Total Maximum Daily Load Document

RS-02466, Burgess Creek Watershed
(Hydrologic Unit Code 030601010302)
Fecal Coliform Bacteria,
Indicator for Pathogens

Prepared for:

Bureau of Water

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Abstract

§303(d) of the Clean Water Act (CWA) and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop total maximum daily loads (TMDLs) for water bodies that are not meeting designated uses under technology-based pollution controls. A TMDL is the maximum amount of pollutant a waterbody can assimilate while meeting water quality standards for the pollutant of concern. All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS).

A fecal coliform (FC) TMDL was developed for RS-02466 along Burgess Creek in Oconee County, SC. This station is located on Whitewater Falls Road (rte 130 or S-37-171). This is a random monitoring site at which data was collected in 2002. 4 of the 12 samples taken during this time violated the state's FC standard of 400 cfu/100mL. The site was initially listed for FC on the State's 303(d) list of impaired waters in 2004. The drainage area for RS-02466 is approximately 2.6 square miles. The upper watershed is located within Sumter National Forest in a natural resources area. The lower watershed is very rural, consisting of some agricultural lands and homes. There are currently no NPDES permitted sanitary waste dischargers or MS4 outfalls within the watershed. Probable sources of fecal contamination include agricultural runoff, failing septic systems, and wildlife.

The load-duration curve methodology was used to calculate existing and TMDL loads for the watershed. Existing pollutant loadings and proposed TMDL reductions for critical hydrologic conditions are presented in Table Ab-1. Critical hydrologic conditions were defined as either moist, mid-range, or dry depending on which condition demonstrated the highest load reductions necessary to meet water quality standards. In order to achieve the target load (slightly below water quality standards) for Burgess Creek and its tributaries, reductions in the existing loads of up to 66% will be necessary at RS-02466. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants. .

The Department recognizes that **adaptive management/implementation** of this TMDL might be needed to achieve the water quality standard and we are committed towards targeting the load reductions to improve water quality in the Burgess Creek Watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL target accordingly.

Table Ab-1. Total Maximum Daily Loads for the Burgess Creek Watershed.
Loads are expressed as colony forming units (cfu) per day.

				Wasteload Allocation (WLA)			Load Allocation (LA)	
Station	Existing Load (cfu/day)	TMDL (cfu/day)	Margin of Safety (MOS) (cfu/day)	Continuous Source[1] (cfu/day)	Non-Continuous Sources[2,4] (% Reduction)	Non-Continuous SCDOT[3,4] (% Reduction)	Load Allocation (cfu/day)	% Reduction to Meet LA[4]
RS-02466	7.18E+10	2.57E+10	1.29E+09	NA	66	0	2.45E+10	66

Table Notes:

1. WLAs are expressed as a daily maximum; NA = not applicable, no point sources. Existing and future continuous discharges are required to meet the prescribed loading or the existing instream standard for the pollutant of concern. Loadings were developed based upon permitted flow and an allowable permitted maximum concentration of 400cfu/100ml.
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 percentage reduction or the existing instream standard for the pollutant of concern in accordance with their NPDES Permit.
3. As long as the conditions within the SCDOT MS4 area remain the same the Department deems the current contributions from SCDOT negligible and no reduction of FC bacteria is necessary. SCDOT must continue to comply with the provisions of its approved NPDES stormwater permit.
4. Percent reduction applies to existing instream load.

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1.0 Introduction

1.1 Background

FC bacteria are widely used as an indicator of pathogens in surface waters and wastewater. Acute gastrointestinal illnesses affect millions of people in the United States and cause billions of dollars of costs each year (Gaffield et al. 2003). Of these illnesses many are caused by contaminated drinking water. Untreated stormwater runoff has been associated with a number of disease outbreaks, most notably an outbreak in Milwaukee that caused many deaths in 1993.

Though occurring at low levels from natural sources, the concentration of FC bacteria can be elevated in water bodies as the result of pollution. Sources of FC bacteria are usually diffuse or nonpoint in nature and originate from stormwater runoff, failing septic systems, agricultural runoff, and leaking sewers among other sources. Occasionally, the source of the pollutant is a point source. Section 303(d) of the Clean Water Act (CWA) and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop TMDLs for water bodies that are not meeting designated uses under technology-based pollution controls. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in stream water quality conditions so that states can establish water quality-based controls to reduce pollution and restore and maintain the quality of water resources (USEPA 1991).

The State of South Carolina has placed a random monitoring station in the Burgess Creek watershed on South Carolina's 2008 §303(d) list for impaired waters due to FC bacteria. This station is identified on Table 1.

Table 1. Burgess Creek Watershed FC Impaired Waters.

Waterbody	Station Number	Description
Burgess Creek	**RS-02466**	**Burgess Creek at S-37-171(Rte 130, Whitewater Falls Rd)**

1.2 Watershed Description

The headwaters of Burgess Creek are located near the town of Salem, SC Burgess Creek begins in Sumter National Forest near the Andrew Pickens Ranger District. The headwaters are located in a natural resources area in the park. The creek flows in a southeasterly direction before joining with Mill Creek to form the North Fork Little River. Downstream, the North Fork Little River becomes the Little River and begins to impound into Lake Keowee. Figure 1 illustrates the subwatershed for sample location RS-02466 as part of the larger Burgess Creek watershed.

Land use within the watershed is predominately forest (90%). Grassland (4.5%) and Pasture/Hay Lands (3%) make up the remainder of the watershed. Less than one percent of the watershed is developed. The drainage area for RS-02466 is approximately 2.6 square miles. There are no NPDES dischargers in this watershed. Table 2 provides a more detailed look into land use within the watershed.

Figure 1. SCDHEC Monitoring Station RS-02466 Impaired with Excessive FC Numbers.

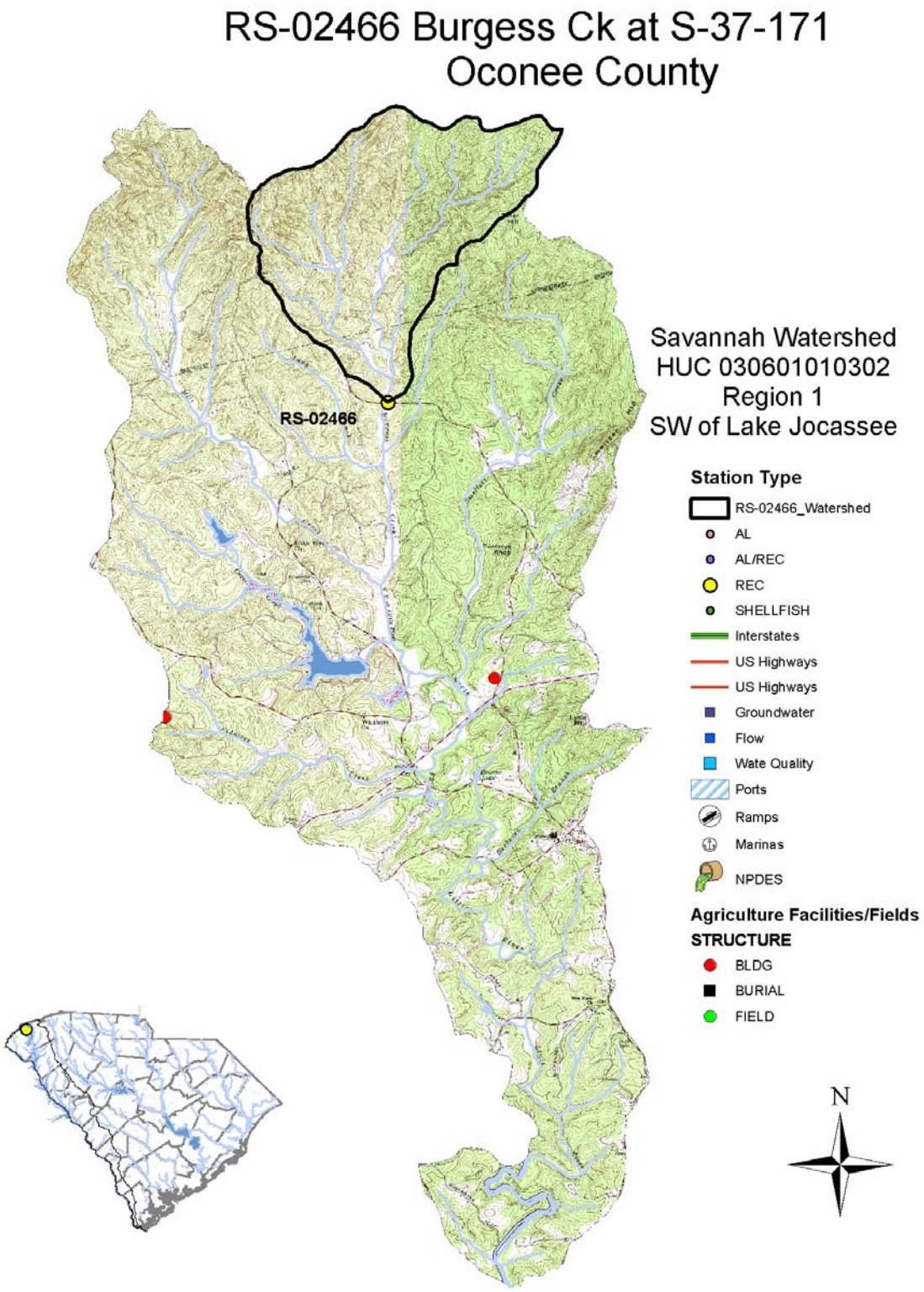


Figure 2. SCDHEC Impaired Monitoring Station RS-02466 Land Use

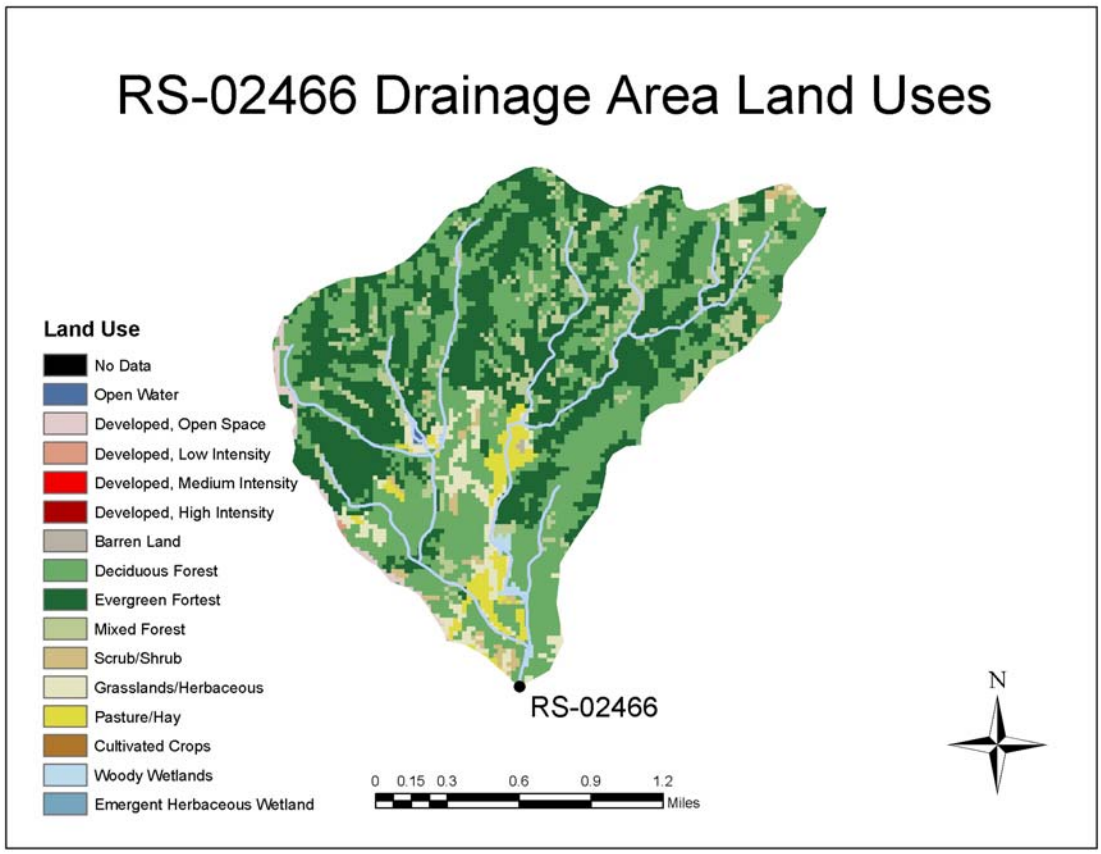


Table 2. Burgess Creek Watershed Land Use (derived from NLCD 2001).

LAND USE	SQUARE MILES	ACRES	PERCENT
Open Water	0.00024	0.15	0.09
Developed, Open Space	0.0208	13.3	0.79
Developed, Low Intensity	0.0014	0.9	0.05
Barren Land	0.0014	0.9	0.05
Deciduous Forest	1.1668	746.7	44.38
Evergreen Forest	0.9556	611.58	36.35
Mixed Forest	0.2398	153.47	9.12
Scrub/Shrub	0.0309	19.78	1.18
Grassland/Herbaceous	0.1181	75.58	4.49
Pasture/Hay	0.0799	51.14	3.04
Woody Wetlands	0.0118	7.55	0.45

1.3 Water Quality Standard

The impaired stream segments of the Burgess Creek basin are designated as Class Freshwater. Waters of this class are described as:

> "Freshwaters (FW) are freshwaters suitable for primary and secondary contact recreation and as a source for 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." (R.61-68)

South Carolina's Water Quality Standard (WQS) for FC in freshwater is:

> "Not to exceed a geometric mean of 200/100 mL, based on five consecutive samples during any 30 day period; nor shall more than 10% of the total samples during any 30 day period exceed 400/100 mL." (R.61-68).

Primary contact recreation is not limited to large streams and lakes. Even streams that are too small to swim in, will allow small children the opportunity to play and immerse their hands and faces. Essentially all perennial streams should therefore be protected from pathogen impairment.

2.0 WATER QUALITY ASSESSMENT

The South Carolina Department of Health and Environmental Control (SCDHEC) conducted monitoring at a location within the Burgess Creek watershed during 2002 (SCDHEC 2002). Waters in which no more than 10% of the samples collected over a five year period are greater than 400 FC counts (or cfu/100 ml) are considered to comply with the South Carolina water quality standard (WQS) for FC bacteria. Waters with more than 10% of samples greater than 400 cfu/100 ml are considered impaired for FC bacteria and placed on South Carolina's §303(d) list[1]. RS-02466 is considered impaired due to FC WQS exceedences. Table 3 provides a summary of the number of samples collected, number of exceedences and exceedence percentage. Figure 3 illustrates precipitation and FC data by date and Table 4 lists the FC count. A positive, but not particularly strong, correlation was observed between FC and rain (r = 0.67) and a negligible correlation was observed between FC and flow (r = -0.08). These correlations suggest that the levels of FC detected at RS-02466 are not necessarily directly proportional to the amount of rain or flow.

[1] The frequency of sampling was fewer than five samples within a 30 day period, therefore the water quality assessment was based on the 10% standard (400/100 mL).

Figure 3. Precipitation and FC Data by Date

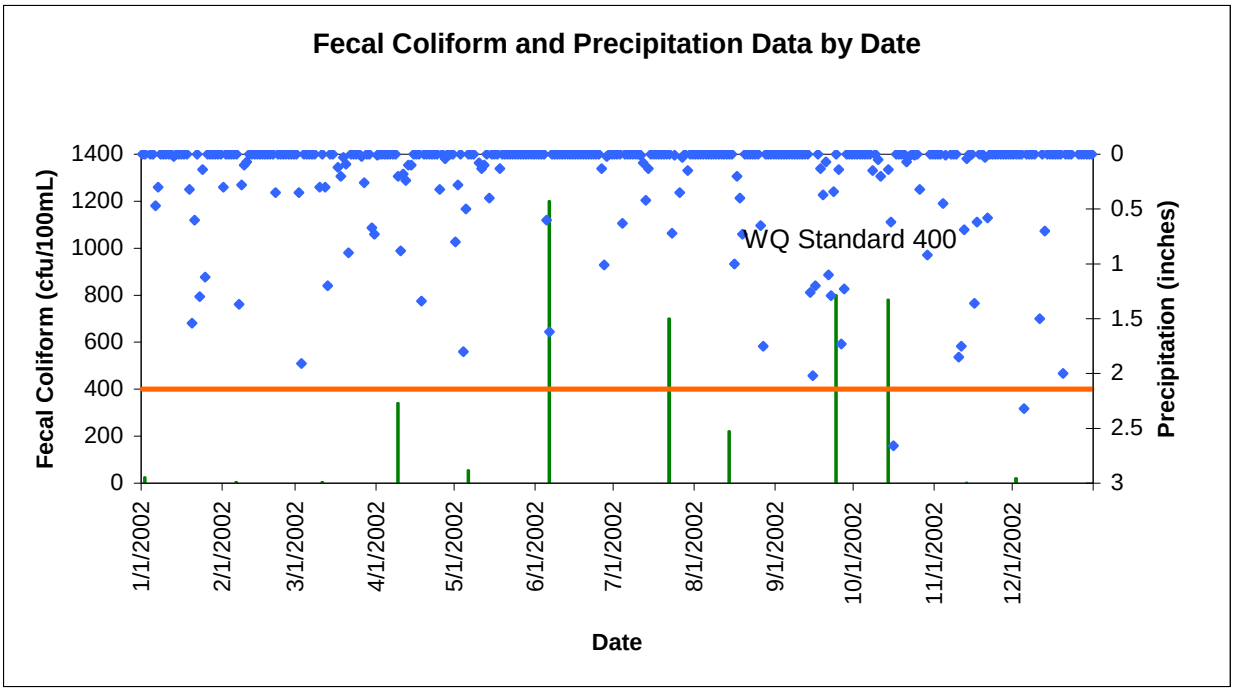


Table 3. FC WQS Exceedence Summary for Impaired Station (2002)

Station	Waterbody	Number of Samples	Number Samples >400/100mL	% Samples Exceed WQS
RS-02466	Burgess Creek	12	4	33.33%

Table 4. FC WQS Exceedence Summary for Impaired Station by Date (2002)

Date	FC (cfu/day)	Date	FC (cfu/day)
1/2/2002	24	7/22/2002	700
2/6/2002	4	8/14/2002	220
3/11/2002	4	9/24/2002	800
4/9/2002	340	10/14/2002	780
5/6/2002	55	11/13/2002	1
6/6/2002	1200	12/2/2002	20

3.0 SOURCE ASSESSMENT AND LOAD ALLOCATION

FC bacteria are used by the State of South Carolina as the indicator for pathogens in surface waters. Pathogens, which are usually difficult to detect, cause disease and make full body contact recreation in lakes and streams a risk to public health. Indicators such as FC bacteria, enterococci, or *E. coli* are easier to measure, have similar sources as pathogens, and persist in surface waters for a similar or longer length of time. These bacteria are not in themselves disease causing, but indicate the potential presence of organisms that may result in sickness.

There are many sources of pathogen pollution in surface waters. In general these sources may be classified as point and nonpoint sources. With the implementation of technology-based controls, pollution from continuous point sources, such as factories and wastewater treatment facilities, has been greatly reduced. These point sources are required by the Clean Water Act (CWA) to obtain a National Pollutant Discharge Elimination System (NPDES) permit. In South Carolina NPDES permits require that dischargers of sanitary wastewater must meet the state standard for FC at the point of discharge. Municipal and private sanitary wastewater treatment facilities may occasionally be sources of pathogen or FC bacteria pollution. However, if these facilities are discharging wastewater that meets their permit limits, they are not causing impairment. If any of these facilities is not meeting its permit limits, enforcement actions/mechanisms are required.

Other non-continuous point sources required to obtain NPDES permits that may be a source of pathogens include Municipal Separate Storm Sewer Systems (MS4s) and stormwater discharges from industrial or construction sites. MS4s may require NPDES discharge permits for industrial and construction activities under the NPDES Stormwater regulations. These sources are also required to comply with the state standard for the pollutant(s) of concern. If MS4s and discharges from construction sites meet the percentage reduction or the water quality standard as prescribed in Section 5 of this TMDL document and required in their MS4 permits, they should not be causing or contributing to an instream FC bacteria impairment.

3.1 Point Sources

3.1.1 Continuous Point Sources

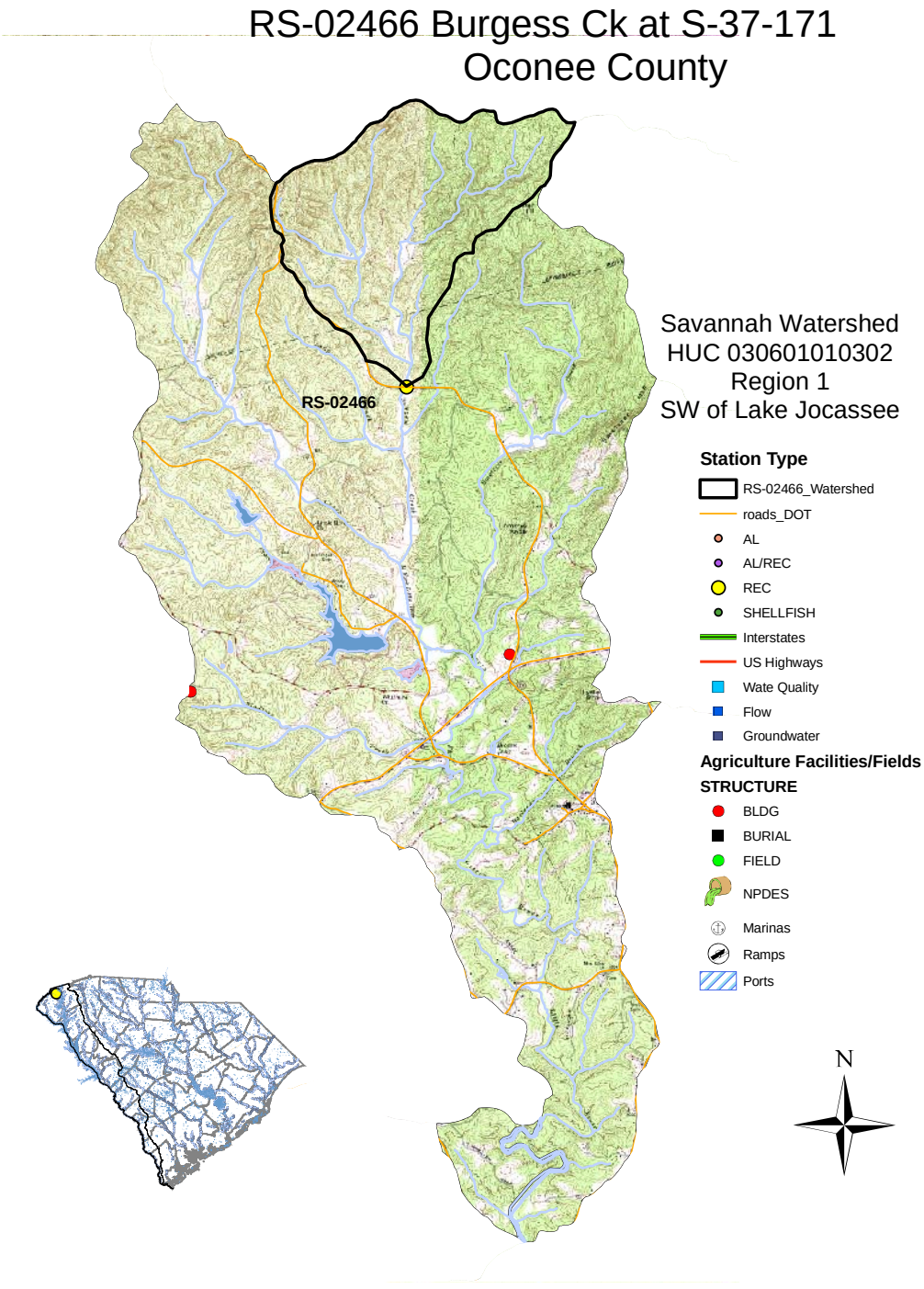
There are currently no permitted continuous point sources within the RS-02466 drainage area at the present time. Future NPDES dischargers in the referenced watershed are required to comply with the load reductions prescribed in the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.

3.1.2 Non-Continuous Point Sources

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS -and SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14)&(15). All regulated MS4 entities have the potential to contribute FC pollutant loadings in the delineated drainage area used in the development of this TMDL.

The South Carolina Department of Transportation (SCDOT) is currently the only designated Municipal Separate Storm Sewer System (MS4) within the watershed. The SCDOT operates under NPDES MS4 Permit SCS040001 and owns and operates one road within the watershed (Figure 4). However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or has enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.

Current Developed land use for the Burgess Creek watershed is 0.85%. Based on current Geographic Information System (GIS) information (available at time of TMDL development) there are currently no SCDOT rest areas or other facilities located in the referenced watershed area.



Other than SCDOT, there are currently no permitted sanitary sewer or stormwater systems in this watershed. Future permitted sanitary sewer or stormwater systems in the referenced watershed are required to comply with the load reductions prescribed in the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.

Industrial facilities that have the potential to cause or contribute to a violation of a water quality standard are covered by the NPDES Storm Water Industrial General Permit (SCR000000). Construction activities are usually covered by the NPDES Storm Water Construction General Permit from DHEC (SCR100000). Where construction activities have the potential to affect water quality of a water body with a TMDL, the Storm Water

Pollution Prevention Plan (SWPPP) for the site must address any pollutants of concern and adhere to any wasteload allocations in the TMDL.

Sanitary sewer overflows (SSOs) to surface waters have the potential to severely impact water quality. These untreated sanitary discharges result in violations of the WQS. It is the responsibility of the NPDES wastewater discharger, or collection system operator for non-permitted 'collection only' systems, to ensure that releases do not occur. Unfortunately releases to surface waters from SSOs are not always preventable or reported. In general, these permitted storm sewer systems are treated as point sources in TMDL calculations. Runoff from developed land that is collected by storm sewers and discharged untreated into streams often is a major source of FC bacteria. However, there are currently no sewer lines that could impact water quality at RS-02466 and therefore, should not be a concern in stormwater runoff.

The Department acknowledges that progress with the assumptions and requirements of the TMDL by MS4s is expected to take one or more permit iteration. Progress towards achieving the WLA reduction for the TMDL may constitute MS4 compliance with its SWMP provided the MEP definition is met, even where the numeric percent reduction may not be achieved in the interim.

3.2 Nonpoint Sources

The Department recognizes that there may be wildlife, agricultural activities, grazing animals, septic tanks, and/or other nonpoint source contributors located within unregulated areas (outside the permitted area) of the Burgess Creek watershed. Nonpoint sources located in unregulated areas are subject to the load allocation and not the waste load allocation of the TMDL document.

3.2.1 Wildlife

Wildlife (mammals and birds) can be a significant contributor of FC bacteria. Wildlife in this area typically includes deer, squirrels, raccoons, bears and other mammals as well as a variety of birds. Wildlife wastes are carried into nearby streams by runoff following rainfall or deposited directly in streams. Waterfowl also may be a significant contributor of FC bacteria in this watershed. There are several small impoundments throughout the watershed, which provide a desirable habitat for geese and ducks. See figure B-4 in Appendix B. Additionally, a natural resources area is located in Sumter National Forest in the upper part of the watershed. According to a study conducted by SCDNR in 2008, there are approximately15-30 deer per square mile in this area of Oconee (SCDNR 2008). The study estimated deer density based on suitable habitat (forests, cropland, pasture). The FC, production rate for deer has been shown to be 3.47 x 10^8 cfu/day per animal in a study conducted by Yagow (1999), of which only a portion will enter the watershed. Beaver activity was also noticed in the watershed during the windshield survey. Wildlife is likely a major contributor of FC in this watershed.

3.2.2 Agricultural Activities

Agricultural activities that involve livestock or animal wastes are potential sources of FC contamination of surface waters. Fecal matter can enter the waterway via runoff from the land or by direct deposition into the stream. Agricultural activities may represent a significant source in the Burgess watershed. One horse pasture was noted in the watershed as well as the historical presence of cattle pastures. These areas are best described as "hobby" farms, which contain a small number of animals, where the primary income of the landowner is not derived from the animal agriculture itself. Additionally, several small agricultural fields are located in close proximity to RS-02466. It is undetermined at this time whether animal wastes are applied to these fields. See Figures B-1 and B-2 in Appendix B.

3.2.2.1 Agricultural Animal Facilities

Owners/operators of most commercial animal growing operations are required by SC Regulation 61-43, Standards for the Permitting of Agricultural Animal Facilities, to obtain permits for the handling, storage, treatment (if necessary) and disposal of the manure, litter and dead animals generated at their facilities (SCDHEC 2002). The requirements of R. 61-43 are designed to protect water quality; therefore, we have a reasonable assurance that facilities operating in compliance with this regulation should not contribute to

downstream water quality impairments. South Carolina currently does not have any confined animal feeding operations (CAFOs) under NPDES coverage; however, the State does have permitted animal feeding operations (AFOs) covered under R. 61-43. These permitted operations are not allowed to discharge to waters of the State and are covered under 'no discharge' (ND) permits. Discharges from these operations to waters of the State are illegal and are subject to enforcement actions by SCDHEC.

There are currently no active animal feeding operations (AFOs) in the Burgess Creek watershed. Future AFOs in the referenced watershed are required to comply with the load reductions prescribed in the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Permitted agricultural facilities that operate in compliance with their permit are not considered to be sources of impairment.

3.2.2.2 Grazing Animals

Livestock, especially cattle, are frequently major contributors of FC bacteria to streams. Cattle on average produce some 1 E+11 cfu/day per animal of FC bacteria (ASAE 1998). Grazing cattle and other livestock may contaminate streams with FC bacteria indirectly by runoff from pastures or directly by defecating into streams and ponds. The grazing of unconfined livestock (in pastures) is not regulated by SCDHEC. The United States Department of Agriculture's National Agricultural Statistics Service reported 19,828 cattle and calves in Oconee County in 2002 (USDA 2002). Direct loading by cattle or other livestock to surface waters within the Burgess Creek watershed is likely to be a significant source of FC. Pastureland within the drainage area of RS-02466 is estimated to be 51 acres (NLCD 2001). Pastureland within Oconee County is estimated to be 55788 acres. By taking the ratio of the above land uses, Burgess Creek is proportional to 0.09 % of the Oconee County pasture land use, assuming an even distribution across Oconee County. This translates to roughly 18 cattle and calves in the Burgess Creek watershed upstream of RS-02466. While no cattle were observed during the site source assessment, the historic presence of cattle in the watershed was discussed with local landowners. In small watersheds like RS-02466 in Burgess Creek, even a few cattle could cause water quality impairments, particularly if the cattle have direct access to streams and are located in close proximity to DHEC monitoring sites. In fact, as noted above, the source assessment for RS-02466 revealed horses, with direct access to streams, located within one mile of the monitoring site. Horses have been shown to produce 4.20 x 10^8 cfu/day per animal (ASAE 1998). See Figure B-3 in Appendix B.

3.2.3 Leaking Sanitary Sewers and Illicit Discharges

Leaking sewer pipes and illicit sewer connections represent a direct threat to public health since they result in the discharge of partially treated or untreated human wastes to the surrounding environment. Quantifying these sources is extremely speculative without direct monitoring of the source because the magnitude is directly proportional to the volume and its proximity to the surface water. Typical values of FC in untreated domestic wastewater range from 10^4 to 10^6 MPN/100mL (Metcalf and Eddy 1991).

Illicit sewer connections into storm drains result in direct discharges of sewage via the storm drainage system outfalls. The existence of illicit sewer connections to storm drains is well documented in many urban drainage systems. However, there are currently no sewer lines that would impact water quality at RS-02466 and therefore, should not be a concern in stormwater runoff.

3.2.4 Failing Septic Systems

Studies demonstrate that wastewater located four feet below properly functioning septic systems contain on average less than one FC bacteria organism per 100 mL (Ayres Associates 1993). Failed or non-conforming septic systems, however, may be a contributor of FC to Burgess Creek and its tributaries. Wastes from failing septic systems enter surface waters either as direct overland flow or via groundwater. Although loading to streams from failing septic systems is likely to be a continual source, wet weather events can increase the rate of transport of pollutants from failing septic systems because of the wash-off effect from runoff and the increased rate of groundwater recharge.

There is no community wastewater treatment plant to serve residents in the Burgess Creek watershed upstream of RS-02466 and therefore the majority of homes in the watershed are likely serviced by on-site

private septic systems. Based on Oconee County Parcel Maps and a windshield survey of the watershed there are approximately 25 residences located in the Burgess Creek Watershed upstream of RS-02466. Assuming one septic tank per household, it is estimated that there are 25 septic tanks in this area. Each of these residences is located within 1.25 miles of RS-02466, some directly adjacent to Burgess Creek or its tributaries. At the time of TMDL development, the functioning status of these systems is currently unknown.

3.2.5 Urban RunOff

Due to the rural nature of this watershed, urban runoff is currently not considered to be a significant source of FC contributing to impairment at RS-02466. However a number of domesticated pets, including cats and dogs, were seen during the windshield survey. While pets are the primary source of FC deposited on the urban landscape, they could be a minor source of impairment in Burgess Creek.

Similar to regulated MS4s, potentially designated MS4 entities (as listed in FR 64, 235, p.68837) or other unregulated MS4 communities located in the Burgess Creek watershed may have the potential to contribute FC bacteria in stormwater runoff. A portion of the watershed lies within the Sumter National Forest and is expected to have a low potential for growth.

4.0 LOAD-DURATION CURVE METHOD

The load-duration curve method was developed as a means of incorporating natural variability, uncertainty, and risk assessment into TMDL development (Bonta and Cleland 2003). The analysis is based on the range of hydrologic conditions for which there are appropriate water quality data. The load-duration curve method uses the cumulative frequency distribution of stream flow and pollutant concentration data to estimate existing and TMDL loads for a water body. Development of the load-duration curve is described in this chapter.

The load-duration curve method depends on an adequate period of record for flow data. USGS Gauge 02185200, “Little River near Walhalla, SC”, was used for this TMDL (USGS 2008). This gauge began recording daily flows in 1967 and provides the flow data required to establish the flow duration curve for RS-02466. Flow data for an eight-year period (1996-2003) were used to establish flow duration curves. These flow records were used to estimate flow at the impaired monitoring station.

The drainage area of RS-02466 was delineated using USGS topographic maps using ArcMap software. The cumulative area drained was calculated and used to estimate flow based on the ratio of the monitoring station drainage area to the referenced USGS gauge. For example, the USGS Little River gauge records flow from 72 square miles (sq mi). The cumulative drainage area at monitoring station RS-02466 (Burgess Creek) is approximately 2.6 sq mi, or 3.6% of the area drained at the Little River gauge. Mean daily flow for the RS-02466 monitoring location was assumed to be 3.6% of the daily flow at the Little River gauge.

Flow duration curves were developed by ranking flows from highest to lowest and calculating the probability of occurrence (presented as a percentage or duration interval), where zero corresponds to the highest flow. The duration interval can be used to determine the percentage of time a given flow is achieved or exceeded, based on the period of record. Flow duration curves were divided into five hydrologic condition categories (High Flows, Moist Conditions, Mid-Range, Dry Conditions and Low Flows). Categorizing flow conditions can assist in determining which hydrologic conditions result in the greatest number of exceedences. A high number of exceedences under dry conditions might indicate a point source or illicit connection issue, whereas moist conditions may indicate nonpoint sources. Data within the High Flow and Low Flow categories are generally not used in the development of a TMDL due to their infrequency.

A target load-duration curve was created by calculating the allowable load using daily flow, the FC WQS concentration and a unit conversion factor. The water quality target was set at 380 cfu/100ml for the instantaneous criterion, which is five percent lower than the water quality criteria of 400 cfu/100ml. A five

percent explicit Margin of Safety (MOS) was reserved from the water quality criteria in developing target load-duration curves. The load-duration curve for station RS-02466 is presented in Figure 4.

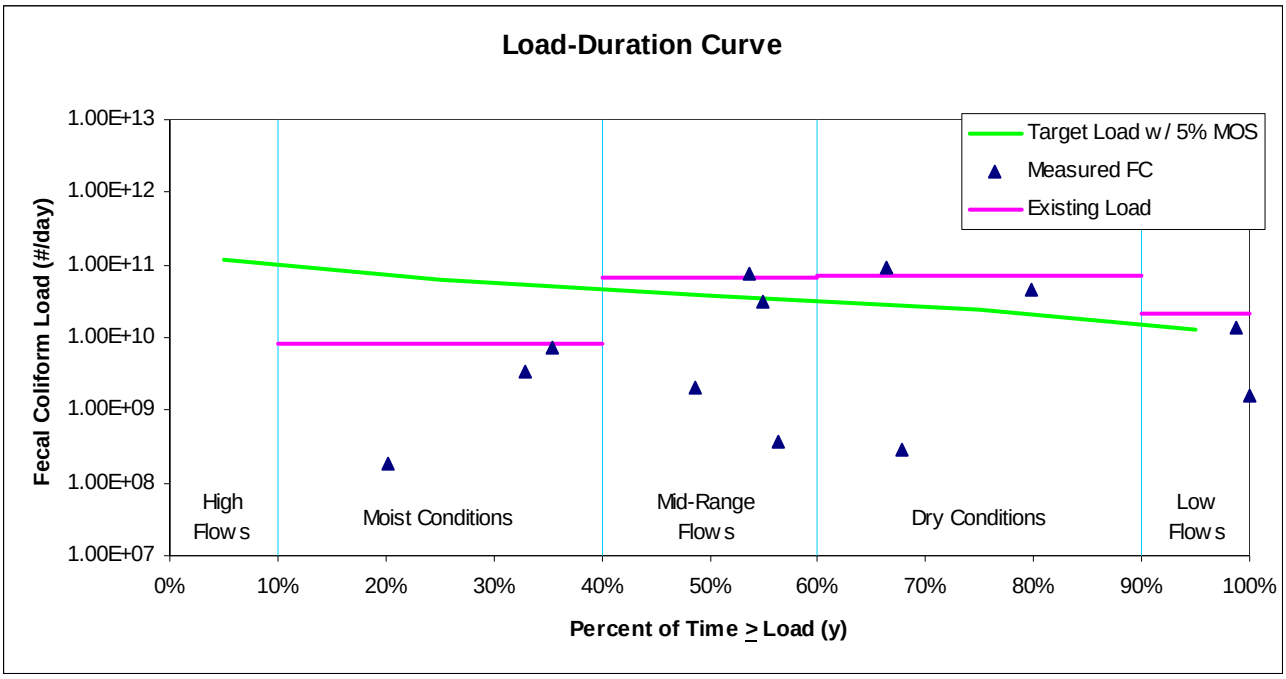
For the load duration curve, the independent variable (X-Axis) represents the percentage of estimated flows greater than value x. The dependent variable (Y-Axis) represent the FC loading at each estimated flow expressed in terms of colony forming units per day (cfu/day). In each defined flow interval, existing and target loadings were calculated by the following equations:

Existing Load = Mid-Point Flow in Each Hydrologic Category *x* 90th Percentile FC Concentration *x* Conversion Factor (24465758.4)

Target Load = Mid-Point Flow in Each Hydrologic Category *x* 380 (WQ criterion minus a 5% MOS) x Conversion Factor (24465758.4)

Percent Reduction = (Existing Load – Target Load) / Existing Load

Figure 4. Load Duration Curve for Burgess Creek Station RS-02466.



Instantaneous loads for each of the impaired stations were calculated. Measured FC concentrations from 2002 were multiplied by measured (or estimated flow based on drainage area) flow on the day of sampling and a unit conversion factor. These data were plotted on the load-duration graph based on the flow duration interval for the day of sampling. Samples above the target line are violations of the WQS while samples below the line are in compliance (Figure 4). Only the instantaneous water quality criterion was targeted because there is insufficient data to evaluate against the 30-day geometric mean.

An existing load was determined for each hydrologic category for the TMDL calculations. The 90th percentile of measured FC concentration within each hydrologic category was multiplied by the flow at each category midpoint (i.e., flow at the 25% duration interval for the Moist Conditions, 50% interval for Mid-Range, and 75% for Dry Condition). The existing loads are plotted on the load-duration curves in Figure 4. These values were compared to the target load (which includes an explicit 5% MOS) at each hydrologic category midpoint to determine the percent load reduction necessary to achieve compliance with the WQS. This TMDL assumes that if the highest percent reduction is achieved the WQS will be attained under all flow conditions.

5.0 DEVELOPMENT OF TOTAL MAXIMUM DAILY LOAD

A total maximum daily load (TMDL) for a given pollutant and water body is comprised of the sum of individual wasteload allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving water body. Conceptually, this definition is represented by the equation:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while still achieving compliance with WQS. In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established and thereby provide the basis to establish water quality-based controls.

For most pollutants, TMDLs are expressed as a mass load (e.g., kilograms per day). For bacteria, however, TMDLs are expressed in terms of number (#), colony forming units (cfu), organism counts (or resulting concentration), or MPN (Most Probable Number), in accordance with 40 CFR 130.2(l).

5.1 Critical Conditions

This TMDL is based on the flow recurrence interval between 10% and 90% and excludes extreme high and low flow conditions; flows that are characterized as 'Low' or 'High' in Figure 4 and Appendix A were not included in the analysis. The critical condition for each monitoring station is identified as the flow condition requiring the largest percent reduction, within the 10-90% duration intervals. Critical conditions for the Burgess Creek watershed pathogen impaired segment are listed in Table 5. These data indicate that for RS-02466, dry weather results in larger bacteria loads and is therefore the critical condition for the station.

5.2 Existing Load

An existing load was determined for each hydrologic category for the TMDL calculations as described in Section 4.0 of this TMDL. The existing load under the critical condition, described in Section 5.1 above was used in the TMDL calculations. Loadings from all sources are included in this value: wildlife, horses/cattle-in-streams, and failing septic systems. The existing load for RS-02466 in the Burgess Creek watershed is provided in Appendix A.

Table 5. Percent Reduction Necessary to Achieve Target Load by Hydrologic Category.

STATION	WATERBODY	MOIST CONDITIONS	MID RANGE FLOWS	DRY CONDITIONS
RS-02466	Burgess Creek	NRN	43	66

Highlighted cells indicate critical condition. NRN = no reduction needed. Existing load below target load.

5.3 Wasteload Allocation

The wasteload allocation (WLA) is the portion of the TMDL allocated to NPDES-permitted point sources (USEPA 1991). Note that all illicit dischargers, including SSOs, are illegal and not covered under the WLA of this TMDL.

5.3.1 Continuous Point Sources

There are currently no NPDES-permitted domestic dischargers upstream of RS-02466 in the Burgess Creek Watershed. Future continuous discharges are required to meet the prescribed loading for the pollutant of concern based on permitted flow and assuming an allowable permitted maximum concentration of 400cfu/100mL.

5.3.2 Non-Continuous Point Sources

Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS & SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14) & (15) (SCDHEC 2003). Illicit discharges, including SSOs, are not covered under any NPDES permit and are subject to enforcement mechanisms. All areas defined as "Urbanized Area" by the US Census are required under the NPDES Phase II Stormwater Regulations to obtain a permit for the discharge of stormwater. Other non-urbanized areas may be required under the NPDES Phase II Stormwater Regulations to obtain a permit for the discharge of stormwater. Currently no part of the RS-02466 drainage area is classified as Urbanized Area.

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. Stormwater discharges are required to meet the percentage reduction or the existing instream standard for the pollutant of concern. The percent reduction is based on the maximum percent reduction (critical condition) within any hydrologic category necessary to achieve target conditions. Table 6 presents the reduction needed at RS-02466. The reduction percentages in this TMDL also apply to the FC waste load attributable to those areas of the watershed which are covered or will be covered under NPDES MS4 permits.

Based on the available information at this time, the portion of the 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 well as recurrence intervals are largely unknown. As appropriate information is made available to further define the pollutant contributions for the permitted MS4, an effort can be made to revise these TMDLs. This effort will be initiated as resources permit and if deemed appropriate by the Department. For the Department to revise these TMDLs the following information should be provided, but not limited to:

1. An inventory of service boundaries of the MS4 covered in the MS4 permit, provided as ARCGIS compatible shape files.
2. An inventory of all existing and planned stormwater discharge points, conveyances, and drainage areas for the discharge points, provided as ARCGIS compatible shape files. If drainage areas are not known, any information that would help estimate the drainage areas should be provided. The percentage of impervious surface within the MS4 area should also be provided.
3. Appropriate and relevant data should be provided to calculate individual pollutant contributions for the MS4 permitted entities. At a minimum, this information should include precipitation, water quality, and flow data for stormwater discharge points.

Table 6. Percent Reduction Necessary to Achieve Target Load.

Station	Waterbody	% Reduction
RS-02466	**Burgess Creek**	**66**

Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. However, the Department recognizes that SCDOT is not a

traditional MS4 in that it does no possess statutory taxing or enforcement powers. SCDOT does not regulate landuse or zoning, issue building or development permits.

5.4 Load Allocation

The Load Allocation applies to the nonpoint sources of FC bacteria and is expressed both as a load and as a percent reduction. The load allocation is calculated as the difference between the target load under the critical condition and the point source WLA. The load allocation for each station is listed in Table Ab-1 and Table 7. There may also be other unregulated MS4s located in the watershed that are subject to the LA component of this TMDL. At such time that the referenced entities, or other future unregulated entities become regulated NPDES MS4 entities and subject to applicable provisions of SC Regulation 61-68 D, 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. 122.26(b)(14) & (15) (SCDHEC 2003).

5.5 Seasonal Variability

Federal regulations require that TMDLs take into account the seasonal variability in watershed loading. The variability in this TMDL is accounted for by using an 8-year hydrological and 1 year water quality sampling data set, which includes data collected from all seasons.

5.6 Margin of Safety

The margin of safety (MOS) may be explicit and/or implicit. The explicit margin of safety is 5% of the TMDL or 20 counts/100mL of the instantaneous criterion of 400 cfu/100 mL (380 cfu/100mL). Target loads are therefore 95% of the assimilative capacity (TMDL) of the waterbody. The MOS is expressed as the value calculated from the critical condition defined in Section 5.1 and is the difference between the TMDL and the sum of the WLA and LA. The calculated value of the MOS for RS-02466 is given in Table 7.

5.7 TMDL

For most pollutants, TMDLs are expressed as a mass load (e.g., kilograms per day). For bacteria, however, TMDLs are expressed in terms of cfu or organism counts (or resulting concentration), in accordance with 40 CFR 130.2(l). Only the instantaneous water quality criterion was targeted because there is insufficient data to evaluate against the 30-day geometric mean. The target load is defined as the load (from point and nonpoint sources) that a stream segment can receive while meeting the WQS. The TMDL value is the median target load within the critical condition (i.e., the middle value within the hydrologic category that requires the greatest load reduction) plus WLA and MOS. Values for each component of the TMDL for the impaired segment of Burgess Creek watershed are provided in Table 7.

While TMDL development was primarily based on instantaneous water quality criterion, terms and conditions of NPDES permits for continuous discharges require facilities to demonstrate compliance with both geometric mean and instantaneous water quality criteria for FC bacteria in treated effluent. NPDES permits for continuous dischargers require data collection sufficient to monitor for compliance of both criteria at the point of outfall.

Table 7 indicates the percentage reduction or water quality standard required for each subwatershed (WQM Station). Note that all future regulated NPDES-permitted stormwater discharges will also be required to meet the prescribed percentage reductions, or the water quality standard. It should be noted that in order to meet the WQS for FC bacteria prescribed load reductions must be targeted from all sources, including NPDES permitted and nonpoint sources.

Based on the available information at this time, the portion of the 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 well as recurrence intervals are largely unknown. Therefore, the

regulated MS4 is assigned the same percent reduction as the non-regulated sources in the watershed. Compliance with the MS4 permit in regards to this TMDL document is determined at the point of discharge to 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 this TMDL document.

Table 7. TMDL Components for the FC Impaired Segments in the Burgess Creek Watershed.
Loads are expressed as colony forming units (cfu) per day.

				Wasteload Allocation (WLA)			Load Allocation (LA)	
Station	Existing Load (cfu/day)	TMDL (cfu/day)	Margin of Safety (MOS) (cfu/day)	Continuous Source[1] (cfu/day)	Non-Continuous Sources[2,4] (% Reduction)	Non-Continuous SCDOT[3,4] (% Reduction)	Load Allocation (cfu/day)	% Reduction to Meet LA[4]
RS-02466	7.18E+10	2.57E+10	1.29E+09	NA	66	0	2.45E+10	66

1. WLAs are expressed as daily maximum; NA = not applicable, no point sources. Existing and future continuous discharges are required to meet the prescribed loading or the existing instream standard for the pollutant of concern. Loadings were developed based upon permitted flow and an allowable permitted maximum concentration of 400cfu/100ml.
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 percentage reduction or the existing instream standard for pollutant of concern in accordance with their NPDES permit.
3. As long as the conditions within the SCDOT MS4 area remain the same the Department deems the current contributions from SCDOT negligible and no reduction of FC bacteria is necessary. SCDOT must continue to comply with the provisions of its approved NPDES stormwater permit.
4. Percent reduction applies to existing instream load.

6.0 IMPLEMENTATION

The implementation of both point (WLA) and non-point (LA) source components of the TMDL are necessary to bring about the required reductions in FC bacteria loading to Burgess Creek and its tributaries in order to achieve water quality standards. Using existing authorities and mechanisms, an implementation plan providing information on how point and non point sources of pollution are being abated or may be abated in order to meet water quality standards is provided. Sections 6.1.1-6.1.7 presented below correspond with sections 3.1.1-3.2.5 of the source assessment presented in the TMDL document. As the implementation strategy progresses, DHEC may continue to monitor the effectiveness of implementation measures and evaluate water quality where deemed appropriate.

Point sources are discernible, confined, and discrete conveyances of pollutants to a water body including but not limited to pipes, outfalls, channels, tunnels, conduits, man-made ditches, etc. The Clean Water Act's primary point source control program is the National Pollutant Discharge Elimination System (NPDES). Point sources can be broken down into continuous and non-continuous point sources. Some examples of a continuous point source are wastewater treatment facilities (WWTF) and industrial facilities. Non-continuous point sources are related to stormwater and include municipal separate storm sewer systems (MS4), construction activities, etc. Current and future NPDES discharges in the referenced watershed are required to comply with the load reductions prescribed in the wasteload allocation (WLA).

Nonpoint source pollution originates from multiple sources over a relatively large area. It is diffuse in nature and indistinct from other sources of pollution. It is generally caused by the pickup and transport of pollutants from rainfall moving over and through the ground. Nonpoint sources of pollution may include, but are not limited to: wildlife, agricultural activities, illicit discharges, failing septic systems, and urban runoff. Nonpoint sources located in unregulated portions of the watershed are subject to the load allocation (LA) and not the WLA of the TMDL document.

South Carolina has several tools available for implementing the non-point source component of this TMDL. The *Implementation Plan for Achieving Total Maximum Daily Load Reductions From Nonpoint Sources for the State of South Carolina* (SCDHEC 1998) document is one example. Another key component for interested parties to control pollution and prevent water quality degredation in the watershed would be the establishment and administration of a program of Best Management Practices (BMPs). Best management practices may be defined as a practice or a combination of practices that have been determined to be the most effective, practical means used in the prevention and/or reduction of pollution.

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 this TMDL and reduce nonpoint source FC loading to Burgess Creek and its tributaries. Congress amended the Clean Water Act (CWA) in 1987 to establish the Section 319 Nonpoint Source Management Program. Under Section 319, States receive grant money to support a wide variety of activities including the restoration of impaired waters. TMDL implementation projects are given highest priority for 319 funding. CWA §319 grants are not available for implementation of the WLA component of this TMDL nor within any permitted jurisdictional MS4 area. Additional resources are provided in Section 7.0 of this TMDL document.

SCDHEC will also work with the existing agencies in the area to provide nonpoint source education in the Burgess Creek watershed. Local sources of nonpoint source education and assistance include the Natural Resource Conservation Service (NRCS), the Oconee County Soil and Water Conservation Services, the Clemson University Cooperative Extension Service, and the South Carolina Department of Natural Resources.

The Department recognizes that **adaptive management/implementation** of this TMDL might be needed to achieve the water quality standard and we are committed towards targeting the load reductions to improve water quality in the Burgess Creek Watershed. As additional data and/or information becomes available, it may become necessary to revise and/or modify the TMDL target accordingly.

6.1 Implementation Strategies

The strategies presented in this document for implementation of the referenced TMDL are not inclusive and are to be used only as guidance. The strategies are informational suggestions which may lead to the required load reductions being met for the referenced watershed while demonstrating consistency with the assumptions and requirements of the TMDL. Application of certain strategies provided within may be voluntary and are not a substitute for actual NPDES permit conditions.

6.1.1 Continuous Point Sources

Continuous point source WLA reductions will be implemented through NPDES permits. Existing and future continuous discharges are required to meet the prescribed loading for the pollutant of concern and demonstrate consistency with the assumptions and requirements of the TMDL. Loadings are developed based upon permitted flow and an allowable permitted maximum concentration of 400 cfu/100ml.

6.1.2 Non-Continuous Point Sources

An iterative BMP approach as defined in the general stormwater NPDES MS4 permit is expected to provide significant implementation of the WLA. Permit requirements for implementing WLAs in approved TMDLs will vary across waterbodies, discharges, and pollutant(s) of concern. The allocations within a TMDL can take many different forms – narrative, numeric, specific BMPs – and may be complimented by other special requirements such as monitoring.

The level of monitoring necessary, deployment of structural and non-structural BMPs, evaluation of BMP performance, and optimization or revisions to the existing pollutant reduction goals of the SWMP or any other plan is TMDL and watershed specific. Hence, it is expected that NPDES permit holders evaluate their existing SWMP or other plans in a manner that would effectively address implementation of this TMDL with an acceptable schedule and activities for their permit compliance. The Department staff (permit writers, TMDL project managers, and compliance staff) is willing to assist in developing or updating the referenced plan as deemed necessary. Please see Appendix D which provides additional information as it relates to evaluating the effectiveness of an MS4 Permit as it related to compliance with approved TMDLs. Compliance with terms and conditions of existing and future NPDES sanitary and stormwater permits (including all construction, industrial and MS4) may effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.

The Department acknowledges that progress with the assumptions and requirements of the TMDL by MS4s is expected to take one or more permit iteration. Achieving the WLA reduction for the TMDL may constitute MS4 compliance with its SWMP, provided the MEP definition is met, even where the numeric percent reduction may not be achieved in the interim.

Regulated MS4 entities are required to develop a SWMP that includes the following: public education, public involvement, illicit discharge detection & elimination, construction site runoff control, post construction runoff control, and pollution prevention/good housekeeping. These measures are not exhaustive and may include additional criterion depending on the type of NPDES MS4 permit that applies. The following examples are recognized as acceptable stormwater practices and may be applied to unregulated MS4 entities or other interested parties in the development of a stormwater management plan.

An informed and knowledgeable community is crucial to the success of a stormwater management plan (USEPA, 2005). MS4 entities may implement a public education program to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of stormwater discharges on local waterbodies and the steps that can be taken to reduce stormwater pollution. Some appropriate BMPs may be brochures, educational programs, storm drain stenciling, stormwater hotlines, tributary signage, and alternative information sources such as web sites, bumper stickers, etc (USEPA, 2005).

The public can provide valuable input and assistance to a stormwater management program and they may have the potential to play an active role in both the development and implementation of the stormwater program

where deemed appropriate by the entity. There are a variety of practices that can involve public participation such as public meetings/citizens panels, volunteer water quality monitoring, volunteer educators, community clean-ups, citizen watch groups, and "Adopt a Storm Drain" programs which encourage individuals or groups to keep storm drains free of debris and monitor what is entering local waterways through storm drains (USEPA, 2005).

Illicit discharge detection and elimination efforts are also necessary. Discharges from MS4s often include wastes and wastewater from non-stormwater sources. These discharges enter the system through either direct connections or indirect connections. The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies (USEPA, 2005). Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health. MS4 entities may have a storm sewer system map which shows the location of all outfalls and to which waters of the US they discharge for instance. If not already in place, an ordinance prohibiting non-stormwater discharges into a MS4 with appropriate enforcement procedures may also be developed. Entities may also have a plan for detecting and addressing non-stormwater discharges. The plan may include locating problem areas through infrared photography, finding the sources through dye testing, removal/correction of illicit connections, and documenting the actions taken to illustrate that progress is being made to eliminate illicit connections and discharges.

A program might also be developed to reduce pollutants in stormwater runoff to the MS4 area from construction activities. An ordinance or other regulatory mechanism may exist requiring the implementation of proper erosion and sediment controls on applicable construction sites. Site plans should be reviewed for projects that consider potential water quality impacts. It is recommended that site inspections should be conducted and control measures enforced where applicable. A procedure might also exist for considering information submitted by the public (USEPA, 2005). For information on specific BMPs please refer to the SCDHEC Stormwater Management BMP Handbook online at: http://www.scdhec.com/environment/ocrm/pubs/docs/SW/BMP_Handbook/Erosion_prevention.pdf

Post-construction stormwater management in areas undergoing new development or redevelopment is recommended because runoff from these areas has been shown to significantly affect receiving waterbodies. Many studies indicate that prior planning and design for the minimization of pollutants in post-construction stormwater discharges is the most cost-effective approach to stormwater quality management (USEPA, 2005). Strategies might be developed to include a combination of structural and/or non-structural BMPs. An ordinance or other regulatory mechanism may also exist requiring the implementation of post-construction runoff controls and ensuring their long term-operation and maintenance. Examples of non-structural BMPs are planning procedures and site-based BMPs (minimization of imperviousness and maximization of open space). Structural BMPs may include but are not limited to stormwater retention/detention BMPs, infiltration BMPs (dry wells, porous pavement, etc.), and vegetative BMPs (grassy swales, filter strips, rain gardens, artificial wetlands, etc.).

Pollution prevention/good housekeeping is also a key element of stormwater management programs. Generally this requires the MS4 entity to examine and alter their programs or activities to ensure reductions in pollution are occurring. It is recommended that a plan be developed to prevent or reduce pollutant runoff from municipal operations into the storm sewer system and it is encouraged to include employee training on how to incorporate and document pollution prevention/good housekeeping techniques. To minimize duplication of effort and conserve resources, the MS4 operator can use training materials that are available from EPA or relevant organizations (USEPA, 2005).

MS4 communities are encouraged to utilize partnerships when developing and implementing a stormwater management program. Watershed associations, educational organizations, and state, county, and city governments are all examples of possible partners with resources that can be shared. For additional information on partnerships contact the SCDHEC Watershed Manager for the waterbody of concern online at: http://www.scdhec.gov/environment/water/shed/contact.htm For additional information on stormwater discharges associated with MS4 entities please see SCDHEC's NPDES web page online at

http://www.scdhec.gov/environment/water/swnpdes.htm as well as the USEPA NPDES website online at http://cfpub.epa.gov/npdes/home.cfm?program_id=6 for information pertaining to the National Menu of BMPs, Urban BMP Performance Tool, Outreach Documents, etc.

6.1.3 Wildlife

Suggested forms of implementation for wildlife will vary widely due to geographic location and species. There are many forms of acceptable wildlife BMPs in practice and development at the present time. For example, contiguous forested areas could be set up and managed to keep wildlife from bedding down and defecating near surface waters. This management practice relies on concentrating wildlife away from water bodies to minimize their impact to pollutant loading. The upper part of the RS-02466 drainage area is located in a natural resources area of Sumter National Forest. Contributions from wildlife could be reduced in protected areas by developing a management plan which would allow hunting access during certain seasons. Although this strategy might not work in all situations, it would decrease FC loading from wildlife in areas where wildlife may be a significant contributor to the overall watershed.

Deterrents may also be used to keep wildlife away from docks and lawns in close proximity to surface waters. Non-toxic spray deterrents, decoys, eagles, kites, noisemakers, scarecrows, and plastic owls are a sample of what is currently available. Many waterfowl species are deterred by foreign objects on lawns and the planting of a shrub buffer along greenways adjacent to impoundments may also be effective.

In addition, homeowners and the hunting community should be educated on the impacts of feeding wildlife or planting wildlife food plots in close proximity to surface waters. Please check local and federal laws before applying deterrents or harassing wildlife. Additional information may be obtained from the "Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water" bulletin provided by USEPA (2001).

6.1.4 Agricultural Activities

Suggested forms of implementation for agricultural activities will vary based on the activity of concern. Agricultural BMPs can be vegetative, structural or management oriented. When selecting BMPs, it is important to keep in mind that nonpoint source pollution occurs when a pollutant becomes available, is detached and then transported to nearby receiving waters. Therefore, for BMPs to be effective, the transport mechanism of the pollutant, fecal coliform, needs to be identified. The presence of horses and possibly cattle in the watershed, particularly ones with direct access to local streams, could be addressed during implementation. For livestock in the referenced watershed, installing fencing along the streams within the watershed and providing an alternative water source where livestock are present would eliminate direct contact with the streams. Figure B-3 shows a property without fencing along Burgess Creek. If fencing is not feasible, it has been shown that installing water troughs within a pasture area reduced the amount of time livestock spent drinking directly from streams by 92% (ASABE 1997). An indirect result of this was a 77% reduction in stream bank erosion by providing an alternative to accessing the stream directly for water supply.

For row crop farms in the referenced watershed, many common practices exist to reduce FC contributions. Unstabilized soil directly adjacent to surface waters can contribute to FC loading during periods of runoff after rain events. Agricultural field borders and filter strips (vegetative buffers) can provide erosion control around the border of planted crop fields. These borders can provide food for wildlife, may possibly be harvested (grass and legume), and also provide an area where farmers can turn around their equipment (SCDNR, 1997). A study conducted in 1998 by the American Society of Agricultural and Biological Engineers (ASABE 1998) has shown that a vegetative buffer measuring 6.1 meters in width can reduce fecal runoff concentrations from 2.0E+7 to an immeasurable amount once filtered through the buffer. A buffer of this width was also shown to reduce phosphorous and nitrogen concentrations by 75%.

The agricultural BMPs listed above are a sample of the many accepted practices that are currently available. Many other techniques such as conservation tillage, responsible pest management, and precision agriculture also exist and may contribute to an improvement in overall water quality in the watershed. Education should be

provided to local farmers on these methods as well as acceptable manure spreading and holding (stacking sheds) practices.

For additional information on accepted agricultural BMPs you can obtain a copy of the "Farming for Clean Water in South Carolina" handbook by contacting Clemson University Cooperative Extension Service at (864) 656-1550. In addition, Clemson Extension Service offers a 'Farm-A-Syst' package to farmers. Farm-A-Syst allows the farmer to evaluate practices on their property and determine the nonpoint source impact they may be having. It recommends best management practices (BMPs) to correct nonpoint source problems on the farm. You can access Farm-A-Syst by going onto the Clemson Extension Service website: http://www.clemson.edu/waterquality/FARM.HTM.

NRCS provides financial and technical assistance to help South Carolina landowners address natural resource concerns, promote environmental quality, and protect wildlife habitat on property they own or control. The cost-share funds are available through the Environmental Quality Incentives Program (EQIP). EQIP helps farmers improve production while protecting environmental quality by addressing such concerns as soil erosion and productivity, grazing management, water quality, animal waste, and forestry concerns. EQIP also assists eligible small-scale farmers who have historically not participated in or ranked high enough to be funded in previous sign ups. Please visit www.sc.nrcs.usda.gov/programs/ for more information, including eligibility requirements.

Also available through NRCS, the Grassland Reserve Program (GRP) is a voluntary program offering landowners the opportunity to protect, restore and enhance grasslands on their property. NRCS and the Farm Service Agency (FSA) coordinate implementation of the GRP, which helps landowners restore and protect grassland, rangeland, pastureland, shrubland and certain other lands and provides assistance for rehabilitating grasslands. The program will conserve vulnerable grasslands from conversion to cropland or other uses and conserve valuable grasslands by helping maintain viable grazing operations. A grazing management plan is required for participants. NRCS has further information on their website for the GRP as well as additional programs such as the Conservation Reserve Program, Conservation Security Progrom, Farm and Ranch Lands Protection Program, etc. You can visit the NRCS website by going to: www.sc.nrcs.usda.gov/programs/.

6.1.5 Leaking Sanitary Sewers and Illicit Discharges

Leaking sanitary sewers and illicit discharges, although illegal and subject to enforcement, may be occuring in regulated or unregulated portions of the watershed at any time. Due to the high concentration of pollutant loading that is generally accociated with these discharges, their detection may provide a substantial improvement in overall water quality in the Potato Creek watershed. Detection methods may include, but are not limited to: dye testing, air pressure testing, static pressure testing, and infrared photography.

SCDHEC recognizes illicit discharge detection and elimination activities are conducted by regulated MS4 entities as pursuant to compliance with existing MS4 permits. Note that these activities are designed to detect and eliminate illicit discharges that may contain FC bacteria. It is the intent of SCDHEC to work with the MS4 entities to recognize FC load reductions as they are achieved. SCDHEC acknowledges that these efforts to reduce illicit discharges and SSOs are ongoing and some reduction may already be accountable (i.e. load reductions occurring during TMDL development process). Thus, the implementation process is an iterative and adaptive process. Regular communication between all implementation stakeholders will result in successful remediation of controllable sources over time. As designated uses are restored, SCDHEC will recognize efforts of implementers where their efforts can be directly linked to restoration.

6.1.6 Failing Septic Systems

A septic system, also known as an onsite wastewater system, is defined as failing when it is not treating or disposing of sewage in an effective manner. The most common reason for failure is improper maintenance by homeowners. Untreated sewage water contains disease-causing bacteria and viruses, as well as unhealthy amounts of nitrate and other chemicals. Failed septic systems can allow untreated sewage to seep into wells,

groundwater, and surface water bodies, where people get their drinking water and recreate. A number of septic tanks exist in this watershed. Investigation as to whether these systems are failing and/or contributing to the impairment will be necessary to implement this TMDL. Pumping a septic tank is probably the single most important thing that can be done to protect the system. If the buildup of solids in the tanks becomes too high and solids move to the drainfield, this could clog and strain the system to the point where a new drainfield will be needed.

SCDHEC's Office of Coastal Resource Management (OCRM) has created a toolkit for homeowners and local governments which includes tips for maintaining septic systems. These septic system Do's and Don't's are as follows:

Do's:

- Conserve water to reduce the amount of wastewater that must be treated and disposed of by your system. Doing laundry over several days will put less stress on your system.
- Repair any leaking faucets or toilets. To detect toilet leaks, add several drops of food dye to the toilet tank and see if dye ends up in the bowl.
- Divert down spouts and other surface water away from your drainfield. Excessive water keeps the soil from adequately cleansing the wastewater.
- Have your septic tank inspected yearly and pumped regularly by a licensed septic tank contractor.

Don'ts:

- Don't drive over your drainfield or compact the soil in any way.
- Don't dig in your drainfield or build anything over it, and don't cover it with a hard surface such as concrete or asphalt.
- Don't plant anything over or near the drainfield except grass. Roots from nearby trees an shrubs may clog and damage the drain lines.
- Don't use your toilet as a trash can or poison your system and the groundwater by pouring harmful chemicals and cleansers down the drain. Harsh chemicals can kill the bacteria that help purify your wastewater.

For additional information on how septic systems work, how to properly plan and maintain a septic system, or to link to the OCRM toolkit mentioned above, please visit the DHEC Environmental Health Onsite Wastewater page at the following link: http://www.scdhec.gov/health/envhlth/onsite_wastewater/septic_tank.htm

6.1.7 Urban Runoff

Urban runoff is surface runoff of rainwater created by urbanization outside of regulated areas which may pick up and carry pollutants to receiving waters. Pavement, compacted areas, roofs, reduced tree canopy and open space increase runoff volumes that rapidly flow into recieving waters. This increase in volume and velocity of runoff often causes stream bank erosion, channel incision and sediment deposition in stream channels. In addition, runoff from these developed areas can increase stream temperatures that along with the increase in flow rate and pollutant loads negatively affect water quality and aquatic life (USEPA 2005). This runoff can pick up FC bacteria along the way. Many strategies currently exist to reduce FC loading from urban runoff and the USEPA nonpoint source pollution website provides extensive resources on this subject which can be accessed online at: http://www.epa.gov/nps/urban.html.

Some examples of urban nonpoint source bmps are street sweeping, stormwater wetlands, pet waste receptacles (equipped with waste bags), and educational signs which can be installed adjacent to receiving waters in the watershed such as parks, common areas, apartment complexes, trails, etc. Low impact development (LID) may also be effective. LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as

preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product. There are many practices that have been used to adhere to these principles such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements (USEPA, 2009).

Some additional urban BMPs that can be adopted in public parks are doggy dooleys and pooch patches. Doggy dooleys are disposal units, which act like septic systems for pet waste, and are installed in the ground where decomposition can occur (USEPA, 2001). This requires that pet owners place the waste into the disposal units. Education should be provided to individual homeowners in the referenced watershed on the contributions to FC loading from pet waste. Education to homeowners in the watershed on the fate of substances poured into storm drain inlets should also be provided. For additional information on urban runoff please see the SCDHEC Nonpoint Source Runoff Pollution homepage at http://www.scdhec.gov/environment/water/npspage.htm.

Clemson Extension's Home-A-Syst handbook can also help homeowners reduce sources of NPS pollution on their property. This document guides homeowners through a self-assessment of their property and can be accessed online at: http://www.clemson.edu/waterquality/HOMASYS.HTM

7.0 RESOURCES FOR POLLUTION MANAGEMENT

This section provides a listing of available resources to aid in the mitigation and control of pollutants. There are examples from across the nation, most of which are easily accessible on the World Wide Web.

7.1 General for Urban and Suburban Stormwater Mitigation

- National Management Measures to Control Nonpoint Source Pollution from Urban Areas – Draft. 2002. EPA842-B-02-003. Available at: http://www.epa.gov/owow/nps/urbanmm/index.html
- Stormwater Management Volume Two: Stormwater Technical Manual. Massachusetts Department of Environmental Management. 1997. Available at: http://www.mass.gov/dep/brp/stormwtr/stormpub.htm
- Fact Sheets for the six minimum control measures for storm sewers regulated under Phase I or Phase II. Available at: http://cfpub1.epa.gov/npdes/stormwater/swfinal.cfm?program_id=6
- A Current Assessment of Urban Best Management Practices. 1992. Metropolitan Washington Council of Governments. Washington, DC
- Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. 1987. Metropolitan Washington Council of Governments. Washington, DC
- 2004 Stormwater Quality Manual. Connecticut Department of Environmental Protection 2004. Available at: http://dep.state.ct.us/wtr/stormwater/strmwtrman.htm
- Stormwater Treatment BMP New Technology Report. California Department of Transportation. 2004. SW-04-069-.04.02 Available at: http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/new_technology/CTSW-RT-04-069.pdf
- Moonlight Beach Urban Runoff Treatment facility: Using Ultraviolet Disinfection to Reduce Bacteria Counts. Rasmus, J. and K. Weldon. 2003. StormWater, May/June 2003. Available at http://www.forester.net/sw_0305_moonlight.html
- Operation, Maintenance, and Management of Stormwater Management Systems. Livingston, Shaver, Skupien, and Horner. August 1997. Watershed Management Institute. Call: (850) 926-5310.
- Model Ordinances to Protect Local Resources – Stormwater Control Operation and Maintenance. USEPA Webpage: http://www.epa.gov/owow/nps/ordinance/stormwater.htm
- Stormwater O & M Fact Sheet Preventive Maintenance. USEPA 1999. 832-F-99-004. Available at: http://www.epa.gov/owm/mtb/prevmain.pdf
- The MassHighway Stormwater Handbook. Massachusetts Highway Department. 2004. Available at: http://166.90.180.162/mhd/downloads/projDev/swbook.pdf
- University of New Hampshire Stormwater Center: Dedicated to the protection of water resources through effective stormwater management. Available at: http://www.unh.edu/erg/cstev/index.htm#

- EPA's Stormwater website: EPA's Stormwater website: http://cfpub.epa.gov/npdes/home.cfm?program_id=6

7.2 Illicit Discharges

- Illicit Discharge Detection and Elimination Manual - A Handbook for Municipalities. 2003. New England Interstate Water Pollution Control Commission. Available at: http://www.neiwpcc.org/PDF_Docs/iddmanual.pdf
- Model Ordinances to Protect Local Resources – Illicit Discharges. USEPA webpage: http://www.epa.gov/owow/nps/ordinance/discharges.htm

7.3 Pet Waste

- National Management Measure to Control Non Point Source Pollution from Urban Areas – Draft. USEPA 2002. EPA 842-B-02-2003. Available from: http://www.epa.gov/owow/nps/urbanmm/index.html
- Septic Systems for Dogs? Nonpoint Source News-Notes 63. Pet Waste: Dealing with a Real Problem in Suburbia. Kemper, J. 2000. New Jersey Department of Environmental Protection. Available from: http://www.state.nj.us/dep/watershedmgt/pet_waste_fredk.htm
- Stormwater Manager's Resource Center. Schueler, T., Center for Watershed Protection, Inc. http://www.stormwatercenter.net
- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. U.S. EPA, Office of Water 1993. Washington, DC.
- National Menu of Best Management Practices for Stormwater Phase II. USEPA. 2002. Available at: http://www.epa.gov/npdes/menuofbmps/menu.htm
- Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water. United States Environmental Protection Agency. EPA 916-F-01-027 Available at: http://www.epa.gov/safewater/sourcewater/pubs/fs_swpp_petwaste.pdf
- Welcome to NVRC'S Four Mile Run Program. NVRC 2001. Available at: http://www.novaregion.org/fourmilerun.htm
- Boston's ordinance on dog waste. City of Boston Municipal Codes, Chapter XVI. 16-1.10A Dog Fouling. Available at: http://www.amlegal.com/boston_ma/
- Pet Waste and Water Quality. Hill, J.A., and D. Johnson. 1994. University of Wisconsin Extension Service. http://cecommerce.uwex.edu/pdfs/GWQ006.PDF
- Long Island Sound Study. Pet Waste Poster. EPA. Available at: http://www.longislandsoundstudy.net/pubs/misc/pet.html
- Source Water Protection Practices Bulletin: Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water. USEPA. 2001. EPA 916-F-01-027. Available at: http://www.epa.gov/safewater/protect/pdfs/petwaste.pdf

7.4 Wildlife

- An example of a bylaw prohibiting the feeding of wildlife: Prohibiting Feeding of Wildlife. Town of Bourne Bylaws Section 3.4.3. Available at: http://www.townofbourne.com/Town%20Offices/Bylaws/chapter__3.htm

- Integrated Management of Urban Canadian Geese. M Underhill. 1999. Conference Proceedings, Waterfowl Information Network.

- Urban Canadian Geese in Missouri. Missouri Conservationist Online. Available at: http://www.conservation.state.mo.us/conmag/2004/02/20.htm

7.5 Septic Systems

- National Management Measures to Control Nonpoint Source Pollution from Urban Areas – Draft. Chapter 6. New and Existing Onsite Wastewater Treatment Systems. USEPA 2002. EPA842-B-02-003. Available at: http://www.epa.gov/owow/nps/urbanmm/index.html

- Septic Systems. USEPA Webpage: http://cfpub.epa.gov/owm/septic/home.cfm

7.6 Field Application of Manure

- Conservation Standard Practice-Irrigation Water Management. Number 449. United States Department of Agriculture (USDA) Natural Resources Conservation Service. 2003. Available at: http://www.nrcs.usda.gov/technical/Standards/nhcp.html

- Conservation Standard Practice-Filter Strip. Number 393. USDA Natural Resources Conservation Service (NRCS). 2003. Available at: http://www.nrcs.usda.gov/technical/Standards/nhcp.html

- Buffer Strips: Common Sense Conservation. USDA Natural Resource Conservations Service. No Date. Website. Available at: http://www.nrcs.usda.gov/feature/buffers/

- Conservation Standard Practice-Riparian Forest Buffer. Number 391. USDA Natural Resource Conservation Service. 2003. Available at: http://www.nrcs.usda.gov/technical/Standards/nhcp.html

- Conservation Standard Practice-Riparian Herbaceous Cover. Number 390 USDA Natural Resource Conservation Service. 2003. Available at: http://www.nrcs.usda.gov/technical/Standards/nhcp.html

7.7 Grazing Management

- Conservation Standard Practice-Stream Crossing. Number 578. USDA Natural Resource Conservation Service. 2003. Available at: http://www.nrcs.usda.gov/technical/Standards/nhcp.html

- Guidance Specifying Management Measures for Nonpoint Source Pollution in Coastal Waters. Chapter 2. Management Measures for Agricultural Sources. Grazing Management. USEPA. Available at: http://www.epa.gov/owow/nps/MMGI/Chapter2/ch2-2e.html

7.8 Animal Feeding Operations and Barnyards

- National Management Measures to Control Nonpoint Source Pollution from Agriculture. USEPA 2003. Report: EPA 841-B-03-004. Available at: http://www.epa.gov/owow/nps/agmm/index.html
- Livestock Manure Storage. Software designed to assess the threat to ground and surface water from manure storage facilities. USEPA. Available at: http://www.epa.gov/seahome/manure.html
- National Engineering Handbook Part 651. Agricultural Waste Management Field Handbook. NRCS. Available At: http://www.wcc.nrcs.usda.gov/awm/awmfh.html
- Animal Waste Management. NRCS website: http://www.wcc.nrcs.usda.gov/awm/
- Animal Waste Management Software. A tool for estimating waste production and storage requirements. Available at: http://www.wcc.nrcs.usda.gov/awm/awm.html
- Manure Management Planner. Software for creating manure management plans. Available at: http://www.agry.purdue.edu/mmp/
- Animal Feeding Operations Virtual Information Center. USEPA website: http://cfpub.epa.gov/npdes/afo/virtualcenter.cfm

7.9 Federal Agriculture Resources: Program Overviews, Technical Assistance, and Funding

- USDA-NRCS assists landowners with planning for the conservation of soil, water, and natural resources. Local, state, and federal agencies and policymakers also rely on NRCS expertise. Cost shares and financial incentives are available in some cases. Most work is done with local partners. The NRCS is the largest funding source for agricultural improvements. To find out about potential funding, see: http://www.ma.nrcs.usda.gov/programs/. To pursue obtaining funding, contact a local NRCS coordinator. Contact information is available at:: http://www.ma.nrcs.usda.gov/contact/employee_directory.html
- NRCS provides a wealth of information and BMP fact sheets tailored to agricultural and conservation practices through the NRCS Electronic Field Office Technical Guide at: http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=SC
- The 2002 USDA Farm Bill (http://www.nrcs.usda.gov/programs/farmbill/2002/) provides a variety of programs related to conservation. Information can be found at: http://www.nrcs.usda.gov/programs/farmbill/2002/products.html. The following programs can be linked to from the USDA Farm Bill website:
  - Conservation Security Program (CSP): http://www.nrcs.usda.gov/programs/csp/
  - Conservation Reserve Program (CRP): http://www.nrcs.usda.gov/programs/crp/
  - Wetlands Reserve Program (WRP): http://www.nrcs.usda.gov/programs/wrp/
  - Environmental Quality Incentives Program (EQIP): http://www.nrcs.usda.gov/programs/eqip/
  - Grassland Reserve Program (GRP): http://www.nrcs.usda.gov/programs/GRP/
  - Conservation of Private Grazing Land Program (CPGL): http://www.nrcs.usda.gov/programs/cpgl/
  - Wildlife Habitat Incentives Program (WHIP): http://www.nrcs.usda.gov/programs/whip/
  - Farm and Ranch Land Protection Program (FRPP): http://www.nrcs.usda.gov/programs/frpp/

- Resource Conservation and Development Program (RC&D): http://www.nrcs.usda.gov/programs/rcd/

- CORE4 Conservation Practices. The common sense approach to natural resource conservation. USDA-NRCS (1999). This manual is intended to help USDA-NRCS personnel and other conservation and nonpoint source management professionals implement effective programs using four core conservation practices: conservation tillage, nutrient management, pest management, and conservation buffers, available at: http://www.nrcs.usda.gov/technical/ECS/agronomy/core4.pdf

- County soil survey maps are available from NRCS at: http://soils.usda.gov

- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. U.S. EPA, Office of Water (1993). Developed for use by State Coastal Nonpoint Pollution Control Programs, Chapter 2 of this document covers erosion control, animal feeding operation management, grazing practices, and management of nutrients, pesticides, and irrigation water, available at:: http://www.epa.gov/owow/nps/MMGI/Chapter2/index.html.

- Farm-A-Syst is a partnership between government agencies and private business that enables landowners to prevent pollution on farms, ranches, and in homes using confidential environmental assessments, available at: http://www.uwex.edu/farmasyst/

- State Environmental Laws Affecting South Carolina Agriculture: A comprehensive assessment of regulatory issues related to South Carolina agriculture has been compiled by the National Association of State Departments, available at: http://www.nasda-hq.org/nasda/nasda/Foundation/state/states.htm

- Waterborne Pathogens in Agricultural Wastewater. Rosen, B. H., 2000. USDA, NRCS, Watershed Science Institute. Available at: ftp://ftp-fc.sc.egov.usda.gov/WSI/pdffiles/Pathogens_in_Agricultural_Watersheds.pdf

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Appendix A

DATA TABLES

90th Percentile FC Concentrations (#/100 mL)

Hydro Categ Range	High Flow 0-10	Moist Cond. 10-40	Mid Range 40-60	Dry Flow 60-90	Low Flow 90-100	Samples
RS-02466	NA	49	662	1116	652	12

Mid Point Hydrologic Category Flow (cfs)

Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
RS-02466	12.59	6.76	4.20	2.63	1.35

Existing Load (#/day)

Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
RS-02466	NA	8.07E+09	6.80E+10	7.18E+10	2.16E+10

Target Load (#/day)

Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
RS-02466	1.17E+11	6.28E+10	3.91E+10	2.45E+10	1.26E+10

Load Reduction Necessary (#/day)

Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
RS-02466	NA	NA	2.89E+10	4.73E+10	0.90E+10

% Load Reduction Necessary

Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
RS-02466	NA	NA	43	66	4

Appendix B

Watershed Pictures

Figure B-1. Example of a small horse pasture in the watershed.

Figure B-2. Agricultural Field near monitoring site.

Figure B-3. Horse pasture with direct stream access.

Figure B-4. Example of a small pond in the watershed.

Appendix C

Evaluating the Progress of MS4 Programs

Evaluating the Progress of MS4 Programs: Meeting the Goals of TMDLs and Attaining Water Quality Standards

Bureau of Water

August 2008

Described below are potential approaches that may be used by MS4 permit holders. These are recommendations and examples only, as SCDHEC-BOW recognizes that other approaches may be utilized or employed to meet compliance goals.

1. Calculate pollutant load reduction for each best management practice (BMP) deployed:
    - Retrofitting stormwater outlets
    - Creation of green space
    - LID activities (e.g., creation of porous pavements)
    - Creations of riparian buffers
    - Stream bank restoration
    - Scoop the poop program (how many pounds of poop were scooped/collected)
    - Street sweeping program (amount of materials collected etc.)
    - Construction & post-construction site runoff controls

2. Description & documentation of programs directed towards reducing pollutant loading
    - Document tangible efforts made to reduce impacts to urban runoff
    - Track type and number of structural BMPs installed
    - Parking lot maintenance program for pollutant load reduction
    - Identification and elimination of illicit discharges
    - Zoning changes and ordinances designed to reduce pollutant loading
    - Modeling of activities & programs for reducing pollutant reductions

3. Description & documentation of social indicators, outreach, and education programs
    - Number/Type of training & education activities conducted and survey results
    - Activities conducted to increase awareness and knowledge – residents, business owners. What changes have been made based on these efforts? Any measured behavior or knowledge changes?
    - Participation in stream and/or lake clean-up events or activities
    - Number of environmental action pledges

4. Water quality monitoring: A direct and effective way to evaluate the effectiveness of stormwater management plan activities.
    - Use of data collected from existing monitoring activities (e.g., SCDHEC data for ambient monitoring program available through STORET; water supply intake testing; voluntary watershed group's monitoring, etc)

- Establish a monitoring program for permitted outfalls and/or waterbodies within MS4 areas as deemed necessary– use a certified lab
- Monitoring should focus on water quality parameters and locations that would both link pollutant sources and BMPs being implemented

2. Links:
   - Evaluating the Effectiveness of Municipal Stormwater Programs. September 2007. EPA 833-F-07-010

   - The BMP database - http://www.bmpdatabase.org/BMPPerformance.htm (this link is specifically to the BMP performance page, and lot more)

   - EPA's STORET data warehouse - http://www.epa.gov/storet/dw_home.html

   - EPARegion 5: STEPL – Spreadsheet tool for estimating pollutant loads http://it.tetratech-ffx.com/stepl/

   - Measurable goals guidance for Phase II Small MS4 - http://cfpub.epa.gov/npdes/stormwater/measurablegoals/index.cfm

   - Environmental indicators for sotrmwater program- http://cfpub.epa.gov/npdes/stormwater/measurablegoals/part5.cfm

   - National menu of stormwater best management practices (BMPs) - http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

   - SCDHEC – BOW: 319 grant program has attempted to calculate the load reductions for the following BMPs:

     - Septic tank repair or replacement
     - Removing livestock from streams (cattle, horses, mules)
     - Livestock fencing
     - Waste Storage Facilities (aka stacking sheds)
     - Strip cropping
     - Prescribed grazing
     - Critical Area Planting
     - Runoff Management System
     - Waste Management System
     - Solids Separation Basin
     - Riparian Buffers

Responsiveness Summary
Burgess Creek TMDL Document

Comments were received from the following:
South Carolina Department of Transportation

Comments from South Carolina Department of Transportation

Comment 1:

"It is important that the SCDHEC develop TMDLs that are implementable, defensible, reasonable, and which achieve the goal of the waterbody meeting the state standard for its appropriate use designation. It is also important that the SCDHEC understands the role and responsibility of the SCDOT in carrying out its mission to provide transportation for the citizens of South Carolina and its limited ability to affect activities not covered under its regulatory authority. The issues related to this TMDL and all others are watershed-based. Only SCDHEC has the authority to develop basin-wide plans to address the regulated and non-regulated contributors to the impairments that lead to the development of this TMDL in the first place."

Response 1:

SCDHEC understands the role and responsibilities of SCDOT. It is part of the Department's mission to develop reasonable, implementable, and scientifically defensible TMDLs which help waterbodies achieve water quality standards. It is further acknowledged that SCDHEC has the authority to develop watershed and basin-wide plans to address regulated and unregulated processes contributing to water quality impairments and the Burgess Creek TMDL is an example of such a plan.

Comment 2:

"TMDLs must consider **all** potential sources of fecal coliform, not just permitted MS4s. These existing sources of pollutants, or other causes of impaired water quality, must be quantified as part of the TMDL process. In this TMDL, DHEC has identified these sources but has not quantified them for use in water quality models. Without this quantification step, there is no basis for determining the effect of the assigned waste load allocation. In the case of this TMDL, even though SCDOT is given a 0% reduction and is considered a "negligible" contributor, because SCDOT is the only identified permitted entity, it possibly could be held in violation of its NPDES permit and subject to sanctions by SCDHEC and the USEPA as well as third party actions if water quality standards are not met. Therefore, all existing point and nonpoint sources that may impact a receiving waterbody must be identified, their contribution quantified, and assigned an appropriate load or waste load allocation. Furthermore, if contribution of FC from SCDOT is considered "negligible" by DHEC, then SCDOT should not be named in the TMDL at all.

A TMDL in and of itself carries no regulatory authority over any entity which it names as a contributor of a pollutant. Therefore, no regulatory authority is needed for DHEC to name any entity as a contributor. The regulatory authority of a TMDL comes only by way of a permit held by named entity and DHEC's plenary power in SC Code §49-1-90 to prohibit discharges without a permit. Simply because DHEC may not issue an NPDES permit to a flock of geese, a herd of

cattle or collectively all leaking sanitary sewers, does not mean that such groups should be excluded from consideration and quantification of the overall water quality in TMDL area."

Response 2:

Reductions from all sources, including point and nonpoint sources, are required to meet the overall percentage reductions of the referenced TMDL and achieve the water quality standard for the pollutant of concern. At present, the contributions from SCDOT have been deemed negligible.

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

It should be noted that unauthorized discharges to Waters of the State, including leaky septic tanks and leaking sewer lines, are illegal and subject to compliance and enforcement mechanisms. Sections 3.2.3 and 3.2.4 (p. 9-10) of the referenced TMDL document discuss leaking sanitary sewers, illicit discharges, and failing septic systems. Maintenance of septic tanks is the responsibility of individual owners. Maintenance of sewer lines is the responsibility of the collection system owner. NPDES permitted stormwater entities (regulated MS4s) must have an illicit discharge detection program in place to help identify illegal discharges, such as those referenced above, in order to ensure that they are eliminated.

Comment 3:

"DHEC should recognize that fecal coliform is not a pollutant of concern for SCDOT for its road system and thus SCDOT should not be required under the TMDL to reduce its "contribution" nor should SCDOT even be listed as a non-continuous point source. Other than in locations where SCDOT owned rest areas and maintenance facilities exist, no original source of fecal coliform bacteria (e.g. warm blooded animals) is under the regulatory authority of SCDOT and thus any discharge on a roadway system is either from natural sources, from other permitted entities or from illicit discharges. In previously drafted TMDL documents, DHEC has indicated a concern that SCDOT may contribute FC through "conveyance" in locations where a SCDOT roadway lies adjacent to animal feeding operations or land application sites, or in the case of wildlife contributions. These are direct sources of FC bacteria which are outside of the control of SCDOT. Each of these sources should be addressed separately either by subtracting natural input from the TMDL or by permitting anthropogenic sources."

Response 3:

By definition of MS4 as prescribed in R.61-9 section 122.26(b), "Municipal separate storm sewer" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)". SCDOT is a phase I MS4 which may have the potential to **contribute** or **convey** fecal coliform loading to waters of the State. It is the responsibility of the MS4 operator (SCDOT) to ensure

that contributions to or the conveyance of FC bacteria loading does not occur within its regulated jurisdictional MS4 area. At present, contributions from SCDOT have been deemed negligible.

AFOs are inspected by SCDHEC for permit compliance. Permitted agricultural facilities that operate in compliance with their permit are not considered to be sources of impairment. Discharges from these operations to waters of the State are illegal and are subject to compliance and enforcement actions by SCDHEC and are therefore not provided a percentage reduction.

TMDL Excerpt 4 (p. ii):

"All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES)-permitted discharges"

Comment 4:

"Upon consideration of the text of the TMDL, this is an incorrect statement. This TMDL and others drafted by DHEC essentially exempt NPDES permit holders who are given numeric effluent limits in their permits (WWTFs) from the wasteload allocation portion of the TMDL. In this particular TMDL, there are no WWTFs in the watershed, but as a general principal, DHEC should acknowledge ALL NPDES permitted discharges and ALL non-permitted point source discharges in the WLA portion of the TMDL."

Response 4:

NPDES permit holders such as WWTFs who are given numeric effluent limits in their permits are not exempt from the wasteload allocation portion of the TMDL. Existing and future continuous discharges are required to meet the prescribed loading or the existing instream standard for the pollutant of concern. Loadings are developed based upon permitted flow and assuming an allowable permitted maximum concentration of 400 cfu/100ml.

TMDL Excerpt 5 (p. ii):

"A fecal coliform (FC) TMDL was developed for RS-02466 along Burgess Creek in Oconee County, SC."

Comment 5:

"The Burgess Creek watershed drains nearly 1700 acres. To base a TMDL for this entire watershed on twelve (12) samples taken from one (1) station is scientifically inadequate and is not an accurate reflection of current water quality conditions."

Response 5:

12 samples were taken from Burgess Creek at S-37-171 from January 2002 - December 2002. The results were considered for use in development of the 2000 and 2008 303(d) lists (as required by 40 CFR Part 130) and, subsequently, the data was used for development of the referenced TMDL in the Burgess Creek watershed. The Department believes the methods used and presented in the referenced TMDL document, with concurrence from EPA Region 4, are valid and scientifically defensible.

TMDL Excerpt 6 (p. ii):

"There are currently no NPDES permitted sanitary waste dischargers or MS4 outfalls within the watershed."

Comment 6:

"If this statement is true, then SCDOT shouldn't be included as a point source in this watershed? Beyond the fact that SCDOT roads produce essentially no FC, since there are no outfalls in the watershed, SCDOT should not be mentioned at all in the TMDL document."

Response 6:

The Department acknowledges that there are currently no MS4 outfalls within the Burgess Creek watershed. Furthermore the Department has deemed the contributions from SCDOT as negligible and no reduction of fecal coliform bacteria is necessary at this time. The Burgess Creek TMDL will be revised on p. ii of the document to reflect the fact that there are **currently** no MS4 outfalls within the watershed.

TMDL Excerpt 7 (p. ii):

"Probable sources of fecal contamination include wildlife, agricultural runoff, failing septic systems, illcit connections, leaking sewers, sanitary sewer overflows and urban runoff."

Comment 7:

"SCDOT agrees with this statement. These sources should be addressed by appropriate reduction requirements in the TMDL. Listing these nonpoint sources collectively in the load allocation portion of the TMDL is inadequate and arbitrary. Each individual source should be quantified."

Response 7:

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. Load allocations are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. Reductions from all sources, including point and nonpoint sources, are required for meeting the overall percentage reduction in the referenced TMDL and to achieve the water quality standard for the pollutant of concern. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 8 (p. ii):

Table Ab-1. Total Maximum DailyLoads for Burgess Creek Watershed

Comment 8:

"The column entitled "Non-Continuous SCDOT (% Reduction)" and its associated footnote 3 should be removed, as SCDOT is not a source of FC in the watershed. As DHEC has stated that

there are no "MS4 outfalls within the watershed," SCDOT should not be mentioned in this TMDL."

Response 8:

The Department acknowledges that there are currently no MS4 outfalls within the Burgess Creek watershed. Furthermore the Department has deemed the contributions from SCDOT as negligible and no reduction of fecal coliform bacteria is necessary at this time. The referenced footnote merely states the facts currently presented concerning SCDOT and the column titled "Non-Continuous SCDOT (% Reduction)" states that SCDOT currently has a WLA of 0 in the Burgess Creek watershed. The Department does not see any need to remove either of these. Future outfalls under NPDES permits applicable to the Burgess Creek watershed will be subject to the assumptions and requirements of the wasteload allocation portion of the referenced TMDL document.

TMDL Excerpt 9 (p. 1):

1.1 Background "Of these illnesses many are caused by contaminated drinking water."

Comment 9:

"This statement is not applicable to this TMDL document. The water quality standard for this TMDL does not cover drinking water which is more rigorous."

Response 9:

TMDLs establish the allowable loading for specific pollutants that a waterbody can receive without exceeding water quality standards. TMDLs developed for waterbodies apply to stormwater, drinking water, wastewater, etc. as they are intricately related in a watershed. Fecal coliform bacteria present in stormwater may affect drinking water in a watershed.

It should also be noted that Burgess Creek is designated as Class Freshwater. Waters of this class are described as:

> "Freshwaters (FW) are freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department." (R. 61-68)

Designated as Class Freshwater, drinking water supply **is** a supported use for the waters of Burgess Creek after conventional treatment.

TMDL Excerpt 10 (p. 1):

"Untreated stormwater runoff has been associated with a number of disease outbreaks, most notably an outbreak in Milwaukee affecting an estimated 403,000 people in 1993 (Corso et al., 2003)."

Comment 10:

"The article from which this statement is inaccurately paraphrased is entitled *Cost of illness in the 1993 Waterborne Cryptosporidium outbreak*. In previously drafted TMDLs, DHEC cited the

article written by Corso et al.. The references in this paragraph and in the bibliography (Section 8.0) of the subject TMDL have been removed, but the statement remains in the text of the TMDL. The statement is a misrepresentation of the referenced article. Although a disease outbreak due to the protozoa Cryptosporidium did occur in Milwaukee in 1993, Corso does not mention either wastewater or stormwater anywhere in the paper; Corso instead states the cause of this outbreak was "an ineffective filtration process" in one of the municipal drinking water plants. The source of the Cryptosporidium was never officially identified, but the suspected sources were cattle wastes, slaughterhouse wastes, and sewage.

Response 10:

The reference for the above mentioned article has not been removed from the bibliography section of the Burgess Creek TMDL document. The reference was never inserted into the bibliography. The Department will insert a reference into the bibliography for the above mentioned article.

The suspected sources of fecal coliform bacteria as noted by SCDOT are "cattle wastes, slaughterhouse wastes, and sewage". These sources qualify as **wastewater** and **untreated stormwater** runoff and have been associated with a number of disease outbreaks, including the above mentioned outbreak in Milwaukee affecting an estimated 403,000 people in 1993.

As defined by the Department in the SC Pollution Control Act Section 48-1-10, sewage is:

> "water-carried human or animal wastes from residences, buildings, industrial establishments or other places, together with such ground water infiltration and surface water as may be present and the admixture with sewage of industrial wastes or other wastes shall also be considered sewage."

Since surface waters are commonly used as drinking water after filtration and generally contain untreated stormwater runoff and wastewater prior to treatment, they were in fact suspected sources in the Crytosporidium outbreak in Milwaukee, 1993.

TMDL Excerpt 11 (p. 1):

"There are no NPDES dischargers in this watershed."

Comment 11:

"Again, if there are no NPDES dischargers in the watershed, then SCDOT should not be mentioned. All references to SCDOT should be removed from this TMDL."

Response 11:

The above mention statement will be revised on p. 1 of the Burgess Creek TMDL document to state that:

> "SCDOT is currently the only NPDES discharger in this watershed."

References to SCDOT will not be removed from the Burgess Creek TMDL since future NPDES discharges from SCDOT will be subject to the assumptions and requirements of the wasteload allocation portion of the referenced TMDL.

TMDL Excerpt 12 (p. 4):

DHEC "conduct monitoring at a location within the Burgess creek watershed during 2002."

Comment 12:

"Twelve (12) samples from one (1) monitoring station seven (7) years ago is scientifically inadequate and is not an accurate reflection of current water quality conditions. More recent data and more data points should have been used."

Response 12:

12 samples were taken from Burgess Creek at S-37-171 from January 2002 - December 2002. The results were considered for use in development of the 2000 and 2008 303(d) lists (as required by 40 CFR Part 130) and, subsequently, the data was used for development of the referenced TMDL in the Burgess Creek watershed. The Department believes the methods used and presented in the referenced TMDL document, with concurrence from EPA Region 4, are valid and scientifically defensible.

TMDL Excerpt 13 (p. 5):

Table 4. FC WQS Exceedence Summary for Impaired Station by Date (2002)

Comment 13:

"The units in this table are given in CFU/day and should be in CFU/100mL. CFU/Day represents a load not a concentration."

Response 13:

The Department agrees that the units presented in Table 4 of the referenced TMDL document should be cfu/100ml and not cfu/day. The document will be revised accordingly.

TMDL Excerpt 14 (p. 6):

"FC bacteria are used by the State of South Carolina as the indicator for pathogens in surface waters. Indicators such as FC bacteria, enteroccoci or *E. coli* are easier to measure."

Comment 14:

"In 1986 the EPA recommended moving from FC to enteroccoci or E. coli since FC has been shown to not correspond well with the presence of pathogens. A TMDL should not be based on an invalid indicator."

Response 14:

The current water quality standard for indicators of pathogens in the State of South Carolina is based on FC bacteria. South Carolina's Water Quality Standard (WQS) for fecal coliform in freshwater is:

> "Not to exceed a geometric mean of 200/100 mL, based on five consecutive samples during any 30 day period; nor shall more than 10% of the total samples during any 30 day period exceed 400/100 mL." (R.61-68).

TMDLs are developed for pollutants that are listed on the section 303(d) list which do not meet the existing promulgated water quality standard. As presented on p. 1 of the referenced TMDL document, the presence of FCs in surface waters may signify a presence of pathogens, which in turn leads to a greater risk of health for individuals participating in recreation activities within water bodies (USEPA, 2001).

TMDL Excerpt 15 (p. 6):

"There are currently no SCDOT rest areas or other facilities located in the referenced watershed area based on Geographical Information System (GIS) data."

Comment 15:

"SCDOT agrees with this statement. As a result, FC is not a pollutant of concern for SCDOT in this watershed and SCDOT should not be mentioned in the TMDL at all."

Response 15:

By definition of MS4 as prescribed in R.61-9 section 122.26(b), "Municipal separate storm sewer" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)". SCDOT is a phase I MS4 which may have the potential to **contribute** or **convey** fecal coliform loading to waters of the State.

The Department has deemed the contributions from SCDOT as negligible and no reduction of fecal coliform bacteria is necessary at this time. The inclusion of SCDOT in the referenced document is to acknowledge that SCDOT has the potential to contribute or convey fecal coliform loading to waters of the State.

TMDL Excerpt 16 (p. 8):

"However, there are currently no sewer lines that could impact water quality at RS-02466 and therefore, should not be a concern in stormwater runoff."

Comment 16:

"It is materially misleading to include a paragraph discussion on the effects of Sanitary Sewer Overflows on water quality in a TMDL for a watershed in which there is no sanitary sewer. Because there is no sanitary sewer in the Burgess Creek watershed, all references to SSOs should be removed from the TMDL."

Response 16:

The referenced statement on page 8 of the Burgess Creek TMDL document reads as follows:

> Sanitary sewer overflows (SSOs) to surface waters have the potential to severely impact water quality. These untreated sanitary discharges result in violations of

> the WQS. It is the responsibility of the NPDES wastewater discharger, or collection system operator for non-permitted 'collection only' systems, to ensure that releases do not occur.

The Department has included this statement in the Burgess Creek TMDL because although TMDLs may be revised where the Department deems appropriate, they never expire. A portion or all of the Burgess Creek watershed may be serviced by a community collection system in the future.

TMDL Excerpt 17 (p. 8):

"The Department recognizes that there may be wildlife, agricultural activities, grazing animals, septic tanks, and/or other nopoint source contributors located within unregulated areas (outside the permitted area) of the Grannies Quarter Creek watershed. Nonpoint sources located in unregulated areas are subject to the load allocation and not the waste load allocation of the TMDL document."

Comment 17:

• "Nopoint" should replaced be replaced with "nonpoint"
• The reference to the Grannies Quarter Creek watershed is a clear indication that this TMDL is simply a cut and paste by DHEC of another TMDL and not a TMDL specifically developed for this watershed.
• Nonpoint sources should be quantified..

Response 17:

The Department agrees that "Nopoint" should be replaced with "nonpoint" and this revision will take place prior to the Burgess Creek TMDL document being placed on Notice of Proposed Decision.

Section 3.2, titled *Nonpoint Sources,* of the referenced TMDL states that:

> "The Department recognizes that there may be wildlife, agricultural activities, grazing animals, septic tanks, and/or other nopoint source contributors located within unregulated areas (outside the permitted area) of the Grannies Quarter Creek watershed. Nonpoint sources located in unregulated areas are subject to the load allocation and not the waste load allocation of the TMDL document."

This statement applies to all TMDLs currently under development in South Carolina. A mistake was made and "Grannies Quarter Creek" should read as "Burgess Creek". The above mentioned paragraph will be revised prior to NOPD to read as follows:

> "The Department recognizes that there may be wildlife, agricultural activities, grazing animals, septic tanks, and/or other nopoint source contributors located within unregulated areas (outside the permitted area) of the Burgess Creek watershed. Nonpoint sources located in unregulated areas are subject to the load allocation and not the waste load allocation of the TMDL document."

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such are covered

under the load allocation portion of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 18 (p. 8):

3.2.1 Wildlife, 3.2.2 Agricultural Activities

Comment 18:

It is evident that this watershed is as close to pristine in environmental quality as any watershed in the state. The cause of the supposed "impairment" of FC bacteria is clearly attributable to wildlife and natural sources.

SCDHEC admits that wildlife and grazing animals are significant contributors of FC to this and other TMDL areas. Specifically mentioned are several ducks impoundments, the Sumter National Forest, and unrestricted livestock in the watershed. These sources should be quantified. DHEC has authority to assigned percent reductions to all sources of FC in the watershed, regardless of whether it is a permitted activity.

If agricultural sources are acknowledged as significant contributors to the FC bacteria load, they should not be exempt from the TMDL simply because their contribution may be difficult to ascertain or they are already permitted separately. They should be listed as contributors and assigned a percent reduction."

Response 18:

It is acknowledged in the referenced TMDL document that wildlife and agriculutural activities may be significant contributors of fecal coliform bacteria to the Burgess Creek watershed. **Wildlife**, **agricultural runoff**, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such **are covered under the load allocation portion** of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 19 (p. 8):

"It is undetermined at this time whether animal wastes are applied to these fields"

Comment 19:

"This determination should be easily ascertainable as DHEC permits land application."

Response 19:

After review, the Department has determined that the regulated application of animal wastes does not occur within the Burgess Creek watershed. Illicit application of animal waste may occur in the watershed and as such are considered a potential source of fecal coliform loading to waters of the State.

TMDL Excerpt 20 (p. 9):

"There are currently no active animal feeding operations (AFOs) in the Burgess Creek watershed."

Comment 20:

"If there are no AFOs in the watershed, DHEC should not devote a 2 paragraph section of the TMDL to discussing the effects of AFOs on water quality. Section 3.2.2.1, Agricultural Animal Facilities, should be removed from the TMDL."

Response 20:

Section 3.2.2.1, Agricultural Animal Facilities has been left in the Burgess Creek TMDL document because animal feeding operations may become present in the watershed in the future. Since TMDLs never expire, an effort is made to acknowledge all possible sources which may contribute to fecal coliform loading in the near future.

TMDL Excerpt 21 (p. 9):

"The grazing of unconfined livestock (in pastures) is not regulated by SCDHEC."

Comment 21:

"This may be a fact but it is of no consequence in a nonregulatory document such as a TMDL. Regardless of the regulatory authority DHEC may or may not have over a potential source of a pollutant, it should be quantified. Additionally DHEC has plenary authority over discharges in SC Code §49-1-90."

Response 21:

This statement is included in the referenced TMDL document to emphasize the fact that the grazing of unconfined livestock (in pastures) is a nonpoint source of pollution and covered under the load allocation portion of the TMDL document.

Wildlife, agricultural runoff, failing septic systems, illicit connections, leaking sewers, sanitary sewer overflows and urban runoff are nonpoint sources of pollution and as such are covered under the load allocation portion of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 22 (p. 9):

"In small watersheds like RS-02466 in Burgess Creek, even a few cattle could cause water quality impairment."

Comment 22:

"This statement illuminates the uncertainty of this TMDL document and its potential to positively affect the water quality of this watershed. If a few cows in the stream can cause the entire watershed to fall short of water quality standards, DHEC should rethink its strategy in declaring water bodies impaired and issuing TMDLs."

Response 22:

The Department acknowledges that a few cattle could cause water quality impairment in any watershed. Livestock in or with access to streams may cause or contribute to water quality impairment but they are only a portion of the fecal coliform loading in the watershed. Contributions from all sources are measured at the water quality monitoring stations and the development of fecal coliform TMDLs targets reducing the existing load from all sources to a target load. These values are presented in Table Ab-1 and Table 7 of the Burgess Creek TMDL document.

TMDL Excerpt 23 (p. 9):

"However, there are currently no sewer lines that would impact water quality at RS-02466 and therefore, should not be a concern in stormwater runoff."

Comment 23:

"If there are no sewer lines in the watershed, this section should not be included in the TMDL. DHEC should focus its attention on sources of FC that do occur in the watershed."

Response 23:

The Department has included this statement in the Burgess Creek TMDL because although TMDLs may be revised where the Department deems appropriate, they never expire. A portion or all of the Burgess Creek watershed may contain sewer lines in the near future. Fecal coliform TMDL documents attempt to identify and address any current or future potential sources of fecal coliform loading to waters of the State.

TMDL Excerpt 24 (p. 10):

"Assuming one septic tank per household, it is estimated that there are 25 septic tanks in this area. Each of these residences is located within 1.25 miles of RS-02466, some directly adjacent to Burgess Creek or its tributaries. At the time of TMDL development, the functioning status of these systems is currently unknown."

Comment 24:

"Many studies show that septic tank discharge is a major source of FC in a stream. The TMDL gives no indication of efforts made prior to developing the TMDL to estimate the impact of failing septic systems to FC loadings. To say that "the functioning status of these systems is currently unknown" is unacceptable. DHEC is charged with permitting and ensuring compliance

of septic systems. Unauthorized discharges to waters of the State, including failing septic systems, are illegal and subject to compliance and enforcement mechanisms. Therefore, quantifying these sources should be a significant compliance and enforcement mechanism under the regulatory authority of DHEC."

Response 24:

Estimates of septic tanks were provided in the referenced TMDL document based upon 2000 U.S census estimates of the number of households in the TMDL watershed and whether a centralized sewer system provides service to the area. The Department believes this is an appropriate approach for estimating septic tanks.

While the SCDHEC Environmental Health Services permits the installation of new septic tanks, SCDHEC generally does not conduct follow-up inspections nor maintain records of septic tank maintenance. Therefore, it is difficult to estimate the number of properly functioning and failing septic tanks in the watershed through the use of existing records archived by SCDHEC Environmental Health Services.

TMDL Excerpt 25 (p. 11):

"Instantaneous loads for each of the impaired stations were calculated."

Comment 25:

"This statement further indicates a lack of attention to detail in DHEC's issuance of TMDLs. There is only one monitoring station in the watershed. The statement implies that there is more than one station."

Response 25:

The Department sees no reason to remove the above mentioned statement. The statement accurately reflects the point that the instantaneous load was calculated for each impaired water quality monitoring station.

TMDL Excerpt 26 (p. 12):

"The wasteload allocation (WLA) is the portion of the TMDL allocated to NPDES-permitted point sources (USAEPA 1991)."

Comment 26:

"This statement is a half truth. The EPA guidance document referenced by DHEC does not specify that the WLA is to be allocated only to NPDES-permitted point sources. It defines WLA as "the portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution." All point sources of a pollutant must be included in the WLA, regardless of whether they are regulated by an NPDES permit."

Response 26:

For the purposes of TMDL development in the watershed and in accordance with EPA guidance, all regulated NPDES permitted points sources of FC bacteria in the referenced watershed are

provided a WLA for the pollutant of concern. All non-regulated sources of FC bacteria, including non-regulated discharges from pipes and diffuse sources (i.e. urban and non-urban runoff) are provided a LA for the purposes of this TMDL. This approach is consistent with the approach for other FC TMDLs approved by USEPA Region 4 and nationally.

TMDL Excerpt 27 (p. 12):

"Note that all illicit dischargers, including SSOs, are illegal and not covered under the WLA of this TMDL."

Comment 27:

"This is another misinterpretation of the WLA portion of TMDLs. All significant sources, regardless of their legality, should be included in either the WLA or the LA. In fact, DHEC correctly included leaking septic tanks in its Big Swamp FC TMDL."

Response 27:

Wildlife, agricultural runoff, **failing septic systems**, **illicit connections**, **leaking sewers**, **sanitary sewer overflows** and urban runoff are nonpoint sources of pollution and as such **are covered under the load allocation portion** of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 28 (p. 13):

"Illicit discharges, including SSOs, are not covered under any NPDES permit and are subject to enforcement mechanisms."

Comment 28:

"Unathorized discharges to waters of the State, including leaking sewer lines and other illict discharges, are illegal and subject to compliance and enforcement mechanisms. Therefore, quantifying these sources in the TMDL is important and a percent reduction should be assigned to them. For example, DHEC's assignment of 100%reduction for leaking septic tanks in the Big Swamp FC TMDL."

Response 28:

Wildlife, agricultural runoff, **failing septic systems**, **illicit connections**, **leaking sewers**, **sanitary sewer overflows** and urban runoff are nonpoint sources of pollution and as such **are covered under the load allocation portion** of the TMDL document. Percent reductions, including the load allocation portion of the TMDL, are provided in Table Ab-1, Table 7, and are further discussed in detail in section 5.4 of this TMDL document. All existing point and nonpoint sources that may impact a receiving waterbody have been identified, their contributions have been quantified where applicable, and they have been assigned an appropriate load or waste load allocation consistent with 40 CFR Part 130 and with concurrence from EPA Region 4.

TMDL Excerpt 29 (p. 13):

"SCDOT is a Phase I permit holder and as such they are identified as a point source and included in the WLA portion of the TMDL."

Comment 29:

"There is no rationale for this. The fact that SCDOT is a Phase I permit holder should not compel DHEC to include SCDOT as a point source. DHEC itself states in the TMDL document that there are no MS4 outfalls in the watershed. As such, SCDOT should not be mentioned in this TMDL."

Response 29:

The Department has deemed the contributions from SCDOT to be negligible at the present time. As additional data and/or information becomes availables, it may become necessary to revise and/or modify the TMDL target accordingly.

TMDL Excerpt 30 (p. 13):

"Table 6 presents that reduction needed at RS-02466. The reduction percentages in this TMDL also apply to the FC waste load attributable to those areas of the watershed which are covered or will be covered under NPDES MS4 permits."

Comment 30:

"This statement, read along with the Table, indicates that the 66% reduction applies to areas of the watershed which are covered under NPDES MS4 permits. Because a SCDOT road borders the watershed boundary, DHEC or a third party challenger could interpret this statement to include SCDOT as a responsible MS4. This statement should be clarified."

Response 30:

The Department has deemed the contributions from SCDOT to be negligible at the present time. As additional data and/or information becomes availables, it may become necessary to revise and/or modify the TMDL target accordingly.

TMDL Excerpt 31 (p. 14):

"The variability in this TMDL is accounted for by using an 8-year hydrological and 1 year water quality sampling data set, which includes data collected from all seasons."

Comment 31:

"Using one year of data from 2002 to represent current conditions is not correct and is arbitrary and capricious."

Response 31:

Water quality monitoring station RS-02466 was listed on the 2004 §303(d) list based on 12 data points collected in 2002. Subsequently, this data is sufficient for TMDL development and was used for the referenced TMDL document with concurrence from EPA Region 4.

TMDL Excerpt 32 (p. 15):

Table 7

Comment 32:

"The column entitled "Non-Continuous SCDOT (% Reduction)" and its associated footnote 3 should be removed, as SCDOT is not a source of FC in the watershed. As DHEC has stated that there are no "MS4 outfalls within the watershed," SCDOT should not be mentioned in this TMDL."

Response 32:

Based on current information, the Department has deemed SCDOT as a negligible contributor of fecal coliform in the delineated drainage area used in the development of this TMDL document. As such, SCDOT is currently required to meet a percentage reduction of 0. Should future changes to landuse or other characteristics occur in the delineated area, this document may be subject to review and revision.

TMDL Excerpt 33 (p. 15):

Table 8

Comment 33:

"This table serves no purpose in the TMDL document and should be removed."

Response 33:

Table 8 has been removed from the referenced TMDL document.

TMDL Excerpt 34 (p. 30):

"Appendix A: 90^{th} Percentile FC Concentration (#/100mL)."

Comment 34:

"These numbers again represent the invalidity of this 90^{th} percentile methodology when dealing with such small sample sizes. These numbers are reportedly obtained as a 90^{th} percentile of the data within each flow category. The reported values do not represent a 90^{th} percentile as given from a standard normal distribution using the mean and standard deviation of the data nor are they equal to 10% of the maximum sample observed. Whatever methodology SCDHEC used to calculate the so called 90^{th} percentile values used in this document is not standard and does not match the methodology reported. Furthermore since the sample sizes used were so small, if the 90^{th} percentile values were actually calculated from a standard normal distribution as

90^{th}%=Mean + Standard_Deviation x 1.2817, then for the low and moist conditions, the values would have been higher than the highest observed value in that flow condition.

When such low sample sizes are used, the assumptions made by SCDHEC to calculate the existing load are invalid.

The numbers reported in this document for the 90^{th} percentile FC concentrations do not match the results obtained using the procedures outlined in the TMDL document.

The "Load Reduction Necessary" values are incorrect as they are not equal to the Existing Load – Target Load. The % reductions are calculated using the correct numbers but cannot be obtained from the numbers reported in the Table in Appendix A.

The department has misreported values in this document, not followed their reported or standard calculation procedure and incorporated statistical assumptions that are invalid because of the small sample size used."

Response 34:

It is acknowledged that the 90^{th} percentile FC concentrations presented in the Burgess Creek TMDL are unable to be duplicated based on the procedures outlined in the referenced document. The Department has revised the formula presented on page 11 of the Burgess Creek TMDL document to read as follows:

> Existing Load = Mid-Point Flow in Each Hydrologic Category *x* 90^{th} Percentile FC Concentration *x* Conversion Factor (24465758.4)
>
> Target Load = Mid-Point Flow in Each Hydrologic Category *x* 380 (WQ criterion minus a 5% MOS) x Conversion Factor (24465758.4)

The "Load Reduction Necessary" values are acknowledged by the Department to be inserted incorrectly. The table presented in Appendix A has been revised as follows:

Load Reduction Necessary (#/day)

Hydro Categ (Mid-Point)	High Flow (5)	Moist Cond. (25)	Mid Range (50)	Dry (75)	Low Flow (95)
RS-02466	NA	NA	2.89E+10	4.73E+10	0.90E+10

The inaccurate values presented in the Burgess Creek TMDL document are due to anthropogenic error and have been corrected as shown above.

The Department does not feel it has "not followed their reported or standard calculation procedure and incorporated statistical assumptions that are invalid because of the small sample size used." The load duration curve (LDC) approach was used in development of the Burgess Creek TMDL document with concurrence from EPA Region 4. This approach is used regionally and nationally and is consistent with guidance from EPA. The Department believes that this method is valid, scientifically defensible, and protective of critical conditions in the watershed.

Amendments to the Burgess Creek TMDL Document

As a result of comments received by the Department during the public comment period from October 30th, 2009 to November 30th, 2009 the following amendments have been made to the Burgess Creek TMDL Document. Changes are shown as bold font and are reflected in the most recent version of the referenced TMDL document.

Amendment Location 1:

Table Ab-1 and Table 8 Footnote

Amendment:

Table notes 2 and 5 have been revised as follows:

Table Notes:

1. WLAs are expressed as a daily maximum; NA = not applicable, no point sources. Existing and future continuous discharges are required to meet the prescribed loading for the pollutant of concern. Loadings were developed based upon permitted flow and an allowable permitted maximum concentration of 400cfu/100ml.
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 percentage reduction or the existing instream standard for pollutant of concern **in accordance with their NPDES Permit.**
3. Percent reduction applies to existing instream load
   By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.
4. **By implementing the best management practices that are prescribed in either the SCDOT annual SWMP or the SCDOT MS4 Permit to address fecal coliform, the SCDOT will comply with this TMDL and its applicable WLA to the maximum extent practicable (MEP) as required by its MS4 permit.**

Amendment Location 2:

Section 3.1.2, Page 6

Amendment:

Section 3.1.2 has been revised to read as follows:

> Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS and SCR and regulated under SC Water Pollution Control Permits Regulation 122.26(b)(14)&(15). **All regulated MS4 entities have the potential to contribute FC pollutant**

loadings in the delineated drainage area used in the development of this TMDL.

The South Carolina Department of Transportation (SCDOT) is currently the only designated Municipal Separate Storm Sewer System (MS4) within the watershed. The SCDOT operates under NPDES MS4 SCS040001 and owns and operates roads in the watershed (Figure 4). However, the Department recognizes that SCDOT is not a traditional MS4 in that it does not possess statutory taxing or has enforcement powers. SCDOT does not regulate land use or zoning, issue building or development permits.

Current Developed land use for the Burgess Creek watershed is 0.85%. Based on current information, FC bacteria contributions from SCDOT are considered negligible in the delineated drainage area used in the development of this TMDL document. If future changes to landuse or other characteristics should occur in the delineated area, this document may be subject to review and revision.

Amendment Location 3:

Section 3.2.5, Page 10

Amendment:

The first paragraph of section 3.2.5 has been revised to read as follows:

> Non-continuous point sources include all NPDES-permitted stormwater discharges, including current and future MS4s, construction and industrial discharges covered under permits numbered SCS & SCR and 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. All areas defined as "Urbanized **Area**" by the US Census are required under the NPDES Stormwater Regulations to obtain a permit for the discharge of stormwater. Other non-urbanized areas may be required under the NPDES Phase II Stormwater Regulations to obtain a permit for the discharge of stormwater.