Total Maximum Daily Load Document for *E. coli* Impairments in the Reedy River and Tributaries Within Hydrological Unit Codes 0305010904 and 0305010906

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Abstract

§303(d) of the Clean Water Act and EPA's *Water Quality Planning and Management Regulations* (40 CFR - Protection of Environment 2017) require states to develop total maximum daily loads (TMDLs) for water bodies that are included on the §303(d) list of impaired waters. A TMDL is the maximum amount of pollutant a waterbody can assimilate while meeting water quality standards (WQS) for the pollutant of concern. All TMDLs include a waste load allocation (WLA) for any National Pollutant Discharge Elimination System (NPDES)-permitted dischargers, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS). This technical report describes the development of *Escherichia coli* (*E. coli)* recreational use TMDLs for impaired water quality monitoring stations in the Reedy River and its tributaries. From upstream (UP) to downstream (DS) these stations are S-073, S-264, S-319, RS-14189, S-013, S-067, S-018, RS-06167, S-323, RS-15285, S-091, S-072, RS-17381, S-178, RS-19501 & RS-20501, RS-17370, S-070, S-311, and S-021 and are located in Greenville and Laurens counties, South Carolina. All 19 stations have been included in South Carolina's final 2020 and 2022 303(d) list for exceeding the *E. coli* WQS for recreational use and have been prioritized and accepted by EPA as metrics in the CWA §303(d) program performance measures.

Stations S-319, S-072, RS-19501 & RS-20501, and S-021 were designated as TMDL stations due to the availability of recent *E. coli* data at these sites. The data collected from these stations were used to calculate TMDLs for the Reedy River TMDL watersheds. The other legacy impaired stations in the watershed with older fecal coliform data will be associated with the appropriate TMDL stations and will receive their corresponding TMDL loads and percent reduction goals.

There are three NPDES-permitted Municipal Separate Storm Sewer (MS4) entities in this watershed: the City of Greenville, Greenville County, and the South Carolina Department of Transportation (SCDOT). The cities of Fountain Inn, Mauldin, Simpsonville, and Travelers Rest are co-permittees under the Greenville County MS4 permit. All MS4s have been allocated a WLA.

Table Ab 1. TMDLs for Reedy River and tributaries. TMDLs are expressed as mpn/day.

Station	Existing Load (mpn/day)	TMDL (mpn/day)	MOS (mpn/day)	WLA			LA	
				Continuous source[1] (mpn/day)	Intermittent MS4[2, 3] (% reduction)	Intermittent MS4 SCDOT[3,4] (% reduction)	mpn/day	% Reduction[3]
S-319	2.84E+12	4.89E+11	2.38E+10	Altamont MHP 1.79E+08	84%	84%	4.65E+11	84%
S-072	9.65E+12	1.96E+12	9.82E+10	ReWa Lower Reedy 1.52E+11 ReWa Mauldin Rd: 3.84E+11	81%	81%	1.33E+12	81%
RS-19501 & RS-20501	9.12E+12	1.40E+12	7.01E+10	Canterbury 1.06E+09 Trollingwood 1.32E+09	85%	85%	1.33E+12	85%
S-021	4.08E+12	3.30E+12	1.65E+11	See note below	23%	23%	3.13E+12	23%

Table Notes:

1. WLAs are expressed as a daily maximum. Existing and future continuous dischargers are required to meet the prescribed loading for pollutants of concern. Future loadings will be calculated based on permitted flow and *E. coli* concentration of 349 mpn/100 mL.
2. Percent reduction applies to all NPDES-permitted stormwater discharges, including current and future MS4, construction, and industrial discharges covered under permits numbered SCS & SCR. Stormwater discharges are expressed as a percentage reduction due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet the percentage reduction or the existing instream standard for pollutants of concern by their NPDES Permit.
3. The percent reductions apply to existing instream *E. coli*.
4. By implementing the BMPs that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 permit to address *E. coli*, the SCDOT will comply with these TMDLs and its applicable WLA to the MEP as required by its MS4 permit.

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1.0 Introduction

1.1 Background

The federal *Clean Water Act (CWA)* requires each state to assess its waters, develop monitoring strategies, and establish water quality standards (WQS) for various types and uses of water bodies. Furthermore, the CWA mandates states to review the monitoring results every two years to ensure compliance with the established WQS. If monitoring indicates that the WQS are not being met or under threat, the states are required to list the impaired bodies under §303(d) of the CWA. These listed sites are then assigned a priority ranking for restoration efforts, and the impairments are addressed through the implementation of Total Maximum Daily Loads (TMDLs), as outlined in *40 Code of Federal Regulations* (CFR) Part 130, based on their respective ranks (40 CFR - Protection of Environment 2017).

A Total Maximum Daily Load (TMDL) is one part of a regulatory framework used to manage and control pollutant levels in water bodies that are impaired by pollutants. It establishes the maximum amount of a specific pollutant that a water body can receive from all sources, continuous point sources, intermittent point sources, nonpoint sources, and natural background levels, while still meeting WQS. The TMDL process includes estimating pollutant contributions from all sources, linking pollutant sources to their impacts on water quality, allocation of pollutant contributions to each source, and establishment of control mechanisms to achieve water quality standards.

A TMDL is comprised of the sum of individual waste load allocations (ΣWLAs) for continuous and intermittent point sources, and load allocations (ΣLAs) for nonpoint sources. In addition, the TMDLs include a margin of safety (MOS), either implicit or explicit, which is a buffer or safety factor included in the TMDL to account for uncertainties in the relationship between pollutant loads and water quality. Conceptually, this definition is represented by the equation:

$$TMDL = \Sigma WLA + \Sigma LA + MOS$$

Eq. 1

This TMDL document is a detailed analysis describing the development of *Escherichia coli* (*E. coli*) bacteria TMDLs for 19 water quality monitoring (WQM) stations that have exceeded the recreational WQS. These stations, located in Greenville and Laurens counties within the Reedy River watershed, were identified in South Carolina's final 2020 and 2022 303(d) list of impaired waters by the South Carolina Department of

Health and Environmental Control (SCDHEC or the Department) as impaired due to *E. coli* bacteria exceedances (SCDHEC 2023c).

The 19 impaired stations, listed from upstream (UP) to downstream (DS), are S-073, S-264, S-319, RS-14189, S-067, S-013, S-018, RS-06167, S-323, RS-15285, S-091, S-072, RS-17381 (S-863), S-178, RS-19501 & RS-20501, RS-17370 (S-778), S-070, S-311, and S-021. Figure 1 provides a visual representation of these impaired WQM stations, and details about their locations can be found in Table 1.

Testing for every potential pathogenic organism in surface water is not feasible, so bacteria like *E. coli* are used as the indicators for presence of human pathogens. Indicator bacteria are practical to measure, persist in surface waters for similar durations, and share common sources with the actual pathogens. *E. coli* bacteria belong to the fecal coliform group and naturally inhabit the gastrointestinal tract of warm-blooded animals. They serve important functions such as preventing the proliferation of harmful bacteria in the gut, producing vitamin K, aiding in lactose digestion, and facilitating fat metabolism. However, certain strains of *E. coli*, such as Shiga toxin-producing 0157:H7, can cause gastrointestinal illnesses, kidney failure, and even death. The presence of *E. coli* bacteria in surface waters indicates recent contamination from human or animal waste, which can stem from various sources such as failing septic systems, agricultural runoff, and sewer leaks (Blount 2015), (Wolfson and Harrigan 2010).

1.2 Watershed Descriptions

Since February 28, 2013, South Carolina (SC) has been using *E. coli* as the freshwater fecal indicator bacteria, replacing fecal coliform (FC). In SC's final 2020 and 2022 303(d) list, 19 stations within the Reedy River watershed were identified as impaired due to exceedances of freshwater *E. coli* WQS. Among these stations, S-021, S-072, S-311, and S-319 have been actively monitored for *E. coli* since 2013. Random statistical monitoring stations RS-19501 & RS-20501, were co-located and sampled in 2019 and 2020, respectively. A TMDL was not calculated at station S-311 due to its location within Boyd Mill Pond. Impaired TMDL stations included in this document were prioritized and accepted by EPA as metrics in the CWA §303(d) program performance measures. Considering the availability of recent data, stations S-319, S-072, RS-19501 & RS-20501, and S-021 were designated as TMDL stations, and the data collected from these stations were used to calculate TMDLs for the Reedy River TMDL watershed. (Figure 1).

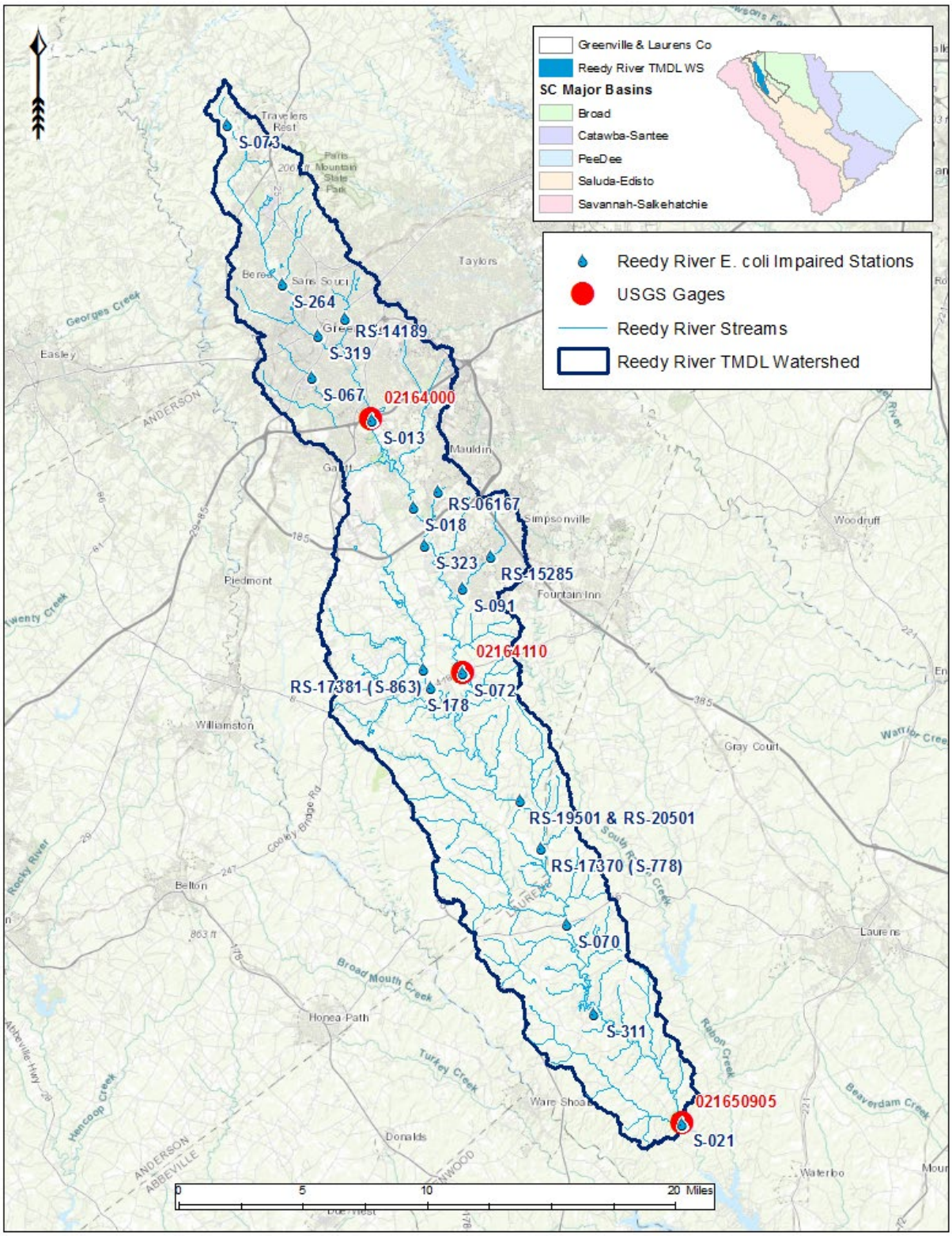

Figure 1. Reedy River TMDL watershed, *E. coli* impaired WQM stations, and USGS gages.

Table 1. Reedy River and its tributaries bacteria impaired stations and location descriptions. Stations are listed from upstream to downstream.

Station	Description
S-073*	REEDY RVR AT UN# RD OFF US 276 .75 MI W TRAVELERS REST
S-264*	LANGSTON CK AT SC 253
S-319	REEDY RVR AT RIVERS ST; DOWNTOWN GREENVILLE
RS-14189*	RICHLAND CR AT SPARTANBURG STREET
S-013*	REEDY RVR AT S-23-30 3.9 MI SE GREENVILLE
S-067*	BRUSHY CK ON GREEN ST
S-018*	REEDY RVR AT S-23-448 1.75 MI SE CONESTEE
RS-06167*	UT TO THE REEDY R IN THE PRESERVE AT PLANTERS ROW
S-323*	REEDY RVR AT S-23-316 3.5 MI SSW OF MAULDIN
RS-15285*	ROCKY CREEK AT ALDER DRIVE
S-091*	ROCKY CK AT S-23-453 3.5 MI SW OF SIMPSONVILLE
S-072	REEDY RVR ON HWY 418 AT FORK SHOALS
RS-17381* (S-863)	HUFF CREEK AT SR 459
S-178*	HUFF CK AT SC 418 1.6 MI NW FORK SHOALS
RS-19501 & RS-20501*	REEDY RIVER AT HILLSIDE CHURCH ROAD
RS-17370* (S-778)	REEDY R. AT SEC. RD. 68
S-070*	REEDY RVR AT U.S. 76
S-311	BOYD MILL POND
S-021	REEDY RVR AT S-30-06 E WARE SHOALS

***** *Deactivated and/or random statistical stations.*
( ) stations in parentheses are aliases, where a random statistical monitoring station was co-located and monitored with another ambient surface monitoring station for a duration of one year.

The drainage areas for the TMDL WQM stations were delineated using the StreamStats online tool provided by USGS (USGS 2019), and later confirmed with the aid of USGS topographic maps and ArcGIS software (Figure 2, Figure 3, Figure 4, and Figure 5). During the initial public participation phase, the department informed the stakeholders via email, followed by a reminder, and during a Microsoft Team meeting that the Reedy River *E. coli* TMDL has been commenced and asked the stakeholders to share relevant data with the department for consideration during the development of the TMDLs. Friends of the Reedy, the City of Greenville, and ReWa were the three entities that submitted data and information. The City of Greenville's data included shapefiles for their stormwater drainage basins within their Municipal Separate Sewer

Storm sewer (MS4) area. Upon completion of delineating the drainage areas for the TMDL stations, these were compared to the stormwater basins submitted by the City of Greenville. Although there were minor differences, no modifications were made to the areas delineated using StreamStats (Table 2).

Currently, in the Reedy River watershed, there are five domestic and municipal wastewater treatment plants (WWTP) National Pollutant Discharge Elimination System (NPDES) permitted dischargers that have a fecal coliform (FC) bacteria limit specified in their permits. However, all five facilities are currently operating with expired NPDES permits and are conducting monitoring specifically for FC. After the renewal and issuance of their new permits, these dischargers will be required to transition their monitoring efforts from FC to *E. coli*, which serves as the fecal bacteria indicator for freshwaters (SCDHEC 2023b).

Land uses and percent imperviousness of the TMDL stations were calculated using the 2019 National Land Cover Database (NLCD) and Esri ArcGIS software (Dewitz and US Geological Survey 2021). Land use characteristics for TMDL stations are summarized in Table 3 and primary and secondary dominant uses are **bolded**. Land use maps of stations S-319, S-072, RS-19501 & RS-20501, and S-021 can be found in Appendix B (Figure 19, Figure 20, Figure 21, and Figure 22). The percent imperviousness of the TMDL stations is shown in Table 4.

Table 2. Percent area of each MS4 within each TMDL station's drainage area.

	% area of MS4 within TMDL Station			
MS4	**S-319**	**S-072**	**RS-19501 & RS20501**	**S-021**
City of Greenville	5.3	32.8	-	-
City of Mauldin	-	4.2	-	-
City of Simpsonville	-	5.4	-	-
City of Travelers Rest	6.2	-	-	-
Greenville County	87.4	56.9	99.4	33.8

Table 3. NLCD 2019 land uses of TMDL stations.

Landuse	S-319 Area (mi^2)	S-319 % of Area	S-072 Area (mi^2)	S-072 % of Area	RS-19501 & RS-20501 Area (mi^2)	RS-19501 & RS-20501 % of Area	S-021 Area (mi^2)	S-021 % of Area
Open Water	0.13	0.41	0.27	0.35	0.43	0.82	0.55	0.62
Developed	**20.01**	**62.23**	**53.09**	**68.36**	10.91	20.54	6.78	7.68
Barren	0.03	0.11	0.10	0.13	0.09	0.18	0.19	0.22
Forest	**8.78**	**27.31**	**16.83**	**21.67**	**25.55**	**48.10**	**57.83**	**65.53**
Pasture Hay	2.56	7.95	6.55	8.43	**14.91**	**28.06**	**21.03**	**23.83**
Forested Wetlands	0.63	1.94	0.79	1.01	1.18	2.22	1.78	2.02
Non-forested Wetlands	0.01	0.05	0.03	0.04	0.05	0.09	0.08	0.09
Total	*32.15*	*100.00*	*77.66*	*100.00*	*53.12*	*100.00*	*88.25*	*100.00*

Table 4. Percent imperviousness of the TMDL stations within the Reedy River watershed based on NLCD 2019 Impervious layer.

Station	% Imperviousness
S-319	21
S-072	27
RS-19501 &RS-20501	6
S-021	1

1.3 TMDL Stations

Station S-319

TMDL station S-319 and its drainage area are located in the upper portion of the Reedy River TMDL watershed in Greenville County. The drainage area of S-319 is 32.1 mi^2 and dominant land uses are developed (62.2%) and forest (27.3%) (Figure 19, Table 3).

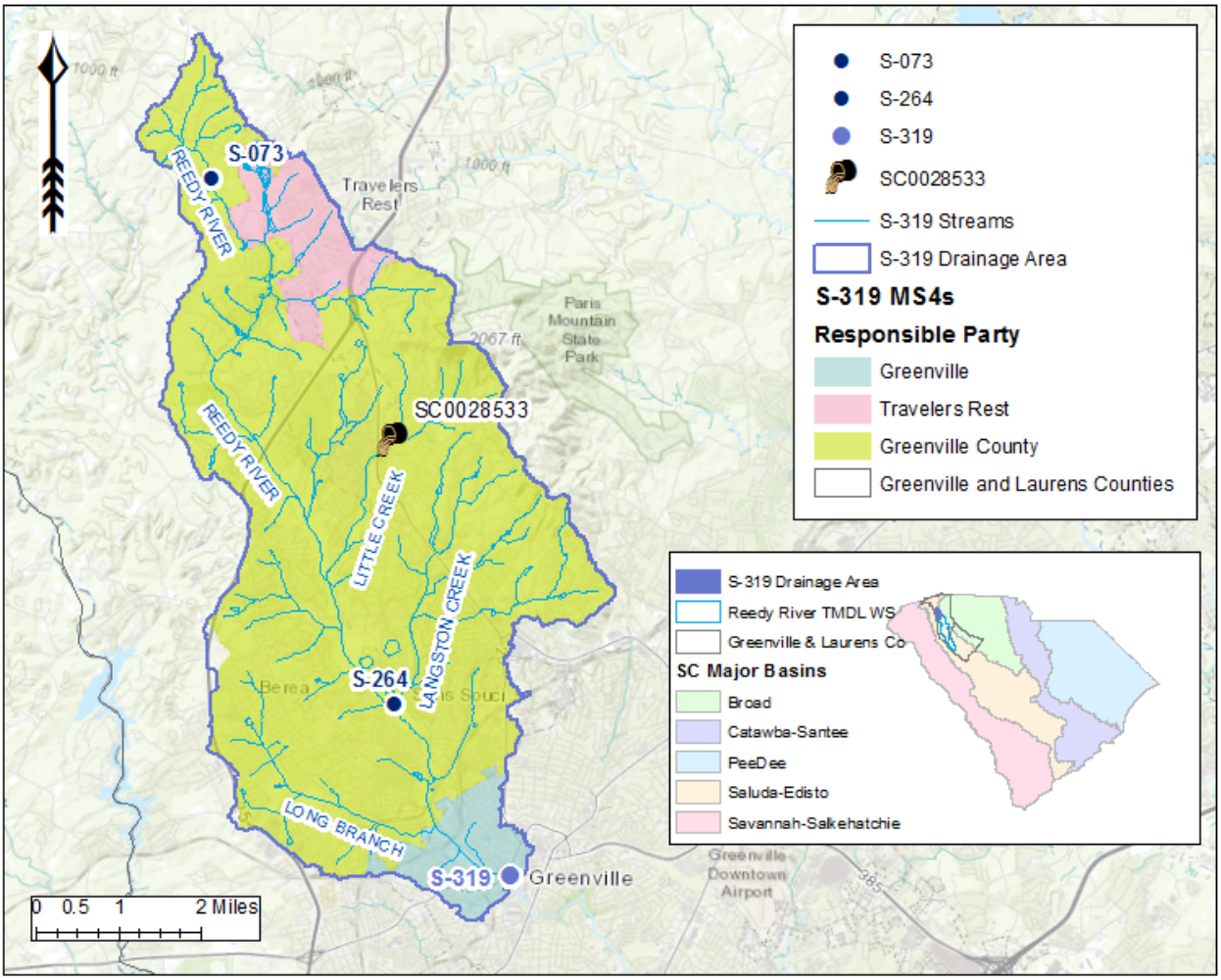

Figure 2. *E. coli* impaired stations, MS4s, and NPDES permitted discharger within the drainage area of station S-319.

In the drainage area of station S-319, there are two stations, S-073 and S-264, that are no longer being monitored. Despite the discontinuation of monitoring, these stations are still considered part of the TMDL area, and they have been allocated the same *E. coli* loading as the TMDL station S-319.

In addition to SCDOT, there are two MS4s, the City of Greenville, and Greenville County and its three co-permittees in the TMDL watershed. The percent area contribution of these MS4s in each station's drainage area was calculated and tabulated in Table 2.

In this subwatershed, there is one domestic NPDES-permitted discharger, Altamont Mobile Home Park (MPH) (SC0028533), that has FC limits specified in their permit. The existing MS4s and Altamont MPH within the drainage area of S-319 are illustrated in Figure 2.

Station S-072

TMDL station S-072 and its drainage area are located in the upper half of the Reedy River TMDL watershed, downstream from S-319, in Greenville County. The drainage area of this station is 77.65 mi^2 and dominant land uses are developed (68.4%) and forest (21.7%) (Figure 20, Table 3).

In the drainage area of station S-072, eight stations, RS-06167, RS-14189, RS-15285, S-013, S-018, S-091, S-323, S-067 are no longer being sampled for *E. coli*. These stations are considered within a TMDL watershed and have been allocated the same *E.* coli loadings as the TMDL station S-072.

In this drainage area, there are two domestic NPDES-permitted WWTPs, ReWa Mauldin Road (SC0041211) and ReWa Lower Reedy (SC0024261), that have FC limits specified in their permit. The existing MS4s, along with WWTPs, within the drainage area of S-072 are depicted in Figure 3, and the percentage of the TMDL stations' drainage area covered by these MS4s is provided in Table 2.

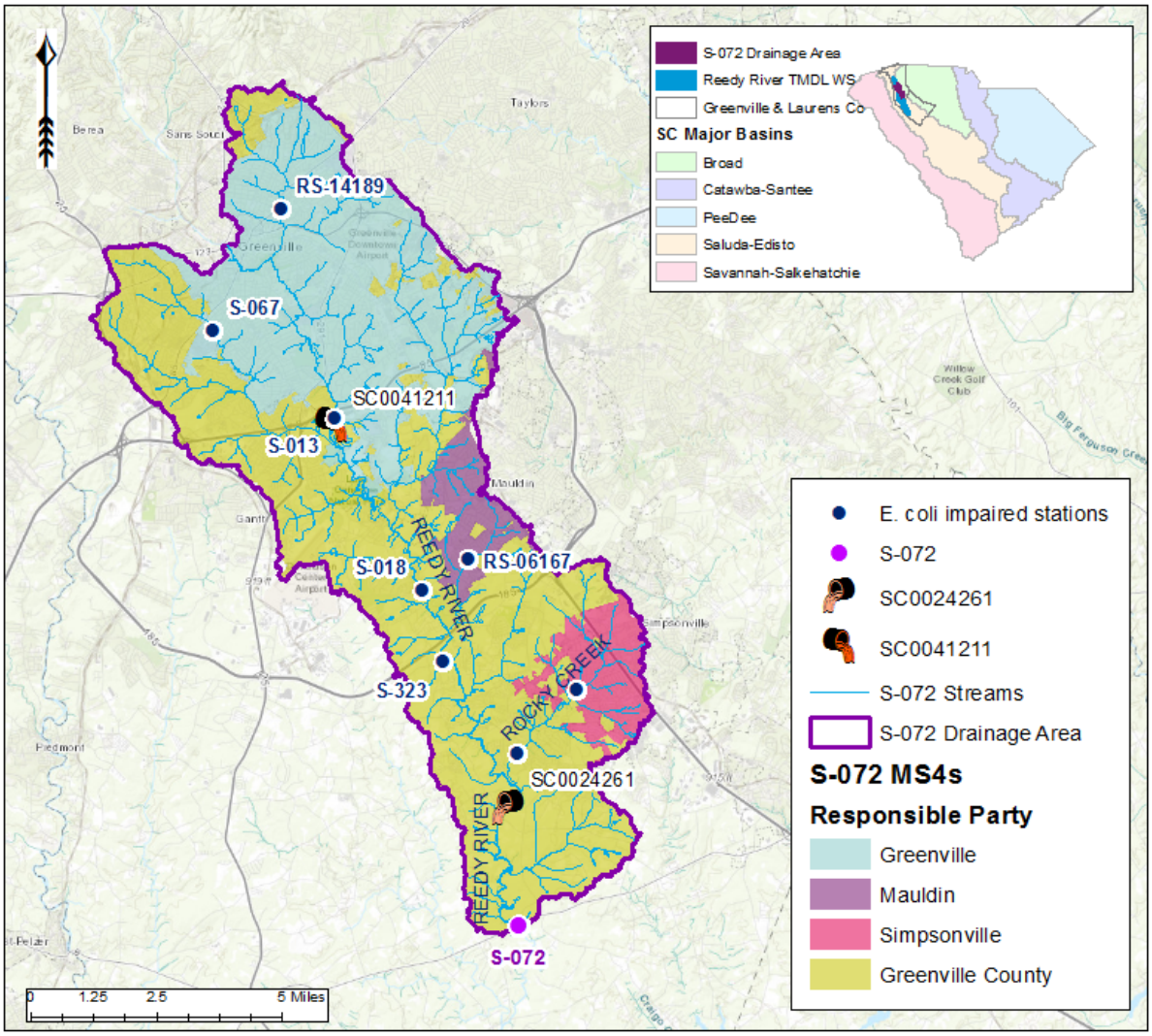

Figure 3. *E. coli* impaired stations, MS4s, and NPDES permitted dischargers within the drainage area of station S-072.

Stations RS-19501 & RS-20501

Stations RS-19501 & RS-20501 are situated in the lower portion of the TMDL watershed in Greenville County. They are co-located and were sampled for *E. coli* in 2019 and 2020, respectively. The drainage area of this station is 53.15 mi^2 and dominant land uses are forest (48.1%) followed by pasture and hay (28.1%) (Table 3, Figure 21).

In the drainage area of stations RS-19501 and RS-20501, two stations, RS-17381 (S-863) and S-178, are no longer monitored for *E. coli*. Despite not being actively sampled, these stations are still considered within the TMDL watershed and have been allocated the same *E. coli* loading as the TMDL station RS-19501 & RS-20501.

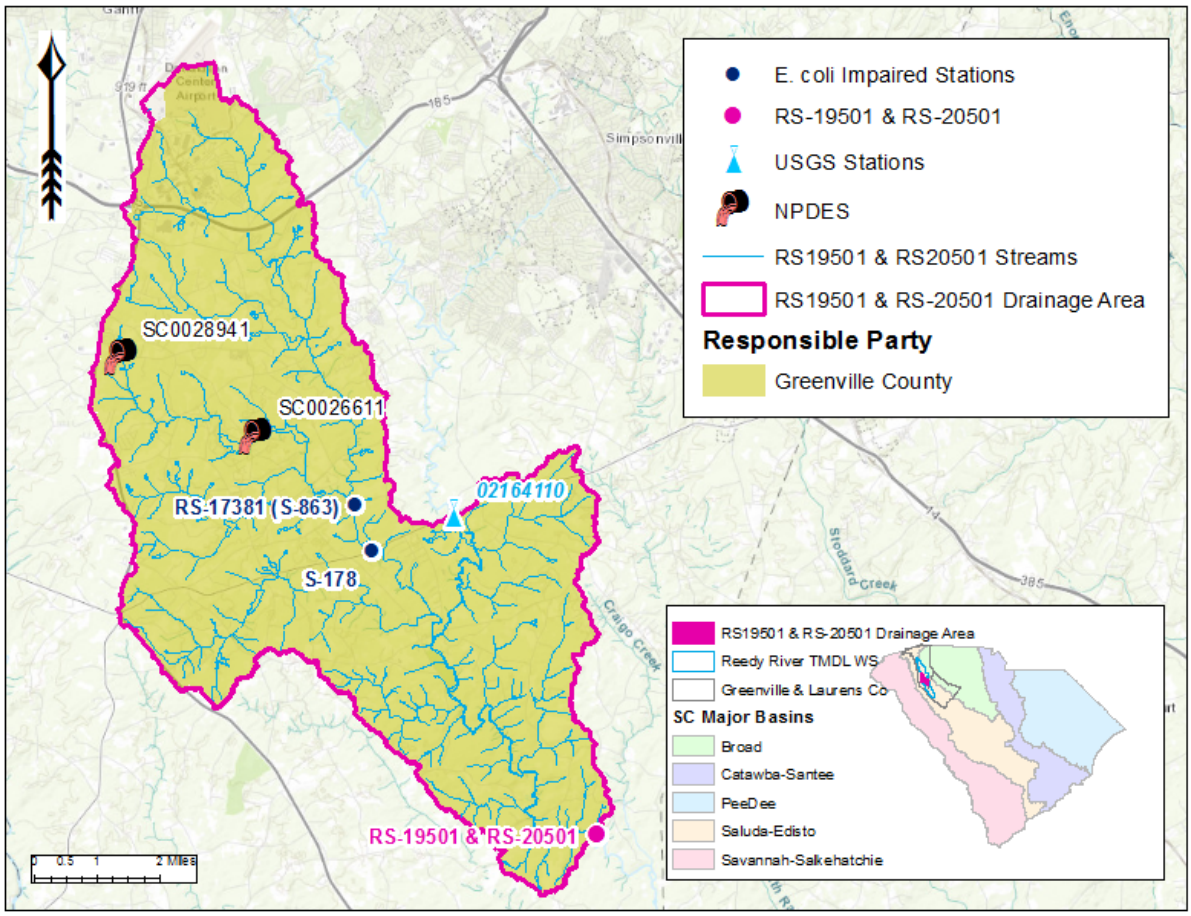

Figure 4. *E. coli* impaired stations, MS4, and NPDES permitted dischargers within the drainage area of stations RS-19501 & RS-20501.

In this drainage area, there are two domestic NPDES-permitted WWTPs, United Utilities Canterbury SD (SC0028941) and United Utilities Trollingwood SD (SC0026611), that have FC limits specified in their permit. The existing MS4s, along with WWTPs, within the drainage area of S-072 are depicted in Figure 4 and the percentage of the TMDL stations' drainage area covered by these MS4s is provided in Table 2.

Station S-021

TMDL station S-021 and its drainage area are located at the bottom of the Reedy River TMDL watershed in Greenville and Laurens counties. The drainage area of this station is 88.3 mi^2 and dominant land uses are forest (65.5%), and pasture and hay (23.8%) (Table 3 and Figure 22).

In the drainage area of station S-021, stations RS-17370 (S-778) and S-070 are no longer being monitored for *E. coli*, however, station S-311 in Boyd Mill Pond will continue to

be monitored. These stations are considered within a TMDL watershed and have been allocated the same *E. coli* loading as the TMDL station S-021.

In this subwatershed, there are no NPDES-permitted continuous point source dischargers. Figure 5 illustrates the existing MS4 within the TMDL watershed percentage of the TMDL station's drainage area covered by Greenville County MS4 is provided in Table 2.

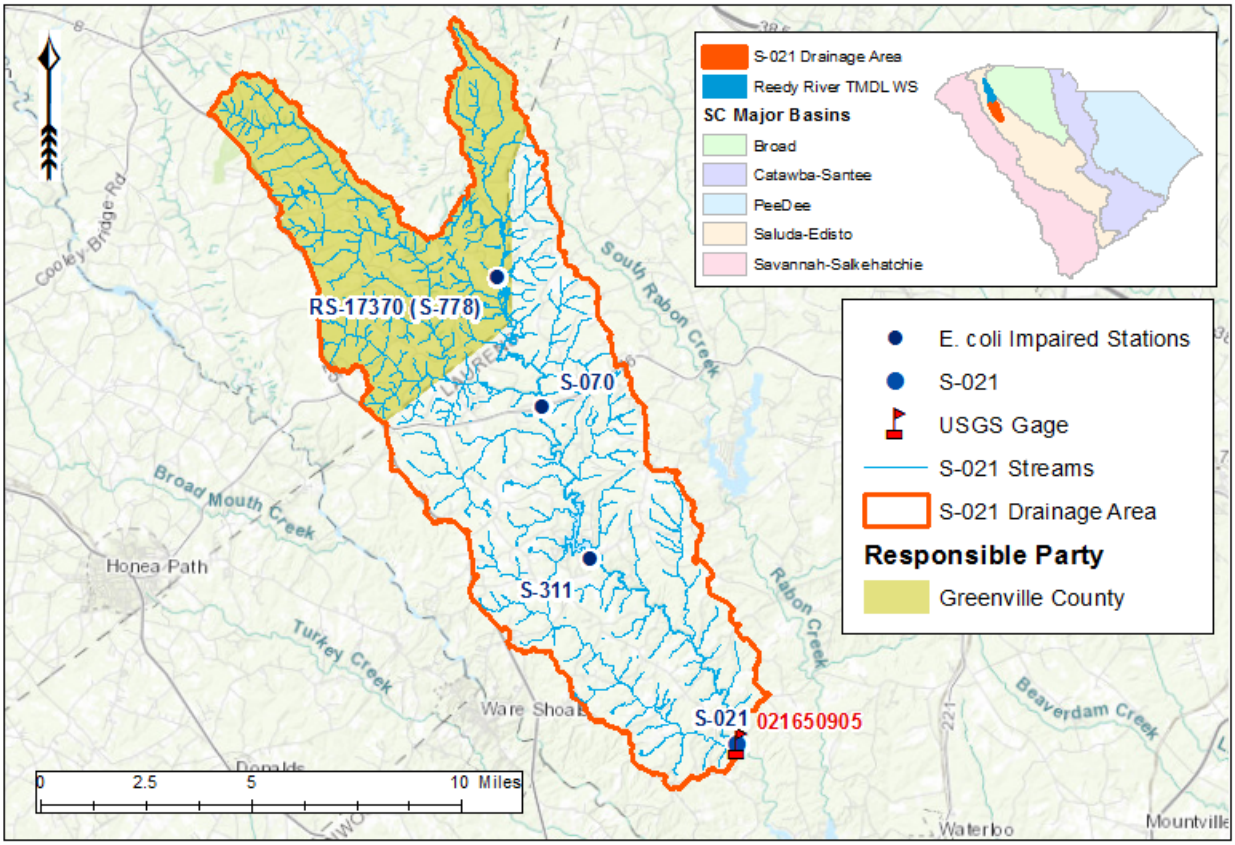

Figure 5. *E. coli* impaired stations and existing regulated MS4 located within the drainage area of station S-021.

Using the NLCD 2019 Percent Developed Imperviousness layer and drainage area of TMDL stations, the percent imperviousness of the TMDL stations was calculated and is shown in Table 4.

1.4 Water Quality Standard

As defined in SC Regulation 61-69 (2023) Freshwaters (FW) are suitable for primary and secondary contact recreation and as a source of drinking water supply after conventional treatment in accordance with the requirements of the Department.

Suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. Suitable also for industrial and agricultural uses.

The indicator bacteria for recreational uses in FW is E. *coli* and the water quality standards are: "*Escherichia coli* Not to exceed a geometric mean of 126/100 mL based on at least four (4) samples collected from a given sampling site over a 30-day period, nor shall more than ten percent (10%) of the total samples during any 30-day period exceed 349/100 mL." (SCDHEC 2023b).

2.0 Water Quality Assessment

Determination for §303(d) listing purposes is based on assessing five consecutive years of data collected from a WQM station. For instance, for the combined final 2020 and 2022 §303(d) list of South Carolina's impaired waters, data collected from 2014 through 2018, and 2016 through 2020 were used for the 2020 and 2022 portions of the combined list, respectively.

For recreational use, if more than 10% of the monthly geometric mean of available data collected during an assessment period exceeds the criterion, the station is listed on South Carolina's §303(d) list. If sufficient data are not available to calculate a monthly geometric mean, the available sample results are compared to the single sample maximum (SSM) criterion. If more than 10% of these samples exceed the criterion, the station is included on South Carolina's §303(d) list of impaired waters as not supporting recreational use. See Table 5 for a summary of the number of samples collected (n), the number of exceedances, and the percentage of samples exceeding the standard.

Table 5. Exceedance summary for *E. coli* impaired TMDL stations.

Station – US to DS	Number of Samples (n)	Number Exceeding WQS	Percent Exceeding WQS	TMDL Data Period
S-319	93	55	59.8	2013 - 2022
S-072	96	25	26.3	2013 - 2022
RS-19501 & RS-20501	24	8	33.3	2019 - 2020
S-021	86	14	16.3	2013 - 2022

3.0 Source Assessment

Surface waters can be contaminated by various sources of pathogens, which can be categorized as continuous and intermittent point sources, and nonpoint sources. Efforts to control pollution from continuous point sources, such as WWTPs, have significantly reduced their impact through the implementation of technology-based controls. These point sources are regulated under the CWA and are required to obtain an NPDES permit. In South Carolina, NPDES permits mandate that dischargers with an *E. coli* limit meet the WQS at the discharge point (end of pipe). While dischargers, mostly domestic and municipal, can occasionally be sources of pathogens, if they are operating within their permit limits, they cannot be considered the cause of impairments. There are enforcement actions and mechanisms in place if these facilities fail to meet their permit requirements.

Regulated MS4, industrial, and construction site stormwater discharges are intermittent point sources. These intermittent sources are required to obtain discharge permits under the NPDES stormwater regulations. Each may be a source of pathogens. These sources are expected to meet the percentage reductions as prescribed in this TMDL document or the existing instream standard for the pollutant(s) of concern, to the maximum extent practicable (MEP), through compliance with the terms and conditions of their NPDES permit.

Nonpoint sources of bacteria in streams include various land-use practices such as agricultural activities, silviculture, urban and rural runoff, malfunctioning septic systems, sanitary sewer overflows, pet waste, wildlife, and poorly managed livestock operations. These activities can contribute to the presence of bacteria in surface water through runoff, leaching, and direct discharge.

3.1 Point Sources

Point sources refer to specific locations where NPDES-permitted effluent is discharged into the environment from identifiable sources such as pipes, outfalls, or conveyance channels. These sources can be traced to a single location such as industrial, municipal, domestic WWTPs, and NPDES-regulated stormwater discharges. Point sources are further divided into “continuous” and “intermittent”.

3.1.1 Continuous Point Sources

Industrial, municipal, and domestic WWTPs have the potential to harbor pathogenic bacteria if their effluent fails to meet the WQS at the discharge point, as defined by their NPDES permit. If these facilities are discharging wastewater that meets their permit limits, they are not contributing to a bacteria impairment. If any of these facilities fail to comply with their permit limits, enforcement actions and mechanisms are in place to address the situation.

Within the Reedy River watershed, five municipal and domestic point source WWTPs monitor FC bacteria levels with limits on their NPDES permits. Table 6 provides a list of these facilities, along with their permit numbers and permitted design flows.

Table 6. Active domestic and municipal NPDES dischargers within the Reedy River TMDL watershed.

Discharger	NPDES Permit Number	Permitted Design Flow (mgd)
Altamont Mobile Home Village	SC0028533	0.0135
ReWa Mauldin Rd	SC0041211	29.0
ReWa Lower Reedy	SC0024261	11.5
United Utilities Canterbury SD	SC0028941	0.08
United Utilities Trollingwood SD	SC0026611	0.10

As previously mentioned, all five domestic and municipal dischargers in the Reedy River watershed are operating with expired NPDES permits and conducting monitoring for FC. However, following the renewal and issuance of their permits, these dischargers will be required to monitor for *E. coli*, which is the fecal bacteria indicator for freshwaters (SCDHEC 2023b).

In addition to the domestic and municipal dischargers listed in Table 6, there are 11 other NPDES permitted facilities in the Reedy River TMDL watershed. These facilities do not have *E. coli* limits due to the nature of their operations and discharges (Table 7). Any future NPDES-permitted dischargers of *E. coli* in this watershed will need to comply with the WLAs in this document.

Table 7. NPDES permitted Industrial facilities in the Reedy River TMDL watershed.

NPDES	Name	Type
ND0082139	CEMEX/PARIS MOUNTAIN ROAD PLT	Industrial
SC0048411	HITACHI ELECTRONIC DEVICES USA INC	Industrial
SCG250075	SAFETY COMPONENTS FAB/DUNEAN	Industrial
SCG250139	CRUCIBLE CHEMICAL COMPANY	Industrial
SCG250165	SOUTHERN WATER TREATMENT CO	Industrial
SCG250262	GVD CORPORATION	Industrial
SCG250314	GVD CORP/FAIRFOREST WAY	Industrial
SCG250327	3M COMPANY	Industrial
SCG730429	VULCAN CONST MAT/PRINCETON QUA	Industrial
SCG730460	BURDETTE ENTERPRISES/CONESTEE	Industrial
SCG731037	CARTER EXCAV/MAULDIN ROAD MINE	Industrial

3.1.2 Intermittent Point Sources

Intermittent point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permit numbers beginning with SCS and SCR and regulated under SC *Water Pollution Control Permits* Regulation R61-9, §122.26(b)(4),(7),(14) - (21) (SCDHEC 2019). All regulated MS4 entities have the potential to contribute *E. coli* and other pathogen loadings in the Reedy River TMDL watershed and are subject to the WLA for intermittent sources.

The presence of a substantial amount of developed and impervious land in a watershed leads to increased runoff from these areas following precipitation, which can contribute to pollution along with other sources. The "developed" land class, which encompasses open spaces, low, medium, and high-intensity areas, was determined for each TMDL station's drainage area using ArcGIS and the NLCD 2019 dataset, and the results are shown in Table 3. Additionally, the percentage of impervious areas in each TMDL station's drainage area was calculated using the NLCD imperviousness layer and is also summarized in Table 8.

Table 8. Aggregate developed land uses and impervious areas within the TMDL watersheds.

Station	Total Area (mi^2)	Developed Area (mi^2)	% Developed Area	% Impervious Area
S-319	32.15	20.01	62.23	21
S-072	77.66	53.09	68.36	26.6
RS-19501 & RS-20501	53.12	10.91	20.54	6.1
S-021	88.25	6.78	7.68	1.1

Stormwater discharges from all regulated MS4 entities operating within the Reedy River TMDL watershed have the potential to contribute to *E. coli* and other pathogens and are subject to the WLA portion of the TMDL. Presently, the City of Greenville, Greenville County, and SCDOT operate three regulated MS4s within the Reedy River TMDL watershed. It is worth noting that the cities of Mauldin, Simpsonville, and Travelers Rest are co-permittees under Greenville County MS4 permit, as shown in Figure 6.

The South Carolina Department of Transportation (SCDOT) is a designated MS4 within these TMDL watersheds, operating under NPDES MS4 Permit SCS040001 (Figure 7). However, SCDOT is not a traditional MS4 as it lacks statutory taxing or enforcement powers, and does not regulate land use or zoning, or issue building or development permits. At the time of TMDL development, there was one SCDOT facility located in the Reedy River TMDL watershed at 1439 Laurens Rd, Greenville.

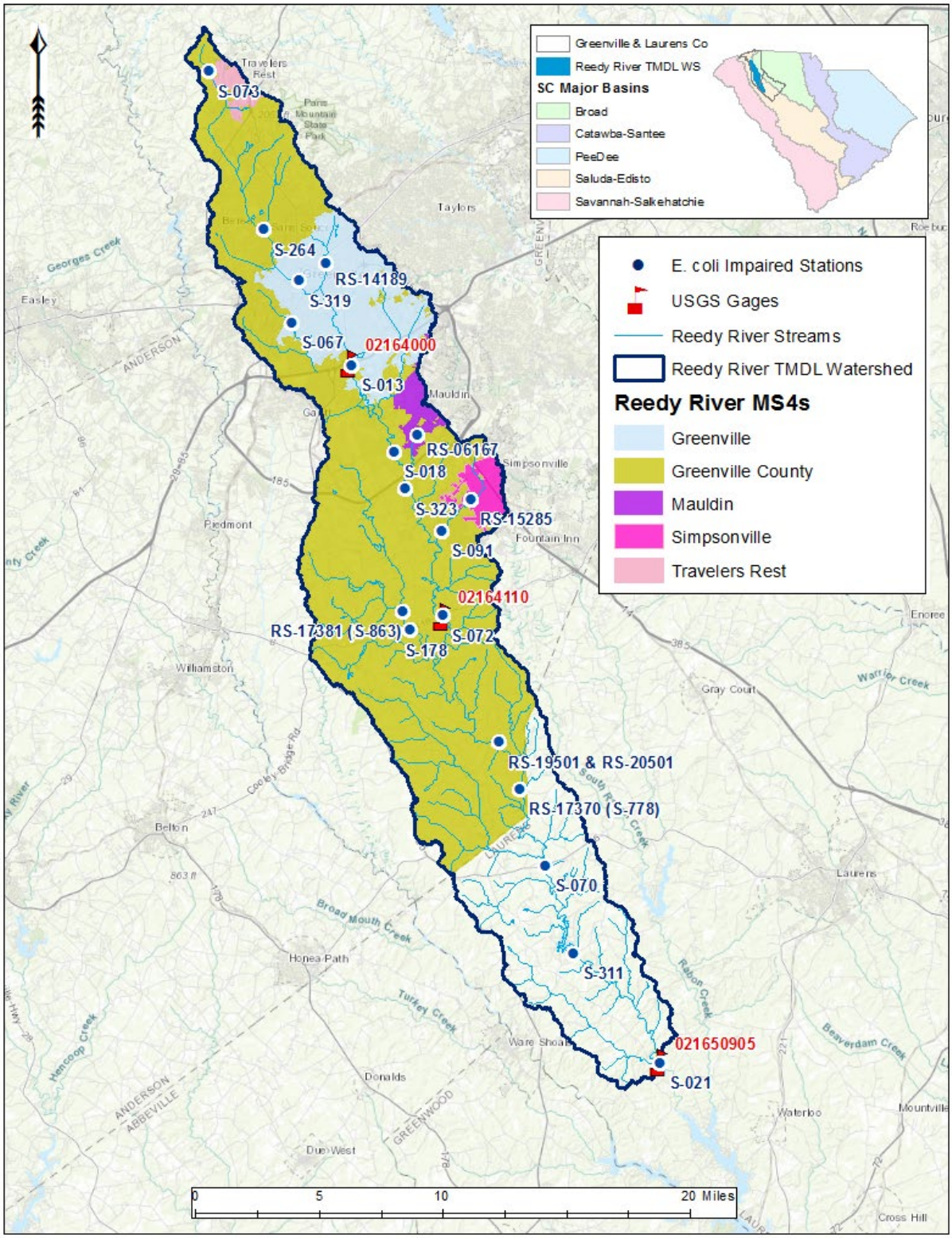

Figure 6. MS4s and responsible parties within the Reedy River TMDL watershed.

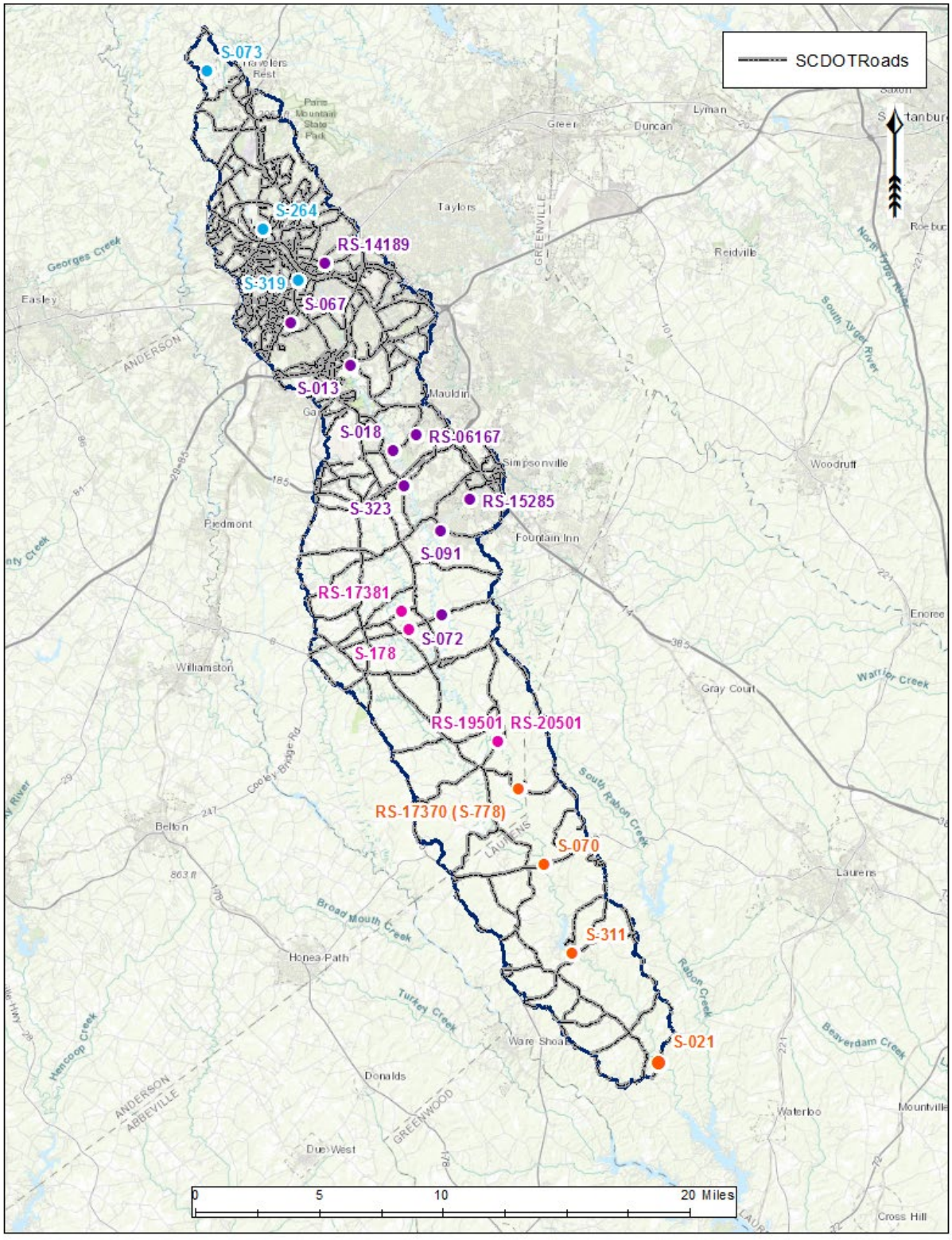

Figure 7. SCDOT owned and operated roads within Reedy River TMDL watersheds.

The areas of Greenville County including co-permittees, and the City of Greenville that are covered by their respective MS4 permits and SCDOT are required to comply with the WLA outlined in this TMDL document and work towards achieving the implementation targets specified in Table 16.

The NPDES stormwater industrial general permit (SCR000000) regulates industrial facilities that could potentially cause or contribute to violations of WQS through stormwater discharges. Similarly, the NPDES stormwater construction general permit (SCR100000) applies to construction activities. If construction activities have the potential to impact a water body with a TMDL, the stormwater pollution prevention plan (SWPPP) must address pollutants of concern and comply with the WLAs specified in this TMDL document. It's important to note that some stormwater discharges in the watershed may not fall under the SCS and SCR permits, and therefore they are not subject to the WLA portion of the TMDL.

Sanitary sewer overflows (SSOs) are intermittent point sources that can have a significant impact on water quality when they release into surface waters. The responsibility for preventing SSOs lies with the NPDES wastewater discharger or the operator of the collection system for non-permitted systems that handle wastewater. However, it is important to note that SSOs are not always preventable or reported. In the Reedy River TMDL watershed, certain areas are serviced by municipal WWTPs and have sewer lines, which can increase the likelihood of SSO occurrences (Figure 8).

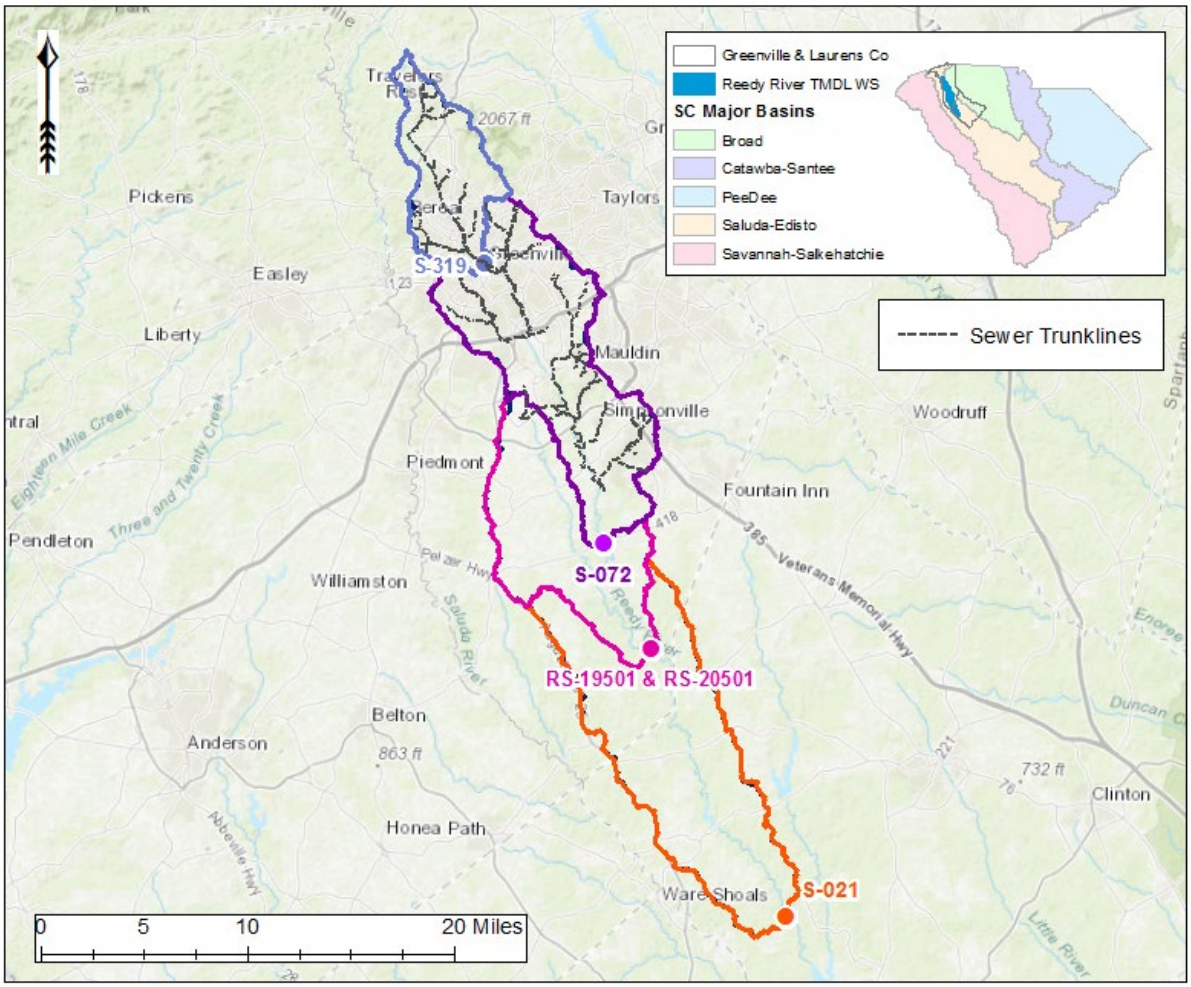

Figure 8. Areas served with sewer lines.

The Department acknowledges that MS4s may require multiple permit iterations to fully meet the assumptions and requirements of the TMDL. In order to comply with the MS4 permit, making progress towards achieving the WLA reduction for the TMDL through compliance with the stormwater management plan (SWMP) may be considered sufficient, as long as the criteria of Maximum Extent Practicable (MEP) are met. This allows for flexibility in the implementation process.

For SCDOT, existing and future NPDES MS4 permittees, compliance with the terms and conditions of their NPDES permit is an effective implementation of the WLA to the MEP and demonstrates consistency with the assumptions and requirements of the TMDL. For existing and future NPDES construction and industrial stormwater permittees, compliance with the terms and conditions of their permit is an effective implementation of the WLA. Required load reductions in the LA portion of this TMDL

can be implemented through voluntary measures and are eligible for the *Clean Water Act* (CWA) §319 grants.

The Department recognizes that adaptive management/implementation of these TMDLs might be needed to achieve the water quality standard.

3.2 Nonpoint Sources

Nonpoint source pollution refers to pollution that originates from various sources across a large area, rather than being released through specific pipes. Nonpoint source pollution arises from a variety of land or water use activities, encompassing practices such as:

- Improper animal-keeping: Inadequate management of animal waste, runoff from livestock operations, and allowing livestock access to surface waters.
- Failing septic tanks: Malfunctioning or poorly maintained septic systems that release contaminants into groundwater or nearby water bodies.
- Agriculture: Runoff of fertilizers, pesticides, and sediment from agricultural lands.
- Forestry practices: Erosion and sedimentation resulting from logging activities and improper forest management.
- Wildlife: Animal waste and other natural sources contribute to water pollution.
- Urban and rural runoff: Surface runoff from developed areas (urban) and open spaces (rural), carrying pollutants like chemicals, oils, and litter into waterways.

These activities can lead to nonpoint source pollution, where pollutants are dispersed and do not have a single identifiable point of origin. These and other nonpoint source contributors located in unregulated areas can contribute to the presence of *E. coli* in the Reedy River and its tributaries. Nonpoint sources in unregulated areas are addressed through the LA portion of the TMDL, rather than the WLA portion. During precipitation events, nonpoint source contributions to in-stream *E. coli* are likely to increase as runoff carries pollutants from the land into waterways.

3.2.1 Wildlife

Wildlife, including deer, feral pigs, squirrels, raccoons, opossums, waterfowl, and other birds, can contribute to the presence of *E. coli* and other fecal-borne pathogens in waterways. Their feces may directly enter surface waters or be transported into streams through runoff after rainfall events. According to a study conducted in 2013, the South Carolina Department of Natural Resources (SCDNR) estimated deer density

based on suitable habitats such as forests, croplands, and pastures. Based on this study, there is an estimated deer population of 30 to 45 per square mile in the Reedy River TMDL watershed (SCDNR 2013). Based on a study by Yagow (Yagow 2001), the bacteria production rate for deer was found to be 347 x 10^6 cfu/head-day, although only a portion of this bacteria will enter the water. As such, wildlife can be considered a potential source of *E. coli* in the Reedy River watershed.

3.2.2 Agriculture

Agricultural activities involving livestock or animal waste can contribute to pathogen contamination of surface waters. Animal feces can enter waterways through runoff or direct deposition. The large quantity of bacteria associated with animal waste makes agricultural activities a significant source of bacteria, including *E. coli*, which can affect water quality. Effective management of manure and animal waste is essential to prevent pathogen contamination in the Reedy River TMDL watershed.

3.2.2.1 Agricultural Animal Facilities

Under SC Regulation 61-43, owners/operators of most commercial animal growing operations are required to obtain permits for the proper handling, storage, treatment, and disposal of manure, litter, and deceased animals (SCDHEC 2021). These regulations aim to safeguard water quality, ensuring that compliant facilities do not contribute to water quality impairments. While South Carolina currently does not have confined animal feeding operations (CAFOs) under NPDES coverage, there are three permitted animal feeding operations (AFOs) covered by R. 61-43. These permitted operations, operating under "no discharge" (ND) permits, are prohibited from releasing any discharges into the waters of the state. Any such discharges are illegal and subject to enforcement actions by SCDHEC.

In the lower portion of the Reedy River TMDL watershed, there are four agricultural facilities. Three of these facilities are animal feeding operations, while one operates as a manure broker (Figure 9 and Table 9).

Table 9. Agricultural Facilities in the lower portion of Reedy River TMDL watershed.

Permit Number	Animal Type	AFO Size	Number of Animals
ND0087840*	NA	NA	NA
ND0068128	Beef cattle	Medium	30
ND0016934	Dairy cows	Small	90
ND0015369	Dairy cows	Small	240

** Permitted to apply manure within the watershed, no AFO associated with the permit.*

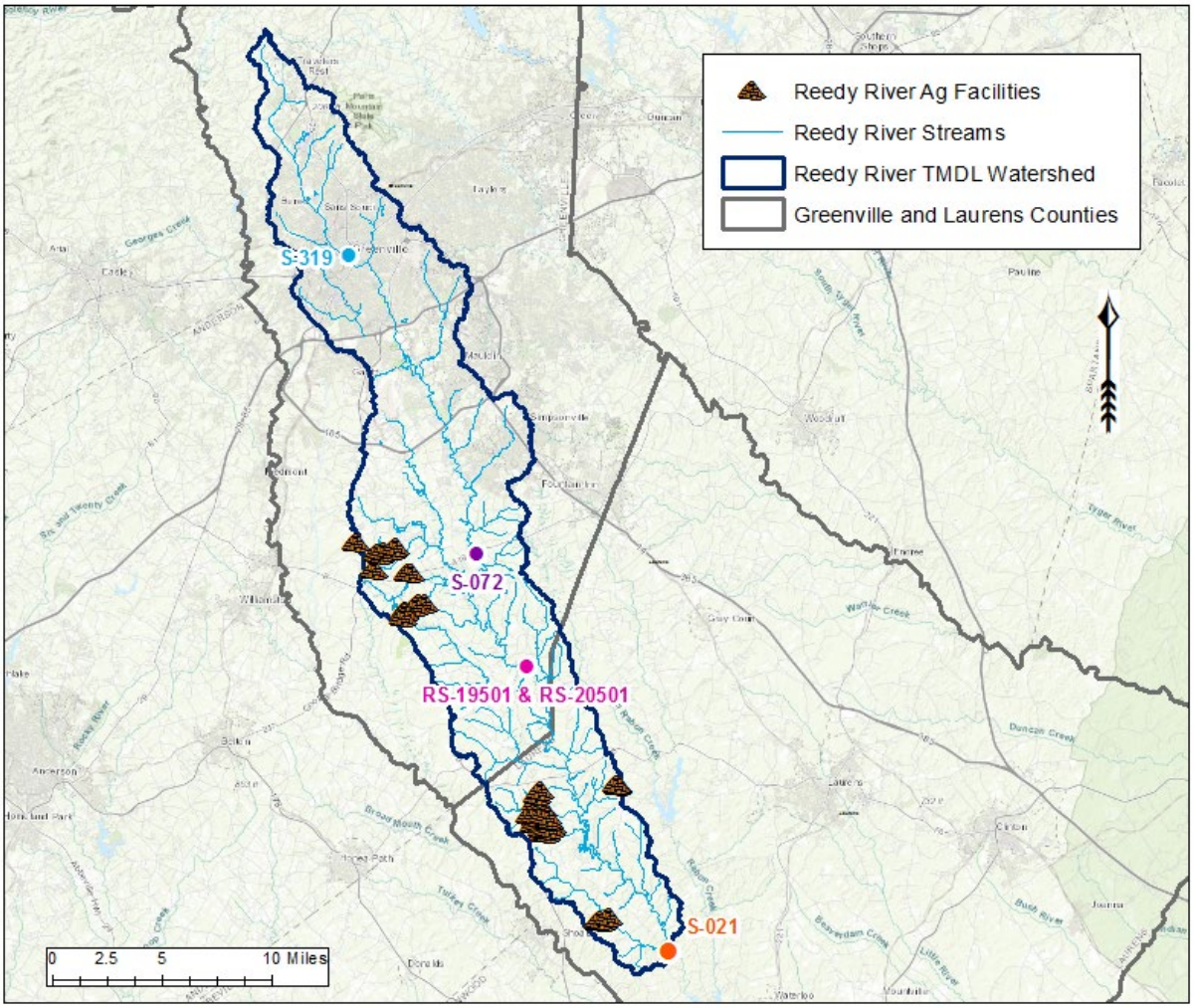

Figure 9. Agricultural Facilities within the Reedy River TMDL watershed.

3.2.2.2 Grazing Livestock

Livestock, especially cattle, are known contributors of *E. coli* and other fecal-borne pathogens in streams. On average, cattle produce approximately 1.0E+11 cfu/day per

animal of FC bacteria. Grazing cattle and other livestock may indirectly contaminate streams with bacteria by runoff from pastures, or directly by defecating into streams and ponds. The grazing of livestock in pastures is not regulated by SCDHEC.

The United States Department of Agriculture's National Agricultural Statistics Service reported 7,042 cattle in Greenville County and 20,709 cattle in Laurens County in 2017 (USDA 2019). Based on the assumption of an even distribution of cattle across pasture/hay areas in Greenville and Laurens counties, approximate estimates of the cattle population were calculated and are presented in Table 10. It is estimated that these cattle could contribute up to 4.5E+14 colony-forming units (CFU) of fecal coliform bacteria per day to the entire watershed, with the possibility of some fraction entering the waterways (Table 11). The NLCD classification system, derived from the Anderson Land Cover Classification System, includes the "Pasture/Hay" category, which represents areas where grasses, legumes, or grass-legume mixtures are grown for livestock grazing or hay production on a perennial cycle. However, it should be noted that not all cattle included in the USDA census are grazed, as dairy cattle and feedlot cattle are often confined and not evenly distributed across Pasture/Hay areas. Therefore, the calculations provide an approximate estimation of the cattle population. Nonetheless, the direct discharge of *E. coli* and other fecal coliform bacteria into surface waters by cattle and other livestock remains a potential contributing source within the TMDL watersheds.

Table 10. Grazing cattle per Acre of Pasture/Hay per county.

County	Number of Cattle	Pasture/Hay Acres	Cattle/Acre Pasture/Hay
Greenville	7042	61312	0.11
Laurens	20709	75430	0.27

Table 11. Estimated Bacteria Produced by Grazing Cattle in TMDL Stations' Drainage Area.

WQM Station	Pasture/Hay Acres	Cattle/Acre of Pasture/Hay	Number of Cattle Grazing in Station DA	Bacteria Produced in Station DA
S-319	1280	0.11	141	1.4E+13
S-072	3411	0.11	375	3.8E+13
RS-19501 & RS-20501	8768	0.11	964	9.6E+13
S-021	11104	0.27	2998	3.0E+14

3.2.3 Land Application of Industrial, Domestic Sludge, or Treated Wastewater

Industrial and domestic wastewater treatment processes that are permitted under the NPDES may produce solid waste byproducts, known as sludge. Some facilities are authorized to apply this sludge to designated land areas under specific conditions. Similarly, there are NPDES-permitted facilities that can apply treated wastewater effluent to land at designated locations and under specific conditions. The regulations governing land application permits for these facilities can be found in SC Regulation 61-9, Sections 503, 504, or 505 (SCDHEC 2019).

Proper management of waste application is crucial to ensure that pollutants are effectively incorporated into the soil or taken up by plants, preventing their entry into streams or groundwater. If not managed correctly, land application sites can become a source of fecal pathogens and contribute to stream impairments. It's important to note that land application sites are not permitted to discharge directly into waterways. Any direct discharges from these sites to surface waters are illegal and can result in enforcement actions by SCDHEC.

In the TMDL watersheds, three facilities have permits to apply sludge from treated wastewater to land. These facilities are Greenville County Schools (permit ND0082139), ReWa Mauldin Road WWTP (permit SC0041211), and ReWa Lower Reedy WWTP (permit SC0048381). They are authorized to apply treated sludge from their WWTP to fields located within the TMDL watershed (Figure 10). The specific application rates of sludge vary depending on field conditions and the production rates of each facility. If not properly managed, land application sites can be a source contributing to *E. coli* exceedances in the TMDL watersheds.

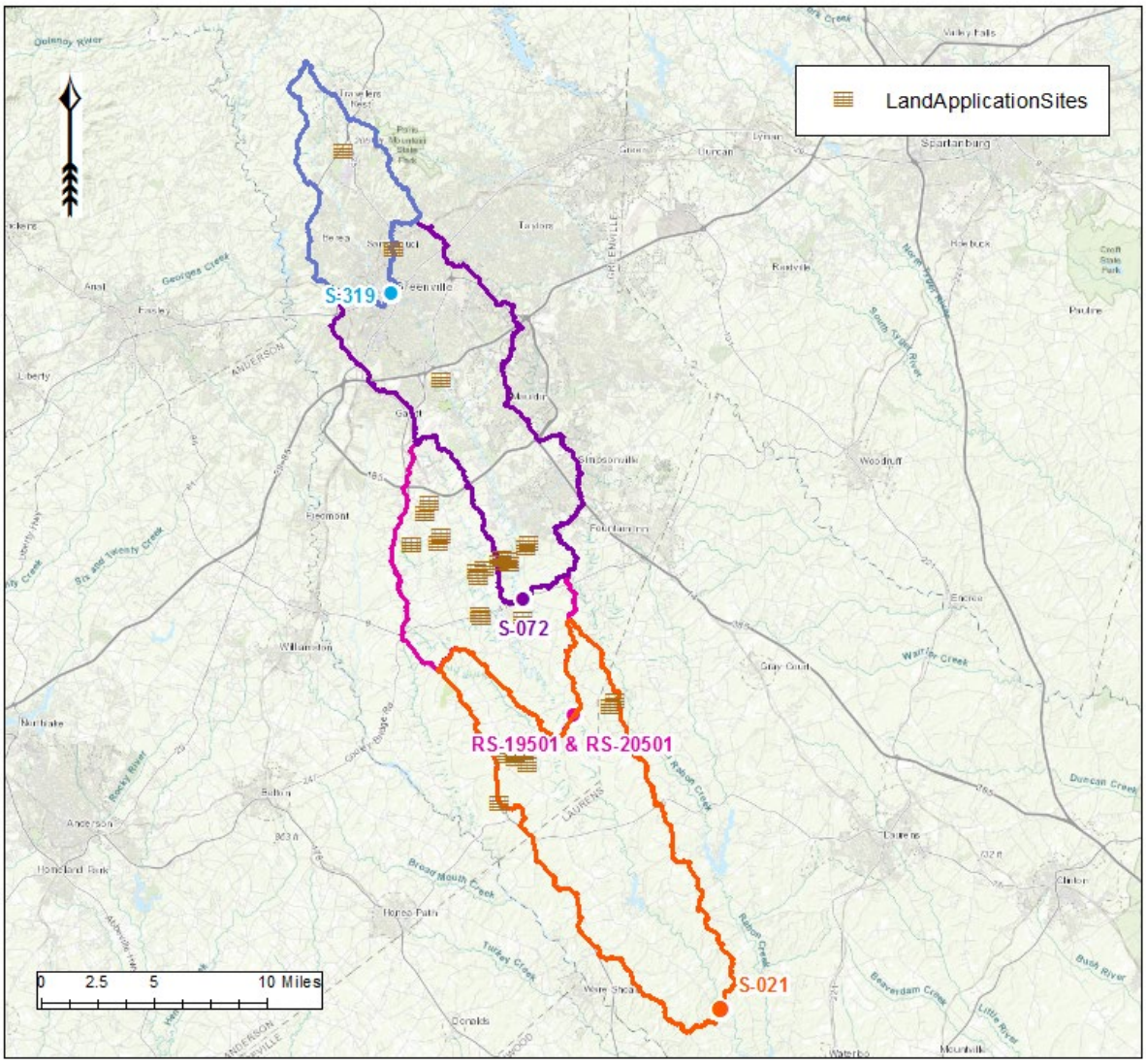

Figure 10. Land application sites within the Reedy River TMDL watershed.

3.2.4 Leaking Sanitary Sewers and Illicit Discharges

Leaking sewer pipes and illicit sewer connections pose a significant public health risk by releasing partially treated or untreated human waste into the environment. Without direct monitoring, it is difficult to accurately quantify the extent of these sources, as their impact depends on factors such as volume and proximity to surface water. Untreated domestic wastewater typically contains bacteria levels ranging from 10^4 to 10^6 MPN per 100mL. GIS data indicates that some areas within the TMDL drainage area are serviced by a sanitary sewer system, suggesting the potential for leakage (Figure 8).

Illicit sewer connections that redirect sewage into storm drains result in the direct discharge of sewage through the outfalls of the storm drainage system. To evaluate this issue, it is crucial to conduct monitoring of the storm drain outfalls during periods of dry weather to determine the presence or absence of sewage in the drainage systems. This monitoring process is essential for identifying and documenting the extent of illicit sewer connections and their impact on the environment. Leaking sewer lines and illicit sewer connections can be one of the potential sources of *E. coli* exceedances in the Reedy River TMDL watershed.

3.2.5 Failing Septic Systems

According to the 2010 U.S. Census, the estimated population of the Reedy River TMDL watershed is 196,339 people, with 87,352 housing units. Based on available data and analysis, approximately 39.5% of the population (77,556 people) and 39.8% of the housing units (34,784 units) are estimated to be connected to sewer lines (Figure 8). The remaining 60.4% of the population (118,783 people) and 60.2% of the housing units (52,568 units) are estimated to rely on onsite wastewater treatment systems (OWTS) such as septic tanks. It should be noted that the GIS layer for sewer lines may not include all newer or smaller branch lines, potentially underrepresenting the proportion of the population and housing units served by wastewater treatment plants. Consequently, this calculation of usage of septic tanks in this watershed may be overestimated.

A separate estimate is based on DHEC records of individual septic tanks in Greenville and Laurens Counties. The number of septic tanks on record by county multiplied by the fraction of the county area in the TMDL watershed gives a total estimated number of septic tanks in the TMDL watershed of 7685 assuming uniform distribution across the counties. This calculation would not include septic tanks installed before record keeping began, and therefore could be underestimated. Both estimates have limitations, as noted, and the actual number of septic tanks in the TMDL watershed is expected to be somewhere in between the two numbers.

When installed and maintained properly, septic systems are safe, long-term options for treating wastewater and preserving valuable water resources. Regulations stipulate that permits for new septic tanks will not be issued when a wastewater treatment facility/public sewer line is accessible for connection.

DHEC has an enforcement program that investigates complaints regarding the functioning of an onsite wastewater system and if an unpermitted discharge of sewage

or other domestic wastewater is identified, prompt timelines for compliance are issued to the responsible party in order to minimize the risk of any discharge presenting significant harm to the environment and public health. At present, the state lacks sufficient regulatory authority for maintenance and upkeep of onsite wastewater systems.

The Reedy River Water Quality Group (RRWQG) received CWA §319 funding for the replacement or repair of septic tanks within the Huff Creek watershed. According to the project's closeout report, there were a total of 2189 septic tanks in the area, with over 70% of the population relying on them for wastewater treatment. Based on EPA statistics and age of the septic tanks in the Huff Creek watershed, the RRWQG projected that 275 septic tanks could be at risk of malfunctioning. Ultimately, the RRWQG reported that only 5 malfunctioning septic tanks were repaired through the project due to low participation.

Failing septic systems can be one of the potential sources of *E. coli* exceedances in the Reedy River TMDL watershed.

3.2.6 Urban and Suburban Runoff

Domesticated pets, such as dogs and cats, are contributors to *E. coli* and other bacteria in urban and suburban areas. Additionally, wildlife species like deer, squirrels, raccoons, opossums, and birds also contribute to the overall bacteria load. In the upper portions of the TMDL watershed, urban runoff is expected to be significant, especially in areas that drain to stations S-319 and S-072, due to the presence of developed land and higher percentages of impervious surfaces. However, in the remaining parts of the TMDL watershed where there is limited development, urban runoff is considered to have a negligible impact.
Unregulated MS4 communities have the potential to contribute to *E. coli* and other bacteria through stormwater runoff. These unregulated entities are subject to the LA portion of the TMDL document.

4.0 Method

The TMDLs for the Reedy River Watershed were determined using the load-duration curve methodology. This method enables the calculation of TMDLs that account for different hydrologic conditions (Bonta and Cleland 2003). The process involves creating load-duration curves by analyzing the cumulative frequency distribution of stream flow and bacteria concentration data. By utilizing these curves, both the

existing pollutant load and the total maximum daily load for a particular waterbody can be estimated. The development of flow-duration curves (FDC) and load-duration curves (LDC) is explained in depth in this section.

4.1 Flow-Duration Curve

The first step of the LDC methodology involves the development of FDC. FDCs are graphical representations that illustrate the cumulative frequency of historical flow data. Typically, these curves are constructed using data obtained from long-term, continuous-record flow-gaging stations maintained by the United States Geological Survey (USGS). These gages provide reliable and comprehensive information on stream flow over an extended period, enabling the creation of accurate flow-duration curves.

In the Reedy River TMDL watershed, there are three active USGS surface water flow gaging stations (Figure 1). Daily mean discharge data from these stations for the period between January 1, 2013, and December 31, 2022, were obtained from the website https://waterdata.usgs.gov/sc/nwis/rt. These data were used to generate FDCs. To account for differences in drainage areas between the USGS station's drainage areas and the TMDL station's drainage areas, drainage area ratios were calculated. The daily mean streamflow from the USGS stations was adjusted for each TMDL station by multiplying the instream flows by the ratio of the TMDL station's drainage (Table 12).

Table 12. USGS flow gage locations, TMDL stations, their drainage areas (DA), and flow ratios.

USGS	Location	USGS Gage DA (mi^2)	TMDL Station	TMDL Station DA (mi^2)	Drainage Area Ratio
02164000	Reedy River near Greenville, SC	48.6	S-319	32.15	0.66
02164110	Reedy River above Fork Shoals, SC	110	S-072	110.0	1
021650905	Reedy River near Waterloo, SC	251	RS-19501 & RS-20501	162.9	0.65
021650905	Reedy River near Waterloo, SC	251	S-021	251	1

To create the FDCs, estimated daily flows for each TMDL station were ranked from highest to lowest. The percentage of time that these flows were exceeded was then calculated. These data points were plotted on a semi-log plot, with flows represented on the y-axis and percent exceedance on the x-axis. In the FDC, higher flows correspond to lower percent exceedances, indicating that these flows are rarely exceeded. Conversely, lower flows correspond to higher percent exceedances, indicating that these flows are nearly always exceeded.

The flows in FDC are categorized into five hydrologic categories: High flows, moist conditions, mid-range flows, dry conditions, and low flows. Categorizing the flows into these categories and comparing bacteria exceedances can provide insights into the potential sources of pollution. A high number of exceedances during dry conditions may indicate NPDES permitted point sources not meeting their bacteria limits, illicit connections, or direct deposition while exceedances during wet conditions indicate runoff from developed areas, impervious surfaces, and nonpoint sources (Table 13). It is important to note that data within the high flow and low flow categories are typically not used in the development of a TMDL due to the infrequency of these flow conditions.

Table 13. Potential sources of E. coli exceedances under various flow duration categories.

Potential Sources	Flow Duration Category				
	High	Moist	Midrange	Dry	Low
Point Sources			Low	Medium	High
WWTP Overflow, SSO	High	Medium			
Riparian Areas		High	High	High	
Impervious area stormwater runoff		High	High	High	
Upland stormwater runoff	High	High	Medium		
Overland flow	High	High	Medium		
Failing septic systems			High	Medium	

Direct delivery (livestock in-stream, wildlife, pets, illegal dumping, illegal connections)	Medium	High	High

Adapted from USEPA 2007, 841-B-07-006 Table 4-1, TMDLs for FIB in the Santa Maria River Watershed in California, Cleland 2012, Willamette Basin TMDL Oregon DEQ 2006.

The three USGS gages mentioned in the previous context are situated downstream from five domestic and municipal wastewater treatment plants (WWTPs). Among these WWTPs, ReWa Mauldin Road and ReWa Lower Reedy are classified as major dischargers (1 MGD or more), while Altamont MPH, Trollingwood, and Canterbury are classified as minor dischargers (less than 1 MGD). The recorded flows at these USGS gages reflect the actual discharge flows from these NPDES-permitted facilities. Flow duration curves for the TMDL stations are shown on Figure 11, Figure 12, Figure 13, and Figure 14 below.

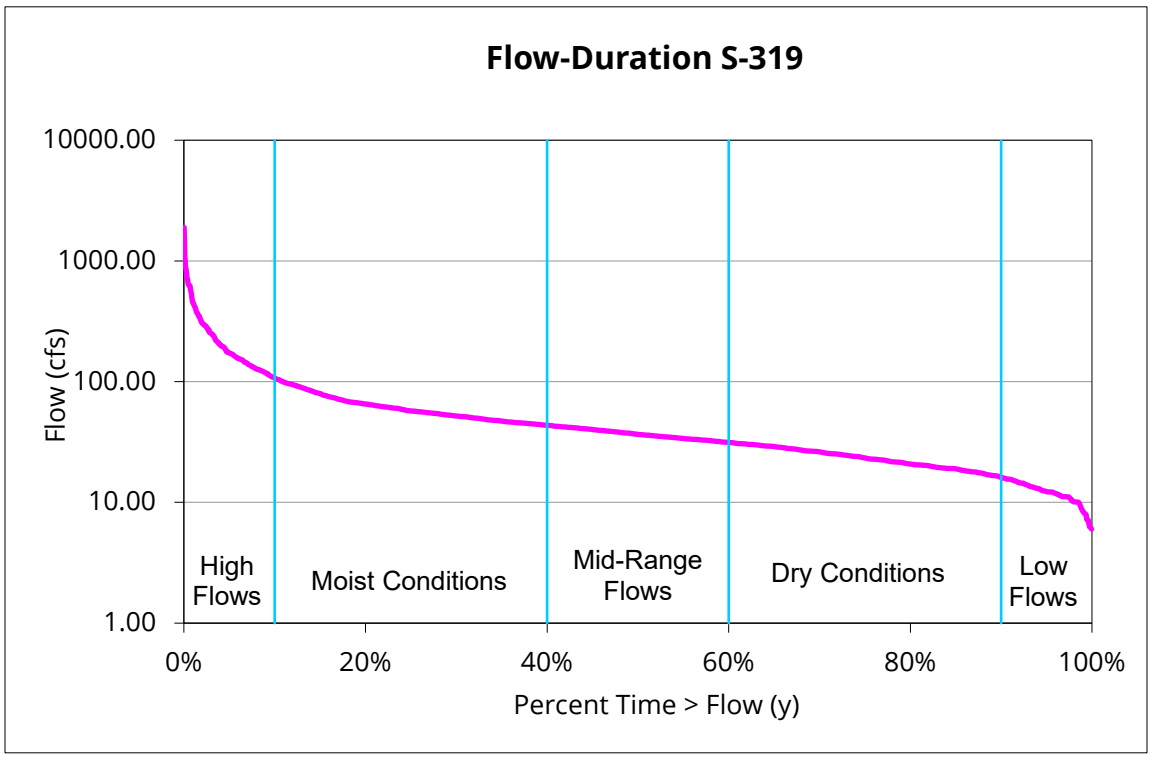

Figure 11. Flow duration curve for station S-319.

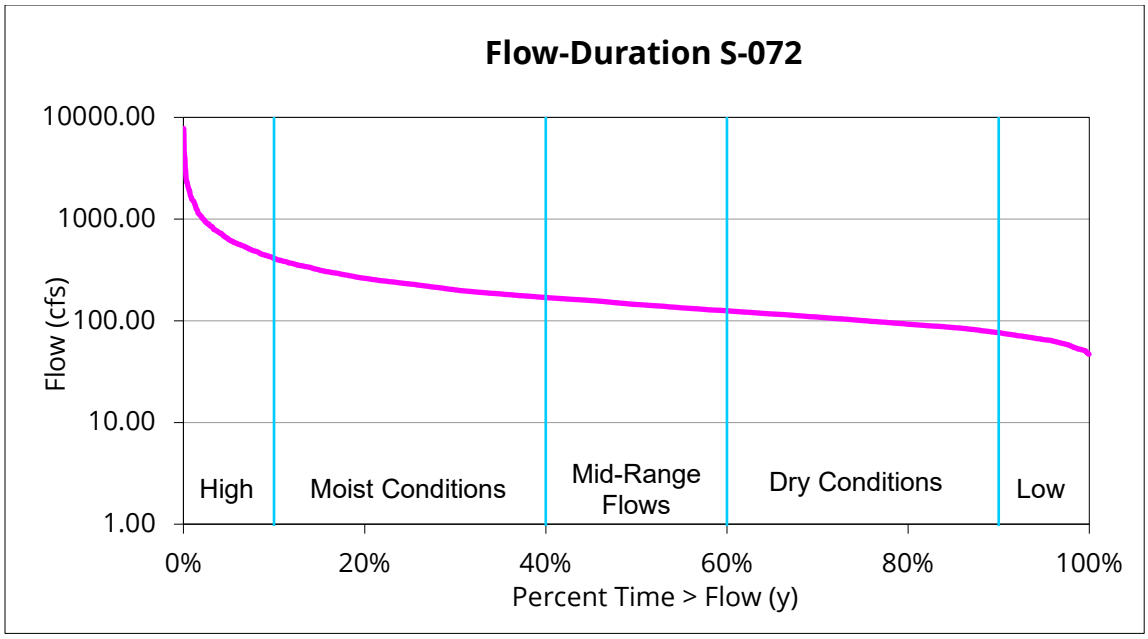

Figure 12. Flow duration curve for station S-072.

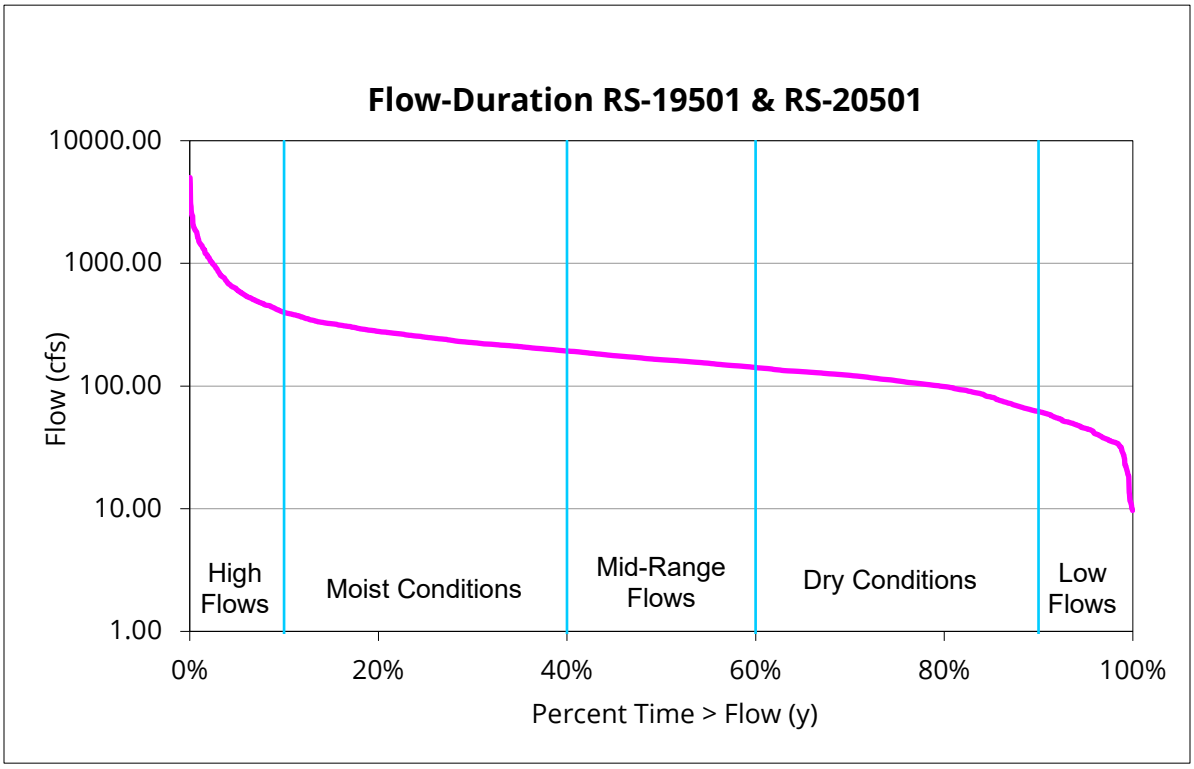

Figure 13. Flow duration curve for stations RS-19501 & RS-20501.

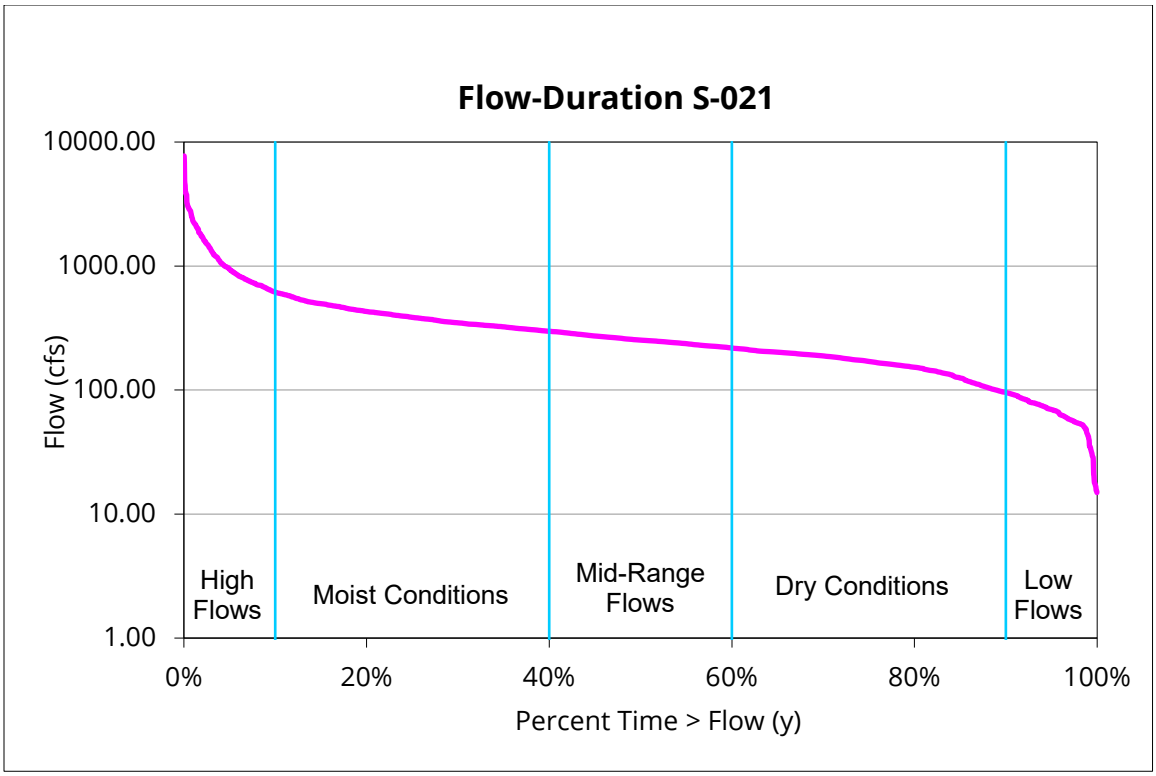

Figure 14. Flow duration curve for station S-021.

4.2 Load Duration Curve

After generating the FDCs, the next step in the analysis was to create LDCs by combining the adjusted flow duration data with *E. coli* data. The *E. coli* data was collected from four TMDL stations over a period spanning from 2013 to 2022.

The LDCs provide valuable insights into the relationship between the duration of specific flow conditions and the corresponding instream *E. coli* loads. By examining the variations in *E. coli* levels under different flow conditions, it becomes possible to assess the sources and transport mechanisms of *E. coli*, as well as the associated risks to water quality.

The utilization of *E. coli* data from multiple TMDL stations over an extended period enables a comprehensive assessment of *E. coli* loads in the monitored water bodies. This information facilitates the identification of patterns, trends, and potential sources of contamination, which can be helpful in the development of effective strategies and measures to address water quality impairments caused by *E. coli*.

The *E. coli* target loads for the TMDL stations were determined based on the estimated daily instream flows and the water quality criterion (332 MPN/100ml), which includes

a 5% explicit MOS deducted from WQS. By incorporating the MOS in the target load calculation, the TMDL takes into account the inherent complexities and uncertainties associated with water quality assessment. This approach enhances the effectiveness of the TMDL in protecting and improving water quality by providing a more realistic and protective framework for managing *E. coli* levels.

The Pearson correlation coefficient, also known as Pearson's r, is a statistical measure that quantifies the strength and direction of the linear relationship between two variables. It is denoted by the symbol "r" and takes values between -1 and +1. The interpretation of the coefficient depends on the context of the data and the specific variables being analyzed. It is important to note that the Pearson correlation coefficient measures only linear relationships and may not capture other types of relationships, such as non-linear associations.

Pearson's r for stations S-319, S-072, RS-19501 & RS-20501, and S-021, which measure the strength and direction of the linear relationship between 24-hour total precipitation for the same day *E. coli* samples were collected and they are 0.5, 0.76, 0.72, and 0.38, respectively (Table 14).

The correlation coefficient of 0.5 for station S-319 indicates a moderate positive relationship between precipitation and *E. coli* levels. This suggests that there is a tendency for *E. coli* levels to increase in the Reedy River with higher precipitation, although the relationship is not as strong as in stations S-072 and RS-19501 & RS-20501.

On the other hand, the correlation coefficients of 0.76 for station S-072 and 0.72 for stations RS-19501 & RS-20501 indicate a strong positive relationship between 24-hour total precipitation and *E. coli* levels. This implies that as precipitation increases, there is a clear tendency for *E. coli* levels to increase in these watersheds.

Lastly, the correlation coefficient of 0.38 for station S-021 suggests a moderate positive relationship between precipitation and *E. coli* levels, but the strength of the relationship is relatively weaker compared to the other stations.

These correlation coefficients provide insights into the association between precipitation and *E. coli* levels in the respective watersheds, helping to understand the influence of rainfall events on bacterial contamination in the Reedy River watershed.

Table 14. Pearson correlation coefficients between precipitation and instream E. coli concentrations for the TMDL stations.

TMDL Station	Pearson's r
S-319	0.5
S-072	0.76
RS-19501 & RS-20501	0.72
S-021	0.38

LDCs were generated for the four impaired stations using exclusively *E. coli* bacteria data. These curves provide a representation of the relationship between the duration of specific flow conditions and the corresponding *E. coli* loads in the water. By combining information on stream flow and *E. coli* concentrations, the target load for each station was determined.

An existing load was determined for each hydrologic category for the TMDL calculations. The 90th percentile of measured bacteria concentrations within each of the hydrologic categories was multiplied by the flow at each category midpoint (i.e., flow at the 25% duration interval for moist conditions, 50% interval for mid-range, and 75% for dry conditions). Existing loads were then plotted on the load-duration curve (pink line). These values were compared to the target load (green line) at each hydrologic category midpoint to determine the percent load reduction necessary to achieve compliance with the WQS. To calculate existing (pink line) and target loads (green line) for each of the flow ranges represented on the LDC graph, the following equations were used:

Existing Load (MPN/day) = Mid-Point Flow in Each Hydrologic Category (ft^3/s) x 90th %tile *E. coli* Concentration x Conversion Factor (24465758.4)

Eq. 2

WLA + LA to Meet Target Load (MPN/day) = Mid-Point Flow in Each Hydrologic Category (ft^3/s) x 332 (*E. coli* WQ criterion MPN/day – 5% MOS) x Conversion Factor (24465758.4)

Eq. 3

In an LDC, the independent variable (X-axis) represents the percentage of time that the estimated flow would be greater than X. In this case, flows are represented by categories: high, moist, mid-range, dry, and low. The dependent variable (Y axis) represents the bacteria load (MPN/day) at each flow. LDCs for TMDL stations are shown on Figure 15, Figure 16, Figure 17, and Figure 18.

There are domestic and municipal point sources upstream of all TMDL stations. All WLAs were calculated using the design flow of the wastewater treatment plant, *E. coli* WQS, and a conversion factor (24465758.4) (Eq 4).

WLA = WWTP Design Flow (mgd) * 1.55 (conversion factor to cfs) * *E. coli* WQS (349 mpn/100 ml) * 24465758.4 (conversion factor)

Eq. 4

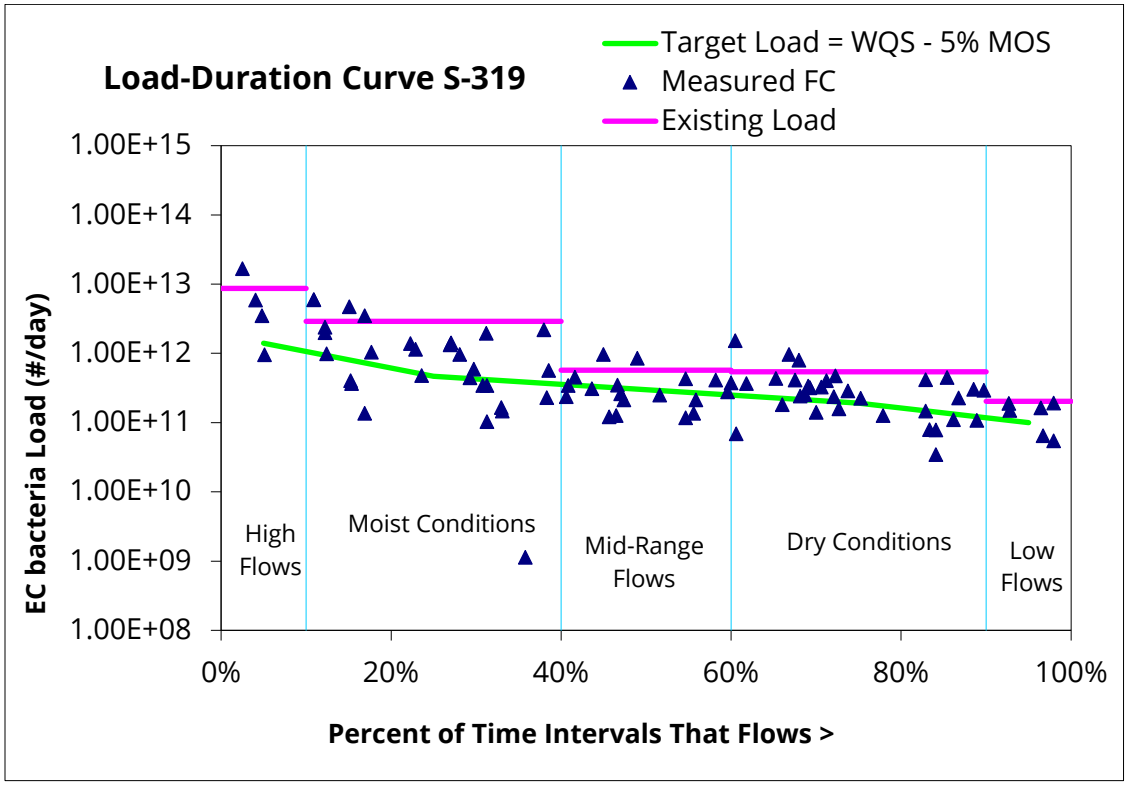

Figure 15. LDC of S-319.

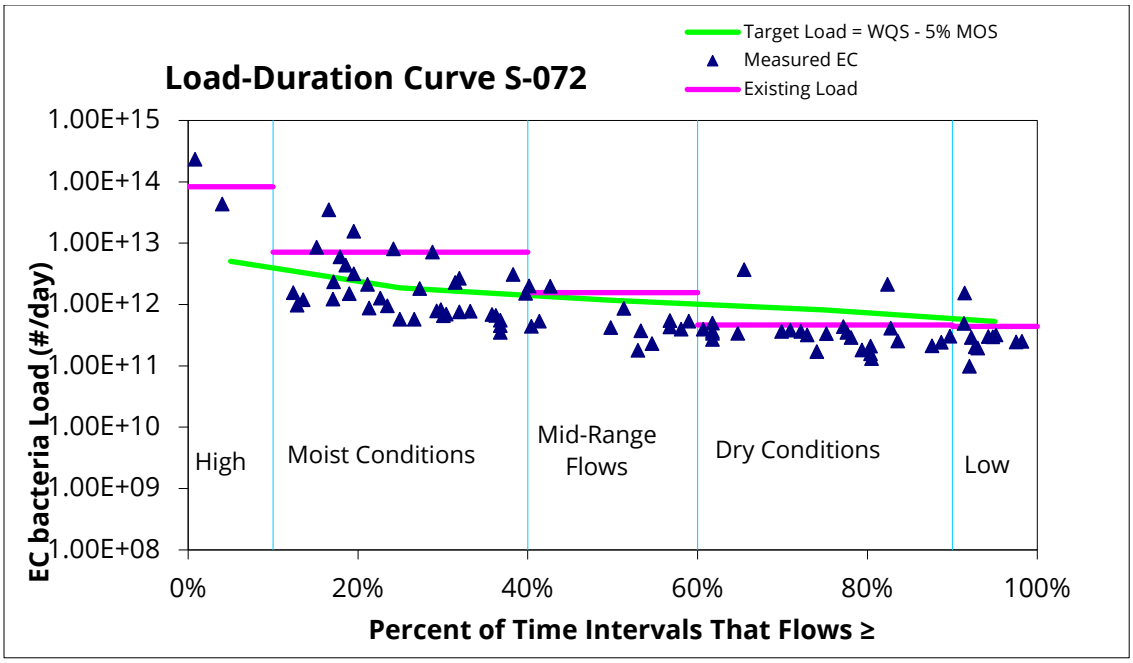

Figure 16. LDC of S-072.

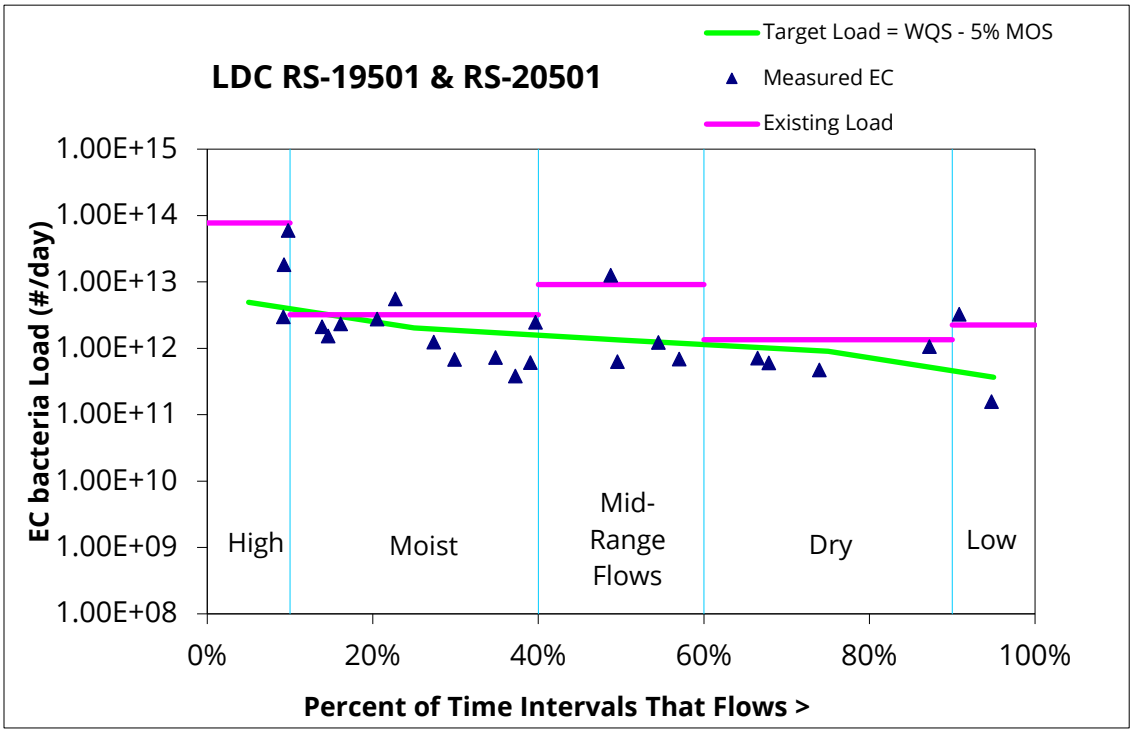

Figure 17. LDC of RS-19501 & RS-20501.

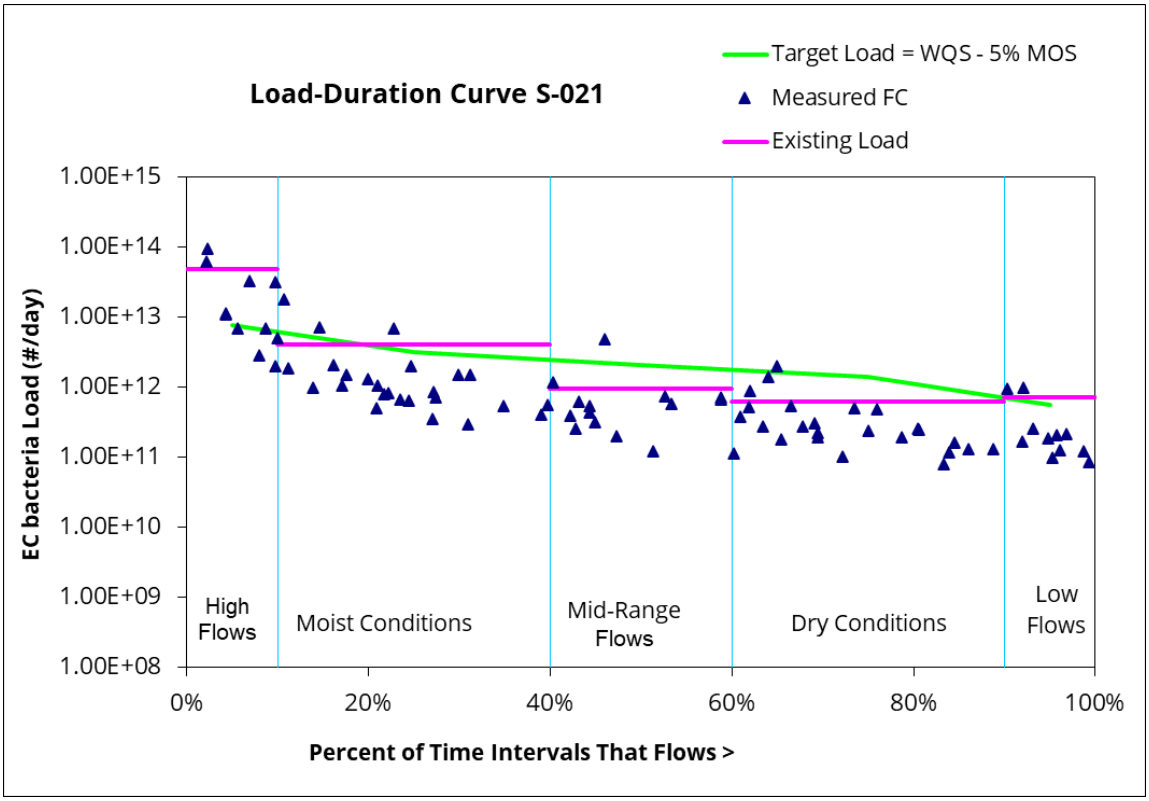

Figure 18. LDC of S-021.

5.0 Development of the TMDL

5.1 Critical Conditions

Critical conditions are the factors that in combination or by themselves cause violations of WQS. Reedy River TMDLs is based on flow intervals between the 5th and 95th percentiles and exclude extreme high (0-5%) and extreme low (95-100%) flow conditions. The critical condition for each monitoring station is identified as the flow condition requiring the largest percent reduction within the 5-95% flow duration intervals. Critical conditions for the WQM stations are listed in Table 15 which also provides percent reductions in other flow categories for TMDL stations. These reductions are included for informational purposes and to encourage permitted entities and others implementing the TMDLs to investigate the causes of exceedances in these flow categories.

For instance, let's consider TMDL station S-319. It exhibits significant exceedances under all flow categories, suggesting that these exceedances are not solely attributable to precipitation-related runoff. Instead, they may be the result of various factors such as illicit discharges, direct input, point sources, and intermittent sources.

By highlighting these exceedances across different flow categories, the intention is to prompt permitted entities to delve deeper into understanding the sources and mechanisms contributing to water quality impairments at the TMDL station. This information can assist them in developing appropriate strategies and measures to address the issues effectively and achieve the necessary reductions in pollutant levels.

Table 15. Reedy River TMDL stations and required (**bolded**) reductions to meet the WQS. Percent reductions for remaining flow conditions are included for information purposes.

Station	High (0-10 %)	Moist (10-40%)	Mid-Range (40-60%)	Dry (60-90%)	Low (90-100%)
S-319	84%	**84%**	48%	65%	51%
S-072	93%	**81%**	25%	23%	NRN
RS-19501 & RS-20501	94%	37%	**85%**	33%	84%
S-021	84%	**23%**	NRN	NRN	19%

NRN = No reduction needed for this flow range

5.2 Existing Load

In the TMDL calculations for each TMDL station, the existing loads were determined using the mid-point flow and 90th percentile *E. coli* concentration of each hydrologic category. This approach is described in Section 4.0 of the TMDL document. The existing load under the critical condition specified in Section 5.1 was utilized for the TMDL calculations.

The existing load considers loadings from all potential sources that contribute to water pollution at the TMDL stations. This includes various sources such as surface runoff, point source discharges exceeding permit limits, farm animals, pets, failing septic systems, and wildlife. By considering these different sources, a comprehensive assessment of the existing pollutant load at the TMDL station can be obtained, allowing for the development of appropriate load reduction targets and strategies to improve water quality.

5.3 Waste Load Allocation

The WLA is the portion of the TMDL allocated to NPDES-permitted point sources. These point sources typically include industrial facilities, wastewater treatment plants, and other regulated dischargers.

It is important to note that the WLA does not cover illicit dischargers, including SSOs or other illegal sources. Illicit discharges are considered unauthorized and are not granted any allocation under the TMDL. These sources are illegal because they introduce pollutants into the water without proper permits or compliance with regulatory requirements.

The WLA is specifically designed to address the allowable pollutant loadings from permitted point sources, while other mechanisms and enforcement actions are typically employed to address and reduce the impacts of illicit discharges and SSOs to protect water quality and public health.

5.3.1 Continuous Point Sources

There are five NPDES-permitted municipal WWTP with *E. coli* limits within the TMDL watersheds (Table 6). The WLAs for five NPDES-permitted point source dischargers are shown in Table 16. Any future continuous discharges will be required to meet the prescribed loading for *E. coli* based on permitted flow and an allowable permitted maximum concentration of 349MPN/100mL.

5.3.1 Intermittent Point Sources

Intermittent point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial stormwater discharges covered under permits numbered SCS000000 & SCR100000 regulated under SC *Water Pollution Control Permits* Regulation 122.26(b)(14) & (15). Illicit discharges, including SSOs, are not covered under any NPDES permit and are subject to enforcement mechanisms. Other non-urbanized areas may be required under the NPDES Phase II Stormwater Regulations to obtain a permit for the discharge of stormwater.

The South Carolina Department of Transportation (SCDOT) is one of the designated MS4s within the Reedy River TMDL watershed. SCDOT operates under NPDES MS4 Permit SCS040001 and owns and operates roads within the watershed. However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or enforcement powers. SCDOT does not regulate land use or zoning, or issue building or development permits.

Waste load allocations for stormwater discharges are expressed as a percentage reduction instead of a numeric loading due to the uncertain nature of stormwater discharge volumes and recurrence intervals. All current and future regulated stormwater discharges are required to meet the percentage reduction or the existing instream standard for the pollutant of concern. The percentage reduction is based on the maximum percent reduction (critical condition) within any hydrologic category necessary to achieve target conditions. The reduction percentages in these TMDLs also apply to the *E. coli* waste load attributable to those areas of the watershed that are covered or will be covered under NPDES MS4 permits (Table 16).

5.4 Load Allocation

The LA applies to the nonpoint sources of *E. coli* and other FC bacteria and is expressed both as a load and as a percent reduction. The load allocations are calculated as the difference between the target load under the critical condition and the point source WLA. There may be other unregulated MS4s that are subject to the LA components of these TMDLs. At such time that the referenced entities or other future unregulated entities become regulated NPDES MS4 entities and are subject to applicable provisions of SC Regulation 61-68D, they will be required to meet load reductions prescribed in the WLA component of the TMDL. This also applies to future discharges associated with industrial and construction activities that will be subject to SC R. 61-9 122.26(b)(14) & (15) (SCDHEC 2019).

5.5 Margin of Safety

A MOS allows for an accounting of the uncertainty in the relationship between pollutant loads and receiving waters. MOS can be incorporated either explicitly or implicitly by using conservative assumptions. An explicit 5%, 17 mpn/100 mL of the WQS (349 mpn/100 mL), is deducted in the TMDL calculations as MOS (Table 16).

5.6 Calculation of the TMDL

While TMDLs for most pollutants are expressed as a mass load (lbs/day), bacteria TMDLs for continuous dischargers are expressed as organism counts per day or concentration (mpn/100 mL, #/100 mL, cfu/100 mL), and as percent reduction for intermittent point sources. Reedy River TMDL targets are based on a single sample maximum WQS for *E. coli* because there is not sufficient data to evaluate the 30-day geometric mean component of the WQS for *E. coli*. The TMDL load is the sum of the

WLA for point sources and LA for non-point sources and a 5% explicit MOS, which is based on the mid-point of the critical flow zone or category.

5.7 Seasonal Variability

Federal regulations require that TMDLs consider seasonal variations in loading to the watershed, which accounts for environmental conditions such as precipitation, flow, temperature, etc. TMDLs for the Reedy River include instream *E. coli* data collected from 2013 through 2022 under varying hydrological conditions, seasons, precipitation, and other factors.

5.8 Reasonable Assurance

When a TMDL is developed for a pollutant that originates from both point and nonpoint sources, or from nonpoint sources only, EPA guidance emphasizes the need to provide reasonable assurances that nonpoint source controls will effectively achieve their expected load reductions. For point sources, such as NPDES-permitted dischargers, the WLA provided in their permits already ensures this assurance.

However, for unregulated nonpoint sources of pollutants, achieving the necessary load reductions can be more challenging. To address this, various measures can be employed, including the implementation of Best Management Practices (BMPs), local ordinances, and outreach and educational efforts. CWA §319 grant funding may be available to interested parties for the purposes of implementing these measures.

The Reedy River flows through the downtown area of the City of Greenville. Within this urban stretch, the river is surrounded by multiple attractions such as Reedy River Falls, Liberty Bridge, picnic areas, playgrounds, restaurants, and cafes. Moreover, the Swamp Rabbit Trail, a 22-mile greenway connecting the cities of Travelers Rest and Greenville, follows the banks of the Reedy River between the two cities. From downtown Greenville, the trail features numerous access points, making it easily accessible for pedestrians, joggers, and cyclists to enjoy the views and recreational opportunities provided by the river and its environs.

Within the Reedy River TMDL watershed, there are multiple non-profit, volunteer-based conservation groups actively engaged in environmental preservation. Among these organizations are Friends of the Reedy and Upstate Forever, which play significant roles in safeguarding the river's water quality.

South Carolina Adopt-a-Stream (SC AAS) is a volunteer citizen science program which provides opportunities to engage interested parties in the protection and management of South Carolina's waterways. Groups are involved in monitoring and reporting of water quality parameters. In the Reedy River TMDL watershed, there are multiple trained volunteer SC AAS groups. These groups are directly involved in monitoring and reporting of water quality data, such as Friends of the Reedy, Daniel Fahr, Lake Conestee Nature Park Group, and City of Greenville Zoo.

In addition to these groups, the RRWQG operates as a consortium, uniting various non-profit volunteer-based conservation groups, city and county entities, university partners, and collaborating with state, regional, and federal agencies.

The City of Greenville and RRWQG were recipients of CWA §319 nonpoint source funds to address nonpoint sources of pollution. Specifically, the City of Greenville obtained funding with the goal of reducing total suspended solids (TSS) in Richland Creek to less than 1600 lbs/year. To achieve this, the city undertook various measures, including streambank restoration, establishment of riparian buffers with native plants, stabilization of outfalls, and the establishment of floodplain connectivity.

In the case of the RRWQG, their assessment revealed a total of 2,189 septic systems within the Huff Creek watershed. The RRWQG estimated that 275 septic tanks were at risk of malfunctioning based on EPA statistics and age of the septic tanks in the Huff Creek watershed. Consequently, the group anticipated that the received funds could support the repair or replacement of 60 septic tanks. Ultimately, five repairs were carried out with the §319 funds. The closeout executive summaries of these projects can be found in Appendix C.

As evidenced by the presence and active engagement of volunteer non-profit organizations, consortiums, and advocacy groups described earlier, there is a collective and dedicated effort to improve water quality within the Reedy River watershed. These entities are actively involved in conservation and restoration activities, which indicates a commitment to addressing the *E. coli* impairments. Given the demonstrated involvement and dedication of these groups, there is a reasonable assurance that the LA portion of the TMDLs will be effectively implemented.

Table 16. TMDLs for Reedy River and its tributaries. TMDLs, WLAs, and MOS are expressed as the mpn/day.

Station	Existing Load (mpn/day)	TMDL (mpn/day)	MOS (mpn/day)	WLA			LA	
				Continuous source[1] (mpn/day)	Intermittent MS4[2, 3] (% reduction)	Intermittent MS4 SCDOT[3,4] (% reduction)	mpn/day	% Reduction[3]
S-319	2.84E+12	4.89E+11	2.38E+10	Altamont MHP 1.79E+08	84%	84%	4.65E+11	84%
S-072	9.65E+12	1.96E+12	9.82E+10	ReWa Lower Reedy 1.52E+11 ReWa Mauldin Rd: 3.84E+11	81%	81%	1.33E+12	81%
RS-19501 & RS-20501	9.12E+12	1.40E+12	7.01E+10	Canterbury 1.06E+09 Trollingwood 1.32E+09	85%	85%	1.33E+12	85%
S-021	4.08E+12	3.30E+12	1.65E+11	See note below	23%	23%	3.13E+12	23%

Table Notes:

1. WLAs are expressed as a daily maximum. Existing and future continuous dischargers are required to meet the prescribed loading for pollutants of concern. Future loadings will be calculated based on permitted flow and *E. coli* concentration of 349 mpn/100 mL.
2. Percent reduction applies to all NPDES-permitted stormwater discharges, including current and future MS4, construction and industrial discharges covered under permits numbered SCS & SCR. Stormwater discharges are expressed as a percentage reduction due to the uncertain nature of stormwater discharge volumes and recurrence intervals. Stormwater discharges are required to meet the percentage reduction or the existing instream standard for pollutants of concern by their NPDES Permit.
3. The percent reductions apply to existing instream *E. coli*.
4. By implementing the BMPs that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 permit to address *E. coli*, the SCDOT will comply with these TMDLs and its applicable WLA to the MEP as required by its MS4 permit.

6.0 Implementation

As implementation strategies progress, SCDHEC will continue to monitor the effectiveness of these measures and evaluate water quality where deemed appropriate. The Department recognizes that adaptive management might be necessary to achieve the water quality standard and we are committed to targeting the load reductions needed to improve water quality in the Reedy River watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL target accordingly. The implementation strategies presented below are not inclusive and are only provided as guidance.

6.1 Continuous Point Sources

NPDES permitted continuous point sources are required to meet the instream WQS for *E. coli* at the end of pipe. Currently, there are five domestic and municipal WWTP in the Reedy River watershed operating with expired permits. Currently, these facilities are monitoring for fecal coliform which is the indicator bacteria indicated in their expired permits. Following the EPA approval of this TMDL document and renewal of their NPDES permits, these facilities will be required to monitor for *E. coli* and meet the WQS at the end of pipe and other requirements stated in their permit. CWA §319 grants are not available for implementation of the WLA component of these TMDLs, however, there may be other sources of funding for capital improvements.

6.2 Intermittent Point Sources

NPDES MS4 entities are required to target and show progress towards implementing the calculated percent reductions to the MEP with each permit cycle by following their permit requirements. These entities are responsible for documenting and reporting their progress toward achieving the percent reductions allocated to the MS4s in the Reedy River watershed.

An iterative approach of water quality monitoring, illicit source detection, and elimination, deploying best management practices (BMPs) and evaluation of their effectiveness, outreach and education, optimization of other tools such as local ordinances, and revision of their stormwater management plan (SWMP) as needed in reducing *E. coli* loading to Reedy River and its tributaries is expected to show improvements in WQS.

For SCDOT, existing, and future NPDES MS4 permittees, compliance with the terms and conditions of the NPDES permit is effective implementation of the WLA to the MEP and demonstrates consistency with the assumptions and requirements of the TMDL. For existing and future NPDES construction and industrial stormwater permittees, compliance with terms and conditions of the permit is effective implementation of the WLA. Voluntary load reductions in the LA portion of these TMDLs can be implemented through voluntary measures and may be eligible for CWA §319 grants.

Based on the available information at this time, the portion of the Reedy River watershed that drains directly to a regulated MS4 and that which drains through the unregulated MS4 has not been clearly defined within the MS4 jurisdictional area. Loading from both types of sources, regulated and unregulated, typically occurs in response to rainfall events, and discharge volumes as recurrence intervals are largely unknown. Therefore, where applicable, the regulated MS4 is assigned the same percent reduction as the unregulated sources in the watershed. Compliance with the MS4 permit in regard to this TMDL document is determined at the point of discharge to the waters of the state. The regulated MS4 entity is only responsible for implementing the TMDL WLA in accordance with their MS4 permit requirements and is not responsible for reducing loads prescribed as LA in the TMDL document.

NPDES-permitted continuous point source dischargers are required to meet the WQS for *E. coli* at the end of their discharge pipe. NPDES-permitted intermittent sources, MS4s, are required to target and show progress towards achieving the reductions shown in Table 16 to the MEP by each permit cycle. There may be other regulated activities, such as land application of sludge and animal feeding operations, that require permits and are not allowed to contribute to bacteria loadings to streams.

Unregulated sources in these TMDL watersheds may include resident and transient wildlife, improper animal keeping practices, clear cutting, and surface runoff from unregulated areas. These sources may be reduced through local ordinances, education through outreach, partnerships with local NGOs and federal agencies, and CWA §319 funded opportunities.

While WLAs and percent reductions for continuous and intermittent NPDES permitted point source dischargers are based on the critical flow category (moist in this case) for the TMDL stations, conditions in other flow categories with *E. coli* exceedances should also be considered when implementing this TMDL. Because exceedances occurring during dryer conditions are likely from a different source than those occurring during wetter conditions (Table 16).

6.2 Nonpoint Sources

South Carolina has several tools available for implementing the nonpoint source component of this TMDL. The Nonpoint Source Management Plan (SC DHEC, 2019) document is one example.

Interested parties (local stakeholder groups, universities, local governments, etc.) may be eligible to apply for CWA §319 grants to install BMPs that will implement the LA portion of these TMDLs and reduce nonpoint source fecal coliform loadings to impaired areas. Congress amended the CWA in 1987 to establish the §319 Nonpoint Source Management Program. Under §319, States receive grant money to support a wide variety of activities including the restoration of impaired waters. TMDL implementation projects are given the highest priority for §319 funding. CWA §319 grants are not available for implementation of the WLA component of this TMDL but may be available for the LA component within permitted MS4 jurisdictional boundaries.

SCDHEC will work with the agencies in the area to provide nonpoint source education in this watershed and the surrounding watersheds. Local sources for nonpoint source education include conservation groups, Natural Resources Conservation Service, Clemson Extension Service, and the South Carolina Department of Natural Resources.

7.0 Bibliography

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Appendix A – Data Used for Calculation of the TMDLs

Date S-319	EC
2/4/2013	131
4/4/2013	2420
6/4/2013	980
8/12/2013	436
10/17/2013	980
12/10/2013	2420
2/27/2014	1
4/8/2014	1203
8/13/2014	328
10/6/2014	248
12/2/2014	91
2/5/2015	125
4/21/2015	2420
6/11/2015	517
8/20/2015	488
10/29/2015	613
12/10/2015	122
1/5/2016	194
3/16/2016	326
5/3/2016	345
7/27/2016	548
9/19/2016	236
11/15/2016	219
1/11/2017	770
2/9/2017	517
3/2/2017	1553
4/11/2017	260
5/3/2017	517
6/13/2017	1203
7/25/2017	261
8/3/2017	435
9/14/2017	488
10/3/2017	770
11/2/2017	397
12/5/2017	365
1/4/2018	73
2/6/2018	83
3/6/2018	1986
4/3/2018	285

Date S-072	EC
1/16/2013	651
3/13/2013	168
5/14/2013	127
7/15/2013	1120
9/19/2013	119
11/18/2013	2420
1/15/2014	173
3/3/2014	131
5/13/2014	70
7/23/2014	135
9/8/2014	2420
11/17/2014	870
1/20/2015	53
3/5/2015	81
5/7/2015	114
7/7/2015	107
9/29/2015	185
11/19/2015	2420
1/13/2016	108
3/10/2016	152
5/12/2016	172
7/14/2016	56
9/14/2016	186
11/9/2016	172
1/3/2017	2420
2/7/2017	58
3/8/2017	138
4/6/2017	2420
5/1/2017	727
6/8/2017	127
7/20/2017	79
8/1/2017	185
9/5/2017	162
10/19/2017	115
11/1/2017	131
12/4/2017	126
1/4/2018	70
2/6/2018	214
3/6/2018	155

Date RS-19501 & RS-20501	EC
1/22/2019	291
2/6/2019	78
3/11/2019	1785
4/22/2019	411
5/23/2019	326
6/4/2019	228
7/8/2019	172
8/28/2019	3106
9/24/2019	613
10/14/2019	2240
11/6/2019	192
12/9/2019	157
1/27/2020	194
2/5/2020	127
3/19/2020	308
4/13/2020	6049
5/14/2020	142
6/2/2020	261
7/7/2020	866
8/4/2020	523
9/8/2020	142
10/7/2020	197
11/17/2020	214
12/8/2020	124
Date S-021	**EC**
2/19/2013	91
4/17/2013	46
6/18/2013	122
8/7/2013	461
10/10/2013	130
12/2/2013	727
2/6/2014	78
4/9/2014	2420
6/12/2014	121
8/18/2014	115
10/23/2014	411
12/10/2014	64
2/24/2015	68
4/16/2015	435

Date S-319	EC
5/1/2018	261
6/28/2018	921
7/17/2018	727
8/13/2018	361
9/6/2018	517
10/2/2018	980
11/6/2018	2420
12/6/2018	225
1/22/2019	77
2/6/2019	461
3/11/2019	210
4/22/2019	272
5/23/2019	488
6/4/2019	238
7/8/2019	517
8/28/2019	1986
9/24/2019	579
10/14/2019	870
11/6/2019	260
12/9/2019	613
1/7/2020	921
2/12/2020	228
3/17/2020	1986
4/14/2020	816
5/12/2020	1046
6/3/2020	770
7/1/2020	435
8/6/2020	488
9/3/2020	488
10/27/2020	517
11/18/2020	276
12/9/2020	225
1/14/2021	308
2/3/2021	138
3/11/2021	210
4/12/2021	276
5/18/2021	365
6/24/2021	387

Date S-072	EC
4/3/2018	91
5/1/2018	172
6/28/2018	479
7/17/2018	2420
8/13/2018	249
9/6/2018	118
10/2/2018	190
11/6/2018	345
12/6/2018	158
1/22/2019	144
2/6/2019	102
3/11/2019	179
4/22/2019	345
5/23/2019	122
6/4/2019	148
7/8/2019	147
8/28/2019	2420
9/24/2019	186
10/14/2019	1298
11/6/2019	124
12/9/2019	68
1/27/2020	115
2/5/2020	142
3/19/2020	163
4/13/2020	5776
5/14/2020	162
6/2/2020	228
7/7/2020	1414
8/4/2020	570
9/8/2020	93
10/7/2020	137
11/17/2020	166
12/8/2020	144
1/13/2021	104
2/23/2021	328
3/10/2021	365
4/7/2021	133
5/27/2021	166

Date S-021	EC
6/17/2015	117
8/26/2015	67
10/27/2015	276
12/9/2015	79
2/10/2016	82
4/4/2016	37
6/2/2016	96
8/9/2016	93
10/24/2016	102
12/12/2016	105
1/23/2017	1203
2/7/2017	24
3/7/2017	53
4/6/2017	326
5/16/2017	50
6/6/2017	326
7/20/2017	36
8/1/2017	59
9/18/2017	126
10/18/2017	152
11/2/2017	102
12/5/2017	55
1/4/2018	52
2/6/2018	1733
3/6/2018	179
4/3/2018	172
5/1/2018	72
6/28/2018	63
7/17/2018	111
8/13/2018	121
9/6/2018	80
10/2/2018	131
11/6/2018	161
12/6/2018	133
1/9/2019	130
2/13/2019	162
3/12/2019	127
4/24/2019	38

Date S-319	EC
7/19/2021	613
8/5/2021	308
10/4/2021	1414
11/2/2021	166
12/6/2021	166
1/11/2022	166
2/2/2022	219
3/2/2022	141
4/6/2022	866
5/17/2022	387
6/2/2022	649
8/9/2022	727
9/6/2022	1046
11/2/2022	727
12/1/2022	1414

Date S-072	EC
6/22/2021	4839
7/21/2021	488
8/25/2021	276
9/8/2021	488
10/11/2021	496
11/16/2021	126
12/8/2021	1414
1/13/2022	119
2/8/2022	108
3/3/2022	111
4/19/2022	2420
5/11/2022	142
6/21/2022	166
7/20/2022	980
8/17/2022	120
9/20/2022	866
10/6/2022	201
11/9/2022	192.0

Date S-021	EC
5/2/2019	31
6/20/2019	48
7/2/2019	36
8/8/2019	23
9/10/2019	81
10/7/2019	479
11/14/2019	46
12/12/2019	20
1/27/2020	579
2/5/2020	55
3/19/2020	172
4/13/2020	2092
5/14/2020	68
6/2/2020	78
7/7/2020	687
8/4/2020	76
9/8/2020	108
10/7/2020	58
11/17/2020	78
12/8/2020	173
1/7/2021	66
2/3/2021	210
3/3/2021	49
5/20/2021	57
6/21/2021	411
7/7/2021	48
8/24/2021	68
9/16/2021	397
10/12/2021	102
11/17/2021	57
12/9/2021	42
1/19/2022	93
2/15/2022	22
3/10/2022	1553
4/12/2022	35

Appendix B – Land Use Maps

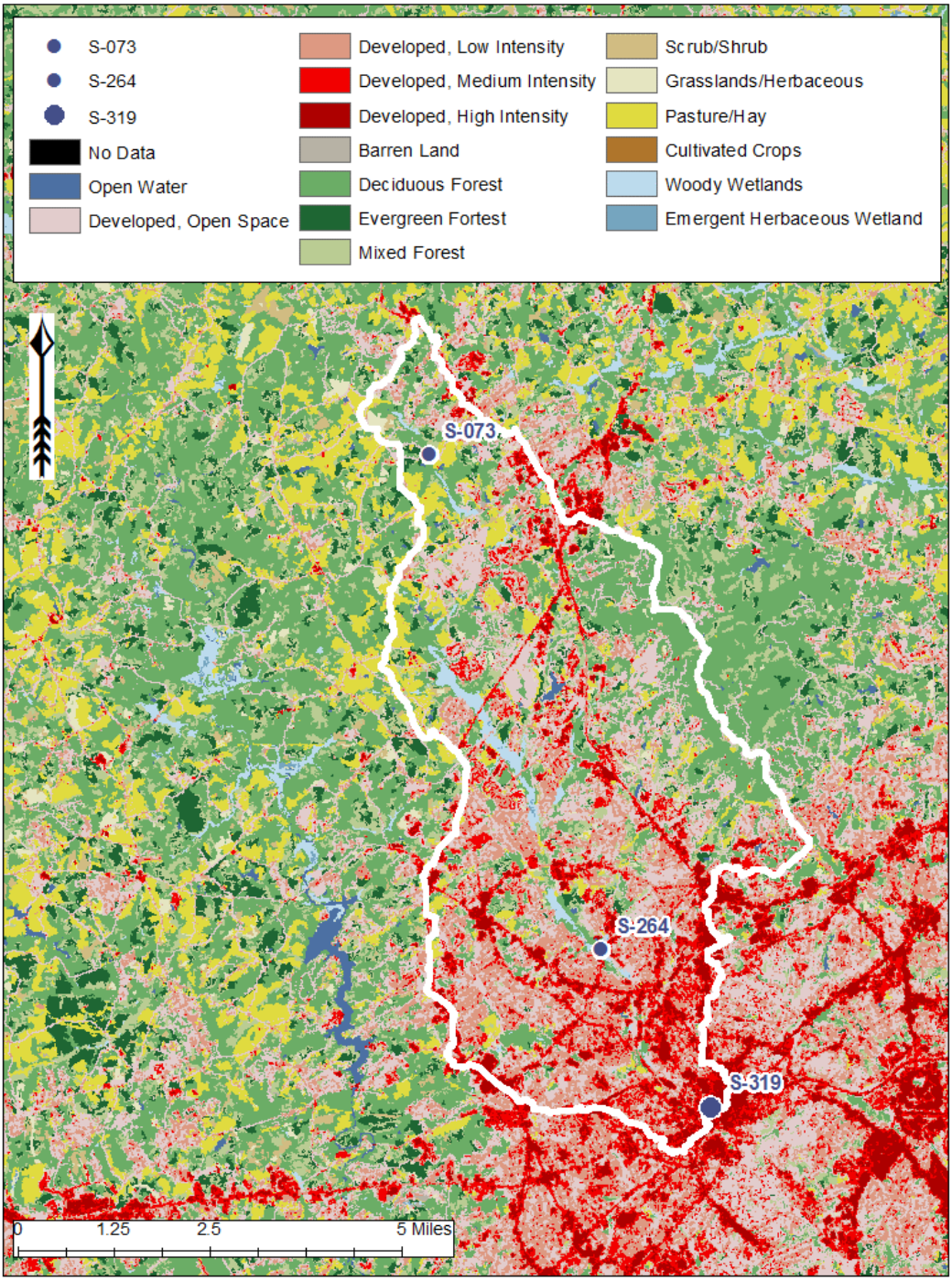

Figure 19. NLCD 2019 land uses of station S-319.

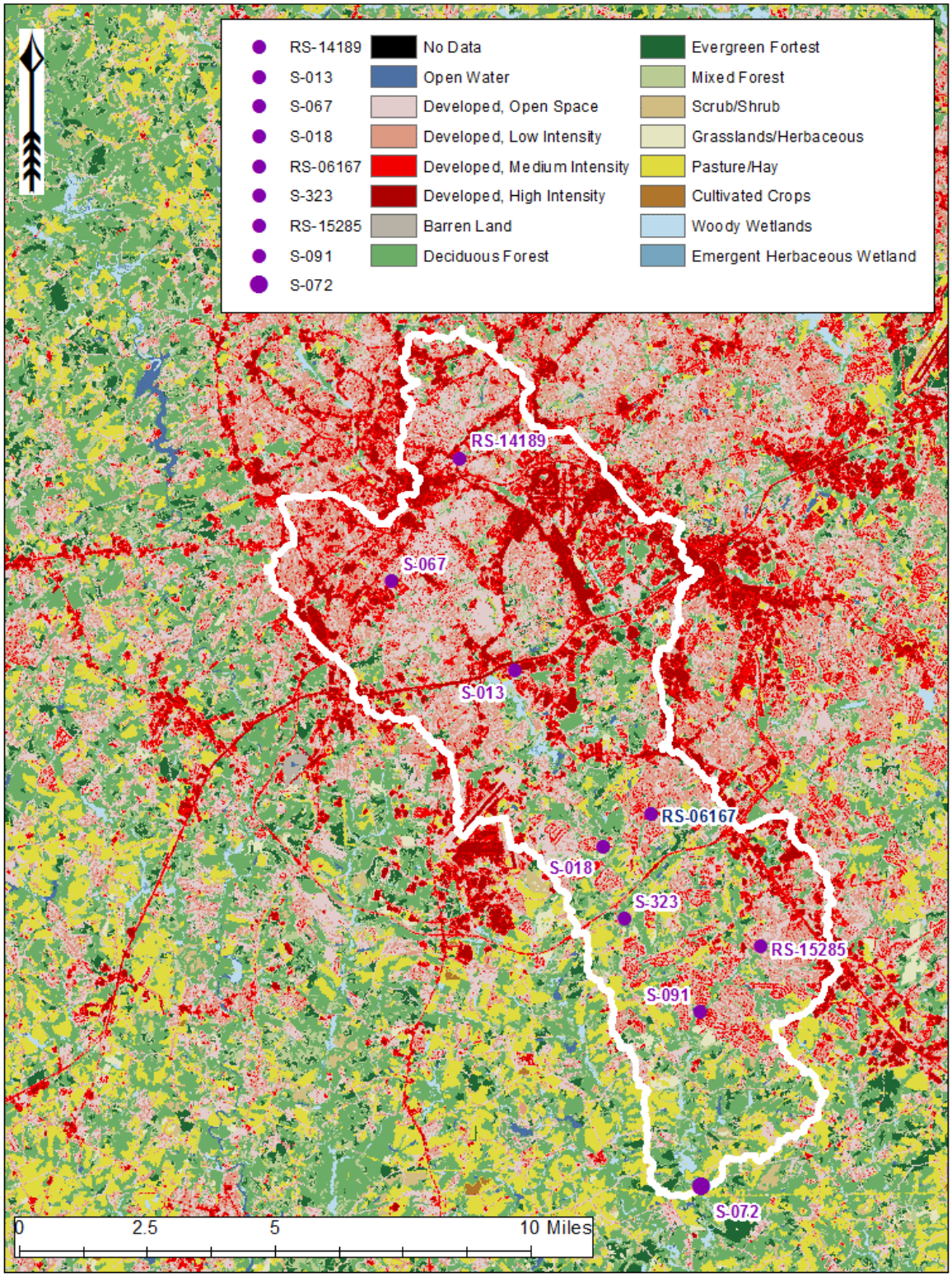

Figure 20. NLCD 2019 land uses of station S-072.

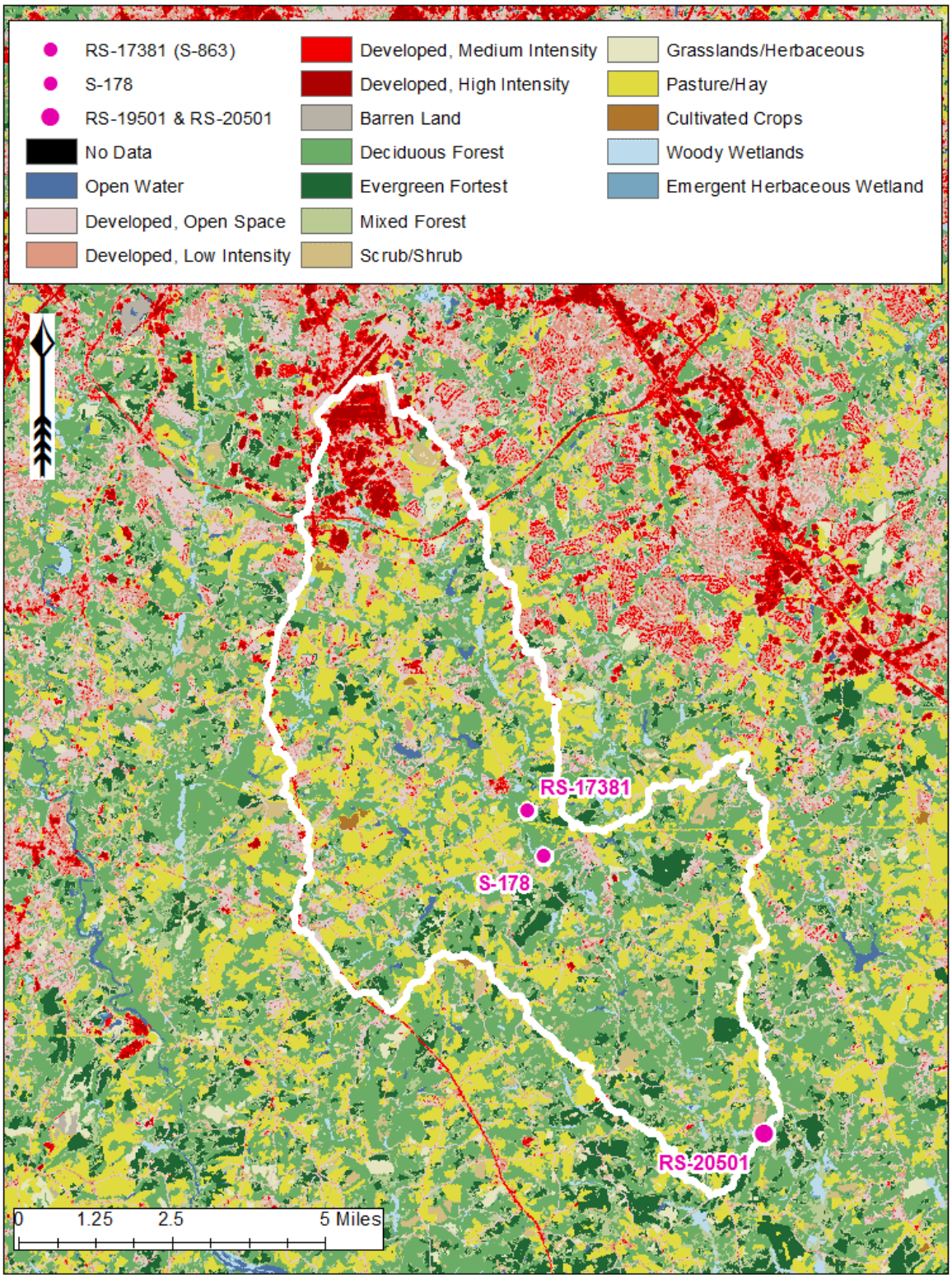

Figure 21. NLCD 2019 land uses of station RS-19501 & RS-20501.

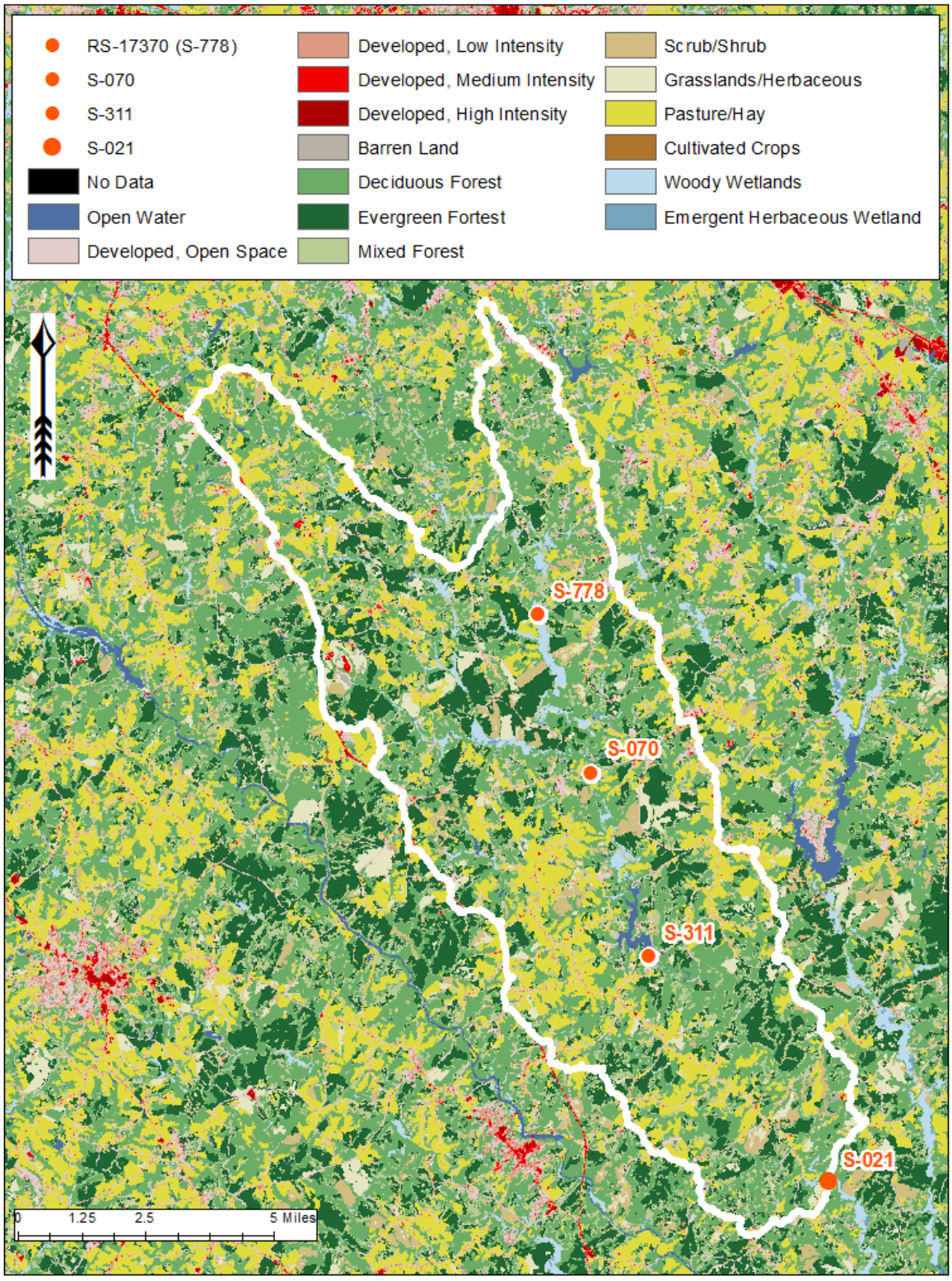

Figure 22. NLCD 2019 land uses of station S-021.

Appendix C – Executive Summaries of Closeout Reports CWA §319 Funded Projects within the Reedy River TMDL Watershed

Richland Creek
Water Quality Master Plan

A §319 Project Closeout Report to
South Carolina Department of Health and Environmental Control

Submitted by

Paul Dow, PE, CFM, Assistant City Engineer - Environmental
City of Greenville
206 S. Main Street
Greenville, SC 29602

August 30, 2019

Funding for this project was provided in part by the South Carolina Department of Health and Environmental Control with funds from the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act.

PROJECT #: 3 FY2015

PROJECT/CONTRACT/GRANT PERIOD: 3/4/2016 – 7/31/2019 (extension)

GRANT AGR/PO/FUND #: EQ-6-394

PROJECT MANAGER EMAIL: pdow@greenvillesc.gov

EXECUTIVE SUMMARY

Summary

The Richland Creek Water Quality Master Plan (Master Plan) ranks projects based on pollutant removal by dollar spent. This grant includes three prioritized projects, known as Phase 1 Implementation, from the Master Plan that include: 1.) McPherson Park which included streambank restoration, bioretention basins and urban porous pavement, 2.) TD Convention Center that included streambank restoration and regenerative stormwater conveowownce, and 3.) Richland Creek Mainstem that includes streambank restoration and in-stream structures.

Project Outcome

The objectives for the Phase 1 Implementation of the Master Plan are to implement BMP construction projects identified with the highest benefit-cost scores based on pounds of TSS removed per dollar spent. The target TSS load identified in the Master Plan is 1,600 lbs/year for the entire Richland Creek Study Area (an approximately 8.6 square mile area that includes a large part of the watershed outside of the three projects). Qualitatively, site inspections and photographic documentation has shown that at all three sites, the base flow within the streams has been improved during the post-construction period. All three sites were finished in 2019, therefore long-term quantitative.

As of the date of this report, additional post-BMP monitoring is required for a more conclusive assessment of the quantitative TSS removal from these projects.

Schedule and Budget

The implementation timeframe for each project was follows:

1.) McPherson Park – Construction started in August of 2018 and substantially completed in March 2019

2.) TD Convention Center – Construction started in July 2018 and was substantially completed in January 2019

3.) Richland Creek Mainstem – Construction started in April 2019 and was substantially completed in July 2019.

Two funding sources supported this implementation; the DHEC 319 program provided a 60% commitment and the City of Greenville stormwater funds provided the remaining funds. The funding request amounts were as follows:

Federal Request: 700,000 Non-Federal Match: 466,667 Total Amount: $1,166,667

The construction contract for McPherson Park and TD Convention Center were contracted together to River Works, Inc. Material overruns and some needed rework exceeded the final budget by $43,270.35.

The construction contract for the Richland Creek Mainstem project was awarded to North State Environmental, Inc. No budget overages occurred for this project.

Project partners, outside of the City of Greenville and DHEC, included support from the following organizations:

- Trees Greenville
- Friends of the Reedy River
- Upstate Forever
- ReWa – Renewable Water Resources
- Naturaland Trust

SECTION 319 NONPOINT SOURCE POLLUTION CONTROL PROGRAM

WATERSHED PROJECT FINAL REPORT

Huff Creek Pollution Reduction for E. Coli

by

Reedy River Water Quality Group

March 3, 2017

This project was conducted in cooperation with the State of South Carolina and the United States Environmental Protection Agency, Region 4.

EXECUTIVE SUMMARY

Project Title:	Huff Creek Pollution Reduction for E. Coli
Grant Number:	EQ-5-495
Grant Source:	South Carolina Department of Health and Environmental Control
Initiation Date:	January 22, 2015
Expiration Date:	January 22, 2017

FUNDING	
Total EPA Grant:	$188,074.00
Local Match:	$126,000.00
TOTAL FUNDING	$314,074.00

EXPENDITURES	
EPA Funds:	$8,732.95
Other Expenditures:	$17,204.12
TOTAL EXPENDITURES	$25,937.07

Summary Accomplishments:

BMP's: Reedy River Water Quality Group (RRWQG) assisted in the completion of five septic tank repairs/replacements as part of an effort to reduce bacterial pollution in Huff Creek.

Outreach: RRWQG published a poster and a brochure as outlined in the application. The poster was posted in area gas stations. The brochure was available at booth events throughout the year and was sent in four sequential mailings. The first mailing was sent to area septic pumpers and area churches. The second mailing was sent to septic owners with the oldest systems that were closest to the creek. The third mailing was sent to those older tanks a little further from the creek, and the fourth was sent to the rest of the septic systems that were in the watershed.

Information for the project was included on the RRWQG website and Facebook page, and the Greenville County Soil and Water Conservation District (GCSWCD) website and Facebook page.

All of the project participants found out about the grant either from the mailer or the website. One was from the mailing to septic pumpers, three were from the direct-to-participant mailing, and one was from the GCSWCD website.

In addition, RRWQG highlighted the grant in the Greenville Journal, on the Your Carolina TV show, and on the Saturday Splash radio show.

Challenges: Despite the thoughtfully conceived direct targeting, participation was not as high as expected.

Appendix D - Addendums

The following changes were made to the Draft Reedy River *E. coli* TMDL document after the public noticed ended.

1. Figure 1 was edited and replaced to show all bacteria impaired stations and those with aliases.
2. On page 8, the following change was made from:
   In the drainage area of station S-072, eight stations, RS-06167, RS-14189, RS-15285, S-013, S-018, S-091, S-323, S-072 are no longer being sampled for *E. coli*.

   To:
   In the drainage area of station S-072, eight stations, RS-06167, RS-14189, RS-15285, S-013, S-018, S-091, S-323, S-067 are no longer being sampled for *E. coli*.

Appendix E - Draft Reedy River *E. coli* TMDL Document: Response to Comments

Three organizations commented on the draft document during the public notice period, which was open from September 25 to October 24, 2023.

Friends of the Reedy River (FoRR) dated October 24, 2023.
The Friends of the Reedy River submitted comments for the draft Reedy River *E. coli* TMDL document. Along with these recent comments, they included their earlier submission which was during the initial public participation period dated November 17, 2022. The resubmitted comments featured pertinent sections highlighted in red text for the readers.

Comment 1
First, we would like to emphasize the need to address the issue of unstable banks and other sources of nonpoint source pollution that lead to sedimentation of the Reedy and its tributaries. Silting accelerates the transportation of contaminants and should be recognized as a primary concern in the TMDL. While sediment is currently mentioned briefly in the section pertaining to nonpoint source pollution due to agriculture, logging activities, and improper forest management (3.2 Nonpoint Sources), it should be called out directly. Additional funding and attention should be considered to reduce sedimentation from in-stream erosion due to unstable banks and bank loss.
Sediment
Research repeatedly shows a strong correlation between underwater sediments and E. coli viability. Further, when sediment has a high level of fine sediments and organic carbon, the E. coli population has shown to survive longer. Winter temperatures do not serve as a significant die-off mechanism, as E. coli can overwinter in these fine sediments. In our observations and work across the Reedy River, sediment loading is a constant challenge. The river bed is mucky as the river and its tributaries flow towards downtown Greenville. Urban river syndrome contributes sediments from the stream banks, further incising the Reedy River and removing its access to its floodplain, creating a cycle of erosion, disconnection, and high sediment load. In evaluating the factors contributing to the sediment load observed after rain events in the Reedy River watershed, if we are to relate E. coli to sediment control, our true pollutant is unmanaged volume control. By this letter, we ask that SCDHEC consider volume control as a mechanism to manage E. coli strains and related pathogens by reducing both in-stream sediment erosion and nonpoint source sediment discharges.

Response 1

The focus of the draft Reedy River TMDL document is centered on addressing *E. coli* impairments within the watershed. As outlined in the draft document, sedimentation and siltation can result from various activities, including stormwater runoff over impervious surfaces in urbanized areas, construction activities lacking proper stormwater management BMPs, uncontrolled access of farm animals to streams and riverbanks, and logging or clear-cutting activities without sufficient BMPs. These activities encompass a mixture of regulated and non-regulated practices, with some falling under MS4 permits, while others are considered nonpoint sources. Regulated activities are addressed through NPDES permits for continuous point source dischargers and NPDES MS4 stormwater permits for intermittent point source discharges. Nonpoint sources are not regulated and can only be addressed through voluntary measures.

The Department's recommendation involves utilizing the existing Reedy River Water Quality Group, which includes the Friends of the Reedy River (FoRR), to collectively address multiple pollutants and pollution sources. This collaborative effort also emphasizes the importance of engaging community leaders and citizens in these initiatives. When every entity within a community works toward a shared objective, it strengthens the effectiveness of the efforts.

Funding opportunities may be available to address nonpoint sources of pollution through CWA §319 Grants. The Department encourages the FoRR to apply for these grants and leverage other available resources. In Appendix C of the draft TMDL document, there is information about two previously §319 funded projects in the Reedy River watershed, one of which was led by Mr. Paul Dow of the City of Greenville which included stream bank restoration, the other by Reedy River Water Quality Group to address malfunctioning septic tanks.

Note that DHEC TMDLs do not specify or regulate which BMPs, or other measures are employed to restore water quality. We acknowledge that volume control is utilized by some local jurisdictions in South Carolina to prevent or reduce erosion and sediment loading, associated pollutants, and resulting water quality impacts.

Comment 2

Second, we at FoRR believe that RNA source tracking is a valuable step to understand the origins of bacteria in our watershed. Policy development to improve bacteria levels will be ill-advised without fully understanding the sources and movements of bacteria across the watershed.

Please see below the letter FoRR submitted in November 2022 for more detailed information on these subjects. We have highlighted the text pertaining to the issues mentioned above in red text, for your convenience.

Source Tracking

A current member of FoRR's Board of Directors wrote her thesis on the nexus between E. coli and land cover/land use in Greenville County, South Carolina. We have attached a copy of her thesis to this letter. At the time of this study (2017-2018) a comprehensive approach, including all of the key stakeholders' data for Greenville County had not yet been engaged at the local level. This research shows that within Greenville County, there is a statistically significant relationship between land cover and impervious land uses and E. coli levels. Three key observations were made:

1. Both developed land cover and land use types lead to increases in E. coli levels. This indicates that stormwater runoff contributes to increased bacteria levels.
2. The presence of National Pollutant Discharge Elimination System permits and agricultural fecal spreading permits lead to decreases in E. coli. This indicates that policy and regulation within a watershed could lead to decreased bacteria levels.
3. Knowledge of the sampling condition, specifically wet weather, is highly correlated to E. coli levels and leads to statistically significant increases in measured E. coli. This third observation indicates that land use, the presence of sewer overflows, failing septic tanks, stormwater runoff, the resuspension of bottom sediment living E. coli, or a combination of these appears to elevate E. coli levels. According to the statistical results, there are sources of E. coli that this study did not account for, indicating additional research is needed. Source tracking for where the bacteria in our watershed is coming from would be a valuable next step. Without understanding the source, policy development to improve bacteria levels within this watershed will be ill advised.

Response 2

Bacteria TMDLs developed in South Carolina and other states in the region do not pinpoint specific sources, identify "hot spots," or differentiate between human, domestic animals, or wildlife origins. The current approach of the Department concerning bacteria TMDLs involves calculating instream aggregate load reductions and allocations to NPDES-permitted entities. Bacteria samples are typically collected from a stream, which captures all potential sources of bacteria upstream of the sampling point. These sources may include surface runoff due to precipitation, improper application of manure, issues related to malfunctioning septic tanks, wildlife contributions, sanitary sewer overflows, illicit discharges, and various other sources. It's essential to recognize that precisely identifying the sources of bacteria in any given sample is a challenging task. Once the TMDL is approved by the EPA, there are clear directives mandating actions that NPDES-permitted entities must implement. Nonpoint sources are not regulated and can only be addressed through voluntary actions.

However, there are communities in South Carolina with approved bacteria TMDLs where permitted entities, environmental groups, citizens, and other organizations collaborate and utilize bacteria source tracking to identify sources of bacterial pollution during implementation of the TMDLs.

Comment 3

An additional area of concern that has risen since the original submittal of November 2022's letter is the issue of reduced National Pollutant Discharge Elimination System (NPDES) permit requirements for controlled animal feeding operations in South Carolina. We strongly urge SC DHEC to reconsider its removal of NPDES permit requirements for controlled animal feeding operations (CAFOs). DHEC proposes to amend Regulation 61.9-122.23 to remove the requirement that all CAFOs apply for a NPDES permit, unless the facility can demonstrate that it has no potential to discharge. In the new rules, only CAFOs that propose to discharge will be required to apply for a NPDES permit. DHEC has stated that this change is necessary because the existing regulatory framework is inconsistent and that the change will not result in weaker regulation of CAFO pollution in South Carolina. DHEC has also stated that General Assembly review is not required because the new regulation claims to maintain compliance with federal law. These claims are incorrect. South Carolina's existing regulations are fully authorized by federal law and the permitting framework is consistent, providing strong substantive and procedural safeguards for water quality and public health on the issue of CAFO regulation. The additional substantive and procedural protections the NPDES regulations impose on large industrial animal facilities—including increased permit limits and monitoring, mandatory permit renewal periods, citizen enforcement, and a 30-day public comment period—would be lost if DHEC moved forward with the proposed rollback. The loss of this regulation has the potential to increase the amount of additional fecal coliform that is introduced to the Reedy and its tributaries in the lower portion of the watershed in southern Greenville County and Laurens County.

Response 3

Regulation 61.9-122.23, when last updated, mandated that all Concentrated Animal Feeding Operations (CAFOs) intending to discharge must apply for an NPDES permit. However, demonstrating a "No Potential" to discharge for CAFOs was practically unfeasible. As a result, the primary alternative was applying for an NPDES permit, allowing the CAFO to discharge treated wastewater. This situation would lead to a direct violation of the existing Regulation 61-43, which governs the issuance of permits to agricultural facilities.

Under Regulation 61-43, permits issued to agricultural facilities are categorized as "No Discharge." These permits imply that no discharge is allowed, alleviating concerns about increased permit limits, mandatory monitoring, or renewal periods, except if the facility decides to expand. Permits issued under Regulation 61-43 for new and expanding facilities are subject to public notice, a practice in place since the enactment of Regulation 61-43. In summary, South Carolina Regulation 61-43 is more stringent compared to CAFO requirements that permit discharges.

Comment 4

Agriculture: We ask that SCDHEC consider proper agricultural practices and bank protection practices on agricultural lands as a mechanism to control and manage E. coli strains in the Reedy River watershed.

Response 4

DHEC considers proper agricultural practices and bank protection practices on agricultural lands through applicable permitting, compliance and enforcement activities in accordance with Regulation 61-43 and the Clean Water Act. For example, facilities permitted under Regulation 61-43 have setback limits preventing them from impacting the waters of the state. In addition, post-TMDL Watershed Based Plan development and implementation including BMPs to address grazing livestock impacts on stream bacteria levels may be eligible for §319 grant funding.

Comment 5

Sanitary Sewer Overflows: We propose that public education be considered as a way to ensure that citizens reliant upon sanitary sewer waste treatment know how to properly dispose of non-biodegradable items, fats, oils, and grease. Additionally,
we recommend that banks supporting sanitary sewer main lines be monitored and maintained to avoid infrastructure failure.

Response 5

These are reasonable suggestions that likely have been considered by the operators of the sanitary sewer collection system in the Reedy River watershed.

Comment 6

Trash is a recurring issue across the Reedy River watershed. FoRR hosts two major river cleanups each year. In recent years, we have had more than 150 residents come out at each event to pick up litter from the floodplain and haul large items out of the river itself. This past fall, during Beach Sweep/River Sweep, FoRR and our volunteers

removed 4.16 tons of large and small debris from further impacting the river and its aquatic community.

Trash makes its way to the river from ditches, infrastructure, and wetland flushing. Trash occurs in the landscape from unmanaged trash cans at businesses, open and overflowing residential trash cans, open and overflowing dumpsters and debris surrounding dumpsters, littering, car accidents, illegal dumping, tire dumping, and more.

Trash correlates with high E. coli in streams. Trash includes items like diapers and dog waste bags, which can transport bacteria and pathogens to a waterway. During our cleanups, we have even removed toilets from the river. Trash can also play a role in increasing organic carbon in a waterway, feeding the existing bacteria population, as well as providing places for bacteria to grow without threat of UV degradation. We encourage SCDHEC to consider the nexus trash has to E. coli throughout the TMDL process.

Response 6
We are not aware of a way to meaningfully link trash and bacteria within our existing bacteria TMDL framework. We acknowledge that trash is an unnecessary, unsightly, and sometimes unsanitary blight on many of the state's waters. We applaud the FoRR-led trash cleanup efforts in the Reedy River watershed.

Comment 7
Recommendations: Smart Growth and Infrastructure Planning; Public Engagement; Homelessness; Opportunities for Watershed Planning/Implementation

Response 7
We appreciate the comments and recommendations. Regarding strategies for developing watershed plans, please reach out to the Nonpoint Source Program in the Division of Water Quality.

Greater Greenville Association of REALTORS and Greenville Chamber dated November 18, 2022. The same letter was resubmitted via email on October 25, 2023, with no additional comments.

Note
After receipt of the November 18, 2022 letter, DHEC met with the parties to discuss the issues raised. The meeting was held on December 15, 2022. DHEC explained why

we were doing the TMDL at this time, how the TMDL would be developed, what data would be used, how it would affect permits and other activities in the basin, the anticipated schedule, etc.

For the record, responses to the comments in the November 18, 2022 letter follow below:

Comment 1

You should be well aware that our region works effectively together to address environmental impairments. These are just three examples:

1. More than 20 years ago, your agency started development of TMDL on the Reedy River for phosphorus impairment. We were one of the first communities in the nation to work with local businesses to remove detergents containing phosphates from local stores. In 2018, SCDHEC's most current 303d list on-line for public use, lists only one tributary of the Reedy River as impaired for phosphorus, which shows our efforts have been effective.

2. Your agency also started work on a TMDL for nutrient which included nitrogen. As a community we initiated a 5R process to address these pollutants of concern. A large group of stakeholders called the Reedy River Water Quality Group, including the two of us signing this letter on behalf of our organizations, have worked diligently to identify the sources of nitrogen and means of mitigating the impairment. Our organizations have raised and contributed substantial funds to the 5R process and doesn't even speak to the funding our citizens have provided through their tax dollars and rate fees to the three local agencies tasked with funding this effort. The Reedy River Water Quality Group is currently developing BMPs that we will propose to address the nitrogen impairment.

   (and in addition, from page 2 of the November 18, 2022 letter):

   In addition, we as a group are near completion of the 5R model for nitrogen. This model will better pinpoint the sources of nitrogen in order to develop a program to target the main contributors. As a part of our 5R stakeholder's subcommittee efforts the engineers and biologists hired to advise us tell us that the BMPs selected to address nitrogen will also target sources of E. coli. The Public Education subcommittee's past and current efforts of educating on the negative effects of pet waste, along with requiring poop stations at parks and a

County Ordinance requiring pet owners to pick up dog waste, are the only BMPs that can address pet waste, a minor contributor.

3. Three times in the last 20 years, as the standard of air quality attainment has become more stringent, our community has come together through our air quality coalition, Ten at the Top, to implement programs to reduce air pollution in our region even as our population has grown by nearly four times the national rate of growth since 2000.

Our community partners work well together. That is why we are disappointed that you chose to notify us on October 7, 2022, that you had begun work on a TMDL for E.coli on May 27, 2022. E.coli is a common impairment in our state's waters. SCDHEC's 303d list, which was last updated in 2018, includes 151 South Carolina waters impaired for E. coli. We found 12 TMDLs for E. coli coupled with other impairments listed on your website and four just for E. coli. Additionally, you have four more TMDLs in process for E. coli.

E. Coli was added to the 303d list as a pollutant in 2012. The Reedy River was listed as impaired for E. coli for the first time in 2014. And since its listing, it has had a priority rank of 2 or 3. In the current 303d list, only one water body received a priority ranking of 1: the Savannah River for dissolved oxygen.

Response 1

Citations of community partnerships working well together on nutrients and air quality aside, the basis for the commenters' disappointment with DHEC's bacteria TMDL effort, or notification of same, is unclear.

For the record, on May 27, 2022, DHEC updated our public TMDL Development webpage to indicate we were restarting work on the Reedy bacteria TMDL. This move was in preparation for upgrading the Reedy bacteria TMDL priority status from "Priority 2" to "Priority 1" in the draft 2022 303(d) List, which was placed on public notice on June 30 through August 1, 2022. No comments were received regarding the upgraded priority status of Reedy bacteria TMDL at that time. On September 15, 2022, DHEC submitted the 303(d) List to EPA for final approval. On October 7, 2022, DHEC notified stakeholders that we were commencing work on the Reedy bacteria TMDL and that we were seeking any data or other information relevant to the TMDL. In addition to data and some supportive comments from other stakeholders, DHEC received the referenced letter dated November 18, 2022, from the commenters. As noted above, DHEC met with the commenters and other stakeholders on December

15, 2022, to discuss the TMDL effort and issues raised in the November letter. EPA approved the 2022 303(d) List on December 28, 2022, with minor exceptions unrelated to the Reedy bacteria TMDL. Consistent with the schedule DHEC presented at the December meeting, DHEC public noticed the draft Reedy bacteria TMDL on September 25 through October 24, 2023. Comments were received from the Greenville Association of Realtors and the Greenville Chamber which were unchanged from the November 18, 2022, letter.

DHEC respects the right to be disappointed or to disagree. Accordingly, we disagree with the commenters' suggestion that the Department's communication has been inadequate or unreasonable regarding the Reedy River bacteria TMDL. We also disagree that the 5R process and nutrient modeling, such that it is, is any cause to further delay the bacteria TMDL. In fact, we believe the opposite. As the commenters suggested, BMPs and other management activities for stormwater and nonpoint sources of nutrients may also apply to bacteria. Completing the nutrient modeling and 5R plan at the same time as the bacteria TMDL should be useful to all parties tasked with, or interested in, implementing measures to maintain and restore nutrient and bacteria standards in the Reedy River basin.

Comment 2
Why the Reedy River?

Response 2
Restoration priority rankings are established as part of the Department's comprehensive planning process and are aligned with the guidance outlined in the EPA's Integrated Report (IR). Each impaired water body is designated a rank of 1, 2, or 3, corresponding to current, near-term, and long-term focus, respectively. This prioritization strategy for TMDL development enables us to concentrate our efforts and limited resources on high-value waters, those extensively used for recreation, or those that garner substantial interest from the public and stakeholders. EPA recognizes these priorities as commitments made by the state to address specific tasks within the specified timeframe.
In the case of the Reedy River Watershed, it was initially designated a priority rank of 2 in 2016, indicating that a TMDL would be scheduled within the timeframe of 2019 – 2022. This rank remained consistent in the 2018 IR. However, during the development of the 2020 and 2022 303(d) lists, the priority rank was elevated to 1, with the intended plan completion set for the timeframe of 2022-2024. This adjustment was made because the TMDL had not yet been finalized. It's worth noting that the prioritization

scheme, including this change, was put on public notice with each IR cycle, along with the rest of the IR.
The letter states that Reedy River impaired stations were first listed in the 2014 303(d) list and ignores the fact that stations in the watershed have been on 303(d) since 1998 (Table 1).

Table 1: 303(d) listed Reedy River WQM stations.

303(d) / Station	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020 - 2022
S-013		x	x	x	x	x	x	x	x	x	x	x
S-018	x	x	x	x	x	x	x	x	x	x	x	x
S-021		x	x		x	x				x	x	x
S-067	x	x	x	x	x	x	x	x	x	x	x	x
S-070		x	x	x	x	x	x	x	x	x	x	x
S-072	x	x	x	x	x	x	x	x	x	x	x	x
S-073	x	x	x	x	x	x	x	x	x	x	x	x
S-091	x	x	x	x	x	x	x	x	x	x	x	x
S-178	x	x	x	x	x	x	x	x	x	x	x	x
S-264	x	x	x	x	x	x	x	x	x	x	x	x
S-311												x
S-319	x	x	x	x	x	x	x	x	x	x	x	x
S-323			x	x	x	x	x	x	x	x	x	x
RS-06167						x	x	x	x	x	x	x
RS-14189										x	x	x
RS-15285											x	x
RS-17370												x
RS-17381												x
RS-19501 & RS-20501												x

Comment 3
Why now?

Response 3
The original Reedy River bacteria Total Maximum Daily Load (TMDL) initiative was initiated in 2005 and concluded in 2010. ENSR was responsible for conducting the TMDL calculations and preparing the associated document, which was funded by the settlement received by DHEC from the Colonial

Pipeline. Commencing with the initial public notice in April 2007, the TMDL underwent a total of four public notices. At that time, a total of 12 monitoring stations were identified as impaired. In the most recent 2020 and 2022 303(d) list, there are currently 19 stations listed as impaired. It's anticipated that this number may potentially increase as DHEC incorporates additional random stations into the assessment.

Comment 4

The EPA has been transparent about their preference of the 5R process because nearly all TMDLs in the last several years have resulted in litigation and a negotiated solution.

Response 4

EPA considers TMDLs as the primary mechanism for addressing impaired waters. TMDLs serve as a preliminary source assessment for both point and nonpoint sources. Although TMDLs remain the primary tool for addressing impaired waters, there are instances where an advanced restoration plan (ARP), previously known as 5R or 5 alt, may effectively achieve WQS in the near term. ARPs are near-term strategies and sets of actions designed with a schedule and milestones, aiming for more immediate and practical measures to achieve WQS. When impairments are addressed through ARPs, impaired waters would remain in the 303(d) list and still require TMDLs until WQS are met. Additionally, EPA does not take action to approve or disapprove ARPs.

To summarize, TMDLs are the primary mechanism for addressing WQ impairments. Under certain circumstances, ARP may be utilized however still requires TMDLs until WQS is attained.

DHEC does not have a history of litigation and negotiated solutions regarding TMDLs.

Comment 5

Therefore, we make the following recommendations:

1. Suspend development of the TMDL for E. coli in the Reedy River
2. Support our community as we finish the work we are doing with the 5R for nitrogen
3. Test for sources of the E. coli impairment
4. Update the 303d list, which is now four years old, to determine whether all of the sampling stations are still impaired for E. coli

Response 5

1. See Response 1 above. We respectfully disagree and would argue that there is no reason to suspend the development of the bacteria TMDL at this time.

2. DHEC has supported the community engaged in the 5R process for nitrogen, and basin management planning for phosphorus, since it began in 2015 and will continue to do so as long as the 5R process is making progress.
3. See Response 2, above, to Friends of the Reedy River. DHEC's current statewide strategy for bacteria TMDLs is based on source targeting, which may include E. coli source testing, during post-TMDL planning and implementation under NPDES stormwater permits or in accordance with nonpoint source watershed-based plans and § 319 grant work plans.
4. No longer applicable. The 2022 303(d) List was finalized on December 28, 2022.

ReWa renewable water resources

Comment 1
The Draft TMDL states that station RS-20501 is on the South Carolina final 2020 and 2022 303(d) list for exceeding the E. coli water quality standard. Station RS-20501 is not on the final 2020 and 2022 303(d) list. Station RS-20501 is co-located with station RS-19501. Station RS-19501 is on the final 2020 and 2022 303(d) list. Recommend removing RS-20501 from the TMDL document and only referencing RS-19501.

Response 1
As noted in the draft Reedy River TMDL document, stations RS-19501 and RS-20501 were co-located and sampled during 2019 and 2020, respectively. The assessment for the 2020 and 2022 303(d) list was based on two years of data, but the station was identified in the list with only one name, RS-19501. Table 5 in the document shows the exceedance summary for the impaired TMDL stations. Note that for stations RS-19501 and RS-20501 the number of samples (n) is 24. Since there are a limited number of active monitoring stations between stations S-072 and S-021 on the main stem of the Reedy River, a decision was made to utilize the data (n=24) from these random monitoring sites and calculate TMDLs. By utilizing this strategy, the Department was able to include stations that are not active within this drainage area for the allocation of waste loads (WLA) for the continuous point sources and calculate percent reductions for intermittent point sources, in addition to the allocation of loads (LA) and percent reductions for the nonpoint sources (Figure 4). Appendix A includes the data used for the calculations of the TMDLs.

Comment 2
On Page 4, Draft TMDL states that Friends of the Reedy and the City of Greenville were the two entities that submitted data and information during the initial public

participation phase. ReWa also submitted in-stream E coli sampling results and requests to be recognized in the TMDL document.

Response 2
The submission of data by ReWa was inadvertently left out of the draft TMDL document. Revised language has been added to the draft TMDL document recognizing ReWa's submission.

Comment 3
Table 13 identifies WWTP Overflow as a potential source of E. coli. This should be revised to sanitary sewer overflow (SSO).

Response 3
Table 13 was generated from various sources, as indicated at the bottom of the table, providing a generalized depiction of potential bacteria sources categorized by different flow duration scenarios. These sources are not exclusive to the Reedy River watershed. The table serves as an investigative aid intended to be used during the implementation of the TMDLs by NPDES-permitted entities, environmental groups, other interest groups, and non-governmental organizations (NGOs) for eliminating sources causing bacteria exceedances and deployment of BMPs. Per ReWa's suggestion, SSOs were incorporated into the table since it is a potential source, which had been inadvertently overlooked during the drafting of the TMDL document.