

Maximum Contaminant Levels, Maximum Residual Disinfectant Levels, and Treatment Technique Requirements

The Pennsylvania Department of Environmental Protection (DEP) Bureau of Safe Drinking Water created this fact sheet to aid interested parties in knowing the specific limits for all contaminants currently regulated in drinking water in Pennsylvania as well as the treatment techniques that are defined in Pennsylvania's Safe Drinking Water regulations, which are codified in Title 25, [Chapter 109](#) of the *Pennsylvania Code*. The contaminants are organized by contaminant groups, followed by the treatment technique requirements organized by source type and/or section they are contained in the regulation.

Pennsylvania's Safe Drinking Water regulations at 25 Pa. Code Chapter 109 define Maximum Contaminant Level (MCL), Maximum Residual Disinfectant Level (MRDL), and Treatment Technique (TT) as:

Maximum Contaminant Level (MCL): the maximum permissible level of a contaminant in water which is delivered to a user of a public water system and includes the primary and secondary MCLs established under the Federal Safe Drinking Water Act, and MCLs adopted under the act. For MCLs incorporated into this chapter by reference, the term refers to the numerical value and the means of determining compliance with that value and does not refer to the U.S. Environmental Protection Agency (EPA) applications to specific types of public water systems or sources.

Maximum Residual Disinfectant Level (MRDL): the maximum permissible level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap without an unacceptable possibility of adverse health effects. The consumer's tap means the entry point for bottled water and vended water systems, retail water facilities, and bulk water hauling systems.

Treatment Technique (TT): a requirement which specifies a specific treatment method known to cause a reduction in the level of a contaminant which cannot practically be regulated by establishing an MCL. The term includes treatment technique requirements established under the federal act, and treatment technique requirements adopted under the act.

The following units of measurements are used in this document:

mrem/yr	millirems/year	
mg/L	milligrams per liter	Equivalent of parts per million (ppm)
µg/L	micrograms per liter	Equivalent of parts per billion (ppb)
ng/L	nanograms per liter	Equivalent of parts per trillion (ppt)
pCi/L	picocuries per liter	
T.O.N.	threshold odor number	
NTU	nephelometric turbidity unit	
µm	micrometers	

PRIMARY CONTAMINANT MCLs

Disinfection Byproducts:

Total Trihalomethanes (TTHMs) (Bromodichloromethane, Bromoform, Chlorodibromomethane, and Chloroform)	0.080	mg/L
Haloacetic Acids (HAA5) (Bromoacetic acid, Chloroacetic acid, Dibromoacetic acid, Dichloroacetic acid, Trichloroacetic acid)	0.060	mg/L
Bromate	0.010	mg/L
Chlorite	1.0	mg/L

E. coli:

A system complies with the MCL for *E. coli* unless:

- The system has an *E. coli*-positive check sample following a total coliform-positive routine sample.
- The system has a total coliform-positive check sample following an *E. coli*-positive routine sample.
- The system fails to take all required check samples following an *E. coli*-positive routine sample.
- The system fails to test for *E. coli* when any check sample tests positive for total coliform.

Inorganic Chemicals (IOCs):

Antimony	0.006	mg/L	Cyanide (free CN)	0.2	mg/L
Arsenic	0.010	mg/L	Fluoride	2	mg/L
Asbestos (Fibers longer than 10 µm)	7 million	fibers/L	Lead*	0.005	mg/L
Barium	2	mg/L	Mercury	0.002	mg/L
Beryllium	0.004	mg/L	Nitrate (as Nitrogen)	10	mg/L
Cadmium	0.005	mg/L	Nitrite (as Nitrogen)	1	mg/L
Chromium (Total)	0.1	mg/L	Selenium	0.05	mg/L
Copper*	1.0	mg/L	Thallium	0.002	mg/L

* The lead and copper primary MCLs are applicable only to bottled, vended, retail, and bulk water hauling systems.

Synthetic Organic Chemicals (SOCs):

Alachlor	0.002	mg/L	Ethylene Dibromide (EDB)	0.00005	mg/L
Altrazine	0.003	mg/L	Glyphosate	0.7	mg/L
Benzo(a)pyrene (PAHs)	0.0002	mg/L	Heptachlor	0.0004	mg/L
Carbofuran	0.04	mg/L	Heptachlor epoxide	0.0002	mg/L
Chlordane	0.002	mg/L	Hexachlorobenzene	0.001	mg/L
2,4-D	0.07	mg/L	Hexachlorocyclopentadiene	0.05	mg/L
Dalapon	0.2	mg/L	Lindane	0.0002	mg/L
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	mg/L	Methoxychlor	0.04	mg/L
Di(2-ethylhexyl) adipate	0.4	mg/L	Oxamyl (Vydate)	0.2	mg/L
Di(2-ethylhexyl) (phthalate)	0.006	mg/L	PCBs (Polychlorinated biphenyls)	0.0005	mg/L
Dinoseb	0.007	mg/L	Pentachlorophenol	0.001	mg/L
Dioxin (2,3,7,8-TCDD)	0.00000003	mg/L	Picloram	0.5	mg/L
Diquat	0.02	mg/L	Simazine	0.004	mg/L
Endothall	0.1	mg/L	Toxaphene	0.003	mg/L
Endrin	0.002	mg/L	2,4,5-TP (Silvex)	0.05	mg/L

Per- and Polyfluoroalkyl Substances (PFAS):

Perfluorooctanoic acid (PFOA)	14	ng/L	Perfluorooctanesulfonic acid (PFOS)	18	ng/L
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Volatile Organic Chemicals (VOCs):

Benzene	0.005	mg/L	Ethylbenzene	0.7	mg/L
Carbon Tetrachloride	0.005	mg/L	Styrene	0.1	mg/L
Chlorobenzene	0.1	mg/L	Tetrachloroethylene	0.005	mg/L
o-Dichlorobenzene	0.6	mg/L	Toluene	1	mg/L
p-Dichlorobenzene	0.075	mg/L	1,2,4-Trichlorobenzene	0.07	mg/L
1,2-Dichloroethane	0.005	mg/L	1,1,1-Trichloroethane	0.2	mg/L
1,1-Dichloroethylene	0.007	mg/L	1,1,2-Trichloroethane	0.005	mg/L
cis-1,2-Dichloroethylene	0.07	mg/L	Trichloroethylene	0.005	mg/L
trans-1,2-Dichloroethylene	0.1	mg/L	Vinyl chloride	0.002	mg/L
Dichloromethane	0.005	mg/L	Xylenes (total)	10	mg/L
1,2-Dichloropropane	0.005	mg/L			

Radionuclides:

Beta Particles and photon emitters	4	millirems/year	Radium 226 and Radium 228 (combined)	5	pCi/L
Gross Alpha* (Alpha Particles)	15	pCi/L	Uranium	30	µg/L

* Gross Alpha MCL excludes Radon and Uranium particle activity.

SECONDARY CONTAMINANTS MCLs

Aluminum	0.2	mg/L	Odor	3	T.O.N.
Chloride	250	mg/L	pH*	6.5–8.5	
Color	15	color units	Silver	0.1	mg/L
Corrosivity	Non-corrosive		Sulfate	250	mg/L
Foaming Agents	0.5	mg/L	Total Dissolved Solids	500	mg/L
Iron	0.3	mg/L	Zinc	5	mg/L
Manganese	0.05	mg/L			

* The pH MCL represents a "reasonable goal for drinking water quality."

MRDLs

Chlorine (as Cl ₂)	4.0	mg/L	Chlorine Dioxide (as ClO ₂)	0.8	mg/L
Chloramines (as Cl ₂)	4.0	mg/L			

TREATMENT TECHNIQUE REQUIREMENTS

Surface Water and Groundwater Under the Direct Influence of Surface Water (GUDI)

All Filtration Types Shall Provide Continuous Filtration and Disinfection

Log Removal and Inactivation for Giardia, Viruses, and Cryptosporidium

- For *Giardia lamblia* cysts, provide at least 99.9% (3.0-log) removal and inactivation.
- For enteric viruses, provide at least 99.99% (4.0-log) removal and inactivation. Unless a facility is awarded removal credit for viruses through a permit, 4.0-log inactivation must be provided.
- For *Cryptosporidium* oocysts, **Bin 1** sources as determined by source water monitoring conducted in accordance with requirements of the Long-Term 2 Enhanced Surface Water Treatment Rule provide:
 - At least 99% (2-log) removal of *Cryptosporidium* oocysts.
- For *Cryptosporidium* oocysts, **Bin 2** sources as determined by source water monitoring conducted in accordance with requirements of the Long-Term 2 Enhanced Surface Water Treatment Rule provide at least 99% (2-log) removal of *Cryptosporidium* oocysts and:
 - 1-log additional treatment at facilities using conventional, slow sand, or diatomaceous earth filtration.
 - 1.5-log additional treatment at facilities using direct filtration.
 - Additional treatment as determined by the DEP for a total of 4.0-log removal and inactivation for alternative filtration technologies.
- For *Cryptosporidium* oocysts, **Bin 3** sources as determined by source water monitoring conducted in accordance with requirements of the Long-Term 2 Enhanced Surface Water Treatment Rule provide at least 99% (2-log) removal of *Cryptosporidium* oocysts and:
 - 2-log additional treatment at facilities using conventional, slow sand, or diatomaceous earth filtration.
 - 2.5-log additional treatment at facilities using direct filtration.
 - Additional treatment as determined by DEP for a total of 5.0-log removal and inactivation for alternative filtration technologies.
- For *Cryptosporidium* oocysts, **Bin 4** sources as determined by source water monitoring conducted in accordance with requirements of the Long-Term 2 Enhanced Surface Water Treatment Rule provide at least 99% (2-log) removal of *Cryptosporidium* oocysts and:
 - 2.5-log additional treatment at facilities using conventional, slow sand, or diatomaceous earth filtration.
 - 3-log additional treatment at facilities using direct filtration.
 - Additional treatment as determined by DEP for a total of 5.5-log removal and inactivation for alternative filtration technologies.

Bin Classification Reporting

Failure to report the Bin classification to DEP for approval within six months after completing the source water monitoring is a treatment technique violation.

Inactivation Requirements

The combined total effect of the disinfection processes used in a filtration plant shall achieve **at least 1.0-log (90%) and 3.0-log (99.9%) inactivation of Giardia cysts and viruses respectively** and the disinfectant residual concentration in the water delivered to the distribution system shall **not be less than 0.20 mg/L**. The log inactivation shall be calculated at least once per day during expected peak hourly flow.

- Failure to achieve the minimum log inactivation for more than four hours constitutes a breakdown in treatment and is a treatment technique violation.
- Failure to maintain the minimum entry point residual for more than four hours is a treatment technique violation.
- Log inactivation for *Giardia* shall be calculated whenever the residual disinfectant concentration at the entry point falls below the minimum specified value and continue to be calculated every four hours until the residual disinfectant concentration at the entry point is at or above the minimum value.

Turbidity Performance Standards

- For public water systems using surface water or GUDI sources and using any conventional or direct filtration, the **combined filter effluent turbidity shall not exceed 0.3 NTU in 95% of the monthly samples and 1 NTU at any time**.
- For public water systems using surface water or GUDI sources and using slow sand filtration or diatomaceous earth filtration, the **combined filter effluent turbidity shall not exceed 1.0 NTU in 95% of the monthly samples and 2.0 NTU at any time**.
- For public water systems using surface water or GUDI sources and using membrane filtration, the **combined filter effluent turbidity shall not exceed 0.15 NTU in 95% of the monthly samples and 1 NTU at any time**.

Recycling of Waste Stream

Public water systems that use surface water and GUDI sources and provide conventional filtration or direct filtration treatment and recycle spent filter backwash water, thickener supernatant, or liquids from dewatering processes shall return these recycled flows through the processes of the system's existing conventional or direct filtration system.

Enhanced Coagulation/Enhanced Softening

Public water systems that use surface water and GUDI sources and use conventional filtration treatment shall provide enhanced coagulation or enhanced softening to improve removal (optimize treatment) of disinfection byproduct precursors as measured by total organic carbon (TOC). A certain percentage of the TOC must be removed from the source water unless the system meets alternative compliance criteria. The required TOC removal percentage is based on the source water levels of the TOC and alkalinity. The alternative compliance criteria include source TOC levels, treated TOC levels, disinfection byproduct levels (TTHMs and HAA5s), specific ultraviolet (UV) light absorption levels, alkalinity levels and magnesium removal levels.

The TOC removal requirements are as follows:

Source Water TOC (mg/L)	Source Water Alkalinity (mg/L)		
	0 to 60	> 60 to 120	> 120
> 2.0 to 4.0	35.0%	25.0%	15.0%
> 4.0 to 8.0	45.0%	35.0%	25.0%
> 8.0	50.0%	40.0%	30.0%

The following alternative compliance criteria can be applied if the removal requirements are not met:

1. Source water TOC is less than 2.0 mg/L,
2. Treated water TOC is less than 2.0 mg/L,
3. The following three running annual averages (RAA) are met:
 - a. The source water TOC is 4.0 mg/L or less,
 - b. The source alkalinity is greater than 60 mg/L,
 - c. Distribution system TTHMs are 0.040 mg/L or less **and** HAA5s are 0.030 mg/L or less,
4. TTHM levels are 0.040 mg/L or less and HAA5 levels are 0.030 mg/L and the water system uses only chlorine for primary and residual disinfection,
5. Source water SUVA (Specific Ultraviolet Absorbance) values are 2.0 L/mg-m or less, as a RAA,
6. Finished water SUVA values are 2.0 L/mg-m or less, as a RAA,

Ground Water Sources

- Community water systems shall provide **continuous disinfection** of groundwater sources not under the direct influence of surface water.
 - Maintain at each groundwater entry point a residual disinfectant concentration no less than 0.40 mg/L free chlorine or other minimum approved by DEP.
 - Non-transient noncommunity and transient noncommunity systems that demonstrate 4.0-log disinfection shall maintain their DEP approved minimum residual at the entry point.

All Systems Specified in the Treatment Technique Description

Acrylamide and Epichlorohydrin

Public water systems using chemicals containing Acrylamide and/or Epichlorohydrin in the water treatment process shall certify that the following specified levels have not been exceeded.

- Acrylamide = 0.05% dosed at 1 mg/L (or equivalent)
- Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

Distribution Disinfectant Residuals

A water system using a chemical disinfectant shall maintain a minimum residual disinfectant concentration throughout the distribution system of at least 0.2 mg/L (or another level approved by DEP for systems using an alternate oxidizing disinfectant treatment). Applies to all community water systems as well as non-transient noncommunity water systems that use a chemical disinfectant and transient noncommunity water systems that have installed 4-log treatment. Failure to do so results in a treatment technique violation.

- Free chlorine for systems using chlorine.
- Total chlorine for systems using chloramines.
- Both free and total chlorine for sampling locations in a mixing zone.
- Both free and total chlorine when a system using chloramines is conducting a free chlorine burn.
 - For a system collecting less than 40 samples per month and uses only groundwater sources, the treatment technique is met when no more than one sample collected per month is less than the minimum level for two consecutive months.

- For a system that collects 40 or more samples per month or that uses surface water or GUDI sources, the treatment technique is met when no more than 5% of the samples collected per month are less than the minimum level for two consecutive months.
- A water supplier that fails to meet the minimum level at any sample location for two consecutive months shall conduct a distribution system investigation within 60 days.

Optimal Corrosion Control Treatment for Lead and Copper

Community and non-transient noncommunity water systems shall provide **optimal corrosion control treatment (OCCT)** which minimizes the lead and copper concentrations at the user's tap while ensuring the treatment does not cause the system to violate a Primary Maximum Contaminant Level (PMCL).

- A **small** (< 3,300 population served) **or medium** (3,301 to 50,000 population served) **water system** is deemed to have optimized corrosion control treatment if the system does not exceed either the action level of 0.015 mg/L for lead or the action level of 1.3 mg/L for copper during each of two consecutive 6-month monitoring periods.
- A **water system** is deemed to have optimized corrosion control if the system demonstrates to DEP that for two consecutive 6-month monitoring periods that the system does not exceed the action level of 0.015 mg/L for lead or the action level of 1.3 mg/L for copper **and** the difference between the 90th percentile tap water **lead** level and the highest source water **lead** concentration is less than 0.005 mg/L
- A water system (large, medium or small) that installs new corrosion control facilities or modifies existing treatment facilities is deemed to have optimized corrosion control if the system operates the treatment facilities in compliance with water quality parameter performance requirements specified by DEP in a permit.

Revised Total Coliform Rule

Assessments

Failure of a public water system to conduct an assessment by the due date or complete a corrective action laid out in an assessment by the provided due date are considered treatment technique violations.

Seasonal Systems

A seasonal system that fails to complete the approved start-up procedure prior to serving water to the public incurs a treatment technique violation.

For more information, visit www.dep.pa.gov.