



# Manganese

## Development of Rulemaking

### Small Water Systems Technical Assistance Center

August 8, 2019

# Manganese : Criteria Development

## CHAPTER 93. WATER QUALITY STANDARDS

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### WATER QUALITY CRITERIA

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TABLE 3

<i>Parameter</i>	<i>Symbol</i>	<i>Criteria</i>	<i>Critical Use*</i>
* * * * *			
Iron	Fe <sub>1</sub>	30-day average 1.5 mg/l as total recoverable.	CWF, WWF, TSF, MF
	Fe <sub>2</sub>	Maximum 0.3 mg/l as dissolved.	PWS
Manganese	Mn	Maximum 1.0 mg/l, as total recoverable.	PWS
Nitrite plus Nitrate	N	Maximum 10 mg/l as nitrogen.	PWS
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## CHAPTER 96. WATER QUALITY STANDARDS

### IMPLEMENTATION

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#### § 96.3. Water quality protection requirements.

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(d) As an exception to subsection (c), the water quality criteria for total dissolved solids, nitrite-nitrate nitrogen, phenolics, chloride, sulfate, **manganese** and fluoride established for the protection of potable water supply shall be met at least 99% of the time at the point of all existing or planned surface potable water supply withdrawals unless otherwise specified in this title.

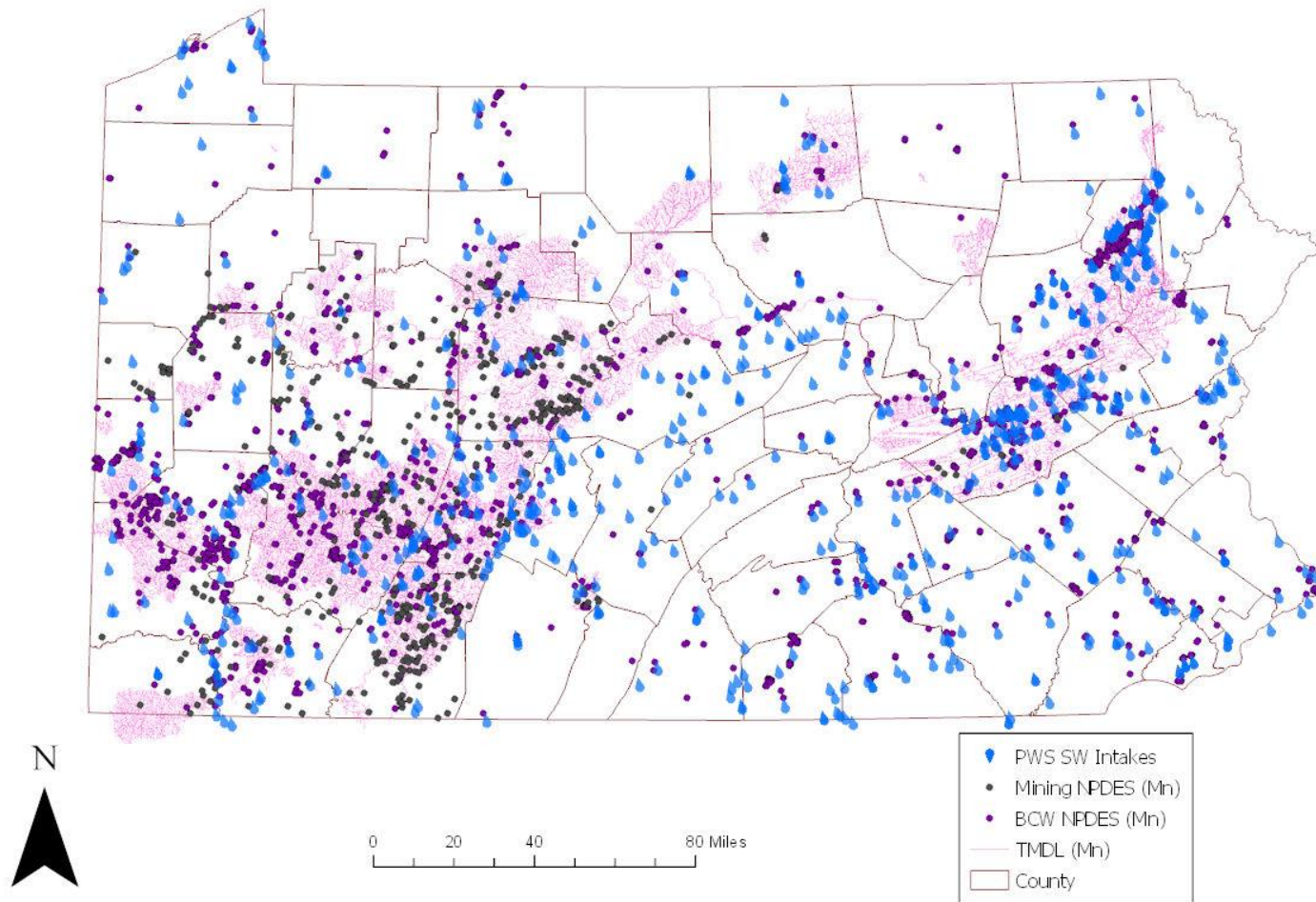
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Impacts to Public Drinking Water Suppliers – facilities are able to remove Mn from source waters containing up to 1 mg/L to achieve the SMCL = 0.05 mg/L; **BUT** modifications will be necessary.

- Sequestration is an option for low Mn concentrations in source water
- Oxidation with chlorine → by-product issues
- Oxidation with  $\text{KMnO}_4$  → also problematic
- HABs are an additional complication – avoid lysing cells
- Removal & disposal of Mn by DW Suppliers = \$\$\$

## PWS Intakes, Statewide NPDES (Mn) and TMDLs (Mn)



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The proposed rule will include a request for comment on the adoption of a toxic substance criterion for manganese.

# Manganese : Criteria Development

## Development of Water Quality Criteria for Human Health Protection for Toxic Substances

### Chapter 93. Water Quality Standards

- § 93.6. *General water quality criteria.*
- § 93.8a. *Toxic substances.*
- § 93.8c. *Human health and aquatic life criteria for toxic substances*

### Chapter 16. Water Quality Toxics Management Strategy – Statement of Policy

- Threshold vs. Non-Threshold toxic effects
- § 16.32. *Threshold level toxic effects*

# Manganese : Criteria Development

## Development of Water Quality Criteria for Human Health Protection for Toxic Substances

Literature review included:

- animal toxicity studies (rats, mice, non-human primates)
- epidemiological studies
- epigenetic studies (human and animal)
- information on human dietary needs, exposure routes and sources, etc.

Many of the reference studies evaluated manganese exposure as it relates to developmental neurotoxicity. The studies and data generally support the continued need for an IRIS reference dose.

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$$AWQC_{Mn} = RfD_w \times RSC \times (BW \div [DWI + (FI \times BAF)])$$

$AWQC_{Mn}$  - Ambient Water Quality Criteria for Manganese

$RfD_w$  (Reference Dose – Water) = 0.05 mg/kg-day

$RSC$  (Relative Source Contribution) = 0.2

$BW$  (Body Weight) = 80 kg

$DWI$  (Drinking Water Intake) = 2.4 L

$FI$  (Fish Intake) = 0.022 kg/day

$BAF$  (Bioaccumulation Factor) = 1

$AWQC_{Mn} = 0.05 \text{ mg/kg-day} \times 0.2 \times (80 \div [2.4 + (0.022 \text{ kg/day} \times 1)])$

$$AWQC_{Mn} = 0.3 \text{ mg/L} = 300 \text{ } \mu\text{g/L}$$



# Manganese : Criteria Development

## Outcome of WRAC July 25

WRAC proposed the following motion:

1. To acknowledge the legislative requirement in Act 40 of 2017 to propose a regulation moving the point of compliance for manganese to the point of all existing or planned surface potable water supply withdrawals; AND
2. To support proposing a regulation either through the Annex or by discussion in the Preamble (whichever is the most legally appropriate) that adds manganese to Table 5 in section 93.8c as a toxic substance for human health at the level of 0.3 mg/L. The compliance point for this standard will be met in all surface waters, as described in section 96.3(c); AND
3. To recommend that the EQB request public comment on this combined approach for consideration in developing a final regulation.



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DEPARTMENT OF ENVIRONMENTAL  
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# Questions?

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