

**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER**

TRIENNIAL REVIEW OF WATER QUALITY STANDARDS

**RATIONALE FOR THE DEVELOPMENT OF
AMBIENT WATER QUALITY CRITERIA FOR**

BACTERIA

PROTECTION OF RECREATIONAL USE

**January 2017
(updated July 2019)**

This rationale document includes revisions in response to comments received during the public comment period. The Environmental Quality Board (Board) adopted the proposed rulemaking at its April 18, 2017 meeting. The proposed rulemaking was published in the *Pennsylvania Bulletin* on October 21, 2017 (47 Pa.B. 6609) with provision for a 70-day public comment period scheduled to end December 29, 2017. The Board originally scheduled three public hearings during the initial 70-day comment period. The hearings were held in Harrisburg, Pittsburgh, and Wilkes-Barre, Pennsylvania. In response to a request received during the initial comment period, the Board extended the public comment period to February 16, 2018 and added another public hearing in Norristown, Pennsylvania. Notice of this public comment period extension and additional public hearing was published in the *Pennsylvania Bulletin* on December 30, 2017 (47 Pa.B. 7852). More details on the public participation, comments, and the Department's responses can be found in the Department's Report to the Board Comments and Responses Document (July 2019). Further description and explanation how the final rule has changed from proposed to final can be found at Section E in the Order, in the Annex, and in this updated rationale.

In response to the comments, the Department has made changes to the magnitude, duration, and frequency components of the criterion.

Federal Recommendation

The United States Environmental Protection Agency (EPA) has released its 2012 recreational water quality criteria (RWQC) recommendations for protecting human health in all coastal and non-coastal waters designated for primary contact recreation use. These recommendations are intended as guidance to states, territories, and authorized tribes in developing water quality standards to protect swimmers from exposure to water that contains organisms that indicate the presence of fecal contamination (EPA 2012a). Statewide application of these nationally recommended recreational use bacteria criteria would provide an appropriate level of protection for those recreating in Pennsylvania's surface waters.

Pennsylvania’s Current Recreational Use Bacteria Criteria

25 Pa. Code Chapter 93: Pennsylvania’s recreational use bacteria criteria during the swimming season have been based upon a maximum fecal coliform level of 200 colony forming units (cfu) per 100 ml since the early 1970s. The 2000 Water Quality Regulatory Basics Initiative Triennial Review, published as a final rulemaking in the *Pennsylvania Bulletin* on November 18, 2000 (30 Pa.B. 6059)¹, gives Pennsylvania its current bacteria criteria as indicated below. The bacteria water quality criteria currently found in § 93.7 (Table 3) of Pennsylvania’s water quality standards (25 Pa. Code Chapter 93) are still based on fecal and/or total coliform indicator organisms, and are as follows.

§ 93.7. Specific water quality criteria.

(a) Table 3 displays specific water quality criteria and associated critical uses. The criteria associated with the Statewide water uses listed in § 93.4, Table 2 apply to all surface waters, unless a specific exception is indicated in §§ 93.9a—93.9z. Other specific water quality criteria apply to surface waters as specified in §§ 93.9a—93.9z. All applicable criteria shall be applied in accordance with this chapter, Chapter 96 (relating to water quality standards implementation) and other applicable State and Federal laws and regulations.

TABLE 3

<i>Parameter</i>	<i>Symbol</i>	<i>Criteria</i>	<i>Critical Use*</i>

Bacteria	Bac ₁	(Fecal coliforms/ 100 ml)—During the swimming season (May 1 through September 30), the maximum fecal coliform level shall be a geometric mean of 200 per 100 milliliters (ml) based on a minimum of five consecutive samples each sample collected on different days during a 30-day period. No more than 10% of the total samples taken during a 30-day period may exceed 400 per 100 ml. For the remainder of the year, the maximum fecal coliform level shall be a geometric mean of 2,000 per 100 milliliters (ml) based on a minimum of five consecutive samples collected on different days during a 30-day period.	WC
	Bac ₂	(Coliforms/100 ml)—Maximum of 5,000/100 ml as a monthly average value, no more than this number in more than 20 of the samples collected during a month,	PWS

¹ The Pennsylvania Bulletin webpage for the 2000 Water Quality Regulatory Basics Initiative Triennial Review rulemaking (<https://www.pabulletin.com/secure/data/vol30/30-47/2027.html>) truncates after the Chapter 95 section. The full rulemaking can be accessed here: https://www.pabulletin.com/secure/data/vol30/30-47/30_47_p2a.pdf.

nor more than 20,000/100 ml in more than 5% of the samples.

The Bac₁ criterion is designed to be protective of activities involving water contact sports (WC) and is systematically applied to all surface waters in the Commonwealth unless otherwise specified in other portions of Pennsylvania's water quality standards.

Historically, the Bac₂ criterion was originally implemented as a site-specific criterion to protect the potable water supply (PWS) use where the WC use was removed. The Bac₂ criterion has always only been implemented in select waters where the WC use was removed. As such, the Bac₂ criterion is currently only applicable in the outer Erie Harbor and Presque Isle Bay, specifically, in the harbor area and central channel dredged and maintained by the United States Army Corps of Engineers.

The Bac₁ criterion affords a better level of use protection to drinking water (i.e., the PWS use) than would be offered by the Bac₂ criterion since Bac₁ is based on much lower concentrations of indicator organisms and Bac₁ is applicable to all waters statewide where the WC use has not been removed.

Reference to 2004 Bacteria Rule in Drainage List X: The federal Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000 (Pub. L. 106-284) required each state and territory with coastal recreation waters to adopt into their water quality standards by April 10, 2004 bacteria criteria that were "as protective of human health as" the nationally recommended 1986 bacteria criteria (EPA 1986). The BEACH Act defined coastal recreation waters as the Great Lakes and coastal waters, including coastal estuaries, that states, territories, and authorized tribes officially recognize or "designate" for swimming, bathing, surfing, or similar activities in the water. The 2004 Bacteria Rule for Coastal and Great Lakes Recreation Waters (40 C.F.R. § 131.41) established federal standards for those states and territories with coastal recreation waters that had not yet adopted bacteria criteria as protective of health as the 1986 criteria into their water quality standards. In Pennsylvania, this federal promulgation included swimming beaches in Lake Erie and Presque Isle. Therefore, the 2004 Bacteria Rule for Coastal and Great Lakes Recreation Waters (40 C.F.R. § 131.41) is referenced in Drainage List X (25 Pa. Code § 93.9x) where applicable. This reference was added to Drainage List X during Pennsylvania's 2009 Triennial Review of Water Quality Standards, which became effective upon publication of the final rulemaking on May 16, 2009 (39 Pa.B. 2523).

28 Pa. Code Chapter 18: The Pennsylvania Department of Health (DOH) maintains regulations under the health and safety title, Title 28, of the Pennsylvania Code. The DOH regulations for bacterial contamination of bathing beaches at 28 Pa. Code § 18.28 have primary jurisdiction to protect swimmers and bathers from contamination at all those places in Pennsylvania designated as bathing beaches. The current DOH regulations apply statewide, not just to the Lake Erie coastal recreation waters. These DOH regulations are based on the nationally recommended 1986 bacteria criteria (EPA 1986) and are given below. § 18.28. Bathing beach contamination.

(a) Use of a bathing beach found to be contaminated shall be discontinued until written approval to reopen the bathing beach for swimming or bathing is obtained

from the Department. The permittee shall prominently post legible signs measuring at least 8" by 11" at all entrances to the bathing beach area informing the public that the bathing beach is closed and that swimming or bathing is prohibited. The approval will be given by the Department when the Department finds that the waters of the bathing beach are no longer contaminated.

(b) The water in bathing beaches will be considered contaminated for bathing purposes when one of the following conditions exists:

(1) The Department determines that a substance is being discharged or may be discharged into the water and is or may be hazardous to the health of persons using the bathing beach.

(2) The *E. coli* density of a water sample taken from the bathing beach exceeds 235 per 100 milliliters.

(3) The *E. coli* density in all water samples taken from the bathing beach, in any 30-day period during the bathing beach's operating season, exceeds a geometric mean of 126 per 100 milliliters.

Reference to DOH Regulations in Drainage List X: During Pennsylvania's 2009 Triennial Review of Water Quality Standards, specific references to DOH regulations at 28 Pa. Code § 18.28 were added to the water quality standards regulations in Drainage List X at 25 Pa. Code § 93.9x as exceptions to specific criteria for Lake Erie and Presque Isle. These references to the DOH regulations were added as a result of the 2004 Bacteria Rule for Coastal and Great Lakes Recreation Waters, which promulgated bacteria criteria for these waters. Although these DOH regulations are currently only referenced in the Department's Water Quality Standards in 25 Pa. Code Chapter 93 as exceptions to specific criteria in Drainage List X, the DOH regulations apply to all designated bathing beaches everywhere in Pennsylvania.

Current National Recommendation: 2012 RWQC

EPA last issued ambient water quality criteria recommendations for recreational waters in 1986. EPA issues such recommendations under the authority of the federal Clean Water Act. Amendments to the federal Clean Water Act by the BEACH Act of 2000 directed EPA to conduct studies associated with pathogens and human health, and to publish new or revised criteria recommendations for pathogens and pathogen indicators based on those studies. The 2012 RWQC recommendations met those requirements set forth by the BEACH Act of 2000 (EPA 2012a).

The 2012 RWQC relied on the latest research and science, including studies showing a link between illness and fecal contamination in recreational waters. The 2012 RWQC use two bacterial indicators of fecal contamination, *Escherichia coli* (*E. coli*) and enterococci (EPA 2012a). Culturable *E. coli* and enterococci are now known to be better indicators of fecal contamination than the previously used general indicators, total coliforms and fecal coliforms (EPA 2012b). The newer criteria are designed to protect primary contact recreation, including

swimming, bathing, surfing, water skiing, tubing, water play by children, and similar water contact activities where a high degree of bodily contact with the water, immersion, and ingestion are likely (EPA 2012b).

Most water quality criteria, including the 2012 RWQC, have three components: magnitude, duration, and frequency. The magnitude of the 2012 RWQC is given as two sets of recommendations. The recommendations differ because they are calculated based on different illness rates. States and tribes may select either one of the two recommended sets of numeric concentration thresholds which comprise the magnitude. EPA maintains that either of these magnitude recommendations would protect the public from exposure to harmful levels of pathogens (EPA 2012b). States and tribes have the flexibility to choose whichever of the two risk paradigms is most appropriate for the circumstances of each state or tribe. The magnitude for both of the 2012 RWQC recommendations is summarized in the table below. Each recommendation includes a geometric mean (GM) and a statistical threshold value (STV). The STV approximates the 90th percentile of the water quality distribution used in setting the 2012 RWQC. As such, the STV is intended to be implemented so that it should not be exceeded in more than ten percent of the samples taken (EPA 2012b). The duration component of the final criteria is 30 days. So, the GM of a set of samples should not exceed the criterion GM magnitude in any 30-day period. In the same 30-day interval, the frequency of exceedances of the selected STV magnitude should not be greater than ten percent (EPA 2012a; EPA 2012b).

Criteria Elements	Recommendation 1		Recommendation 2	
	Estimated illness rate = 36/1,000		Estimated illness rate = 32/1,000	
Indicator	GM (cfu/100 ml)	STV (cfu/100 ml)	GM (cfu/100 ml)	STV (cfu/100 ml)
Enterococci (marine & fresh)	35	130	30	110
<i>E. coli</i> (fresh)	126	410	100	320

Pennsylvania’s Recommended Criteria

The Department is recommending changes to its bacteria criteria which include replacing the current Bac₁ fecal coliform criterion for the WC use during the swimming season (i.e., May 1 to September 30) at 25 Pa. Code § 93.7, Table 3 with EPA’s 2012 RWQC. This change is designed to protect the WC use – defined in 25 Pa. Code § 93.3 as the “use of the water for swimming and related activities” – from fecal contamination. As discussed above, there are two sets of recommendations in the 2012 RWQC based on two different risk paradigms: 32 illnesses per 1,000 swimmers and 36 illnesses per 1,000 swimmers. EPA maintains that both risk paradigms are adequately protective (EPA 2012b). The Department recommends adopting the *E. coli* freshwater levels associated with the 36 per 1,000 illness rate (i.e., Recommendation 1 in the 2012 RWQC). The *E. coli* levels associated with this risk paradigm (i.e., GM = 126 cfu/100 ml; STV = 410 cfu/100 ml) are most closely akin to the current DOH standards at 28 Pa. Code § 18.28. The criteria values for the current DOH standards and the criteria values that were promulgated under the BEACH Act of 2000 for Lake Erie beaches including Presque Isle Bay are a GM value of 126 cfu/100 ml and a single sample maximum value of 235 cfu/100 ml. To

achieve the most consistent approach, to facilitate a more seamless transition, and because EPA considers both risk paradigms presented in the 2012 RWQC to be adequately protective, the Department favors the criteria based on Recommendation 1 in the 2012 RWQC.

In Table 3 at 25 Pa. Code § 93.7, the Department recommends retaining the current Bac₁ fecal coliform criterion – a GM maximum value of 2,000 cfu/100 ml – applicable to the WC use in all surface waters statewide from October 1 to April 30, the non-swimming season when only secondary contact recreation occurs. EPA is currently conducting research to help in designing criteria that will be protective of secondary contact recreation. When EPA finalizes and recommends these new federal secondary contact recreational criteria, the Department will evaluate these recommendations and propose to adopt them if they are appropriate for Pennsylvania.

The current Bac₂ total coliform criterion with a critical use of PWS in Table 3 at 25 Pa. Code § 93.7 has always been implemented as a site-specific criterion rather than a statewide criterion. This current total coliform criterion applies to specific waters where the WC use has been removed: currently only portions of Lake Erie in the outer Erie Harbor and Presque Isle Bay in Drainage List X at 25 Pa. Code § 93.9x. Insofar as the Bac₁ criterion allows for a lower number of a taxonomically narrower group of indicator organisms than the Bac₂ criterion, the Bac₁ criterion is a more restrictive standard than the Bac₂ criterion. Therefore, the Bac₁ criterion provides statewide protection at least as protective as the Bac₂ criterion. The Department therefore recommends that the site-specific Bac₂ criterion be deleted from Table 3 at 25 Pa. Code § 93.7 and incorporated into Drainage List X at 25 Pa. Code § 93.9x as an exception to specific criteria.

Since the DOH bathing beach regulations at 28 Pa. Code § 18.28 apply to all regulated beaches statewide, the Department recommends deleting references in 25 Pa. Code § 93.9x to the DOH regulations since the DOH regulations are not limited to Lake Erie. The Department also recommends deleting the language referring to the 2004 Bacteria Rule for Coastal and Great Lakes Recreation Waters (40 C.F.R. § 131.41) currently found at 25 Pa. Code § 93.9x pertaining to Lake Erie and Presque Isle beaches. These references to the 2004 Bacteria Rule for Coastal and Great Lakes Recreation Waters and to DOH regulations as exceptions to specific criteria are no longer necessary since the final Bac₁ *E. coli* WC criteria will apply statewide, and the DOH regulations already apply statewide. Recommended amendments to Table 3 at 25 Pa. Code § 93.7 and to 25 Pa. Code § 93.9x are shown below. Additional changes to the magnitude, duration, and frequency were made to Table 3 at 25 Pa. Code § 93.7 in response to comments received during the public comment period. The amendments are formatted to be consistent with the Annex in the final rulemaking: language added following the proposed rulemaking appears in capital letters, in bold font, and underlined; and language deleted following the proposed rulemaking appears enclosed in brackets, in bold font, and struck through.

TABLE 3

Parameter Symbol Criteria

Critical Use*

Bacteria	Bac ₁	<p>[(Fecal coliforms/ 100 ml)] (<i>Escherichia coli</i> COLONY FORMING UNITS PER 100 MILLILITERS (CFU PER 100 ML)[/400ml]) During the swimming season (May 1 through September 30), the maximum [fecal coliform] <i>E. coli</i> level shall be a geometric mean of [200] 126 CFU per 100 ML. THE GEOMETRIC MEAN FOR THE SAMPLES COLLECTED IN THE WATERBODY SHOULD NOT BE GREATER THAN 126 CFU PER 100 ML IN ANY 30-DAY INTERVAL. THERE SHOULD NOT BE GREATER THAN A 10% EXCURSION FREQUENCY OF 410 CFU PER 100 ML FOR THE SAMPLES COLLECTED IN THE SAME 30-DAY DURATION INTERVAL. [milliliters (ml) based on] [a minimum of five] [consecutive samples, each sample collected on different days during a 30-day period. No more than 10% of the total samples taken during a 30-day period may exceed] [400] [410] [per 100 ml.] (Fecal coliforms/ 100 ml)—For the remainder of the year, the maximum fecal coliform level shall be a geometric mean of 2,000 per 100 milliliters (ml) based on a minimum of five consecutive samples collected on different days during a 30-day period.</p>	WC
	[Bac ₂	(Coliforms/100 ml)—Maximum of 5,000/100 ml as a monthly average value, no more than this number in more than 20 of the samples collected during a month, nor more than 20,000/100 ml in more than 5% of the samples.	PWS]

§ 93.9x. Drainage List X.

Lake Erie					
Stream	Zone	County	Water Uses Protected	Exceptions to Specific Criteria	
1—Lake Erie	All sections of lake in PA except Outer	Erie	CWF	<i>Delete</i> Fe[,] <u>and</u> DO ₁ [and Bac ₁] See GLWQA	

	Erie Harbor and Presque Isle Bay				[Add E. coli per 40 CFR 131.41 (Except (f)) and See 28 Pa. Code § 18.28(b)(2) and (3)]
1—Lake Erie (Outer Erie Harbor and Presque Isle Bay)	Portion of lake bordered by Presque Isle on west, longitude 80° 01' 50" on east, and latitude 42° 10' 18" on north, except harbor area and central channel dredged and maintained by United States Army Corps of Engineers	Erie	WWF		Delete pH Add pH between 7 and 9 [Add E. coli per 40 CFR 131.41 (Except (f)) and See 28 Pa. Code § 18.28(b)(2) and (3)]

The following criterion is specific to Lake Erie (Outer Erie Harbor and Presque Isle Bay) waters in the Harbor area and central channel dredged and maintained by United States Army Corps of Engineers, based on special studies.

<i>Parameter</i>	<i>Symbol</i>	<i>Criteria</i>	<i>Critical Use</i>
Bacteria	Bac₂	<u>Total Coliforms/100 ml. Maximum of 5,000/100 ml as a monthly average value, no more than this number in more than 20% of the samples collected during a month, nor more than 20,000/100 ml in more than 5% of the samples.</u>	<u>PWS</u>

1—Lake Erie (Outer Erie Harbor and Presque Isle Bay)	Harbor area and central channel dredged and maintained by United States Army Corps of Engineers	Erie	WWF, Delete WC	Delete pH and Bac ₁ Add pH between 7 and 9, Bac ₂
* * * * *				

References

United States Environmental Protection Agency. 1986. *Ambient Water Quality Criteria for Bacteria*. EPA 440/5-84-002. United States Environmental Protection Agency, Washington, D.C. <https://www.epa.gov/sites/production/files/2019-03/documents/ambient-wqc-bacteria-1986.pdf>.

United States Environmental Protection Agency. 2012a. *2012 Recreational Water Quality Criteria (Fact Sheet)*. EPA-820-F-12-061. United States Environmental Protection Agency, Washington, D.C. <http://www.epa.gov/sites/production/files/2015-10/documents/rec-factsheet-2012.pdf>.

United States Environmental Protection Agency. 2012b. *Recreational Water Quality Criteria*. 820-F-12-058. United States Environmental Protection Agency, Washington, D.C. <http://www.epa.gov/sites/production/files/2015-10/documents/rwqc2012.pdf>.