Bacteria Indicator Supplement
Satilla River Basin – 2006 Fecal Coliform TMDL
Action ID: GAR4_22_07_33

As part of the 2019 Water Quality Standards Triennial Review, Georgia proposed *E. coli* and enterococci criteria for waters designated as fishing, coastal fishing, and drinking water to protect recreators who may inadvertently ingest water. Enterococci is the bacterial indicator for estuarine water, while *E. coli* is the bacterial indicator for all other waters. E. coli and enterococci have a better correlation with gastrointestinal illness than fecal coliform, and the E. coli and enterococci criteria are as protective of the fecal coliform criterion. Georgia EPD adopted the primary contact criteria for the recreational months, May through October, when immersion is expected to occur, and there is a higher likelihood of water ingestion. For non-recreational months, November through April, EPD adopted secondary contact criteria based on the estimated incidental water consumption rate from the 2019 update to Chapter 3 of the EPA Exposure Factors Handbook, Ingestion of Water and Other Select Liquids. Prior to these changes, fecal coliform was the bacterial indicator for the designated uses described above.

This supplement was developed to document the translation of the fecal coliform calculations to the new bacteria indicator, either *E. coli* or enterococci, for segments listed in the existing approved Total Maximum Daily Load (TMDL) document. To the extent that the existing approved TMDL document makes specific permitting recommendations based on fecal coliform, those recommendations will be translated to the approved bacteria indicator in all permits.

The loading curve approach was used to determine the allowable summer and winter seasonal loads. For waterbodies designated as recreational waters, a single curve represents the TMDL and is the 30-day recreational geometric mean criteria for the various bacterial indicators. For waterbodies designated as fishing, coastal fishing, and drinking water, two curves represent the TMDL. One curve represents the summer TMDL for the period May through October when the 30-day geometric mean water quality criteria are equal to the primary contact recreation bacteria criteria for the various indicators, and the second curve represents the winter TMDL for the period November through April when the 30-day geometric mean criteria are higher and are equal to the secondary contact recreation bacteria criteria.

The TMDL also has a single sample maximum criterion for fecal coliform or a Statistical Threshold Value (STV) for *E. coli* and enterococci. The single sample maximum applies for the months of November through April; whereas, the STV applies year round. The STV shall not be exceeded more than 10% of the time in a 30-day period. If a single sample exceeds the maximum criterion or the STV and a geometric mean criterion was also exceeded, then the TMDL is based on the criteria exceedance requiring the largest load reduction. The difference between the critical load and the TMDL curve represented the load reduction required for the stream segment to meet the appropriate instream standard.

The TMDL calculation is given using the following equation:

$$TMDL = C_{standard} \times Q$$

Where: TMDL = Total Maximum Bacteria Load either as a 30-day geometric mean or a single sample maximum
$C_{standard}$ = applicable state water quality standard
Q = stream flow

The applicable water quality standard for fecal coliform was:

May-October 200 counts/100 mL (as a 30-day geometric mean)
November-April 1,000 counts/100 mL (as a 30-day geometric mean)
November-April 4,000 counts/100 mL (as a single sample maximum)

The applicable water quality standard for *E. coli* is:

May-October 126 counts/100 mL (as a 30-day geometric mean)
May-October 410 counts/100 mL (as a STV)
November-April 265 counts/100 mL (as a 30-day geometric mean)
November-April 861 counts/100 mL (as a STV)

The applicable water quality standard for enterococci is:

May-October 35 counts/100 mL (as a 30-day geometric mean)
May-October 130 counts/100 mL (as a STV)
November-April 74 counts/100 mL (as a 30-day geometric mean)
November-April 273 counts/100 mL (as a STV)

TMDLs are the sum of all wasteload allocations (WLA) plus load allocation (LA) plus a margin of safety (MOS), or, stated as an equation, TMDL = ∑WLA + ∑LA + MOS. The MOS can be either implicit or explicit. For bacteria TMDLs, the practice has been to allocate an explicit ten percent MOS. TMDLs have given WLAs for all point sources equivalent to the recreational 30-day geometric mean criteria. The LA has also been given as the appropriate seasonal 30-day geometric mean criteria.

The wasteload allocation (WLA) is the portion of the receiving water's loading capacity that is allocated to existing or future point sources. WLAs were provided to the point sources with municipal wastewater treatment systems and to point sources with sanitary waste streams. Industrial wastewater treatment systems may also receive a WLA if they discharge bacteria because of the type of treatment processes employed or due to commingled sanitary waste streams.

For permitted point sources identified in the original TMDL, the WLAs were calculated based on permitted or design flow and primary recreation season bacteria criteria and are expressed as an accumulated load over a 30-day period and presented in units of counts per 30 days. If a facility expands its capacity and the permitted flow increases, the WLA for the facility would increase in proportion to the flow. If there is a new facility, the WLA would be the design flow times the summertime bacteria criteria. The established WLAs will meet the applicable water quality criteria. In addition, the permits may include routine monitoring and reporting requirements.

The reasonable assurance language included in the original TMDL in Section 6.3 shall be considered superseded and replaced by the following language.

The GA EPD is responsible for administering and enforcing laws to protect the waters of the State. Reasonable assurance ensures that a TMDL's wasteload and load allocations are properly distributed to meet the applicable water quality standards. Without such distribution, a TMDL's ability to serve as an effective guidepost for water quality improvement is significantly diminished. Federal regulations implementing the CWA require that effluent limits in permits be consistent with "the assumptions and requirements of any available [WLA]" in an approved

TMDL [40 CFR 122.44(d)(1)(vii)(B)]. NPDES point source permits will be given effluent limits in the permit consistent with the individual WLAs specified in the TMDL.

The GA EPD is the lead agency for implementing the State's Nonpoint Source Management Program. Regulatory responsibilities that have a bearing on nonpoint source pollution include establishing water quality standards and use classifications, assessing and reporting water quality conditions, and regulating land use activities that may affect water quality. Georgia works with local governments, agricultural and forestry agencies, such as the Natural Resources Conservation Service, the Georgia Soil and Water Conservation Commission, and the Georgia Forestry Commission, to foster the implementation of best management practices to address nonpoint sources. In addition, public education efforts will be targeted to individual stakeholders to provide information regarding the use of best management practices to protect water quality.

Table 11a. *E. coli* WLAs Required

Facility Name	Permit No.	Receiving Stream	Listed Stream Segment	Bacteria Indicator	WLA (counts/ 30 days)
Alma WPCP	GA0032328	Hurricane Creek Tributary	Hurricane Creek – Downstream to Little Creek to Ten Mile Creek near Alma, GA	*E. coli*	1.08E+11
Douglas Southeast	GA0024431	Seventeen Mile Creek	Seventeen Mile River- Twenty Mile Cr. N. of Douglas to Otter Cr. Downstream Gen. Coffee State Park	*E. coli*	8.63E+11
Milliken Alma Plant	GA0024619	Little Hurricane Creek	Little Hurricane Creek-GA Hwy 32 to Hurricane Creek	*E. coli*	4.30E+10[a]

a Note: This facility has no permit limits for flow or fecal coliform bacteria. The flow used to calculate the WLA was the estimated average flow provided in an attachment to the permit. The fecal coliform bacteria concentration used for the calculation was 200 cnts/100 ml, which is the standard limit given in the majority of NPDES permits.

Table 12a. *E. coli* Loads Required

Stream Segment	Location	Bacteria Indicator	Current Load (counts/ 30 days)	TMDL Components					Percent Reduction
				WLA[1] (counts/ 30 days)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Big Satilla Creek GAR030702020101	Headwaters near Hazelhurst to Sweetwater Cr. near Baxley (Jeff Davis, Appling Co.)	*E. coli*	[2]			1.88E+13	2.10E+12	2.10E+13	Undetermined[3]
Boggy Creek GAR030702020402	Dry Creek to Little Satilla Cr. N. of Screven (Wayne Co.)	*E. coli*	[2]			6.00E+12	6.68E+11	6.68E+12	Undetermined[3]
Broxton Creek GAR030702010401	Seven Creek to Seventeen Mile River near Broxton, GA (Coffee Co.)	*E. coli*	[2]			7.12E+12	7.94E+11	7.94E+12	Undetermined[3]
City Drainage Canal GAR030702010701	Tributary to Satilla River, Waycross (Ware Co)	*E. coli*	[2]			7.62E+13	8.44E+12	8.44E+13	Undetermined[3]
Colemans Creek GAR030702020301	Dry Branch south of Surrency to Big Satilla Creek near Screven, GA (Appling, Wayne Co.)	*E. coli*	[2]			2.97E+11	3.30E+10	3.30E+11	Undetermined[3]
Hog Creek GAR030702010602	Downstream County Road 185 to Hurricane Creek near Nicholls (Coffee Co)	*E. coli*	[2]			1.25E+12	1.39E+11	1.39E+12	Undetermined[3]
Hog Creek GAR030702010601	Hurricane Creek to Satilla River south of Nicholls near Bickley, GA (Coffee, Ware Co.)	*E. coli*	[2]			2.40E+13	2.67E+12	2.67E+13	Undetermined[3]
Hurricane Creek GAR030702011001	Downstream Little Creek to Ten Mile Creek near Alma, GA (Bacon Co.)	*E. coli*	[2]			2.30E+13	2.56E+12	2.56E+13	Undetermined[3]
Little Hurricane Creek GAR030702010901	GA Hwy 32 to Hurricane Creek (Bacon, Ware, Pierce Co.)	*E. coli*	[2]			3.07E+12	3.45E+11	3.45E+12	Undetermined[3]
Little Satilla Creek GAR030702020404	Keene Bay Branch to Dry Creek (Wayne Co.)	*E. coli*	[2]			2.99E+12	3.33E+11	3.33E+12	Undetermined[3]
Little Satilla River GAR030702020502	Big Satilla Creek to Sixty Foot Branch (Pierce/Wayne/Brantley Co)	*E. coli*	[2]			7.69E+13	8.51E+12	8.51E+13	Undetermined[3]
Pudding Creek GAR030702010201	Park Bay to Satilla River North of Pearson (Atkinson Co)	*E. coli*	[2]			1.04E+13	1.16E+12	1.16E+13	Undetermined[3]

Stream Segment	Location	Bacteria Indicator	Current Load (counts/ 30 days)	TMDL Components					Percent Reduction
				WLA[1] (counts/ 30 days)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Reedy Creek GAR030702020403	Headwaters to Little Satilla Creek near Screven (Previously called Headwaters to Big Satilla Creek) (Appling, Wayne Co.)	*E. coli*	[2]			4.91E+12	5.46E+11	5.46E+12	Undetermined[3]
Roses Creek GAR030702010402	Upstream Ga Hwy 206 to Seveenteen Mile River, near Broxton, GA (Coffee Co.)	*E. coli*	[2]			3.24E+12	3.60E+11	3.60E+12	Undetermined[3]
Satilla Creek GAR030702010102	Hunters Creek east of Ocilla to Satilla River (Irwin, Coffee Co.)	*E. coli*	[2]			4.29E+12	4.77E+11	4.77E+12	Undetermined[3]
Satilla River GAR030702010302	Pudding Creek to Smut Branch near Pearson (Atkinson Co)	*E. coli*	[2]			2.61E+13	2.90E+12	2.90E+13	Undetermined[3]
Seventeen Mile River GAR030702010502	Twenty Mile Creek N of Douglas to Otter Creek Downstream Gen Coffee State Park (Coffee Co.)	*E. coli*	[2]			6.93E+13	7.81E+12	7.81E+13	Undetermined[3]
Sweetwater Creek GAR030702020201	Black Water Creek to Big Satilla Creek near Baxley, GA (Appling Co.)	*E. coli*	[2]			1.40E+12	1.56E+11	1.56E+12	Undetermined[3]

Notes:

(1) The assigned bacteria load from the NPDES permitted facility for WLA was determined as the product of the *E. coli* permit limit and the facility average monthly discharge at the time of the critical load.
(2) Samples were not analyzed for E. coli, therefore critical load calculation not possible
(3) Percent reduction could not be determined due to absence of current load calculation