Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Manganese

-The maximum acceptable concentration (MAC) for total manganese in drinking water is 0.12 mg/L (120 µg/L). The aesthetic objective (AO) for total manganese in drinking water is 0.02 mg/L (20 µg/L).

-Manganese occurs naturally in the environment and is widely distributed in air, water and soil. It is not found in the elemental form in the environment but can exist in several oxidation states. Manganese may be present in water in the environment from natural sources (rock and soil weathering) or as a result of human activities (such as mining, industrial discharges and landfill leaching). It is used in various industries, including in the steel industry, in the manufacture of various products (e.g., fireworks, dry-cell batteries, fertilizers, fungicides and cosmetics and paints). Manganese may also be added to water as an oxidizing agent (permanganate) or as an impurity in coagulants used in the treatment of drinking water.

-This guideline technical document reviews and assesses all identified health risks associated with manganese in drinking water. It incorporates new studies and approaches and takes into consideration the availability of appropriate treatment technology. Based on this review, the drinking water guideline for manganese is a maximum acceptable concentration (MAC) of 0.12 mg/L (120 µg/L), based on infants, the most sensitive population. Although the MAC established in this document is based on infants, this value is intended to protect all Canadians.

-Manganese is an essential element for humans. Deficiency is considered unlikely in Canada, as adequate amounts are obtained from food. A non-cancer endpoint was chosen for this assessment as available studies are not adequate to support a link between manganese and cancer. Some studies in humans suggest an association between manganese in drinking water and neurological effects in children; however, they can only be used to support the choice of the key health effect. The effects observed in children are consistent with the neurological effects reported in the key animal studies used to establish the MAC.

-Concerns regarding the presence of manganese in drinking water are often related to consumer complaints regarding discoloured water. The aesthetic objective (AO) of 0.02 mg/L (20 µg/L) is intended to minimize the occurrence of discoloured water complaints based on the presence of manganese oxides and to improve consumer confidence in drinking water quality.

-Manganese occurs naturally and is widely distributed in the environment. Canadians can be exposed to manganese through its presence in air, food, consumer products, soil and drinking water, with food being the main source of exposure. However, manganese is more readily absorbed from drinking water than when it is ingested with food. Levels of manganese in fresh water in Canada are usually below 0.1 mg/L, with some spikes reaching into the milligrams per litre range. Higher levels can occur under acidic or reducing conditions that are found in groundwater and some lakes and reservoirs as well as due to industrial discharges. Manganese is generally more prevalent in groundwaters than in surface waters. Intake of manganese from drinking water is not expected through either skin contact or inhalation.