Fact Sheet Date: 08/03/2023

NEW YORK STATE
FACT SHEET

DRAFT- Ambient Water Quality Value for Protection of Recreational Uses

SUBSTANCE: Enterococci **CAS REGISTRY NUMBER:** Not Applicable

AMBIENT WATER QUALITY VALUE:

Geometric Mean (GM): 72 cfu/100 mL[1]
Statistical Threshold value (STV): 266 cfu/100 mL[1]

BASIS: 6 NYCRR 702.12

REMARKS:

[1] For waterbodies supporting secondary contact recreation, the GM should not be greater than 72 cfu/100 mL in any 30-day interval and no more than ten percent of measurements should exceed the 266 cfu/100 mL STV in the same 30-day interval.

BACKGROUND:

The risks and exposure associated with secondary contact recreation (boating and fishing) are different that those associated with primary contact recreation (swimming and bathing). Since there are no Clean Water Act (CWA) 304(a) criteria associated with secondary contact recreation (SCR), the current 304(a) criteria for primary contact recreation (PCR) must be adjusted based on differences in exposure/ingestion between the two types of activities.

In 2012, the United States Environmental Protection Agency (U.S. EPA) developed recreational water quality criteria (RWQC) recommendations to protect human health associated pathogens and primary contact recreation. Two sets of recommended criteria were provided based on the available scientific evidence of illness associated with fecal pathogens and bacterial indicators of Escherichia coli (freshwaters) and Enterococci (marine and freshwaters). The criteria are intended to be protective of primary contact recreation activities where full body immersion may occur and the potential of water ingestion is likely (Table 1). Illness rates were derived from the National Epidemiological and Environmental Assessment of Recreational Water (NEEAR) definition of gastrointestinal illness (U.S. EPA, 2012). The New York State Department of Environmental Conservation (NYSDEC) adopted the recommended enterococci criteria (Table 1, Recommendation 1) for coastal waters marine as part of update to 6 NYCRR 703.4 in June 2019. With the 2019 rule making, the State determined that use of the 36 in 1000 illness rate was

sufficient to protect the primary contact recreation best use. The 2019 enterococci water quality standards for the coastal marine waters are summarized in Table 2.

Table 1. U.S. EPA 2012 RWQC for Enterococci

Criteria Elements	**Recommendation 1** (Estimated Illness Rate (NGI): 36 per 1,000 primary contact recreators)		**Recommendation 2** (Estimated Illness Rate (NGI): 32 per 1,000 primary contact recreators)	
Indicator	GM (cfu/100 mL)	STV (cfu/100 mL)	GM (cfu/100 mL)	STV (cfu/100 mL)
Enterococci (marine and fresh)	35	130	30	110

The STV approximates the 90th percentile of the water quality distribution and is intended to be a value that should not be exceeded by more than 10% of the samples used to calculate the GM.

Table 2. Coastal recreation water quality standards for enterococci established in 6-NYCRR 703.4

Indicator	**Classes**	**Standard**
Enterococci (number per 100 mL [colony-forming units or most probable number])	Coastal recreation waters of the following classes: SA and SB	The geometric mean of samples collected over any consecutive 30-day period shall not exceed 35, and no more than 10 percent of the samples collected in the same 30-day period shall exceed 130.

The enterococci standards for Class SA and SB coastal recreation waters shall apply: during the period of May 1st through October 31st; in any other instance where the department determines it necessary to protect human health or the best usages of the waters; and where required by State or Federal law or interstate compact.

In 2022, U.S. EPA introduced an approach for deriving multipliers to be applied to the 2012 RWQC criteria to protect SCR activities (U.S. EPA, 2022). The derived multipliers, based on comparisons of exposure factors for various on- or near-water activities, can be applied to GM and STV values from the 2012 RWQC to establish criteria protective of SCR.

METHODS:

The equation from U.S. EPA 2022 used to establish the PCR to SCR multiplier is as follows:

$$C_{Non-primar}^{FIB} = C_{Primary}^{FIB} \times \frac{I_{primary}}{I_{non-primary}}$$

where:

$C_{Non-primar}^{FIB}$ = the concentration of fecal indicator bacteria (FIB) associated with a particular risk of illness during non-primary contact recreation

$C_{Primary}^{FIB}$ = the concentration of FIB in the same ambient water associated with the same risk of illness during primary contact recreation

$I_{primary} =$ the amount of ambient water incidentally ingested during primary contact recreation as described in EPA's 2012 RWQC

$I_{non-primary} =$ the amount of ambient water incidentally ingested during a specific non-primary contact recreational activity

The equation is highly dependent on accurate selection of primary and non-primary ingestion rates, which can vary significantly between studies. $C_{Primary}^{FIB}$ is equal to the NYS primary contact recreation water quality standard for Enterococci (GM = 35 cfu/100 mL; STV = 130 cfu/100 mL). Estimated ingestion rates for limited and full contact scenarios were derived from a single study to minimize sampling bias (Dorevitch et al., 2011). These values were presented in Table 3-96 of the U.S. EPA document "Update for Chapter 3 of the Exposure Factors Handbook Ingestion of Water and Other Select Liquids" presented in (U.S. EPA, 2019).

6 NYCRR 700.1 defines SCR as "activities where contact with the water is minimal and where ingestion of the water is not probable. Secondary contact recreation includes, but is not limited to, fishing and boating". Dorevitch et al. (2011), estimated water volume ingestion for both full contact (swimming) and limited contact activities (canoeing, fishing, kayaking, wading/splashing, and walking). Of the limited contact activities presented in the study, the kayaking (all activities) ingestion rate was selected to be a conservative representation for all SCR ingestion rates, while still meeting the definition of SCR listed in 6 NYCRR 700.1.

Kayaking had the highest ingestion risk of all presented SCR activities and therefore serves as a protective value for other SCR activities where ingestion risk is lower. Although capsizing ingestion rates for canoeing and kayaking are slightly higher than the kayaking (all activities) rate, these scenarios are not consistent with the 6 NYCRR 700.1 SCR definition where, "contact with the water is minimal and where ingestion of the water is not probable". For capsizing events, contact with the water is more than minimal and capsizing is not a probable component of every kayaking trip. Therefore, kayaking (all activities) was selected as the representative ingestion rate for SCR activities.

Upper confidence limits (UCLs = mean + 1.96 × SD) for ingestion rates were selected for $I_{primary}$ and $I_{non-primary}$ values. UCLs were used rather than mean values to be more conservative when incorporating ingestion rates into the equation.

A ratio ($I_{primary}$ to $I_{non-primary}$) was calculated to derive criteria multipliers. The calculated ratio was then multiplied by the corresponding GM and STV $C_{Primary}^{FIB}$ values to calculate the Final $C_{Non-primar}^{FIB}$ ambient water quality criteria presented in Table 3.

Table 3. Enterococci ambient water quality criteria for GM and STV derivation within secondary contact waters.

GM

Activity	Ingestion rate as UCL (mL/hr.)	Ratio ($I_{primary}$/ $I_{non-primary}$)	$C^{FIB}_{Primary}$ GM (cfu/100 mL)	$C^{FIB}_{Non-primary}$ GM (cfu/100 mL)
Kayaking ($I_{non-primary}$)	17	2.047	35	72
Swimming ($I_{primary}$)	34.8			
			Final $C^{FIB}_{Non-primary}$ GM (cfu/100 mL)	**72**

STV

Activity	Ingestion rate as UCL (mL/hr.)	Ratio ($I_{primary}$/ $I_{non-primary}$)	$C^{FIB}_{Primary}$ STV (cfu/100 mL)	$C^{FIB}_{Non-primary}$ STV (cfu/100 mL)
Kayaking ($I_{non-primary}$)	17	2.047	130	266
Swimming ($I_{primary}$)	34.8			
			Final $C^{FIB}_{Non-primary}$ STV (cfu/100 mL)	**266**

SUMMARY:

Protective secondary contact recreation criteria were calculated for Enterococci in ambient waters as a GM = 72 cfu/100 mL and STV = 266 cfu/100 mL following U.S. EPA guidance (U.S. EPA, 2022). The geometric mean of samples collected over any consecutive 30-day period shall not exceed 72 cfu/100 mL, and no more than 10 percent of the samples collected in the same 30-day period shall exceed 266 cfu/100 mL.

REFERENCES:

Dorevitch, S., Panthi, S., Huang, Y., Li, H., Michalek, A.M., Pratap, P., Wroblewski, M., Liu, L., Scheff, P.A., Li, A. 2011. Water ingestion during water recreation. Water Res. 45, 2020–2028.

U.S. EPA. 2012. Recreational Water Quality Criteria; Office of Water, United States Environmental Protection Agency: Washington, D.C., USA. EPA 820-F-12-058.

U.S. EPA. 2019. Update for Chapter 3 of the Exposure Factors Handbook Ingestion of Water and Other Select Liquids. National Center for Environmental Assessment Office of Research and Development U.S. Environmental Protection Agency, Washington, DC 20460. EPA/600/R-18/259F

U.S. EPA. 2022. An Approach for Applying EPA's 2012 Recreational Water Quality Criteria Recommendation to Non-primary Contact Exposure Scenarios White Paper. Office of Science and Technology, Office of Water, U. S. Environmental Protection Agency, Washington, DC 20460. EPA 823-B-22-001.