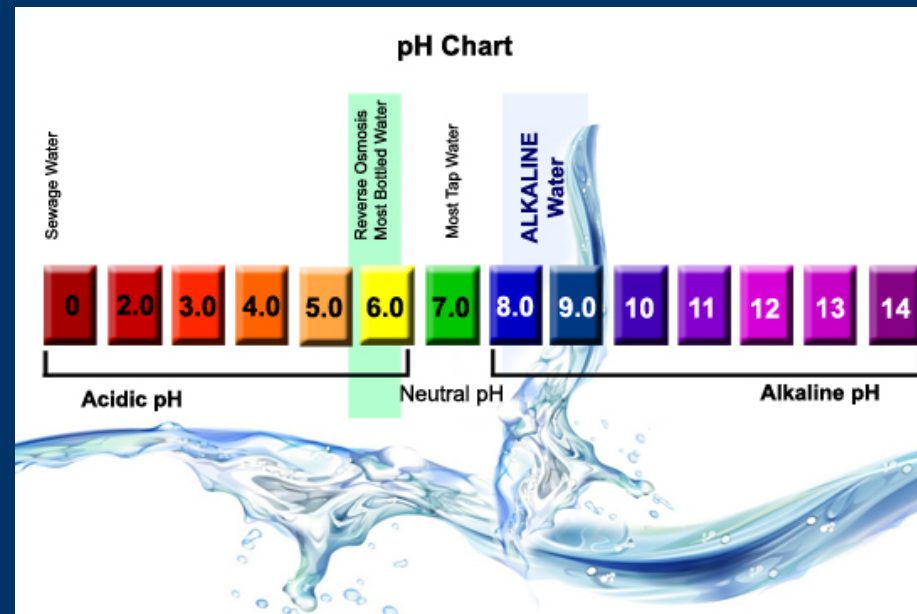
Relevant Changes to Guidelines for NL

- pH
- Lead
- Manganese



pH

- Measure of the acidity/basicity of water.
- Control of pH is critical for water treatment and distribution system processes.



pH Guideline

- Old: 6.5-8.5
- New: 7.0-10.5
- Current NL: 6.5-10.5

Corrective Measures - pH

- pH adjustment system
 - There are currently 57 pH adjustment systems in NL
- Switch from gas chlorination to hypo-chlorination if appropriate

Lead

- Lead is usually found in drinking water as a result of leaching from distribution and plumbing system components.
- Occasionally, lead is naturally occurring in groundwater supplies.



Lead Guideline

- Existing: MAC = 0.01 mg/L
- New: MAC = 0.005 mg/L
- New guideline is based on the controlling of corrosion in distribution and treatment systems.

NL Lead Assessment

- Used historical tap data for assessment
- Communities with lead MAC exceedances were broken down into five categories:

Tier 1	Regular exceedances with averages above the MAC (>0.005 mg/L)
Tier 2	Semi-regular exceedances with averages close to the MAC (0.004-0.005 mg/L)
Tier 3	Semi-regular exceedances with averages close to the MAC (0.003-0.039 mg/L)
Tier 4	Occasional exceedances with averages close to the MAC (0.002-0.029 mg/L)
Tier 5	Less than four exceedances with average below the MAC (<0.002 mg/L)

NL Lead Assessment

Tier 1	3 water supplies	Two surface water supplies. One groundwater supply that has naturally occurring lead.
Tier 2	9 water supplies	Majority of surface water supplies which service a range of populations.
Tier 3	10 water supplies	Majority of surface water supplies which service a range of populations.
Tier 4	25 water supplies	Majority of surface water supplies which service a range of populations.
Tier 5	72 water supplies	Majority of surface water supplies which service a range of populations.

Corrective Measures - Lead

- Removal of lead components in the distribution system
- pH adjustment system
- Corrosion inhibitor addition
- Lead removal system
 - Only for naturally occurring lead

Manganese

- Manganese occurs naturally in the environment in both surface water and groundwater supplies.



Manganese Guideline

- Existing: **AO = 0.05 mg/L**
 - Based on taste and staining of laundry and plumbing fixtures
- Proposed: **MAC = 0.12 mg/L**
 - Based on health effects in infants but is intended to protect all Canadians

AO = 0.02 mg/L

- Intended to minimize the occurrence of discolored water complaints and to improve consumer confidence in drinking water quality

NL Manganese Assessment

- Used historical tap data for assessment
- Communities with manganese MAC exceedances were broken down into three categories:

Tier 1	Regular exceedances with averages above the MAC
Tier 2	Semi-regular exceedances with averages close to the MAC
Tier 3	A minimum of one exceedance of the MAC with averages below the MAC

NL Manganese Assessment

Tier 1	14 water supplies	Majority are groundwater systems which service very small populations.
Tier 2	11 water supplies	Both surface water and groundwater supplies which service a range of populations.
Tier 3	94 water supplies	Both surface water and groundwater supplies which service a range of populations.

- The proposed aesthetic guideline approximately doubles the number of exceedances.

Corrective Measures - Mn

- Manganese removal systems
 - Often used in conjunction with iron removal
- Currently 6 manganese removal systems in NL
- Current system removal effectiveness ranges from 49% to 100% removal of manganese

Corrective Measures - Mn

- Two common forms of Mn:
 - Mn (II) – dissolved
 - Mn (IV) – particulate

- Mn removal systems are selected based on the type of Mn present.

Corrective Measures - Mn

- A special sampling study was conducted to determine the type of Mn present in NL.
- Water supplies in Tier 1 and Tier 2 were selected.
- 23 water supplies tested for Mn speciation:
 - 20 were identified as Mn (II) – 87%
 - 3 were identified as Mn (IV) – 13%

Corrective Measures - Mn

- Oxidation/Filtration
 - Oxidation changes Mn(II) to Mn (IV)
 - Potassium permanganate, ozone, chlorine

- Oxidation/Adsorption
 - Manganese oxide coated filter media adsorbs Mn (II) and retains it in the filter bed.
 - Manganese greensand, dioxide coated sand, dioxide ore

Corrective Measures - Mn

- Biological Filtration
 - Manganese-oxidizing bacteria in the biofilm that forms on the filter media
 - Aeration and $\text{pH}=7.5$ is required
 - Most suitable for groundwater supplies

- Ion Exchange
 - Typically used as a water softener
 - Removal of cations and anions
 - Mn (II) is a dissolved cation and is retained on the media

Path Forward

- Continue to monitor the progress of proposed new guidelines on the national level.
- Assess proposed guidelines and how they impact the water supplies in NL.
- Provide materials and guidance to communities to communicate any new guidelines that may impact NL water supplies.

Thank you!



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