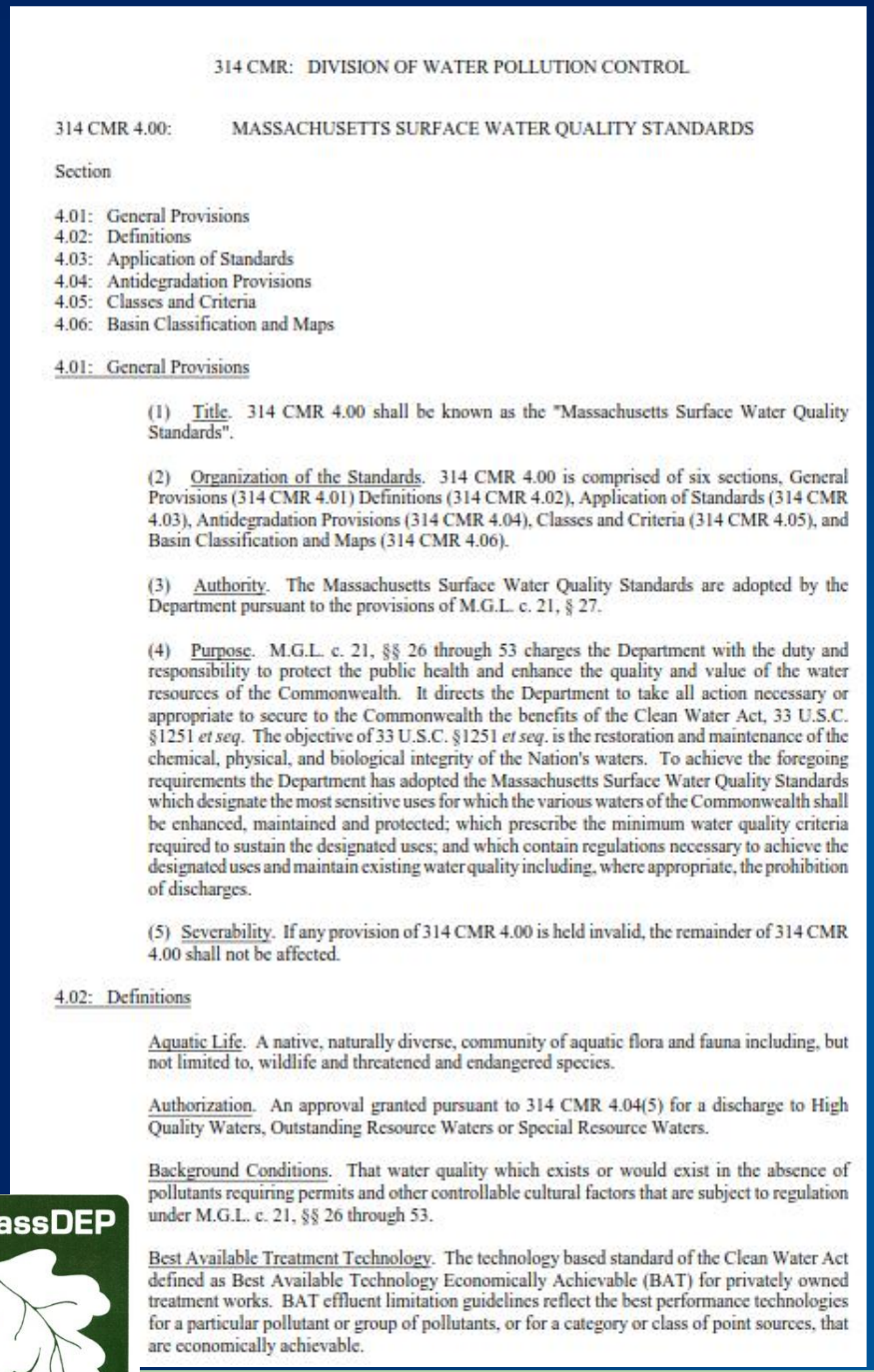


314 CMR: DIVISION OF WATER POLLUTION CONTROL

314 CMR 4.00: MASSACHUSETTS SURFACE WATER QUALITY STANDARDS

Section

4.01: General Provisions
4.02: Definitions
4.03: Application of Standards
4.04: Antidegradation Provisions
4.05: Classes and Criteria
4.06: Basin Classification and Maps

4.01: General Provisions

(1) Title. 314 CMR 4.00 shall be known as the "Massachusetts Surface Water Quality Standards".

(2) Organization of the Standards. 314 CMR 4.00 is comprised of six sections, General Provisions (314 CMR 4.01) Definitions (314 CMR 4.02), Application of Standards (314 CMR 4.03), Antidegradation Provisions (314 CMR 4.04), Classes and Criteria (314 CMR 4.05), and Basin Classification and Maps (314 CMR 4.06).

(3) Authority. The Massachusetts Surface Water Quality Standards are adopted by the Department pursuant to the provisions of M.G.L. c. 21, § 27.

(4) Purpose. M.G.L. c. 21, §§ 26 through 53 charges the Department with the duty and responsibility to protect the public health and enhance the quality and value of the water resources of the Commonwealth. It directs the Department to take all action necessary or appropriate to secure to the Commonwealth the benefits of the Clean Water Act, 33 U.S.C. §1251 *et seq*. The objective of 33 U.S.C. §1251 *et seq*. is the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters. To achieve the foregoing requirements the Department has adopted the Massachusetts Surface Water Quality Standards which designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected; which prescribe the minimum water quality criteria required to sustain the designated uses; and which contain regulations necessary to achieve the designated uses and maintain existing water quality including, where appropriate, the prohibition of discharges.

(5) Severability. If any provision of 314 CMR 4.00 is held invalid, the remainder of 314 CMR 4.00 shall not be affected.

4.02: Definitions

Aquatic Life. A native, naturally diverse, community of aquatic flora and fauna including, but not limited to, wildlife and threatened and endangered species.

Authorization. An approval granted pursuant to 314 CMR 4.04(5) for a discharge to High Quality Waters, Outstanding Resource Waters or Special Resource Waters.

Background Conditions. That water quality which exists or would exist in the absence of pollutants requiring permits and other controllable cultural factors that are subject to regulation under M.G.L. c. 21, §§ 26 through 53.

Best Available Treatment Technology. The technology based standard of the Clean Water Act defined as Best Available Technology Economically Achievable (BAT) for privately owned treatment works. BAT effluent limitation guidelines reflect the best performance technologies for a particular pollutant or group of pollutants, or for a category or class of point sources, that are economically achievable.

Final Revisions to 314 CMR 4.00: Massachusetts Surface Water Quality Standards (SWQS)

MassDEP
Bureau of Water Resources
Division of Watershed Management
Watershed Planning Program

www.Mass.Gov/DEP

MassDEP

Tables & Figures 1-27: Improve Clarity

- Modified overall format (including arranging basins alphabetically)
- Corrected spelling, boundary descriptions, missing information
- Added footnotes (definitions and explanations) to the tables
- Updated two coastal figures for consistency with major basin delineations in MassGIS
- Updated Combined Sewer Overflow and Public Water Supply qualifiers
- Added classes where surface water names were listed with a qualifier (e.g., Cold Water) but without a class
  - Note: only one substantive change was made to a surface water classification

MassDEP

Tables 1-27: Cold Water Designations

- The revisions added 153 *Cold Water* stream designations to Tables 1-27
- The Division of Fisheries and Wildlife (MassWildlife) has already designated these 153 streams as *Coldwater Fish Resource* (CFR)
- Adding these 153 stream designations will better align DEP's SWQS with MassWildlife's CFR designations

Table 28: Site-Specific (SS) Criteria

- In 2013, 15 copper and 1 zinc SS criteria were added, derived using EPA's Water Effect Ratio (WER) approach
  - EPA recently determined that the 15 copper SS criteria are not sufficiently protective
  - DEP removed these criteria from Table 28
  - DEP updated the zinc SS criteria based on EPA's technical review
- In 2006, 17 Cape Cod nitrogen SS criteria were added based on draft or preliminary TMDLs
  - The criteria were revised to reflect the final TMDLs

MassDEP

Key Revisions to SWQS Narrative Section

- General Provisions (314 CMR 4.01)
- Procedures for Sampling and Analyses (314 CMR 4.03(6))
- 401 Water Quality Certifications (314 CMR 4.03(7))
  - Federal rule finalized in 2020
- Toxic Pollutants (314 CMR 4.05(5)(e))
  - Naturally occurring background concentrations
  - New Table 29: Generally Applicable Criteria
  - Updates to model- and equation-based criteria

MassDEP

Key Revisions to SWQS Narrative Section

- Bacteria Criteria (314 CMR 4.05(5)(f))
  - Updated for consistency with EPA 2012
- Organoleptic Effect Criteria (314 CMR 4.05(5)(g))
  - Created a new Table 30
- Application of Criteria (314 CMR 4.05(6))
  - Determining Aquatic Life Criteria Applicability Where Fresh Water and Coastal and Marine Waters Mix

Bacteria Criteria (314 CMR 4.05(5)(f))

- In 2012, EPA released new recommended recreational bacteria criteria for the protection of human health
  - Minor change to the geometric mean criteria
  - Replaced a single-sample maximum value with a value not to be exceeded more than 10% of the time
- DEP coordinated with Department of Public Health (DPH) on the revisions
  - No changes to the criteria in DPH's regulation used to make determinations for beach closures
- DEP's criteria used to assess water quality for long-term recreational use

Bacteria Criteria (314 CMR 4.05(5)(f)) Geometric Mean

- **Geometric Mean:** DEP selected EPA's recommended criteria at an illness rate of 36 illnesses per 1,000 persons.
- The 5-sample minimum requirement in the SWQS is to be eliminated per EPA recommendation.

		Criteria (colony-forming units per 100 milliliters; cfu/mL)	
Bacterial Indicator	**Type of Water**	**Existing**	**New**
Enterococci*	Marine and Fresh Water	35 cfu/mL (marine) 33 cfu/mL (fresh)	35 cfu/mL
Escherichia coli (E. coli)	Fresh Water	126 cfu/mL	126 cfu/mL

*The enterococci change from 33 to 35 cfu/mL is not considered significant and will ensure consistency with EPA's 2012 guidance.

Bacteria Criteria (314 CMR 4.05(5)(f)) Averaging Period

- **Criteria calculation changes:** The time period over which the bacteria levels are averaged to compare to criteria will change in the SWQS revisions.

		Calculation of the Geometric Mean	
Type of Water	**Applicable Season**	**Existing**	**New* (no minimum sample requirement)**
Bathing Waters	Bathing Season	5 most recent samples taken over the bathing season	30-day or smaller interval
Bathing Waters	Non-Bathing Season	6-month averaging period with a minimum of 5 samples	90-day or smaller interval
All Other Waters	Entire Year	6-month averaging period with a minimum of 5 samples	90-day or smaller interval

*In the SWQS revisions, the 30-day or smaller interval is also used for CSO- and POTW-impacted segments.

Bacteria Criteria (314 CMR 4.05(5)(f)) Statistical Threshold Values

- DEP added statistical threshold values (STVs) as recommended in the 2012 EPA guidance.
- STVs replace existing single-sample maximums (SSMs).

Bacterial Indicator	Type of Water	Existing SSM	New STV * (not to be exceeded by more than 10% of samples)
Enterococci	Marine and Fresh Water	104 cfu/mL (marine) 61 cfu/mL (fresh)	130 cfu/mL
Escherichia coli (E. coli)	Fresh Water	235 cfu/mL	410 cfu/mL

*The intervals for calculating the geomean (30-day or smaller interval and 90-day or smaller interval) also apply to STVs.

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Generally Applicable Criteria

- Under CWA Section 303(c)(2)(B), states are required to adopt *Ambient Water Quality Criteria* (AWQC) for all toxic pollutants for which criteria have been published by EPA
  - If states do not adopt the criteria, they are required to provide an explanation to EPA
- In 2006, MassDEP incorporated EPA's 2002 toxic pollutant criteria by reference
- EPA has requested that MassDEP incorporate the AWQC directly into 314 CMR 4.00

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Generally Applicable Criteria

EPA's Updated or New Criteria Since 2002

Aquatic Life Criteria	
Pollutant	**Fresh or Marine**
Acrolein (2009)	Fresh
Aluminum (2018, update to 1988 guidance)	Fresh
Ammonia (2013, update to 1999 guidance)	Fresh
Cadmium (2016, update to 2001 guidance)	Fresh and Marine
Carbaryl (2012)	Fresh and Marine
Copper (2007, update to 1996 guidance)	Fresh
Diazinon (2005)	Fresh and Marine
Nonylphenol (2005)	Fresh and Marine
Selenium (2016, update to 1999 guidance)	Fresh
Tributyltin (2004)	Fresh and Marine

Human Health Criteria
104 updated criteria
4 new criteria

MassDEP

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Generally Applicable Criteria

- Adoption of all new or updated EPA recommended criteria since 2002, except selenium (2016) and cyanobacteria (2019), which require further evaluation before adoption
- All pollutant criteria were incorporated into Table 29
  - Table 29a: Aquatic Life Criteria
  - Table 29b: Human Health Criteria
- Most criteria are presented as absolute values
- Some criteria use model- or equation-based formulas:
  - 7 metals (models and equations)
  - Ammonia (temperature- and pH-based equation)
  - Pentachlorophenol (pH dependent)

MassDEP

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Generally Applicable Criteria

- The revisions allow for use of EPA's recommended *Water Effect Ratio* (WER) method to adjust aquatic life criteria
- For certain metals, the WER may be used where adjustments to local conditions are desired
  - Will require data collection, toxicity testing, and analysis
- WER-adjusted criteria need approval by DEP and EPA for use in establishing effluent limits in NPDES permits

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Freshwater Aluminum Criteria

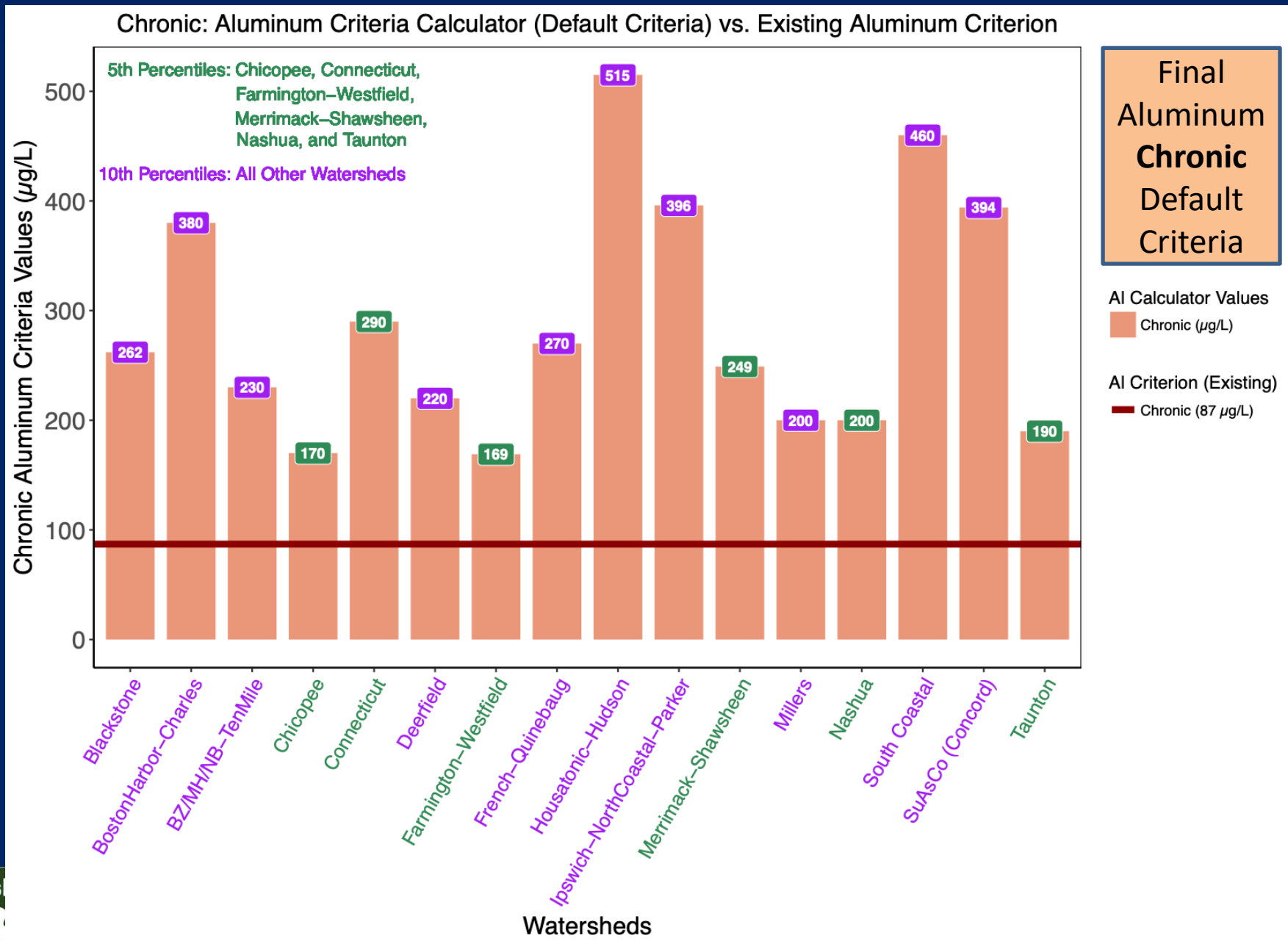
- Existing SWQS include aluminum criteria based on 1988 EPA guidance
  - Fixed values: 87 µg/L chronic & 750 µg/L acute
- In 2018, EPA published updated aluminum criteria guidance that recommends use of the Aluminum Criteria Calculator, which is based on Multiple Linear Regression (MLR) models
  - Criteria values are calculated based on site water chemistry: pH, total hardness, and dissolved organic carbon (DOC)
- The *variable* 2018 aluminum criteria supersede the fixed 1988 aluminum criteria (87 µg/L chronic and 750 µg/L acute)
- DEP included the 2018 aluminum criteria in the new Table 29a

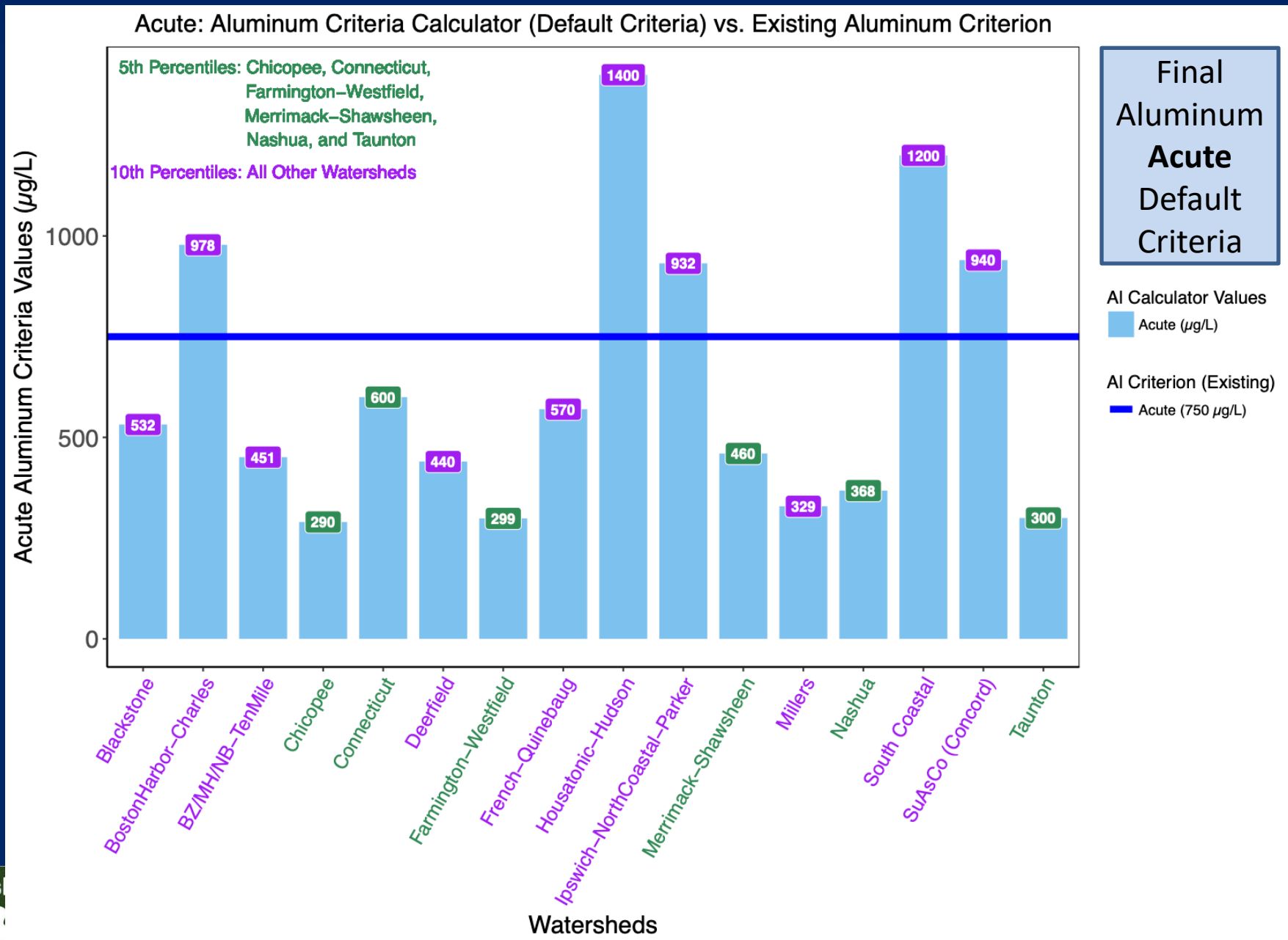
Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Freshwater Aluminum Criteria

Default Freshwater Aluminum Criteria by Watershed (River Basin or Coastal Drainage Area)†*		
River Basin or Coastal Drainage Area	CMC (Acute) µg/L	CCC (Chronic) µg/L
Blackstone	532	262
Boston Harbor/Charles	978	380
Buzzards Bay/Mt Hope Bay/Narragansett Bay/Ten-Mile	451	230
Cape Cod Coastal[41]	--	--
Chicopee (5th percentile)	290	170
Connecticut (5th percentile)	600	290
Deerfield	440	220
Farmington/Westfield (5th percentile)	299	169
French/Quinebaug	570	270
Housatonic/Hudson	1400	515
Ipswich/North Coastal/Parker	932	396
Islands Coastal[41]	--	--
Merrimack/Shawsheen (5th percentile)	460	249
Millers	329	200
Nashua (5th percentile)	368	200
South Coastal	1200	460
Sudbury, Assabet, and Concord (SuAsCo)	940	394
Taunton (5th percentile)	300	190

† Defaults are based on 10th percentile criteria calculated from concurrent pH, DOC, and hardness data, except watersheds marked as 5th percentile to protect state and federal endangered species.

* Acronyms:
CCC = Criterion Continuous Concentration
CMC = Criterion Maximum Concentration


Chronic: Aluminum Criteria Calculator (Default Criteria) vs. Existing Aluminum Criterion
5th Percentiles: Chicopee, Connecticut, Farmington–Westfield, Merrimack–Shawsheen, Nashua, and Taunton
10th Percentiles: All Other Watersheds
Chronic Aluminum Criteria Values (µg/L)
0
100
200
300
400
500
262
380
230
170
290
220
169
270
515
396
249
200
200
460
394
190
Blackstone
BostonHarbor–Charles
BZ/MH/NB–TenMile
Chicopee
Connecticut
Deerfield
Farmington–Westfield
French–Quinebaug
Housatonic–Hudson
Ipswich–NorthCoastal–Parker
Merrimack–Shawsheen
Millers
Nashua
South Coastal
SuAsCo (Concord)
Taunton
Watersheds
Final Aluminum Chronic Default Criteria
Al Calculator Values
Chronic (µg/L)
Al Criterion (Existing)
Chronic (87 µg/L)


Acute: Aluminum Criteria Calculator (Default Criteria) vs. Existing Aluminum Criterion
5th Percentiles: Chicopee, Connecticut, Farmington–Westfield, Merrimack–Shawsheen, Nashua, and Taunton
10th Percentiles: All Other Watersheds
Acute Aluminum Criteria Values (µg/L)
0
500
1000
532
978
451
290
600
440
299
570
1400
932
460
329
368
1200
940
300
Blackstone
BostonHarbor–Charles
BZ/MH/NB–TenMile
Chicopee
Connecticut
Deerfield
Farmington–Westfield
French–Quinebaug
Housatonic–Hudson
Ipswich–NorthCoastal–Parker
Merrimack–Shawsheen
Millers
Nashua
South Coastal
SuAsCo (Concord)
Taunton
Watersheds
Final Aluminum Acute Default Criteria
Al Calculator Values
Acute (µg/L)
Al Criterion (Existing)
Acute (750 µg/L)

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Freshwater Aluminum Criteria

- The revisions also allow for the use of ambient water quality data to derive site-dependent criteria values.
- If site-dependent criteria values are calculated, those criteria will supersede the watershed default criteria.
- Site-dependent criteria values calculated for use in establishing effluent limits in NPDES permits require approval by DEP and EPA, and will be subject to public notice in connection with the NPDES permitting process.

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Freshwater Copper Criteria

- EPA Guidance
  - In 2007, EPA recommended a bioavailability model (Biotic Ligand Model; BLM) to calculate freshwater criteria for copper
- DEP Regulation
  - Continue use of the hardness-based equation for copper criteria in Table 29a
  - Allow for the use of the 2007 copper BLM in Table 29a

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Freshwater Copper Criteria

- Copper Biotic Ligand Model (BLM)
  - The BLM allows site-dependent criteria values to be calculated based on water chemistry at a site.
  - This approach requires 10 water chemistry parameters as inputs (pH, dissolved organic carbon (DOC), major cations (Ca, Mg, Na, & K), major anions (SO_4 & Cl), temperature, and alkalinity).
  - Use of the BLM requires sample collection to calculate criteria values.

Toxic Pollutant Criteria (314 CMR 4.05(5)(e)) Freshwater Copper Criteria

Hardness-Based Equations

- Copper criteria values are calculated using site water chemistry and equations
- Site water chemistry:
  - Hardness (Ca and Mg)

Biotic Ligand Model (BLM)

- Copper criteria values are calculated using site water chemistry and equations (model)
- Site water chemistry:
  - 10 parameters
  - pH, DOC, major cations (Ca, Mg, Na, & K), major anions (SO_4 & Cl), temperature, and alkalinity

MassDEP