groundwater or lakes. However, depending on the pH and the dissolved oxygen content of the water, a combination of dissolved and particulate manganese can be present. In general, treatment methods used for manganese rely on a combination of processes (e.g. oxidation, adsorption, filtration) to remove both the dissolved and particulate forms. At the point of use, reverse osmosis is the most effective and reliable treatment technology; however, point-of-use units using ion exchange media are also moderately effective. To reduce water discoloration and staining of laundry and fixtures, ion exchange and greensand filtration with careful operation and maintenance can be used at the point of entry.

Low levels of manganese in source or treated water can accumulate in the distribution system. Periodic release of manganese can then occur, resulting in high levels at the tap. Releases can occur as a result of physical or hydraulic disturbances to the system (e.g. mains breaks, hydrant flushing) or changes in water chemistry (e.g. changes in pH, temperature, chlorine residual, source water type/blending). Physical and hydraulic disturbances most often release particulate manganese and can cause discoloured water and consumer complaints. Chemical releases can go unnoticed if manganese occurs predominantly in the dissolved form. Other contaminants (e.g. arsenic, barium, chromium, lead, uranium) that deposit with manganese oxides in the distribution system may also be released into the water and reach consumers' taps. Control measures to minimize manganese release events include maintaining stable water chemistry and minimizing manganese levels entering the distribution system, the amount of manganese oxide deposits in the distribution system (through best practices for water mains cleaning), and physical or hydraulic disturbances.

MCPA

MCPA is a phenoxyacetic acid herbicide that is found in various formulations: as the free acid (CAS No. 94-74-6), as a dimethylamine salt (CAS No. 2039-46-5), as a sodium salt (CAS No. 3653-48-3) and as a 2-ethylhexyl ester (CAS No. 29450-45-1). It is a post-emergence herbicide that is widely used against broadleaf weeds in agriculture and horticulture and on grassland and lawns. All forms of MCPA will dissociate in water to the acid (anion) form. MCPA is highly soluble in water. Biological degradation is an important process in determining MCPA's environmental fate. Chlorophenols and chlorocresols are potential soil metabolites and may, if present in water, give rise to unacceptable tastes. Surface water may be contaminated via spray drift and runoff, whereas groundwater may be contaminated via leaching from soil. Exposure from food is likely to be low.

Reason for not establishing a guideline value	Occurs in drinking-water or drinking-water sources at concentrations well below those of health concern
Health-based value*	0.7 mg/l
Acute health-based value**	20 mg/l
Occurrence	Concentrations in surface water usually less than 1 μg/l; concentrations in drinking-water usually below 0.1 μg/l

ADI	0–0.1 mg/kg bw for MCPA ion, based on an overall NOAEL of 12 mg/kg bw per day for changes in clinical chemistry parameters indicative of effects on the kidneys from four subchronic studies in rats and application of a safety factor of 100 ADI established for the sum of MCPA and its salts and esters, expressed as MCPA acid equivalents
ARfD	0.6 mg/kg bw for MCPA ion, based on the overall NOAEL of 60 mg/kg bw for maternal and developmental toxicity in rats and application of a safety factor of 100 ARfD established for the sum of MCPA and its salts and esters, expressed as MCPA acid equivalents
Limit of detection	0.8 µg/L using HPLC with a photodiode array UV detector; 0.09 µg/l using derivatization and GC with ECD; limit of quantification of 0.0005 µg/l for LC-MS/MS
Treatment performance	Conventional treatment not effective; activated carbon adsorption and/or ozonation and advanced oxidation processes (e.g. UV with hydrogen peroxide) are effective; membrane filtration processes (e.g. reverse osmosis) may be effective
Health-based value derivation	
• allocation to water	20% of upper bound of unrounded ADI (0.12 mg/kg bw)
• weight	60 kg adult
• consumption	2 litres/day
Acute health-based value derivation	
• allocation to water	100% of ARfD
• weight	60 kg adult
• consumption	2 litres/day
Additional comments	The default allocation factor of 20% has been used to account for the fact that the available food exposure data, which suggest that exposure via this route is low, do not generally include information from developing countries, where exposure via this route may be higher.
	As a general principle, the concentration of pesticides in water, including MCPA, should be kept as low as possible and concentrations should not be allowed to increase up to the health-based value.
	Further guidance on interpreting the health-based value and deciding when to monitor can be found in section 8.5.3.
Assessment date	2016
Principal references	WHO (2013). *Pesticide residues in food – 2012 evaluations* WHO (2016). *MCPA in drinking-water*

* When a formal guideline value is not established, a "health-based value" may be determined in order to provide guidance to Member States when there is reason for local concern. Establishing a formal guideline value for such substances may encourage Member States to incorporate a value into their national standards when this may be unnecessary.

** For more information on acute health-based values, see section 8.7.5.

The target organs for the MCPA ion are the kidney, liver and blood. MCPA is not carcinogenic in mice or rats, and the MCPA ion exhibits no genotoxic potential. In multigeneration studies in rats, there was no evidence of reproductive toxicity up to the highest dose tested. The MCPA ion was not teratogenic in rats or rabbits.