Bacteria Indicator Supplement
Savannah River Basin – 2005 Fecal Coliform TMDL
Action ID: GAR4_22_01_36

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, $TMDL = \sum WLA + \sum LA + MOS$. 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 12a. *E. coli* WLAs Required

Facility Name	Permit No.	Receiving Stream	Listed Stream Segment	Bacteria Indicator	WLA (counts/ 30 days)
Augusta-Spirit Creek WPCP	GA0047147	Spirit Creek	Spirit Creek - McDade Pond to Savannah River	*E. coli*	3.21E+11
Columbia Co - Reed WPCP	GA0031992	Reed Creek	Reed Creek - Rd S1727 to Bowen Pond near Martinez	*E. coli*	6.62E+11
Commerce - Northside WPCP	GA0026247	Beaver Dam Creek Tributary	Hudson River - Black Creek to Nails Creek near Fort Lamar	*E. coli*	1.51E+11
DHR Gracewood Hospital	GA0022161	Spirit Creek	Spirit Creek - McDade Pond to Savannah River	*E. coli*	7.18E+10
Elberton - Fortson Cr WPCP	GA0025631	Fortson Creek Tributary	Beaverdam Creek - Confluence of N & S Beaverdam Creeks to Savannah River near Elberton	*E. coli*	8.63E+10
Franklin Springs Pond	GA0050172	Haynes Creek Tributary	Broad River - SR 281 to Scull Shoal Creek near Danielsville	*E. coli*	1.44E+10
Sardis WPCP	GA0020893	Chandler Mill Branch	Brier Creek - Hwy 305 to MacIntosh Creek	*E. coli*	1.44E+10
Sylvania WPCP	GA0021385	Buck Creek	Buck Creek - Downstream Sylvania WPCP to Savannah River	*E. coli*	2.17E+11
Waynesboro WPCP	GA0020231	McIntosh Creek Trib.	Brier Creek - Hwy 305 to MacIntosh Creek	*E. coli*	2.87E+11
Wrens WPCP	GA0021857	Brushy Creek	Brushy Creek - SR 80 (Rd S1571) west Wrens to Brier Creek	*E. coli*	6.87E+10

Table 13a. *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)	
Beaverdam Creek GAR030601030313	Confluence of North & South Beaverdam Creeks to Savannah River near Elberton (Elbert Co.)	*E. coli*	2	5.90E+10		4.81E+12	5.41E+11	5.41E+12	Undetermined[3]
Brier Creek GAR030601080101	Big Brier Creek to Sweetwater Creek near Thomson (McDuffie Co.)	*E. coli*	2			7.31E+11	8.06E+10	8.06E+11	Undetermined[3]
Brier Creek GAR030601080302	Hwy 305 to MacIntosh Creek (Burke Co.)	*E. coli*	2	1.49E+11	6.09E+11	6.62E+12	8.19E+11	8.19E+12	Undetermined[3]
Broad River GAR030601040302	SR 281 to Scull Shoal Creek near Danielsville (Madison Co.)	*E. coli*	2			1.97E+15	2.18E+14	2.18E+15	Undetermined[3]
Broad River GAR030601040601	Hwy 77 to Clarks Hill Lake (Elbert Co.)	*E. coli*	2		1.98E+13	7.94E+15	8.88E+14	8.88E+15	Undetermined[3]
Brushy Creek GAR030601080201	SR 80 (Rd S1571) west Wrens to Brier Creek (Jefferson, Burke Co.)	*E. coli*	2	6.19E+10		3.10E+12	3.52E+11	3.52E+12	Undetermined[3]
Buck Creek GAR030601090101	Downstream Sylvania WPCP to Savannah River (Screven Co.)	*E. coli*	2	1.02E+11		4.26E+14	4.73E+13	4.73E+14	Undetermined[3]
Cedar Creek GAR030601030406	Little Cedar Creek to Savannah River near Montevideo (Hart Co.)	*E. coli*	2			5.58E+11	6.20E+10	6.20E+11	Undetermined[3]
Clark Creek GAR030601040501	Greensboro Branch to Long Creek near Tignall (Wilkes Co.)	*E. coli*	2			2.78E+11	3.09E+10	3.09E+11	Undetermined[3]
Cold Water Creek GAR030601030407	SR 77 to Little Cold Water Creek near Ruckersville (Elbert Co.)	*E. coli*	2			1.63E+12	1.81E+11	1.81E+12	Undetermined[3]
Crawford Creek GAR030601020503	Upstream Lake Hartwell near Lavonia (Franklin Co.)	*E. coli*	2			2.25E+11	2.49E+10	2.49E+11	Undetermined[3]
Falling Creek GAR030601040602	Dry Fork Creek to Broad River near Fortsonia (Elbert Co.)	*E. coli*	2			6.68E+11	7.37E+10	7.37E+11	Undetermined[3]
Hudson River GAR030601040201	Mountain Creek to Webb Creek near Homer (Banks Co.)	*E. coli*	2			3.83E+12	4.25E+11	4.25E+12	Undetermined[3]

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				WLA[1] (counts/ 30 days)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Hudson River GAR030601040203	Black Creek to Nails Creek near Fort Lamar (Franklin, Madison Co.)	*E. coli*	[2]	8.76E+10		2.32E+13	2.58E+12	2.58E+13	Undetermined[3]
Little River GAR030601050101	Confluence of N & S Forks to Kettle Creek near Washington (Taliaferro, Wilkes Co.)	*E. coli*	[2]			3.29E+12	3.65E+11	3.65E+12	Undetermined[3]
Long Creek GAR030601040502	Macks Creek to Clark Creek (Wilkes Co.)	*E. coli*	[2]			5.81E+11	6.43E+10	6.43E+11	Undetermined[3]
McBean Creek GAR030601060608	Poorly Branch to Savannah River (Richmond, Burke Co.)	*E. coli*	[2]		5.41E+11	9.14E+11	1.62E+11	1.62E+12	Undetermined[3]
Middle Fork Broad River GAR030601040102	Nancy Town Creek to Hunters Creek (Banks, Franklin Co.)	*E. coli*	[2]			8.19E+12	9.14E+11	9.14E+12	Undetermined[3]
North Fork Broad River GAR030601040103	Unawatti Creek to Broad River near Carnesville (Franklin Co.)	*E. coli*	[2]			1.01E+13	1.13E+12	1.13E+13	Undetermined[3]
Panther Creek GAR030601020404	Upstream Lake Yonah (Habersham, Stephens Co.)	*E. coli*	[2]			5.83E+11	6.49E+10	6.49E+11	Undetermined[3]
Reed Creek GAR030601020504	Upstream Lake Hartwell (Hart Co.)	*E. coli*	[2]			1.17E+11	1.30E+10	1.30E+11	Undetermined[3]
Reed Creek GAR030601060604	Rd S1727 to Bowen Pond near Martinez (Columbia Co.)	*E. coli*	[2]	4.10E+11	1.09E+11	4.68E+10	6.29E+10	6.29E+11	Undetermined[3]
Reedy Creek GAR030601080202	Warren Co line to Brier Creek near Wrens (Jefferson Co.)	*E. coli*	[2]			1.25E+12	1.39E+11	1.39E+12	Undetermined[3]
Runs Branch (Ebenezer Creek) GAR030601090211	Cowpen Creek to Little Ebenezer Creek near Clyo (Effingham Co.)	*E. coli*	[2]			1.17E+13	1.30E+12	1.30E+13	Undetermined[3]
Shoal Creek GAR030601020502	Poolers Creek to Lake Hartwell, Parkertown (Hart Co.)	*E. coli*	[2]		1.49E+12	6.36E+11	2.36E+11	2.36E+12	Undetermined[3]
South Fork Broad River GAR030601040401	Brush Creek to Beaverdam Creek near Comer (Madison Co.)	*E. coli*	[2]		1.16E+11	3.98E+12	4.55E+11	4.55E+12	Undetermined[3]
South Fork Broad River GAR030601040402	Clouds Creek to Fork Creek near Carlton (Madison, Oglethorpe Co.)	*E. coli*	[2]		6.87E+10	4.20E+12	4.74E+11	4.74E+12	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)	
Spirit Creek GAR030601060308	McDade Pond to Savannah River (Richmond Co.)	*E. coli*	[2]	5.10E+11	7.06E+11	3.03E+11	1.69E+11	1.69E+12	Undetermined[3]
Tallulah River GAR030601020106	Upstream Lake Burton (Rabun Co.)	*E. coli*	[2]			3.24E+12	3.61E+11	3.61E+12	Undetermined[3]
Toccoa Creek GAR030601020401	Little Toccoa Creek to Lake Hartwell (Stephens Co.)	*E. coli*	[2]			1.15E+12	1.27E+11	1.27E+12	Undetermined[3]
Uchee Creek GAR030601060101	Tudor Branch to upstream Little River near Evans (Columbus Co.)	*E. coli*	[2]		2.07E+11	1.66E+12	2.08E+11	2.08E+12	Undetermined[3]
Warwoman Creek GAR030601020209	Sarah's Creek to Chattooga River (Rabun Co.)	*E. coli*	[2]		1.47E+11	1.18E+12	1.48E+11	1.48E+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