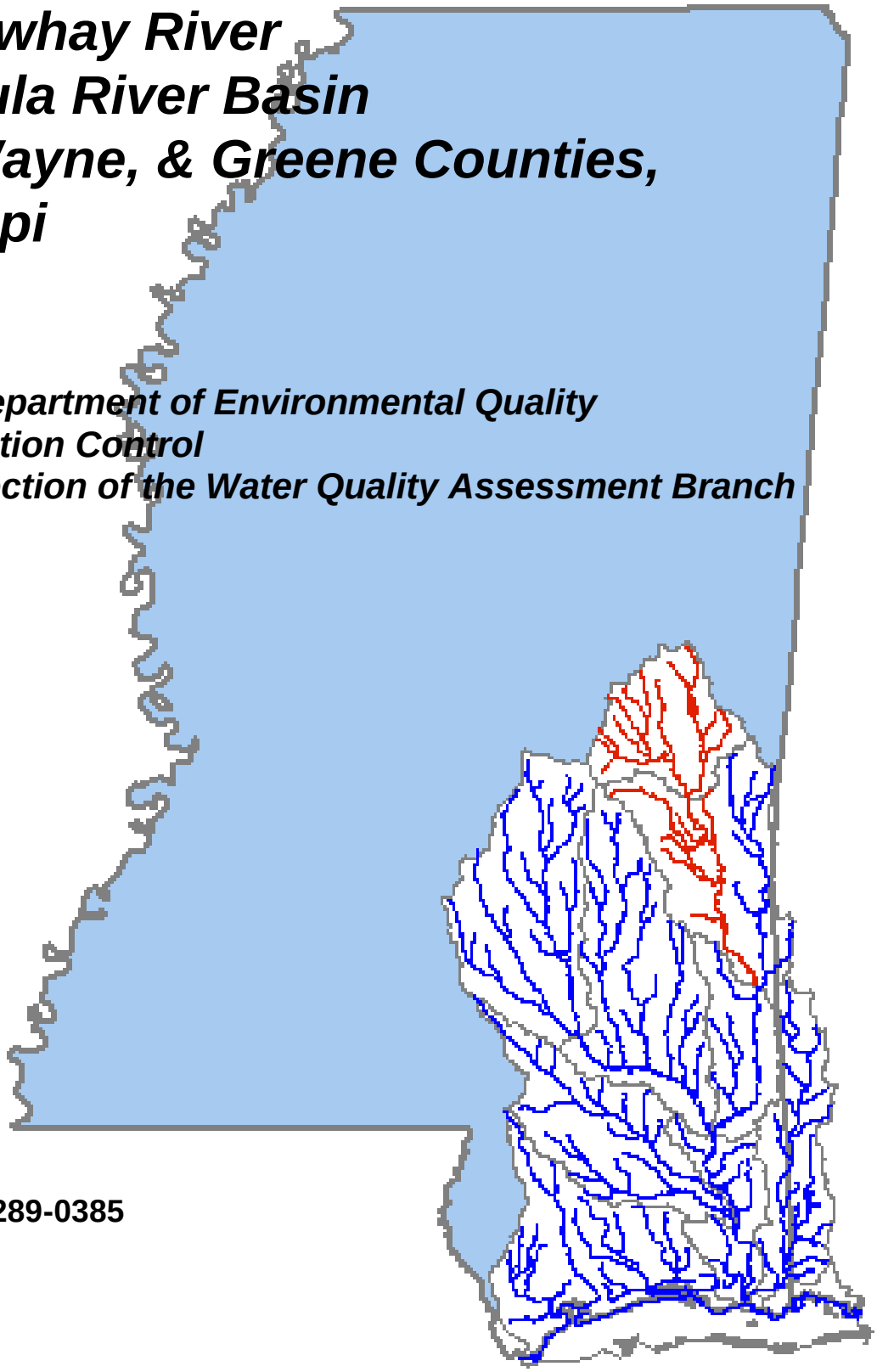
Fecal Coliform TMDL

For

Chickasawhay River
Pascagoula River Basin
Clarke, Wayne, & Greene Counties, Mississippi

Prepared By

Mississippi Department of Environmental Quality
Office of Pollution Control
TMDL/WLA Section of the Water Quality Assessment Branch



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FOREWORD

This report has been prepared in accordance with the schedule contained within the federal consent decree dated December 22, 1998. The report contains one or more Total Maximum Daily Loads (TMDLs) for waterbody segments found on Mississippi=s 1996 Section 303(d) List of Impaired Waterbodies. Because of the accelerated schedule required by the consent decree, many of these TMDLs have been prepared out of sequence with the State=s rotating basin approach. The segments addressed are comprised of monitored segments that have data indicating impairment. However, the report may also include evaluated segments with insufficient data to indicate impairment. The evaluated waterbody segments in this report were included because they are hydrologically linked to the monitored segment. The implementation of the TMDLs contained herein will be prioritized within Mississippi=s rotating basin approach.

The amount and quality of the data on which this report is based are limited. As additional information becomes available, the TMDLs may be updated. Such additional information may include water quality and quantity data, changes in pollutant loadings, or changes in landuse within the watershed. In some cases, additional water quality data may indicate that no impairment exists.

CONTENTS

MONITORED SEGMENT IDENTIFICATION

Name:	Chickasawhay River segment 2
Waterbody ID:	MS065M
Location:	At Waynesboro: from Highway 84 to County Bridge northwest of Buckatunna
County:	Wayne County, Mississippi
USGS HUC Code:	03170002
NRCS Watershed:	040
Length:	19 miles
Use Impairment:	Secondary Contact Recreation
Cause Noted:	Fecal Coliform, an Indicator for the Presence of Pathogenic Bacteria
Priority Rank:	108
NPDES Permits:	There are 47 NPDES Permits issued for facilities that may discharge fecal coliform in the watershed (Table 3.1).
Pollutant Standard:	For the summer months, fecal coliform colony counts shall not exceed a geometric mean of 200 per 100 ml, nor shall more than ten percent of the samples examined during any month exceed a colony count of 400 per 100 ml.
Waste Load Allocation:	6.32E+12 counts per 30 days (The TMDL requires all dischargers to meet water quality standards for disinfection.)
Load Allocation:	35.7E+12 counts per 30 days
Margin of Safety:	Implicit modeling assumptions - The model considered 11 years.
Total Maximum Daily Load (TMDL):	42.1E+12 The TMDL is a combination of the direct input of fecal coliform from NPDES Permitted dischargers and nonpoint sources due to cows with access to streams, failing septic tanks, and land surface fecal coliform application rates necessary to meet the fecal coliform standard.

EVALUATED SEGMENT IDENTIFICATION

Name:	Chickasawhay River segment 1
Waterbody ID:	MS063M
Location:	At Enterprise: from confluence of Chunky River and Okatibbee Creek to Highway 512 in Quitman
County:	Clarke County, Mississippi
USGS HUC Code:	03170002
Length:	21 miles
Use Impairment:	Contact Recreation
Cause Noted:	Fecal Coliform, an Indicator for the Presence of Pathogenic Bacteria
Priority Rank:	Low
NPDES Permits:	The NPDES Permits are included in the monitored section description.
Pollutant Standard:	Fecal coliform colony counts shall not exceed a geometric mean of 200 per 100 ml, nor shall more than ten percent of the samples examined during any month exceed a colony count of 400 per 100 ml.
Waste Load Allocation:	6.32E+12 counts per 30 days (The TMDL requires all dischargers to meet water quality standards for disinfection.)
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EXECUTIVE SUMMARY

A segment of the Chickasawhay River has been placed on the Mississippi 1998 Section 303(d) List of Waterbodies as an impaired waterbody segment, due to fecal coliform bacteria. Another segment of the Chickasawhay River has been placed on the list as an evaluated waterbody segment, due to fecal coliform bacteria. The evaluated segment was listed for two designated uses, Contact Recreation and Secondary Contact Recreation. For both of these waterbody segments, the applicable state standard specifies that for the summer months, the maximum allowable level of fecal coliform shall not exceed a geometric mean of 200 per 100 ml, nor shall more than ten percent of the samples examined during any month exceed a colony count of 400 per 100 ml. For the evaluated segment, the difference in the use designations is that the winter limits are not relaxed for contact recreation use. A review of the available monitoring data for the watershed indicates that there is a violation of the standard for the impaired waterbody.

The Chunky River and Okatibbee Creek join to form the Chickasawhay River in Clarke County. The Chickasawhay River and the Leaf River join to create the Pascagoula River. The Chickasawhay River flows in a southern direction from its beginning to the beginning of the Pascagoula River, in Greene County. This TMDL has been developed for the two sections of the Chickasawhay River found on the 303(d) List. The 19-mile long impaired section of the river is in Wayne County between Waynesboro and Buckatunna. The 21-mile long evaluated section of the river with two designated uses is in Clarke County between Enterprise and Quitman. The BASINS Nonpoint Source Model (NPSM) was selected as the modeling framework for performing the TMDL allocations for this study. Daily flow data from the USGS gage 2478500 on the Chickasawhay River near Leakesville were used to calibrate the hydrologic flow for the watershed. The weather data used for this model were collected at Meridian and Leakesville. The representative hydrologic period used for this TMDL was January 1, 1984, through December 31, 1995.

Fecal coliform loading from nonpoint sources in the watershed were calculated based upon wildlife populations; numbers of cattle, hogs, and chickens; information on livestock and manure management practices for the Pascagoula Basin; and urban development. The estimated fecal coliform production and accumulation rates due to nonpoint sources for the watershed were incorporated into the model. Also represented in the model were the nonpoint sources such as failing septic systems and cattle that have direct access to tributaries of the Chickasawhay River. There are 47 NPDES Permitted discharges located in the watershed that contribute fecal coliform bacteria to the waterbody. Under existing conditions, output from the model indicates violation of the fecal coliform standard in the stream at the evaluated segment and at the impaired segment. After applying a load reduction scenario, there were no violations of the standard in the impaired segment according to the model.

The scenario used to reduce the fecal coliform load involves a cooperative effort between all fecal coliform contributors in the Chickasawhay River Watershed. First, all NPDES facilities will be required to disinfect the discharge so that the fecal coliform concentrations do not exceed water quality standards. Careful monitoring of all permitted facilities in the Chickasawhay River Watershed should be continued to ensure that compliance with permit limits is consistently attained. Second is the removal of 75% of the cattle=s direct access to tributaries. This could be

accomplished by fencing streams in cattle pastures. Education on best management practices is a vital part of achieving this goal. Finally, a 50% reduction in the fecal coliform contribution from failing septic tanks is required. The model assumed there is a 40% failure rate of septic tanks in the drainage area. A reduction could be accomplished by education on best management practices for septic tank owners. Additionally, users of individual onsite wastewater treatment plants could be educated on the importance of disinfection of the effluent from their treatment plant.

The model developed for this TMDL was built upon work contained in another TMDL study. The Okatibbee Creek TMDL for fecal coliform bacteria has been incorporated in this study. The Okatibbee Creek model outputs for both "as is" and "reduction" scenarios were used in the development of this model study. The reduction scenarios and NPDES Permit waste loads used in that model were also used in this model. Also, output from this model was used as input for the Pascagoula River TMDL for fecal coliform bacteria in a similar fashion.

The Chickasawhay River model accounted for seasonal variations in hydrology, climatic conditions, and watershed activities. The use of the continuous simulation model allowed for consideration of the seasonal aspects of rainfall and temperature patterns within the watershed. Calculation of the fecal coliform accumulation parameters and source contributions on a monthly basis accounted for seasonal variations in watershed activities such as livestock grazing and land application of manure.

1.0 INTRODUCTION

1.1 Background

The identification of waterbodies not meeting their designated use and the development of total maximum daily loads (TMDLs) for those waterbodies are required by Section 303(d) of the Clean Water Act and the Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (40 CFR part 130). This TMDL is being developed under the regulations in force in August 1999. The TMDL process is designed to restore and maintain the quality of those impaired waterbodies through the establishment of pollutant specific allowable loads. The pollutant of concern for this TMDL is fecal coliform. Fecal coliform bacteria are used as indicator organisms. They are readily identifiable and indicate the possible presence of other pathogenic organisms in the waterbody. The TMDL process can be used to establish water quality based controls to reduce pollution from both point and nonpoint sources, and restore and maintain the quality of water resources.

The Mississippi Department of Environmental Quality (MDEQ) has identified a segment of the Chickasawhay River as being impaired by fecal coliform bacteria for a length of 19 miles as reported in the Mississippi 1998 Section 303(d) List of Waterbodies. This segment is listed as impaired because sufficient monitoring data is available to show that there is an impairment in this segment. The impaired segment begins at Waynesboro and ends at Buckatunna.

MDEQ has identified another segment of the Chickasawhay River as being evaluated for the presence of fecal coliform bacteria for a length of 21 miles as reported in the Mississippi 1998 Section 303(d) List of Waterbodies. The evaluated segment begins at Enterprise and ends at Quitman. It is also listed for two designated uses, Contact Recreation and Secondary Contact Recreation. This segment is listed as evaluated because the data available for this segment are insufficient to show a definite impairment caused by fecal coliform bacteria. The Chunky River Watershed and the Okatibbee Creek Watershed are included in this study as the headwaters for the Chickasawhay River. The monitored and evaluated sections of the Chickasawhay River and the headwater watersheds are shown in Figure 1.1.

In order to analyze the sources of fecal coliform bacteria in the Chickasawhay River Watershed, the entire drainage area was divided into five separate subwatersheds. The subwatersheds are identified by the Reach File 3 (RF3) stream designation for this report. The monitored segment is the downstream waterbody segment, 03170002015. The evaluated waterbody segment is two RF3 segments. These are 03170002019 and 03170002020. Because the evaluated segment flows into the monitored segment, the load and waste load allocations submitted in this TMDL are based on water quality in the monitored segment.

The drainage area of the both the monitored segment and the evaluated segment, from the headwaters to the end of the impaired section, is approximately 1.1 million acres; and lies within portions of Lauderdale, Clarke, and Wayne Counties. The watershed is rural in nature but includes the City of Meridian and the smaller towns of Newton, Quitman, and Waynesboro.

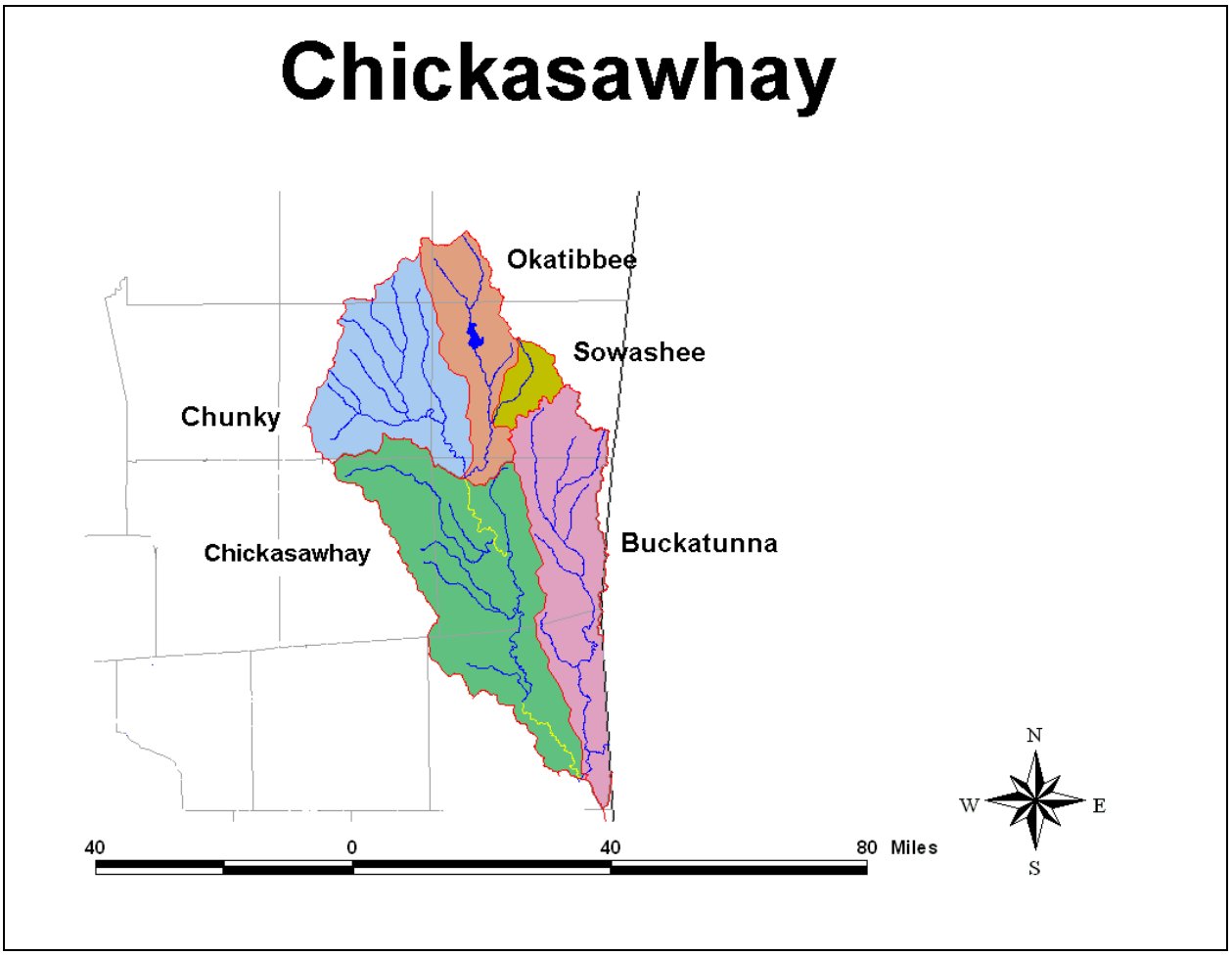


Figure 1.1 Map of Chickasawhay River Watersheds

Figure 1.1, shows the evaluated segment MS063M upstream of the monitored segment MS065M. These two segments are colored yellow. The evaluated segment receives flow from the Chunky River – light blue, the Okatibbee Creek – light orange, and Sowashee Creek – gold. Buckatunna Creek – pink, is not included in this model. Thus, the drainage area for the evaluated section is also the drainage area for the monitored section. The drainage area for both sections begins at the headwaters of the Chunky River and Okatibbee Creek. These two streams merge to form the Chickasawhay River. That confluence is the beginning point of the evaluated segment for this TMDL. The drainage area for the monitored segment also includes the remainder of HUC 03170002. Forests are the dominant landuse within this watershed. Figure 3.1 shows the landuse distribution within both the monitored and evaluated drainage areas.

1.2 Applicable Waterbody Segment Use

Designated beneficial uses and water quality standards are established by the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* regulations. The designated uses for the Chickasawhay River as defined by the regulations are Contact Recreation, Secondary Contact Recreation, and Fish and Wildlife Support. The monitored section of the Chickasawhay

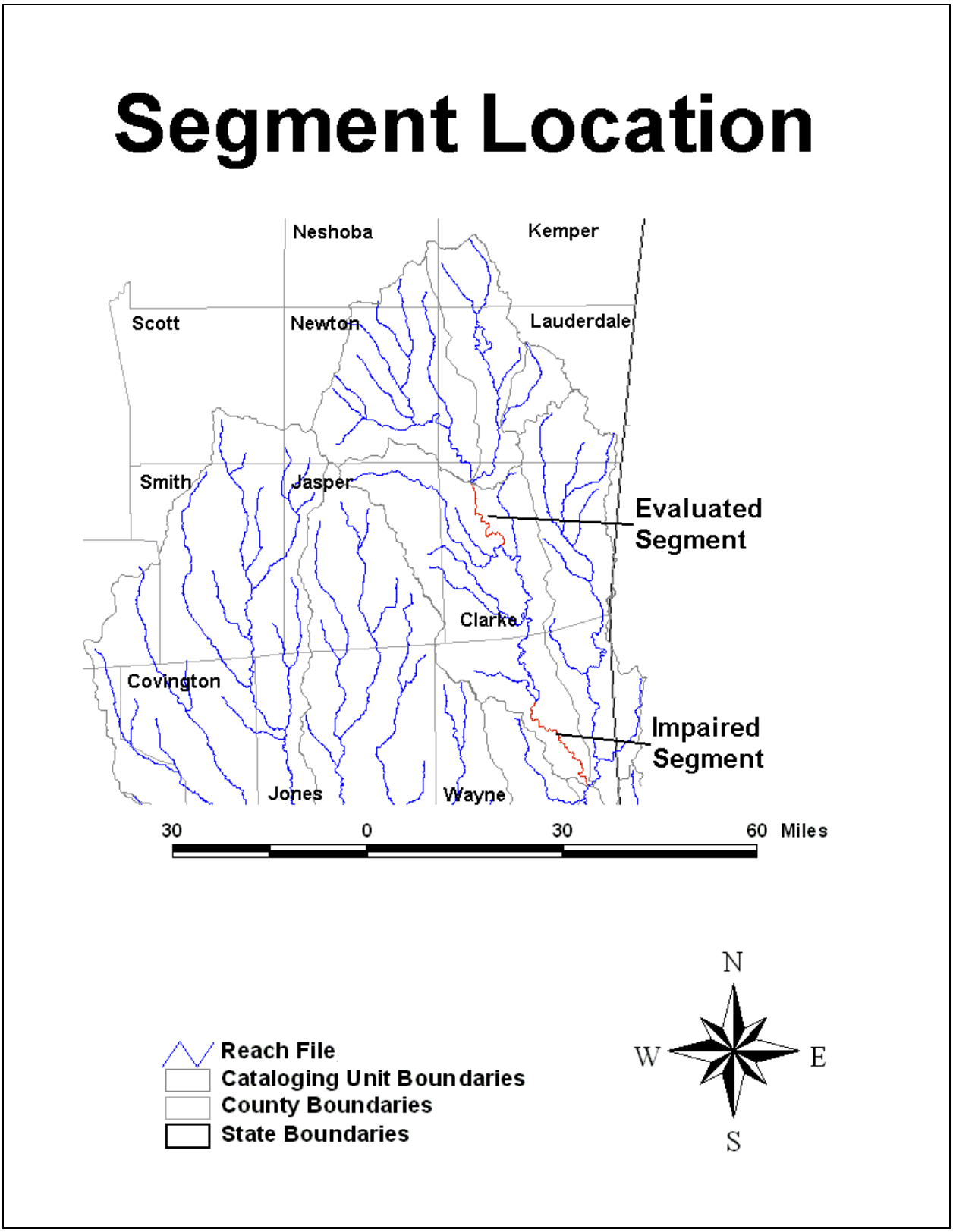


Figure 1.2 Location Map for Evaluated and Impaired Segments

River has the designated use of Secondary Contact Recreation. The evaluated section of the Chickasawhay River has two designated uses, Secondary Contact Recreation and Contact Recreation. Secondary contact recreation is defined as incidental contact with the water, including wading and occasional swimming. Contact Recreation means the waters are to be suitable for recreational purposes, including such water contact activities as swimming and water skiing. The waters shall also be suitable for use for which waters of lower quality will be satisfactory.

1.3 Applicable Waterbody Segment Standard

The water quality standard applicable to the use of the waterbody segments and the pollutant of concern is defined in the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters*. The standard states for Secondary Contact Recreation that from May through October the fecal coliform colony counts shall not exceed a geometric mean of 200 per 100 ml, nor shall more than ten percent of the samples examined during any month exceed a colony count of 400 per 100 ml. And, that from November through April the fecal coliform colony counts shall not exceed a geometric mean of 2000 per 100 ml, nor shall more than ten percent of the samples examined during any month exceed a colony count of 4000 per 100 ml. For Contact Recreation, the winter relaxing of the standards is eliminated. Therefore, since the Contact Recreation standard is more stringent, it has been chosen for the development of this TMDL. This Contact Recreation water quality standard will be used as targeted endpoints to evaluate impairments and establish this TMDL.

2.0 TMDL ENDPOINT AND WATER QUALITY ASSESSMENT

2.1 Selection of a TMDL Endpoint and Critical Condition

One of the major components of a TMDL is the establishment of instream numeric endpoints, which are used to evaluate the attainment of acceptable water quality. Instream numeric endpoints, therefore, represent the water quality goals that are to be achieved by implementing the load and waste load reductions specified in the TMDL. The endpoints allow for a comparison between observed instream conditions and conditions that are expected to restore designated uses. The instream fecal coliform target for this TMDL is a 30-day geometric mean of 200 colony counts per 100 ml.

Because fecal coliform may be attributed to both nonpoint and point sources, the critical condition used for the modeling and evaluation of stream response was represented by a multi-year period. Critical conditions for waters impaired by nonpoint sources generally occur during periods of wet-weather and high surface runoff. But, critical conditions for point source dominated systems generally occur during low-flow, low-dilution conditions. The 1985-1995 period represents both low-flow conditions as well as wet-weather conditions and encompasses a range of wet and dry seasons. Therefore, the 11-year period was selected as representing critical conditions associated with all potential sources of fecal coliform bacteria within the watershed.

2.2 Discussion of Instream Water Quality

Water quality data available for the monitored segment of the Chickasawhay River show that high levels of fecal coliform bacteria impair the stream. There is one ambient station operated by MDEQ that collected fecal coliform data from 1993 through 1996. Monitoring for flow and fecal coliform continued on a bimonthly basis at station 02477560 at Waynesboro, beginning January 12, 1993, and ending September 9, 1996. The data indicate that high instream fecal coliform concentrations occurred during periods of high flow.

2.2.1 Inventory of Available Water Quality Monitoring Data

The State's 1996 Section 305(b) Water Quality Assessment Report was reviewed for water quality conditions and data available for the watershed. According to the report, the Chickasawhay River is not supporting the use of Secondary Contact Recreation. These conclusions were based on instantaneous data collected at station 02477560. Data collected at the station are listed below in Table 2.1.

Table 2.1 Fecal Coliform Data reported in Chickasawhay River, Station 02477560

Date	Flow (cfs)	Fecal Coliform (counts/100 ml)
1/12/93	7200	3000*
3/8/93	3400	40
5/3/93	3200	70
7/12/93	720	5000*
9/13/93	220	40
11/1/93	2000	2400*
1/10/94	2500	800*
3/7/94	9000	220
5/4/94	2400	800*
6/20/94	400	130
8/22/94	290	80
11/7/94	450	500*
1/9/95	1550	110
3/6/95	4400	220
4/17/95	1100	80
7/10/95	300	80
9/11/95	185	20
11/8/95	1000	1400*
1/9/96	2170	110
3/4/96	1570	40
5/6/96	1150	40
7/9/96	260	40
9/9/96	780	500*

* Indicates a violation of the Secondary Contact Recreation Standard for Fecal Coliform

2.2.2 Analysis of Instream Water Quality Monitoring Data

A statistical summary of the water quality data discussed above is presented in Table 2.3. Samples are compared to the instantaneous maximum standard of 400 counts per 100 ml.; 4000 counts per 100 ml. in the winter. The percent exceedance was calculated by dividing the number of exceedances by the total number of samples and does not represent the amount of time that the water quality is in violation.

Table 2.3 Statistical Summaries

Station Number	Number of Samples	Minimum Value (counts/100ml)	Maximum Value (counts/100ml)	Number of Exceedances	Percent Instantaneous Exceedance
02477560	23	20	5000	8	35%

3.0 SOURCE ASSESSMENT

The TMDL evaluation summarized in this report examined all known potential fecal coliform sources in the Chickasawhay River Watershed. The source assessment was used as the basis of development for the model and ultimate analysis of the TMDL allocation options. In evaluation of the sources, wasteloads were characterized by the best available information, monitoring data, literature values, and local management activities. This section documents the available information and interpretation for the analysis. The representation of the following sources in the model is discussed in Section 4.0.

The Chickasawhay River was generally divided into a new reach at the confluence of each major tributary. The watershed delineations were based primarily on an analysis of the RF3 stream network in the basin as well as a topographic analysis of the watershed.

3.1 Assessment of Point Sources

Point sources of fecal coliform bacteria have their greatest potential impact on water quality during periods of low flow. Thus, a careful evaluation of point sources that discharge fecal coliform bacteria was necessary in order to quantify the degree of impairment present during the low-flow, critical condition. The 47-wastewater treatment plants in the Chickasawhay River Watershed serve a variety of activities including residential subdivisions, schools, recreational areas, municipalities, and other businesses. The majority of the 47-wastewater treatment plants serve schools and residential subdivisions. Of these, 29 facilities have been included in the Chickasawhay River model. The other facilities are included in the Okatibbee Creek TMDL.

A point source assessment was completed for each subwatershed in the Chickasawhay River drainage area. Figure 3.1 shows a map of the drainage area of the impaired section of the Chickasawhay River and its division into subwatersheds. Table 3.1 lists the NPDES Permitted fecal coliform dischargers, along with the permit number and the receiving waterbody. The NPDES Permitted facilities in the Okatibbee Creek Watershed and the Sowashee Creek Watershed are included in this model as components of the Okatibbee Creek TMDL. Those facilities are not included in the table.

Once the permitted dischargers were located, the effluent from each source was characterized based on all available monitoring data including permit limits, discharge monitoring reports, and information on treatment types. Discharge monitoring reports (DMRs) were the best data source for characterizing effluent because they report measurements of flow and fecal coliform present in effluent samples. Of the facilities for which they were available, the DMRs for the past five years, 1993 through 1998, were analyzed. When data were available, the fecal coliform concentrations used in the model were calculated by taking an average of fecal coliform concentrations reported in the discharge monitoring reports. If evidence of insufficient treatment existed, best professional judgement was used to estimate a fecal coliform loading rate in the model. The permit limits of each facility included in the Chickasawhay River model are given in Table 3.1.

Table 3.1 Inventory of Point Source Dischargers

Facility Name	Sub Watershed	NPDES Permit	Fecal Coliform (counts/100ml)	Receiving Waterbody
North East High School	Chunky	MS0049689	200	Chickasawhay Creek
Huntington Park S/D	Chunky	MS0049867	200	Chickasawhay Creek
Union POTW	Chunky	MS0023744	200/2000*	Chunky Creek
Chunky POTW	Chunky	MS0024767	200	Chunky River
Ten Mile Junction	Chunky	MS0049042	200	Chunky River
Lost Mountain MHP	Chunky	MS0039241	200	Cow Creek
Palmer MHP	Chunky	MS0043593	200	Rogers Creek
South Meridian Apartments	Chunky	MS0035611	200	Dry Creek
Decatur POTW	Chunky	MS0020621	200/2386*	Okahatta Creek
Decatur POTW	Chunky	MS0028908	200/2000*	Okahatta Creek
Hickory POTW	Chunky	MS0025101	**	Potterchitto Creek
Newton POTW	Chunky	MS0036323	200/2000*	Potterchitto Creek
Safe MHP	Chunky	MS0050733	200	Potterchitto Creek
Turkey Creek Water Park	Chunky	MS0038571	200	Turkey Creek
MDOT Newton Office	Chunky	MS0038962	200	Turkey Creek
MS Christian Camp	Chunky	MS0045942	200	Turkey Creek
Waynesboro POTW	Chickasawhay	MS0024228	200/2000*	Patton Creek
McIlwains Catfish	Chickasawhay	MS0055328	200	Patton Creek
Clarkdale Attendance Center	Chickasawhay	MS0049654	200	Chickasawhay Creek
Buckatunna Attendance Center	Chickasawhay	MS0038784	200	Chickasawhay Creek
Stonewall POTW	Chickasawhay	MS0040151	200	Chickasawhay River
Quitman POTW	Chickasawhay	MS0024589	200	Chickasawhay River
Shubuta POTW	Chickasawhay	MS0030155	200	Chickasawhay River
Enterprise POTW	Chickasawhay	MS0037826	200	Chickasawhay River
Maynor Creek Water Park	Chickasawhay	MS0027162	200	Maynor Creek
Pachuta POTW	Chickasawhay	MS0035700	200	Pachuta Creek
South East Middle School	Chickasawhay	MS0048895	200	Walter's Branch
Clarke County State Park	Chickasawhay	MS0030481	200	Moore Mill Creek
St. Mary's Headstart	Chickasawhay	MS0049140	200	Shubuta Creek

* Winter Limits ** No Limits

3.2 Assessment of Nonpoint Sources

There are many potential nonpoint sources of fecal coliform bacteria for Chickasawhay River, including:

- Failing septic systems
- Wildlife
- Land application of hog and cattle manure
- Grazing animals
- Land application of poultry litter
- Cattle contributions directly deposited instream
- Urban development

The 1.1 million-acre drainage area for the monitored segment of the Chickasawhay River contains many different landuse types, including urban, forests, cropland, pasture, barren, and wetlands. The landuse information is based on data collected by the State of Mississippi's Automated Information System (MARIS), 1997. This data set is based on Landsat Thematic Mapper digital images taken between 1992 and 1993. This classification is based on a modified Anderson level one and two system with additional level two wetland classifications. The contribution of each of these land types to the fecal coliform loading of the Chickasawhay River was considered on a subwatershed basis. Table 3.2 shows the landuse distribution within each subwatershed in number of acres.

Table 3.2 Landuse Distribution in Number of Acres

Subwatershed	Forest	Croplands	Pasture	Urban	Total
Chuncky River	257,768	4,219	67,833	3,623	333,443
Okatibbee Creek	144,080	1,600	41,081	3,847	190,608
Sowashee Creek	28,908	603	12,634	10,825	52,970
Chickasawhay	403,159	5,562	109,271	7,101	525,093
All Watersheds	833,915	11,984	230,819	25,396	1,102,114

The nonpoint fecal coliform contribution from each landuse was estimated using the latest information available. The MARIS landuse data for Mississippi was utilized by the BASINS model to extract landuse sizes, populations, agriculture census data, and other information. MDEQ contacted several agencies to refine the assumptions made in determining the fecal coliform loading. The Mississippi Department of Wildlife, Fisheries, and Parks provided information of wildlife density in the Chickasawhay River Watershed. The Mississippi State Department of Health was contacted regarding the failure rate of septic tank systems in this portion of the state. Mississippi State University researchers provided valuable information on manure application practices and loading rates for hog farms and cattle operations. The Natural Resources Conservation Service also gave MDEQ information on manure treatment practices and land application of manure.

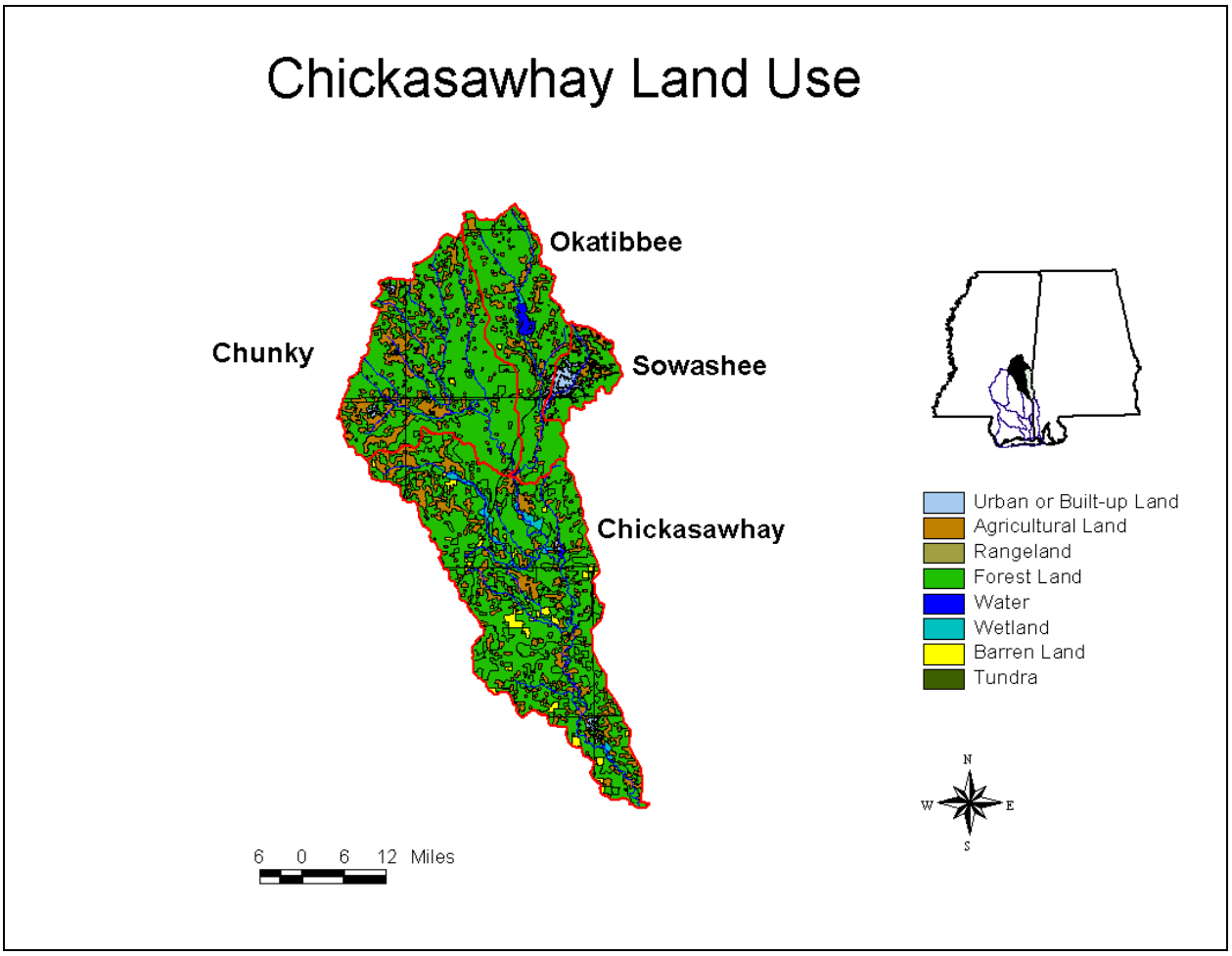


Figure 3.1 Chickasawhay River Watershed Landuse

3.2.1 Failing Septic Systems

Septic systems have a potential to deliver fecal coliform bacteria loads to surface waters due to malfunctions, failures, and direct pipe discharges. Properly operating septic systems treat wastewater and dispose of the water through a series of underground field lines. The water is applied through these lines into a rock substrate, thence into underground absorption. The systems can fail when the field lines are broken, or when the underground substrate is clogged or flooded. A failing septic system's discharge can reach the surface, where it becomes available for wash-off into the stream. Another potential problem is a direct bypass from the system to a stream. In an effort to keep the water off the land, pipes are occasionally placed from the septic tank or the field lines directly to the creek.

Another consideration is the use of individual onsite wastewater treatment plants. These treatment systems are in wide use in Mississippi. They can adequately treat wastewater when properly maintained. However, these systems do not typically receive the maintenance needed for proper, long-term operation. These systems require some sort of disinfection to properly operate. When this expense is ignored, the water does not receive adequate disinfection prior to release.

3.2.2 Wildlife

Wildlife present in the Chickasawhay River watershed contributes to fecal coliform bacteria on the land surface. In the Chickasawhay River model, all wildlife was accounted for by considering contributions from deer. Estimates of deer population were designed to account for the deer combined with all of the other wildlife contributing to the area. An upper limit of 45 deer per square mile was used as the estimate. It was assumed that the wildlife population remained constant throughout the year, and that wildlife was present on all land classified as pastureland, cropland, and forest. It was also assumed that the wildlife and the manure produced by the wildlife were evenly distributed throughout these land types.

3.2.3 Land Application of Hog and Cattle Manure

In the Pascagoula River Basin processed manure from confined hog and dairy cattle operations is typically collected in lagoons and routinely applied to pastureland during March through May and October through November. This manure is a potential contributor of bacteria to receiving waterbodies due to runoff produced during a rain event. Hog farms in the Pascagoula River Basin operate by either keeping the animals confined by or allowing hogs to graze in a small pasture or pen. For this model, it was assumed that all of the hog manure produced by either farming method was applied evenly to the available pastureland. Application rates of hog manure to pastureland from confined operations varied monthly according to management practices currently used in this area.

The dairy farms that are currently operating in the Chickasawhay River Watershed only confine the animals for a limited time during the day. The model assumed a confinement time of four hours per day, during which time the cattle are milked and fed. During all other times, dairy cattle are allowed to graze on pasturelands. The manure collected during confinement is applied to the available pastureland in the watershed. Like the hog farms, application rates of dairy cow manure to pastureland vary monthly according to management practices currently used in this area.

3.2.4 Grazing Beef and Dairy Cattle

Grazing cattle deposit manure on pastureland where it is available for wash-off and delivery to receiving waterbodies. Beef cattle have access to pastureland for grazing all of the time. However, dairy cattle can spend four hours per day confined in milking barns, and the remainder of their time grazing on pastureland. Manure produced by grazing beef and dairy cows is directly deposited onto pastureland.

3.2.5 Land Application of Poultry Litter

There are a considerable number of chickens produced in this area of the State each year. In these counties, poultry farming operations use houses in which chickens are confined all of the time. The litter produced by the chickens is collected and is routinely applied as a fertilizer to pastureland in the watershed. Application rates of the litter vary monthly.

Predominantly, two kinds of chickens are raised on farms in the basin, broilers and layers. For the broiler chickens, the amount of growth time from when the chicken is born to when it is sold off the farm is approximately 48 days or 1.6 months. Layer chickens remain on farms for ten months or longer. More than 93% of the chickens raised in this area are broilers. For the model, a weighted average of growth time was determined to account for both types of chickens. An average growth time of 52 days, or 1/7 of a year, was used. To determine the number of chickens on farms on any given day, the yearly population of chickens sold was divided by seven.

3.2.6 Cattle Contributions Directly Deposited Instream

Cattle often have direct access to flowing and intermittent streams that run through pastureland. These small streams are tributaries of larger streams. Fecal coliform bacteria deposited in these streams by grazing cattle are modeled as a direct input of bacteria to the stream. Due to the general topography in the Chickasawhay River Watershed, it was assumed that all land slopes in the watershed are such that cattle are able to access the intermittent streams in all pastures. In order to determine the amount of bacteria introduced into streams from cattle, it was assumed that all grazing cattle spent five percent of their time standing in the streams. Thus, the model assumes that five percent of the manure produced by grazing beef and dairy cows are deposited directly in the stream.

3.2.7 Urban Development

Urban areas include land classified as urban and barren. Even though only a small percentage of the watershed is classified as urban, the contribution of the urban areas to fecal coliform loading in Chickasawhay River was considered. Municipalities within the Chickasawhay River Watershed include Meridian, Newton, Quitman, Enterprise, Waynesboro, Hickory, Shubuta, and Decatur. Fecal coliform contributions from urban areas may come from storm water runoff, runoff from construction sites, and runoff contribution from improper disposal of materials such as household toxic materials and litter.

4.0 MODELING PROCEDURE: LINKING THE SOURCES TO THE ENDPOINT

Establishing the relationship between the instream water quality target and the source loading is a critical component of TMDL development. It allows for the evaluation of management options that will achieve the desired source load reductions. The link can be established though a range of techniques, from qualitative assumptions based on sound scientific principles to sophisticated modeling techniques. Ideally, the linkage will be supported by monitoring data that allow the TMDL developer to associate certain waterbody responses to flow and loading conditions. In this section, the selection of the modeling tools, setup, and model application are discussed.

4.1 Modeling Framework Selection

The BASINS model platform and the NPSM model were used to predict the significance of fecal coliform sources to fecal coliform levels in the Chickasawhay River Watershed. BASINS is a multipurpose environmental analysis system for use in performing watershed and water quality-based studies. A geographic information system (GIS) provides the integrating framework for BASINS and allows for the display and analysis of a wide variety of landscape information such as landuses, monitoring stations, point source discharges, and stream descriptions. The NPSM model simulates nonpoint source runoff from selected watersheds, as well as the transport and flow of the pollutants through stream reaches. A key reason for using BASINS as the modeling framework is its ability to integrate both point and nonpoint sources in the simulation, as well as its ability to assess instream water quality response.

4.2 Model Setup

The Chickasawhay River TMDL model includes the impaired segment of the creek as well as all the drainage areas that are upstream of the segment. Thus, all upstream contributors of bacteria are accounted for in the model. To obtain a spatial variation of the concentration of bacteria along the Chickasawhay River, the watershed was divided into four subwatersheds in an effort to isolate the major stream reaches in the watershed. This allowed the relative contribution of point and nonpoint sources to be addressed within each subwatershed.

4.3 Source Representation

Both point and nonpoint sources were represented in this model. Due to die-off rates and overland transportation assumptions, the fecal coliform loading from point and nonpoint sources must be addressed separately. There are 47 NPDES Permitted facilities in the basin that contribute fecal coliform bacteria to the watershed. Of these, 29 are included in this model specifically. The others are included in the Okatibbee TMDL for Fecal Coliform. The load of fecal coliform from the effluent discharge was added as a direct input into the appropriate reach in the model. Fecal coliform loading rates for point sources are input to the model as flow in cubic feet per second and fecal coliform contribution in colony counts per hour.

The nonpoint sources are represented in the model with two different methods. The first of these methods is a direct fecal coliform loading to the Chickasawhay River. Other sources are represented as an application rate to the land in the watershed. For these sources, fecal coliform accumulation rates in counts per acre per day were calculated for each subwatershed on a monthly basis and input to the model for each landuse. Fecal coliform contributions from forests and wetlands were considered at the same time, and all forest and wetland contributions were combined for model input. Urban and barren areas were combined and input into the model in the same manner.

Appendix A contains a portion of the Fecal Coliform Spreadsheet developed by MDEQ for quantifying point and nonpoint sources of bacteria for the model. The model inputs for fecal coliform loading due to point and nonpoint sources have been calculated using assumptions about land management, septic systems, farming practices, and permitted point source contributions. Each of the potential bacteria sources is covered in the fecal coliform spreadsheet. The spreadsheet also contains a reference page that lists the literature references used to generate the fecal coliform loading rates.

4.3.1 Failing Septic Systems

The number of failing septic systems used in the model was derived from the watershed area normalized population of the area. Based on the best available information, a failure rate of 40% was assumed. The percentage of septic tanks per county and the assumed failure rate has been used to calculate the estimated number of failing septic tanks per watershed. The number of failing septic tanks also incorporates an estimate for the failing onsite wastewater treatment systems in the area.

Discharges from failing septic systems were quantified based on several factors including the estimated population served by the septic systems, an average daily discharge of 100 gallons per person per day, and a septic system effluent fecal coliform concentration of 10^4 counts per 100 ml.

4.3.2 Wildlife

Based on information provided by the Mississippi Department of Wildlife, Fisheries, and Parks, the deer population throughout the watershed was estimated to be 30 to 45 animals per square mile. For the model, the upper limit of 45 deer per square mile was used to account for the deer and all other wildlife contributing to fecal coliform accumulation in the area. The wildlife contribution in counts per acre per day is calculated by multiplying a loading rate by the number of animals. The loading rate used in the model was estimated to be 5.00E+08 counts per day per animal.

4.3.3 Land Application of Hog and Cattle Manure

The fecal coliform spreadsheet was used to estimate the amount of waste and the concentration of fecal coliform bacteria contained in hog and dairy cattle manure produced by confined animal feeding operations. The livestock count per county is based upon the 1997 Census of Agriculture data. The county livestock count is used to estimate the number of livestock on a subwatershed scale. This is calculated by multiplying the county livestock figures with the area of the county within the subwatershed boundaries. This estimate is made with the assumption that the livestock are

uniformly distributed throughout the county. A fecal coliform production rate in counts per day per animals was multiplied by the number of confined animals to quantify the amount of bacteria produced. The manure produced by these operations is collected in lagoons and applied evenly to all pastureland. Manure application rates to pastureland vary on a monthly basis. This monthly variation is incorporated into the model by using monthly loading rates.

4.3.4 Grazing Beef and Dairy Cattle

The model assumes that the manure produced by grazing beef and dairy cattle is evenly spread on pastureland throughout the year. The fecal coliform content of manure produced by grazing cattle is estimated by multiplying the number of grazing cattle by a fecal coliform production of 5.40E+09 counts per day per animal. The resulting fecal coliform loads are in the units of counts per acre per day.

4.3.5 Land Application of Poultry Litter

The concentration of bacteria, which accumulates in the dry litter where poultry waste is collected, is estimated with the fecal coliform spreadsheet. This is done by multiplying the daily number of chickens on farms by a fecal coliform production rate in counts per day per animal. The model assumed a watershed area normalized chicken population. The chicken population was determined from the 1997 Census of Agriculture Data for the number of chickens sold from each county per year. Litter application to pastureland varies monthly, and is modeled with a monthly loading rate.

4.3.6 Cattle Contributions Deposited Directly Instream

The contribution of fecal coliform from cattle to a stream is represented as a direct input into the stream by the model. In order to estimate the point source loading produced by grazing beef and dairy cattle with access to streams, it is assumed that five percent of the number of grazing cattle in each subwatershed are standing in a stream at any given time. When cattle are standing in a stream, their fecal coliform production is estimated as flow in cubic feet per second and a concentration in counts per hour. The fecal coliform concentration has been calculated using the number of cows in the stream and a bacteria production rate of 5.40E+09 counts per animal per day.

4.3.7 Urban Development

The MARIS landuse data divide urban land into several categories. For the Chickasawhay River watershed, the urban land is divided into different categories: high density, low density, and transportation. For the model, fecal coliform buildup rates for each category were determined by using literature values from Horner, 1992. The literature value accounts for all of the potential fecal coliform sources in each urban category. In the model, fecal coliform loading rates on urban land are input as counts per acre per day.

4.4 Stream Characteristics

The stream characteristics given below describe the impaired section of the Chickasawhay River. This section begins at Waynesboro and ends at the end of the monitored reach, near Buckatunna. The channel geometry and lengths for the impaired segment of the Chickasawhay River are based on data available within the BASINS modeling system. The 7Q10 flow was determined from USGS data. The characteristics of the modeled section are as follows.

♦ Segment	03170002015	03170002019
♦ Call	Monitored as Impaired	Evaluated
♦ Use	Secondary Contact Rec.	Contact and Secondary Contact Rec.
♦ Length	23 miles	17 miles
♦ Average Depth	1.6 ft	1.0 ft
♦ Average Width	144.8 ft	105.1 ft
♦ Mean Flow	2615 cubic ft per second	1308 cubic ft per second
♦ Mean Velocity	2.33 ft per second	1.81 ft per second
♦ 7Q10 Flow	152.32 cubic ft per second	30.98 cubic ft per second
♦ Slope	.00035 ft per ft	.00019 ft per ft

4.5 Selection of Representative Modeling Period

The model was run for 12 years, from January 1, 1984, through December 31, 1995. The first year of data were used to stabilize the model. Results from the model were evaluated for the time period from January 1, 1985, until December 31, 1995. Because this 11-year time span is used, a margin of safety is implicitly applied. Seasonality and critical conditions are accounted for during the extended time frame of the simulation.

The critical condition for fecal coliform impairment from nonpoint source contributors occurs after a heavy rainfall that is preceded by several days of dry weather. The dry weather allows a build up of fecal coliform bacteria, which is then washed off the ground by a heavy rainfall. By using the 11-year time period, many such occurrences are captured in the model results. Critical conditions for point sources, which occur during low flow and low dilution conditions, are simulated as well.

4.6 Model Calibration Process

Several assumptions were made to determine the fecal coliform loading rates from the nonpoint source contributors. Many of these assumptions were incorporated into the fecal coliform spreadsheet. An effort was made to contact researchers and agricultural experts to give as much validity as possible to the assumptions made within the BASINS model. A data set was applied to 12 various gages in the basin as a means of hydrologic calibration and validation. The weather data used for this model were collected at Leakesville and Meridian. The representative hydrologic period used for the TMDL was January 1, 1985, through December 31, 1995.

The hydrological model had a continuous USGS gage available on Chickasawhay River near Leakesville for comparison with the modeled flow in reach 03170002015. A sample of these results is included in Appendix B, Graph B-5, B-6, and B-7. Modeled output and actual gage data are shown on the same graph for 3 years. There is a very good correlation between the two data sets.

4.7 Existing Loading

Appendix B includes two sets of graphs of the model results showing the instream fecal coliform concentrations for reach the impaired segment of the Chickasawhay River and the evaluated segment of the Chickasawhay River. Graphs B-1 and B-3 show the fecal coliform levels in the segments (impaired and evaluated, respectively) during the 11-year modeling period. Similarly, Graphs B-2 and B-4 show the same area and time with the reduction scenario applied. The graphs show a 30-day geometric mean of the data. The straight line at 200 counts per 100 ml indicates the water quality standard for the stream during the summer.

5.0 ALLOCATION

The allocation for this TMDL involves a wasteload allocation for point sources and a load allocation for nonpoint sources necessary for attainment of water quality standards in segments MS063M and MS065M. Point source contributions enter the stream directly in the appropriate reach. The nonpoint fecal coliform sources used in the model have two different transportation methods. Cows in the stream and failing septic tanks were modeled as direct inputs to the stream. The other nonpoint source contributions were applied to land area on a counts per day per acre basis. The fecal coliform bacteria applied to land are subject to a die-off rate and an absorption rate before entering the stream. The TMDL calculation is based on the WLA and LA component and is referenced in Appendix B.

5.1 Wasteload Allocations

Point sources within the watershed discharging at their current level are subject to reduction from their current level of fecal coliform contribution. The contribution of point sources was considered on a subwatershed basis for the model. Within each subwatershed, the modeled contribution of each discharger was based on the facility's discharge monitoring data and other records of past performance. In several cases, the fecal coliform contribution attributed to the model from a facility is much greater than the permitted limit of 200 counts per 100 ml. As part of this TMDL, all wastewater treatment facilities will be required to meet water quality standards at the end of pipe. All wastewater treatment facilities with current NPDES Permits that meet water quality standards should take steps to comply with their current permits. Table 5.1 lists the point source contributions, on a subwatershed basis, along with their existing load, allocated load, and percent reduction.

Table 5.1 Contribution to the Wasteload Allocations from NPDES Point Sources

Sub Watershed	Existing Flow (cfs)	Existing Load (counts/hr)	Allocated Flow (cfs)	Allocated Load (counts/hr)	Percent Reduction
Okatibbee*	20.8	8.27E+08	20.8	4.16E+08	50%
Chunky	2.6	1.18E+10	2.6	5.29E+08	95%
Chickasawhay	5.6	7.12E+09	5.6	1.14E+09	84%
Total	29.0	1.97E+10	29.0	2.09E+09	89%

* Okatibbee Creek TMDL (includes contribution from Sowashee Creek)

5.2 Load Allocations

Nonpoint sources that contribute to fecal coliform accumulation within the Chickasawhay River Watershed are subject to reduction from their current level of contribution. Reductions in the load allocation for this TMDL involve two different types of nonpoint sources: cattle access to streams and septic tanks. Contributions from both of these sources are input into the model in a manner similar to point source input, with a flow and fecal coliform concentration in counts per hour. Table 5.2 lists the nonpoint source contributions due to cattle access to streams, on a subwatershed basis,

along with their existing load, allocated load, and percent reduction. Table 5.3 gives the same parameters for contributions due to septic tank failure. The septic tank failures in reality are both point and nonpoint source contributions and have been calculated as equal contributors to the WLA and the LA component of the TMDL calculation.

Table 5.2 Fecal Coliform Loading Rates for Nonpoint Source Contribution of Cattle Access to Streams

Sub Watershed	Existing Flow (cfs)	Existing Load (counts/hr)	Allocated Flow (cfs)	Allocated Load (counts/hr)	Percent Reduction
Okatibbee*	8.38E-04	3.20E+10	2.09E-04	8.04E+09	75%
Chunky	5.58E-03	2.13E+11	1.39E-03	1.52E+09	75%
Chickasawhay	4.49E-03	1.7E+11	1.12E-03	4.29E+10	75%
Total	1.09E-02	4.15E+11	2.72E-03	5.25E+10	75%

* Okatibbee Creek TMDL (includes contribution from Sowashee Creek)

Table 5.3 Fecal Coliform Loading Rates from Failing Septic Tanks (50% to WLA, 50% to LA)

Sub Watershed	Existing Flow (cfs)	Existing Load (counts/hr)	Allocated Flow (cfs)	Allocated Load (counts/hr)	Percent Reduction
Okatibbee*	1.36E+00	2.08E+10	6.92E-01	1.04E+10	50%
Chunky	5.96E-01	6.06E+09	2.98E-01	3.03E+09	50%
Chickasawhay	6.56E-01	6.7E+09	3.28E-01	3.34E+09	50%
Total	2.61E+00	3.36E+10	1.32E+00	1.68E+10	50%

* Okatibbee Creek TMDL (includes contribution from Sowashee Creek)

Nonpoint fecal coliform loading due to cattle grazing; land application of manure produced by confined dairy cattle, hogs, and poultry; wildlife; and urban development are also included in the load allocation. Currently, no reduction is required for these contributors in order for the Chickasawhay River to achieve water quality standards. The loading rates are constant throughout the year for forest, cropland, and urban land. The loading rates for pastureland vary for each month.

The scenario chosen for the load allocation in the Chickasawhay River watershed is a 75% reduction in contributions from cows in the stream, and a 50% reduction from failing septic tanks. The scenario also requires all permitted dischargers to meet water quality standards for disinfection. This scenario could be achieved by supporting BMP projects that promote fencing around streams in pastures, and by supporting education projects that encourage homeowners to properly maintain their septic tanks by routinely pumping them out, repairing broken field lines, and disinfecting the effluent from small individual onsite wastewater treatment plants.

5.3 Incorporation of a Margin of Safety

The two types of MOS development are to implicitly incorporate the MOS using conservative model assumptions or to explicitly specify a portion of the total TMDL as the MOS. The MOS selected for this model is implicit. Running the model for 11 years with no violations of the water quality standard provides the primary component of the MOS. Ensuring compliance with the standard throughout all of the critical condition periods represented during the 11 years is a conservative practice. Another component of the MOS is the conservative assumption that in the model all of the fecal coliform bacteria discharged from failing septic tanks reaches the stream, while it is likely that only a portion of the bacteria will reach the stream due to filtration and die off during transport.

5.4 Seasonality

For many streams in the state, fecal coliform limits vary according to the seasons. This stream, however, is designated for the use of contact recreation. For this use, the pollutant standard is constant throughout the year.

Because the model was established for an 11-year time span, it took into account all of the seasons within the calendar years from 1985 to 1995. The extended time period allowed the simulation of many different atmospheric conditions such as rainy and dry periods and high and low temperatures. It also allowed seasonal critical conditions to be simulated.

6.0 IMPLEMENTATION

6.1 Follow-Up Monitoring

MDEQ has adopted the Basin Approach to Water Quality Management, a plan that divides Mississippi's major drainage basins into five groups. During each yearlong cycle, MDEQ resources for water quality monitoring will be focused on one of the basin groups. During the next monitoring phase in the Pascagoula Basin, the Chickasawhay River may receive follow-up monitoring to identify the improvement in water quality from the implementation of the strategies in this TMDL.

6.2 Reasonable Assurance

The fecal coliform reduction scenario used by this TMDL includes requiring all NPDES Permitted dischargers of fecal coliform to meet water standards for disinfection, along with reducing 75% of the cattle access to streams and 50% of the failing septic tanks in the watershed. Reasonable assurance for the implementation of the TMDL has been considered for both point and nonpoint source contributors.

The TMDL will not impact existing or future NPDES Permits as long as the effluent is disinfected to meet water quality standards for fecal coliform bacteria. MDEQ will not approve any NPDES Permit application that does not plan to meet water quality standards for disinfection. Education projects that teach best management practices should be used as a tool for reducing nonpoint source contributions. These projects may be funded by CWA Section 319 nonpoint source grants.

6.3 Public Participation

This TMDL will be published for a 30-day public notice. During this time, the public will be notified by publication in the statewide newspaper and a newspaper in Meridian. The public will be given an opportunity to review the TMDL and submit comments. At the end of the 30-day period, MDEQ will determine the level of interest in the TMDL and make a decision on the necessity of holding a public hearing.

If a public hearing is deemed appropriate, the public will be given a 30-day notice of the hearing to be held at a location near the watershed. That public hearing would be an official hearing of the Mississippi Commission on Environmental Quality, and would be transcribed.

All comments received during the public notice period and at any public hearings become a part of the record of this TMDL. All comments will be considered in the ultimate approval of this TMDL by the Commission on Environmental Quality and for submission of this TMDL to EPA Region IV for final approval.

APPENDIX A

The following documents comprise a section of the spreadsheet used to estimate all of the fecal coliform loading used in the model. The spreadsheet consists of several sheets, each dealing with a different aspect of the estimation. The final sheets bring all of the inputs into one format for model input. The final component is the reference sheet used in the model.

POINT SOURCES FOR EACH SUBWATERSHED (Point Sources\Loads)

	Cattle in Streams		Septic Tanks		Dischargers		Fresh Water	Total		Total Input	
	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)
03170001012	3.20E-04	1.22E+10	7.67E-02	7.81E+08	9.09E-01	6.90E+09	6.00E+00	6.99E+00	1.99E+10	0.00E+00	4.78E+10
03170001013	6.96E-04	2.66E+10	1.30E-01	1.33E+09	0.00E+00	0.00E+00	0.00E+00	1.31E-01	2.79E+10	0.00E+00	0.00E+00
03170001014	2.75E-04	1.05E+10	3.03E-02	3.08E+08	1.55E-02	1.60E+07	0.00E+00	4.61E-02	1.08E+10	0.00E+00	1.08E+10
03170001015	3.36E-05	1.28E+09	2.83E-03	2.88E+07	0.00E+00	0.00E+00	0.00E+00	2.87E-03	1.31E+09	0.00E+00	1.31E+09
03170001016	1.33E-04	5.07E+09	1.12E-02	1.14E+08	0.00E+00	0.00E+00	0.00E+00	1.13E-02	5.18E+09	0.00E+00	8.00E+10
03170001017	1.84E-04	7.03E+09	1.55E-02	1.58E+08	0.00E+00	0.00E+00	0.00E+00	1.57E-02	7.19E+09	0.00E+00	0.00E+00
03170001018	8.67E-04	3.31E+10	7.03E-02	7.15E+08	0.00E+00	0.00E+00	0.00E+00	7.12E-02	3.38E+10	0.00E+00	0.00E+00
03170001019	2.34E-04	8.95E+09	1.96E-02	2.00E+08	0.00E+00	0.00E+00	0.00E+00	1.99E-02	9.15E+09	0.00E+00	0.00E+00
03170001020	6.30E-04	2.41E+10	5.29E-02	5.39E+08	0.00E+00	0.00E+00	0.00E+00	5.36E-02	2.46E+10	0.00E+00	0.00E+00

LANDUSE AREAS (for verification purposes only)

SUBSHED	CROPLAND	FOREST	URBAN	PASTURE	TOTAL
03170001012	448	28847	550	5061	**15382**
03170001013	299	48578	329	8054	**39391**
03170001014	304	13503	329	2657	**53540**
03170001015	23	1353	45	395	**80090**
03170001016	126	5711	73	1306	**23791**
03170001017	91	8389	0	1553	**10034**
03170001018	175	31560	0	8412	**40147**
03170001019	70	9063	0	3298	**12431**
03170001020	258	24453	164	8781	**33655**
TOTAL	**1794**	**171459**	**1490**	**39516**	**214259**

SCENARIOS

Source	% Reduced*
Cattle Access	0
Septic Failure	0
Pastureland	0

* Changing the % Reduced will change only the values on this sheet

Dischargers Effluent Concetration Level = est high

(enter concentration used for current run, i.e. estimated for modeling period, maximum currently permitted, maximum reccommended permitted, etc…)

PASTURELAND AND CROPLAND - ACCUM (Data Editor\PERLND\PQAL\Monthly Input\MON-ACCUM)

Monthly Input - ACCUM

	03170001012		03170001013		03170001014		03170001015		03170001016	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	1.19E+09	3.52E+07	1.59E+09	3.52E+07	1.93E+09	3.52E+07	1.59E+09	3.52E+07	1.89E+09	3.52E+07
February	1.19E+09	3.52E+07	1.60E+09	3.52E+07	1.93E+09	3.52E+07	1.60E+09	3.52E+07	1.90E+09	3.52E+07
March	1.19E+09	3.52E+07	1.59E+09	3.52E+07	1.93E+09	3.52E+07	1.59E+09	3.52E+07	1.89E+09	3.52E+07
April	1.61E+09	3.52E+07	2.57E+09	3.52E+07	3.63E+09	3.52E+07	3.12E+09	3.52E+07	3.72E+09	3.52E+07
May	1.60E+09	3.52E+07	2.53E+09	3.52E+07	3.57E+09	3.52E+07	3.07E+09	3.52E+07	3.65E+09	3.52E+07
June	1.54E+09	3.52E+07	2.48E+09	3.52E+07	3.48E+09	3.52E+07	2.98E+09	3.52E+07	3.56E+09	3.52E+07
July	1.53E+09	3.52E+07	2.45E+09	3.52E+07	3.42E+09	3.52E+07	2.94E+09	3.52E+07	3.50E+09	3.52E+07
August	1.53E+09	3.52E+07	2.45E+09	3.52E+07	3.42E+09	3.52E+07	2.94E+09	3.52E+07	3.50E+09	3.52E+07
September	1.59E+09	3.52E+07	2.55E+09	3.52E+07	3.59E+09	3.52E+07	3.09E+09	3.52E+07	3.68E+09	3.52E+07
October	1.58E+09	3.52E+07	2.51E+09	3.52E+07	3.53E+09	3.52E+07	3.03E+09	3.52E+07	3.61E+09	3.52E+07
November	1.19E+09	3.52E+07	1.59E+09	3.52E+07	1.93E+09	3.52E+07	1.59E+09	3.52E+07	1.89E+09	3.52E+07
December	1.18E+09	3.52E+07	1.58E+09	3.52E+07	1.91E+09	3.52E+07	1.58E+09	3.52E+07	1.87E+09	3.52E+07

	03170001017		03170001018		03170001019		03170001020	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	2.20E+09	3.52E+07	1.89E+09	3.52E+07	1.33E+09	3.52E+07	1.35E+09	3.52E+07
February	2.21E+09	3.52E+07	1.89E+09	3.52E+07	1.34E+09	3.52E+07	1.35E+09	3.52E+07
March	2.20E+09	3.52E+07	1.89E+09	3.52E+07	1.33E+09	3.52E+07	1.35E+09	3.52E+07
April	4.33E+09	3.52E+07	3.59E+09	3.52E+07	2.60E+09	3.52E+07	2.63E+09	3.52E+07
May	4.26E+09	3.52E+07	3.53E+09	3.52E+07	2.55E+09	3.52E+07	2.59E+09	3.52E+07
June	4.15E+09	3.52E+07	3.48E+09	3.52E+07	2.49E+09	3.52E+07	2.52E+09	3.52E+07
July	4.08E+09	3.52E+07	3.43E+09	3.52E+07	2.45E+09	3.52E+07	2.48E+09	3.52E+07
August	4.08E+09	3.52E+07	3.43E+09	3.52E+07	2.45E+09	3.52E+07	2.48E+09	3.52E+07
September	4.29E+09	3.52E+07	3.57E+09	3.52E+07	2.57E+09	3.52E+07	2.60E+09	3.52E+07
October	4.21E+09	3.52E+07	3.50E+09	3.52E+07	2.52E+09	3.52E+07	2.55E+09	3.52E+07
November	2.20E+09	3.52E+07	1.89E+09	3.52E+07	1.33E+09	3.52E+07	1.35E+09	3.52E+07
December	2.18E+09	3.52E+07	1.88E+09	3.52E+07	1.32E+09	3.52E+07	1.33E+09	3.52E+07

PASTURELAND AND CROPLAND - SQOLIM (Data Editor\PERLND\PQAL\Monthly Input\MON-SQOLIM)

Monthly Input - SQOLIM

	03170001012		03170001013		03170001014		03170001015		03170001016	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	4.74E+09	1.41E+08	6.36E+09	1.41E+08	7.70E+09	1.41E+08	6.37E+09	1.41E+08	7.56E+09	1.41E+08
February	4.76E+09	1.41E+08	6.38E+09	1.41E+08	7.74E+09	1.41E+08	6.40E+09	1.41E+08	7.60E+09	1.41E+08
March	4.74E+09	1.41E+08	6.36E+09	1.41E+08	7.70E+09	1.41E+08	6.37E+09	1.41E+08	7.56E+09	1.41E+08
April	6.45E+09	1.41E+08	1.03E+10	1.41E+08	1.45E+10	1.41E+08	1.25E+10	1.41E+08	1.49E+10	1.41E+08
May	6.39E+09	1.41E+08	1.01E+10	1.41E+08	1.43E+10	1.41E+08	1.23E+10	1.41E+08	1.46E+10	1.41E+08
June	6.15E+09	1.41E+08	9.92E+09	1.41E+08	1.39E+10	1.41E+08	1.19E+10	1.41E+08	1.42E+10	1.41E+08
July	6.10E+09	1.41E+08	9.80E+09	1.41E+08	1.37E+10	1.41E+08	1.17E+10	1.41E+08	1.40E+10	1.41E+08
August	6.10E+09	1.41E+08	9.80E+09	1.41E+08	1.37E+10	1.41E+08	1.17E+10	1.41E+08	1.40E+10	1.41E+08
September	6.37E+09	1.41E+08	1.02E+10	1.41E+08	1.44E+10	1.41E+08	1.24E+10	1.41E+08	1.47E+10	1.41E+08
October	6.30E+09	1.41E+08	1.00E+10	1.41E+08	1.41E+10	1.41E+08	1.21E+10	1.41E+08	1.44E+10	1.41E+08
November	4.75E+09	1.41E+08	6.37E+09	1.41E+08	7.71E+09	1.41E+08	6.38E+09	1.41E+08	7.58E+09	1.41E+08
December	4.70E+09	1.41E+08	6.32E+09	1.41E+08	7.64E+09	1.41E+08	6.31E+09	1.41E+08	7.50E+09	1.41E+08

	03170001017		03170001018		03170001019		03170001020	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	8.80E+09	1.41E+08	7.55E+09	1.41E+08	5.33E+09	1.41E+08	5.39E+09	1.41E+08
February	8.85E+09	1.41E+08	7.58E+09	1.41E+08	5.35E+09	1.41E+08	5.41E+09	1.41E+08
March	8.80E+09	1.41E+08	7.55E+09	1.41E+08	5.33E+09	1.41E+08	5.39E+09	1.41E+08
April	1.73E+10	1.41E+08	1.44E+10	1.41E+08	1.04E+10	1.41E+08	1.05E+10	1.41E+08
May	1.70E+10	1.41E+08	1.41E+10	1.41E+08	1.02E+10	1.41E+08	1.03E+10	1.41E+08
June	1.66E+10	1.41E+08	1.39E+10	1.41E+08	9.96E+09	1.41E+08	1.01E+10	1.41E+08
July	1.63E+10	1.41E+08	1.37E+10	1.41E+08	9.80E+09	1.41E+08	9.92E+09	1.41E+08
August	1.63E+10	1.41E+08	1.37E+10	1.41E+08	9.80E+09	1.41E+08	9.92E+09	1.41E+08
September	1.72E+10	1.41E+08	1.43E+10	1.41E+08	1.03E+10	1.41E+08	1.04E+10	1.41E+08
October	1.68E+10	1.41E+08	1.40E+10	1.41E+08	1.01E+10	1.41E+08	1.02E+10	1.41E+08
November	8.82E+09	1.41E+08	7.56E+09	1.41E+08	5.34E+09	1.41E+08	5.39E+09	1.41E+08
December	8.72E+09	1.41E+08	7.51E+09	1.41E+08	5.28E+09	1.41E+08	5.34E+09	1.41E+08

URBAN AND FOREST - ACQOP & SQOLIM (Data Editor\PERLND\PQAL\QUAL-INPUT\ACQOP & SQOLIM)

ACQOP for all months

	Urb & Bar	For & Wet
03170001012	7.18E+06	3.52E+07
03170001013	7.18E+06	3.52E+07
03170001014	7.18E+06	3.52E+07
03170001015	7.18E+06	3.52E+07
03170001016	7.18E+06	3.52E+07
03170001017	0.00E+00	3.52E+07
03170001018	0.00E+00	3.52E+07
03170001019	0.00E+00	3.52E+07
03170001020	7.18E+06	3.52E+07

SQOLIM for all months

	Urb & Bar	For & Wet
03170001012	2.87E+07	1.41E+08
03170001013	2.87E+07	1.41E+08
03170001014	2.87E+07	1.41E+08
03170001015	2.87E+07	1.41E+08
03170001016	2.87E+07	1.41E+08
03170001017	0.00E+00	1.41E+08
03170001018	0.00E+00	1.41E+08
03170001019	0.00E+00	1.41E+08
03170001020	2.87E+07	1.41E+08

POINT SOURCES FOR EACH SUBWATERSHED (Point Sources\Loads)

	Cattle in Streams		Septic Tanks		Dischargers		Fresh Water	Total		Total Input	
	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)
03170001021	5.44E-04	2.08E+10	4.58E-02	4.66E+08	3.56E-01	1.00E+09	0.00E+00	4.02E-01	2.22E+10	0.00E+00	0.00E+00
03170001022	6.33E-04	2.42E+10	5.35E-02	5.44E+08	1.34E+00	3.90E+09	0.00E+00	1.40E+00	2.86E+10	0.00E+00	9.11E+10
03170001023	2.70E-04	1.03E+10	2.28E-02	2.32E+08	2.01E-02	9.10E+06	0.00E+00	4.31E-02	1.06E+10	0.00E+00	0.00E+00
03170001024	7.78E-06	2.97E+08	6.62E-04	6.73E+06	0.00E+00	0.00E+00	0.00E+00	6.70E-04	3.04E+08	0.00E+00	0.00E+00
03170001025	4.02E-04	1.54E+10	3.39E-02	3.45E+08	0.00E+00	0.00E+00	0.00E+00	3.43E-02	1.57E+10	0.00E+00	0.00E+00
03170001026	3.50E-04	1.34E+10	2.95E-02	3.00E+08	0.00E+00	0.00E+00	0.00E+00	2.98E-02	1.37E+10	0.00E+00	0.00E+00
03170002002	1.42E-04	5.42E+09	2.00E-02	2.04E+08	0.00E+00	0.00E+00	0.00E+00	2.01E-02	5.62E+09	0.00E+00	5.62E+09
03170002003	2.35E-04	8.98E+09	4.04E-02	4.12E+08	0.00E+00	0.00E+00	0.00E+00	4.07E-02	9.39E+09	0.00E+00	0.00E+00
03170002004	4.02E-04	1.54E+10	5.82E-02	5.92E+08	5.36E-02	4.40E+08	0.00E+00	1.12E-01	1.64E+10	1.53E-01	2.58E+10

LANDUSE AREAS (for verification purposes only)

SUBSHED	CROPLAND	FOREST	URBAN	PASTURE	TOTAL
03170001021	274	20994	226	7826	**15382**
03170001022	823	24564	303	8832	**39391**
03170001023	52	12107	129	2060	**53540**
03170001024	0	379	0	46	**80090**
03170001025	459	15677	685	4726	**23791**
03170001026	817	12587	790	4827	**19022**
03170002002	0	11877	389	3840	**16106**
03170002003	0	9652	0	3394	**13047**
03170002004	7	32057	260	10200	**42523**
TOTAL	**2432**	**139895**	**2782**	**45751**	**190860**

SCENARIOS

Source	% Reduced*
Cattle Access	0
Septic Failure	0
Pastureland	0

* Changing the % Reduced will change only the values on this sheet

Dischargers Effluent Concetration Level = est high
(enter concentration used for current run,
i.e. estimated for modeling period, maximum currently permitted, maximum reccommended permitted, etc…)

PASTURELAND AND CROPLAND - ACCUM (Data Editor\PERLND\PQAL\Monthly Input\MON-ACCUM)

Monthly Input - ACCUM

	03170001021		03170001022		03170001023		03170001024		03170001025	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	1.31E+09	3.52E+07	1.35E+09	3.52E+07	2.44E+09	3.52E+07	3.12E+09	#DIV/0!	1.59E+09	3.52E+07
February	1.31E+09	3.52E+07	1.35E+09	3.52E+07	2.45E+09	3.52E+07	3.13E+09	#DIV/0!	1.60E+09	3.52E+07
March	1.31E+09	3.52E+07	1.35E+09	3.52E+07	2.44E+09	3.52E+07	3.12E+09	#DIV/0!	1.59E+09	3.52E+07
April	2.56E+09	3.52E+07	2.63E+09	3.52E+07	4.80E+09	3.52E+07	6.15E+09	#DIV/0!	3.12E+09	3.52E+07
May	2.51E+09	3.52E+07	2.59E+09	3.52E+07	4.72E+09	3.52E+07	6.05E+09	#DIV/0!	3.07E+09	3.52E+07
June	2.45E+09	3.52E+07	2.52E+09	3.52E+07	4.59E+09	3.52E+07	5.88E+09	#DIV/0!	2.99E+09	3.52E+07
July	2.41E+09	3.52E+07	2.48E+09	3.52E+07	4.52E+09	3.52E+07	5.78E+09	#DIV/0!	2.94E+09	3.52E+07
August	2.41E+09	3.52E+07	2.48E+09	3.52E+07	4.52E+09	3.52E+07	5.78E+09	#DIV/0!	2.94E+09	3.52E+07
September	2.53E+09	3.52E+07	2.61E+09	3.52E+07	4.75E+09	3.52E+07	6.08E+09	#DIV/0!	3.09E+09	3.52E+07
October	2.48E+09	3.52E+07	2.56E+09	3.52E+07	4.66E+09	3.52E+07	5.96E+09	#DIV/0!	3.03E+09	3.52E+07
November	1.31E+09	3.52E+07	1.35E+09	3.52E+07	2.44E+09	3.52E+07	3.12E+09	#DIV/0!	1.59E+09	3.52E+07
December	1.29E+09	3.52E+07	1.33E+09	3.52E+07	2.41E+09	3.52E+07	3.08E+09	#DIV/0!	1.58E+09	3.52E+07

	03170001026		03170002002		03170002003		03170002004	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	1.36E+09	3.52E+07	7.13E+08	#DIV/0!	1.47E+09	#DIV/0!	7.51E+08	3.52E+07
February	1.37E+09	3.52E+07	7.17E+08	#DIV/0!	1.49E+09	#DIV/0!	7.54E+08	3.52E+07
March	1.36E+09	3.52E+07	7.13E+08	#DIV/0!	1.47E+09	#DIV/0!	7.51E+08	3.52E+07
April	2.67E+09	3.52E+07	1.69E+09	#DIV/0!	3.01E+09	#DIV/0!	1.72E+09	3.52E+07
May	2.62E+09	3.52E+07	1.65E+09	#DIV/0!	2.95E+09	#DIV/0!	1.69E+09	3.52E+07
June	2.55E+09	3.52E+07	1.64E+09	#DIV/0!	2.73E+09	#DIV/0!	1.69E+09	3.52E+07
July	2.51E+09	3.52E+07	1.61E+09	#DIV/0!	2.68E+09	#DIV/0!	1.66E+09	3.52E+07
August	2.51E+09	3.52E+07	1.61E+09	#DIV/0!	2.68E+09	#DIV/0!	1.66E+09	3.52E+07
September	2.64E+09	3.52E+07	1.67E+09	#DIV/0!	2.92E+09	#DIV/0!	1.71E+09	3.52E+07
October	2.59E+09	3.52E+07	1.63E+09	#DIV/0!	2.85E+09	#DIV/0!	1.67E+09	3.52E+07
November	1.36E+09	3.52E+07	7.14E+08	#DIV/0!	1.48E+09	#DIV/0!	7.52E+08	3.52E+07
December	1.35E+09	3.52E+07	7.06E+08	#DIV/0!	1.42E+09	#DIV/0!	7.45E+08	3.52E+07

PASTURELAND AND CROPLAND - SQOLIM (Data Editor\PERLND\PQAL\Monthly Input\MON-SQOLIM)

Monthly Input - SQOLIM

	03170001021		03170001022		03170001023		03170001024		03170001025	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	5.22E+09	1.41E+08	5.38E+09	1.41E+08	9.74E+09	1.41E+08	1.25E+10	#DIV/0!	6.37E+09	1.41E+08
February	5.25E+09	1.41E+08	5.41E+09	1.41E+08	9.79E+09	1.41E+08	1.25E+10	#DIV/0!	6.40E+09	1.41E+08
March	5.22E+09	1.41E+08	5.38E+09	1.41E+08	9.74E+09	1.41E+08	1.25E+10	#DIV/0!	6.37E+09	1.41E+08
April	1.02E+10	1.41E+08	1.05E+10	1.41E+08	1.92E+10	1.41E+08	2.46E+10	#DIV/0!	1.25E+10	1.41E+08
May	1.01E+10	1.41E+08	1.04E+10	1.41E+08	1.89E+10	1.41E+08	2.42E+10	#DIV/0!	1.23E+10	1.41E+08
June	9.79E+09	1.41E+08	1.01E+10	1.41E+08	1.84E+10	1.41E+08	2.35E+10	#DIV/0!	1.20E+10	1.41E+08
July	9.63E+09	1.41E+08	9.92E+09	1.41E+08	1.81E+10	1.41E+08	2.31E+10	#DIV/0!	1.18E+10	1.41E+08
August	9.63E+09	1.41E+08	9.92E+09	1.41E+08	1.81E+10	1.41E+08	2.31E+10	#DIV/0!	1.18E+10	1.41E+08
September	1.01E+10	1.41E+08	1.04E+10	1.41E+08	1.90E+10	1.41E+08	2.43E+10	#DIV/0!	1.24E+10	1.41E+08
October	9.93E+09	1.41E+08	1.02E+10	1.41E+08	1.86E+10	1.41E+08	2.39E+10	#DIV/0!	1.21E+10	1.41E+08
November	5.23E+09	1.41E+08	5.39E+09	1.41E+08	9.76E+09	1.41E+08	1.25E+10	#DIV/0!	6.38E+09	1.41E+08
December	5.18E+09	1.41E+08	5.33E+09	1.41E+08	9.65E+09	1.41E+08	1.23E+10	#DIV/0!	6.31E+09	1.41E+08

	03170001026		03170002002		03170002003		03170002004	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	5.45E+09	1.41E+08	2.85E+09	#DIV/0!	5.88E+09	#DIV/0!	3.00E+09	1.41E+08
February	5.47E+09	1.41E+08	2.87E+09	#DIV/0!	5.98E+09	#DIV/0!	3.02E+09	1.41E+08
March	5.45E+09	1.41E+08	2.85E+09	#DIV/0!	5.88E+09	#DIV/0!	3.00E+09	1.41E+08
April	1.07E+10	1.41E+08	6.75E+09	#DIV/0!	1.20E+10	#DIV/0!	6.90E+09	1.41E+08
May	1.05E+10	1.41E+08	6.62E+09	#DIV/0!	1.18E+10	#DIV/0!	6.77E+09	1.41E+08
June	1.02E+10	1.41E+08	6.57E+09	#DIV/0!	1.09E+10	#DIV/0!	6.75E+09	1.41E+08
July	1.00E+10	1.41E+08	6.45E+09	#DIV/0!	1.07E+10	#DIV/0!	6.63E+09	1.41E+08
August	1.00E+10	1.41E+08	6.45E+09	#DIV/0!	1.07E+10	#DIV/0!	6.63E+09	1.41E+08
September	1.06E+10	1.41E+08	6.69E+09	#DIV/0!	1.17E+10	#DIV/0!	6.85E+09	1.41E+08
October	1.04E+10	1.41E+08	6.54E+09	#DIV/0!	1.14E+10	#DIV/0!	6.70E+09	1.41E+08
November	5.45E+09	1.41E+08	2.86E+09	#DIV/0!	5.91E+09	#DIV/0!	3.01E+09	1.41E+08
December	5.40E+09	1.41E+08	2.82E+09	#DIV/0!	5.70E+09	#DIV/0!	2.98E+09	1.41E+08

URBAN AND FOREST - ACQOP & SQOLIM (Data Editor\PERLND\PQAL\QUAL-INPUT\ACQOP & SQOLIM)

ACQOP for all months

	Urb & Bar	For & Wet
03170001021	7.18E+06	3.52E+07
03170001022	7.18E+06	3.52E+07
03170001023	7.18E+06	3.52E+07
03170001024	0.00E+00	3.52E+07
03170001025	7.18E+06	3.52E+07
03170001026	7.18E+06	3.52E+07
03170002002	7.18E+06	3.52E+07
03170002003	0.00E+00	3.52E+07
03170002004	7.18E+06	3.52E+07

SQOLIM for all months

	Urb & Bar	For & Wet
03170001021	2.87E+07	1.41E+08
03170001022	2.87E+07	1.41E+08
03170001023	2.87E+07	1.41E+08
03170001024	0.00E+00	1.41E+08
03170001025	2.87E+07	1.41E+08
03170001026	2.87E+07	1.41E+08
03170002002	2.87E+07	1.41E+08
03170002003	0.00E+00	1.41E+08
03170002004	2.87E+07	1.41E+08

POINT SOURCES FOR EACH SUBWATERSHED (Point Sources\Loads)

	Cattle in Streams		Septic Tanks		Dischargers		Fresh Water	Total		Total Input	
	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)
03170002005	5.86E-04	2.24E+10	9.20E-02	9.36E+08	0.00E+00	0.00E+00	0.00E+00	9.26E-02	2.33E+10	0.00E+00	2.33E+10
03170002006	1.01E-04	3.86E+09	1.68E-02	1.71E+08	0.00E+00	0.00E+00	0.00E+00	1.69E-02	4.03E+09	3.07E-01	4.95E+10
03170002007	1.45E-04	5.53E+09	2.40E-02	2.44E+08	0.00E+00	0.00E+00	0.00E+00	2.42E-02	5.77E+09	0.00E+00	0.00E+00
03170002008	2.61E-05	9.98E+08	4.33E-03	4.41E+07	0.00E+00	0.00E+00	0.00E+00	4.36E-03	1.04E+09	0.00E+00	0.00E+00
03170002009	5.61E-05	2.14E+09	9.28E-03	9.44E+07	0.00E+00	0.00E+00	0.00E+00	9.33E-03	2.24E+09	0.00E+00	0.00E+00
03170002010	1.74E-04	6.63E+09	4.22E-02	4.29E+08	0.00E+00	0.00E+00	0.00E+00	4.24E-02	7.06E+09	0.00E+00	0.00E+00
03170002011	3.48E-04	1.33E+10	1.13E-01	1.15E+09	0.00E+00	0.00E+00	0.00E+00	1.14E-01	1.45E+10	0.00E+00	0.00E+00
03170002012	3.64E-04	1.39E+10	9.57E-02	9.74E+08	0.00E+00	0.00E+00	0.00E+00	9.60E-02	1.49E+10	0.00E+00	0.00E+00
03170002013	1.12E-04	4.29E+09	1.87E-02	1.90E+08	0.00E+00	0.00E+00	0.00E+00	1.88E-02	4.48E+09	0.00E+00	4.48E+09

LANDUSE AREAS (for verification purposes only)

SUBSHED	CROPLAND	FOREST	URBAN	PASTURE	TOTAL
03170002005	15	56050	96	19247	**15382**
03170002006	11	11132	7	2990	**39391**
03170002007	12	16131	0	4071	**53540**
03170002008	0	3338	0	338	**80090**
03170002009	0	6045	12	1824	**23791**
03170002010	0	16777	34	6886	**23698**
03170002011	48	33356	33	13244	**46681**
03170002012	794	36030	194	12699	**49717**
03170002013	0	11492	0	4344	**15837**
TOTAL	**880**	**190351**	**376**	**65645**	**257252**

SCENARIOS

Source	% Reduced*
Cattle Access	0
Septic Failure	0
Pastureland	0

* Changing the % Reduced will change only the values on this sheet

Dischargers Effluent Concetration Level = est high
(enter concentration used for current run,
i.e. estimated for modeling period, maximum currently permitted, maximum reccommended permitted, etc…)

PASTURELAND AND CROPLAND - ACCUM (Data Editor\PERLND\PQAL\Monthly Input\MON-ACCUM)

Monthly Input - ACCUM

	03170002005		03170002006		03170002007		03170002008		03170002009	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	6.12E+08	3.52E+07	6.92E+08	3.52E+07	7.26E+08	3.52E+07	1.54E+09	#DIV/0!	6.33E+08	#DIV/0!
February	6.17E+08	3.52E+07	7.00E+08	3.52E+07	7.34E+08	3.52E+07	1.55E+09	#DIV/0!	6.40E+08	#DIV/0!
March	6.12E+08	3.52E+07	6.92E+08	3.52E+07	7.26E+08	3.52E+07	1.54E+09	#DIV/0!	6.33E+08	#DIV/0!
April	9.82E+08	3.52E+07	8.25E+08	3.52E+07	8.65E+08	3.52E+07	1.84E+09	#DIV/0!	7.54E+08	#DIV/0!
May	9.68E+08	3.52E+07	8.18E+08	3.52E+07	8.59E+08	3.52E+07	1.83E+09	#DIV/0!	7.48E+08	#DIV/0!
June	9.22E+08	3.52E+07	7.38E+08	3.52E+07	7.74E+08	3.52E+07	1.64E+09	#DIV/0!	6.75E+08	#DIV/0!
July	9.11E+08	3.52E+07	7.34E+08	3.52E+07	7.70E+08	3.52E+07	1.63E+09	#DIV/0!	6.72E+08	#DIV/0!
August	9.11E+08	3.52E+07	7.34E+08	3.52E+07	7.70E+08	3.52E+07	1.63E+09	#DIV/0!	6.72E+08	#DIV/0!
September	9.62E+08	3.52E+07	7.97E+08	3.52E+07	8.36E+08	3.52E+07	1.78E+09	#DIV/0!	7.28E+08	#DIV/0!
October	9.48E+08	3.52E+07	7.91E+08	3.52E+07	8.30E+08	3.52E+07	1.76E+09	#DIV/0!	7.23E+08	#DIV/0!
November	6.14E+08	3.52E+07	6.95E+08	3.52E+07	7.29E+08	3.52E+07	1.54E+09	#DIV/0!	6.36E+08	#DIV/0!
December	6.03E+08	3.52E+07	6.79E+08	3.52E+07	7.12E+08	3.52E+07	1.51E+09	#DIV/0!	6.21E+08	#DIV/0!

	03170002010		03170002011		03170002012		03170002013	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	5.08E+08	#DIV/0!	5.10E+08	3.52E+07	5.69E+08	3.52E+07	5.38E+08	#DIV/0!
February	5.12E+08	#DIV/0!	5.12E+08	3.52E+07	5.72E+08	3.52E+07	5.44E+08	#DIV/0!
March	5.08E+08	#DIV/0!	5.10E+08	3.52E+07	5.69E+08	3.52E+07	5.38E+08	#DIV/0!
April	5.75E+08	#DIV/0!	5.44E+08	3.52E+07	6.35E+08	3.52E+07	6.40E+08	#DIV/0!
May	5.71E+08	#DIV/0!	5.43E+08	3.52E+07	6.32E+08	3.52E+07	6.35E+08	#DIV/0!
June	5.31E+08	#DIV/0!	5.22E+08	3.52E+07	5.92E+08	3.52E+07	5.74E+08	#DIV/0!
July	5.29E+08	#DIV/0!	5.21E+08	3.52E+07	5.90E+08	3.52E+07	5.71E+08	#DIV/0!
August	5.29E+08	#DIV/0!	5.21E+08	3.52E+07	5.90E+08	3.52E+07	5.71E+08	#DIV/0!
September	5.61E+08	#DIV/0!	5.38E+08	3.52E+07	6.22E+08	3.52E+07	6.18E+08	#DIV/0!
October	5.58E+08	#DIV/0!	5.36E+08	3.52E+07	6.19E+08	3.52E+07	6.14E+08	#DIV/0!
November	5.09E+08	#DIV/0!	5.10E+08	3.52E+07	5.70E+08	3.52E+07	5.40E+08	#DIV/0!
December	5.01E+08	#DIV/0!	5.07E+08	3.52E+07	5.62E+08	3.52E+07	5.28E+08	#DIV/0!

PASTURELAND AND CROPLAND - SQOLIM (Data Editor\PERLND\PQAL\Monthly Input\MON-SQOLIM)

Monthly Input - SQOLIM

	03170002005		03170002006		03170002007		03170002008		03170002009	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	2.45E+09	1.41E+08	2.77E+09	1.41E+08	2.91E+09	1.41E+08	6.15E+09	#DIV/0!	2.53E+09	#DIV/0!
February	2.47E+09	1.41E+08	2.80E+09	1.41E+08	2.94E+09	1.41E+08	6.22E+09	#DIV/0!	2.56E+09	#DIV/0!
March	2.45E+09	1.41E+08	2.77E+09	1.41E+08	2.91E+09	1.41E+08	6.15E+09	#DIV/0!	2.53E+09	#DIV/0!
April	3.93E+09	1.41E+08	3.30E+09	1.41E+08	3.46E+09	1.41E+08	7.36E+09	#DIV/0!	3.02E+09	#DIV/0!
May	3.87E+09	1.41E+08	3.27E+09	1.41E+08	3.43E+09	1.41E+08	7.30E+09	#DIV/0!	2.99E+09	#DIV/0!
June	3.69E+09	1.41E+08	2.95E+09	1.41E+08	3.10E+09	1.41E+08	6.57E+09	#DIV/0!	2.70E+09	#DIV/0!
July	3.64E+09	1.41E+08	2.94E+09	1.41E+08	3.08E+09	1.41E+08	6.53E+09	#DIV/0!	2.69E+09	#DIV/0!
August	3.64E+09	1.41E+08	2.94E+09	1.41E+08	3.08E+09	1.41E+08	6.53E+09	#DIV/0!	2.69E+09	#DIV/0!
September	3.85E+09	1.41E+08	3.19E+09	1.41E+08	3.34E+09	1.41E+08	7.10E+09	#DIV/0!	2.91E+09	#DIV/0!
October	3.79E+09	1.41E+08	3.16E+09	1.41E+08	3.32E+09	1.41E+08	7.05E+09	#DIV/0!	2.89E+09	#DIV/0!
November	2.46E+09	1.41E+08	2.78E+09	1.41E+08	2.92E+09	1.41E+08	6.17E+09	#DIV/0!	2.54E+09	#DIV/0!
December	2.41E+09	1.41E+08	2.71E+09	1.41E+08	2.85E+09	1.41E+08	6.02E+09	#DIV/0!	2.48E+09	#DIV/0!

	03170002010		03170002011		03170002012		03170002013	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	2.03E+09	#DIV/0!	2.04E+09	1.41E+08	2.27E+09	1.41E+08	2.15E+09	#DIV/0!
February	2.05E+09	#DIV/0!	2.05E+09	1.41E+08	2.29E+09	1.41E+08	2.18E+09	#DIV/0!
March	2.03E+09	#DIV/0!	2.04E+09	1.41E+08	2.27E+09	1.41E+08	2.15E+09	#DIV/0!
April	2.30E+09	#DIV/0!	2.18E+09	1.41E+08	2.54E+09	1.41E+08	2.56E+09	#DIV/0!
May	2.29E+09	#DIV/0!	2.17E+09	1.41E+08	2.53E+09	1.41E+08	2.54E+09	#DIV/0!
June	2.12E+09	#DIV/0!	2.09E+09	1.41E+08	2.37E+09	1.41E+08	2.29E+09	#DIV/0!
July	2.12E+09	#DIV/0!	2.08E+09	1.41E+08	2.36E+09	1.41E+08	2.28E+09	#DIV/0!
August	2.12E+09	#DIV/0!	2.08E+09	1.41E+08	2.36E+09	1.41E+08	2.28E+09	#DIV/0!
September	2.24E+09	#DIV/0!	2.15E+09	1.41E+08	2.49E+09	1.41E+08	2.47E+09	#DIV/0!
October	2.23E+09	#DIV/0!	2.14E+09	1.41E+08	2.48E+09	1.41E+08	2.46E+09	#DIV/0!
November	2.04E+09	#DIV/0!	2.04E+09	1.41E+08	2.28E+09	1.41E+08	2.16E+09	#DIV/0!
December	2.01E+09	#DIV/0!	2.03E+09	1.41E+08	2.25E+09	1.41E+08	2.11E+09	#DIV/0!

URBAN AND FOREST - ACQOP & SQOLIM (Data Editor\PERLND\PQAL\QUAL-INPUT\ACQOP & SQOLIM)

ACQOP for all months

	Urb & Bar	For & Wet
03170002005	7.18E+06	3.52E+07
03170002006	7.18E+06	3.52E+07
03170002007	0.00E+00	3.52E+07
03170002008	0.00E+00	3.52E+07
03170002009	7.18E+06	3.52E+07
03170002010	7.18E+06	3.52E+07
03170002011	7.18E+06	3.52E+07
03170002012	7.18E+06	3.52E+07
03170002013	0.00E+00	3.52E+07

SQOLIM for all months

	Urb & Bar	For & Wet
03170002005	2.87E+07	1.41E+08
03170002006	2.87E+07	1.41E+08
03170002007	0.00E+00	1.41E+08
03170002008	0.00E+00	1.41E+08
03170002009	2.87E+07	1.41E+08
03170002010	2.87E+07	1.41E+08
03170002011	2.87E+07	1.41E+08
03170002012	2.87E+07	1.41E+08
03170002013	0.00E+00	1.41E+08

POINT SOURCES FOR EACH SUBWATERSHED (Point Sources\Loads)

	Cattle in Streams		Septic Tanks		Dischargers		Fresh Water	Total		Total Input	
	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)
03170002014	1.81E-04	6.92E+09	2.60E-02	2.64E+08	0.00E+00	0.00E+00	0.00E+00	2.61E-02	7.18E+09	0.00E+00	7.18E+09
03170002015	4.87E-04	1.86E+10	6.80E-02	6.92E+08	3.49E+00	3.90E+08	0.00E+00	3.55E+00	1.97E+10	0.00E+00	1.97E+10
03170002016	8.11E-04	3.10E+10	1.19E-01	1.21E+09	2.12E+00	6.70E+09	0.00E+00	2.24E+00	3.89E+10	0.00E+00	3.89E+10
03170002017	2.54E-04	9.71E+09	4.22E-02	4.29E+08	0.00E+00	0.00E+00	0.00E+00	4.24E-02	1.01E+10	0.00E+00	1.01E+10
03170002018	2.78E-04	1.06E+10	4.61E-02	4.69E+08	1.55E-02	3.10E+06	0.00E+00	6.18E-02	1.11E+10	0.00E+00	0.00E+00
03170002019	2.88E-05	1.10E+09	4.77E-03	4.85E+07	0.00E+00	0.00E+00	0.00E+00	4.80E-03	1.15E+09	0.00E+00	1.22E+10
03170002020	2.48E-04	9.48E+09	4.12E-02	4.19E+08	0.00E+00	0.00E+00	0.00E+00	4.14E-02	9.89E+09	0.00E+00	9.89E+09
03170002021	3.96E-05	1.51E+09	6.57E-03	6.69E+07	0.00E+00	0.00E+00	0.00E+00	6.61E-03	1.58E+09	0.00E+00	3.92E+09
03170002022	5.87E-05	2.24E+09	9.77E-03	9.94E+07	0.00E+00	0.00E+00	0.00E+00	9.83E-03	2.34E+09	0.00E+00	0.00E+00

LANDUSE AREAS (for verification purposes only)

SUBSHED	CROPLAND	FOREST	URBAN	PASTURE	TOTAL
03170002014	0	15146	15	6496	**15382**
03170002015	74	37023	2648	16135	**39391**
03170002016	680	75881	1308	21498	**53540**
03170002017	29	27918	272	7189	**80090**
03170002018	307	29900	418	7849	**23791**
03170002019	168	3171	246	345	**3929**
03170002020	864	27161	651	5579	**34255**
03170002021	154	4647	0	765	**5567**
03170002022	50	6564	50	1556	**8220**
TOTAL	**2326**	**227411**	**5608**	**67412**	**302756**

SCENARIOS

Source	% Reduced*
Cattle Access	0
Septic Failure	0
Pastureland	0

* Changing the % Reduced will change only the values on this sheet

Dischargers Effluent Concetration Level = est high
(enter concentration used for current run,
i.e. estimated for modeling period, maximum currently permitted, maximum reccommended permitted, etc…)

PASTURELAND AND CROPLAND - ACCUM (Data Editor\PERLND\PQAL\Monthly Input\MON-ACCUM)

Monthly Input - ACCUM

	03170002014		03170002015		03170002016		03170002017		03170002018	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	5.48E+08	#DIV/0!	5.85E+08	3.52E+07	7.35E+08	3.52E+07	7.23E+08	3.52E+07	7.23E+08	3.52E+07
February	5.51E+08	#DIV/0!	5.88E+08	3.52E+07	7.39E+08	3.52E+07	7.30E+08	3.52E+07	7.30E+08	3.52E+07
March	5.48E+08	#DIV/0!	5.85E+08	3.52E+07	7.35E+08	3.52E+07	7.23E+08	3.52E+07	7.23E+08	3.52E+07
April	1.20E+09	#DIV/0!	1.39E+09	3.52E+07	1.48E+09	3.52E+07	8.61E+08	3.52E+07	8.61E+08	3.52E+07
May	1.18E+09	#DIV/0!	1.36E+09	3.52E+07	1.45E+09	3.52E+07	8.54E+08	3.52E+07	8.54E+08	3.52E+07
June	1.17E+09	#DIV/0!	1.36E+09	3.52E+07	1.43E+09	3.52E+07	7.70E+08	3.52E+07	7.70E+08	3.52E+07
July	1.15E+09	#DIV/0!	1.33E+09	3.52E+07	1.40E+09	3.52E+07	7.66E+08	3.52E+07	7.66E+08	3.52E+07
August	1.15E+09	#DIV/0!	1.33E+09	3.52E+07	1.40E+09	3.52E+07	7.66E+08	3.52E+07	7.66E+08	3.52E+07
September	1.19E+09	#DIV/0!	1.38E+09	3.52E+07	1.46E+09	3.52E+07	8.31E+08	3.52E+07	8.31E+08	3.52E+07
October	1.17E+09	#DIV/0!	1.35E+09	3.52E+07	1.43E+09	3.52E+07	8.25E+08	3.52E+07	8.25E+08	3.52E+07
November	5.49E+08	#DIV/0!	5.86E+08	3.52E+07	7.36E+08	3.52E+07	7.25E+08	3.52E+07	7.25E+08	3.52E+07
December	5.43E+08	#DIV/0!	5.80E+08	3.52E+07	7.26E+08	3.52E+07	7.08E+08	3.52E+07	7.08E+08	3.52E+07

	03170002019		03170002020		03170002021		03170002022	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	1.66E+09	3.52E+07	9.00E+08	3.52E+07	1.04E+09	3.52E+07	7.68E+08	3.52E+07
February	1.67E+09	3.52E+07	9.09E+08	3.52E+07	1.05E+09	3.52E+07	7.77E+08	3.52E+07
March	1.66E+09	3.52E+07	9.00E+08	3.52E+07	1.04E+09	3.52E+07	7.68E+08	3.52E+07
April	1.97E+09	3.52E+07	1.07E+09	3.52E+07	1.24E+09	3.52E+07	9.14E+08	3.52E+07
May	1.96E+09	3.52E+07	1.07E+09	3.52E+07	1.23E+09	3.52E+07	9.07E+08	3.52E+07
June	1.77E+09	3.52E+07	9.60E+08	3.52E+07	1.11E+09	3.52E+07	8.19E+08	3.52E+07
July	1.76E+09	3.52E+07	9.55E+08	3.52E+07	1.11E+09	3.52E+07	8.15E+08	3.52E+07
August	1.76E+09	3.52E+07	9.55E+08	3.52E+07	1.11E+09	3.52E+07	8.15E+08	3.52E+07
September	1.91E+09	3.52E+07	1.04E+09	3.52E+07	1.20E+09	3.52E+07	8.83E+08	3.52E+07
October	1.89E+09	3.52E+07	1.03E+09	3.52E+07	1.19E+09	3.52E+07	8.77E+08	3.52E+07
November	1.66E+09	3.52E+07	9.03E+08	3.52E+07	1.04E+09	3.52E+07	7.71E+08	3.52E+07
December	1.62E+09	3.52E+07	8.82E+08	3.52E+07	1.02E+09	3.52E+07	7.53E+08	3.52E+07

PASTURELAND AND CROPLAND - SQOLIM (Data Editor\PERLND\PQAL\Monthly Input\MON-SQOLIM)

Monthly Input - SQOLIM

	03170002014		03170002015		03170002016		03170002017		03170002018	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	2.19E+09	#DIV/0!	2.34E+09	1.41E+08	2.94E+09	1.41E+08	2.89E+09	1.41E+08	2.89E+09	1.41E+08
February	2.20E+09	#DIV/0!	2.35E+09	1.41E+08	2.96E+09	1.41E+08	2.92E+09	1.41E+08	2.92E+09	1.41E+08
March	2.19E+09	#DIV/0!	2.34E+09	1.41E+08	2.94E+09	1.41E+08	2.89E+09	1.41E+08	2.89E+09	1.41E+08
April	4.81E+09	#DIV/0!	5.55E+09	1.41E+08	5.92E+09	1.41E+08	3.44E+09	1.41E+08	3.44E+09	1.41E+08
May	4.72E+09	#DIV/0!	5.44E+09	1.41E+08	5.82E+09	1.41E+08	3.42E+09	1.41E+08	3.42E+09	1.41E+08
June	4.68E+09	#DIV/0!	5.43E+09	1.41E+08	5.70E+09	1.41E+08	3.08E+09	1.41E+08	3.08E+09	1.41E+08
July	4.59E+09	#DIV/0!	5.33E+09	1.41E+08	5.61E+09	1.41E+08	3.07E+09	1.41E+08	3.07E+09	1.41E+08
August	4.59E+09	#DIV/0!	5.33E+09	1.41E+08	5.61E+09	1.41E+08	3.07E+09	1.41E+08	3.07E+09	1.41E+08
September	4.77E+09	#DIV/0!	5.51E+09	1.41E+08	5.85E+09	1.41E+08	3.33E+09	1.41E+08	3.32E+09	1.41E+08
October	4.66E+09	#DIV/0!	5.38E+09	1.41E+08	5.73E+09	1.41E+08	3.30E+09	1.41E+08	3.30E+09	1.41E+08
November	2.20E+09	#DIV/0!	2.34E+09	1.41E+08	2.94E+09	1.41E+08	2.90E+09	1.41E+08	2.90E+09	1.41E+08
December	2.17E+09	#DIV/0!	2.32E+09	1.41E+08	2.90E+09	1.41E+08	2.83E+09	1.41E+08	2.83E+09	1.41E+08

	03170002019		03170002020		03170002021		03170002022	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	6.62E+09	1.41E+08	3.60E+09	1.41E+08	4.17E+09	1.41E+08	3.07E+09	1.41E+08
February	6.69E+09	1.41E+08	3.64E+09	1.41E+08	4.21E+09	1.41E+08	3.11E+09	1.41E+08
March	6.62E+09	1.41E+08	3.60E+09	1.41E+08	4.17E+09	1.41E+08	3.07E+09	1.41E+08
April	7.90E+09	1.41E+08	4.30E+09	1.41E+08	4.98E+09	1.41E+08	3.66E+09	1.41E+08
May	7.83E+09	1.41E+08	4.26E+09	1.41E+08	4.94E+09	1.41E+08	3.63E+09	1.41E+08
June	7.06E+09	1.41E+08	3.84E+09	1.41E+08	4.45E+09	1.41E+08	3.28E+09	1.41E+08
July	7.03E+09	1.41E+08	3.82E+09	1.41E+08	4.42E+09	1.41E+08	3.26E+09	1.41E+08
August	7.03E+09	1.41E+08	3.82E+09	1.41E+08	4.42E+09	1.41E+08	3.26E+09	1.41E+08
September	7.62E+09	1.41E+08	4.15E+09	1.41E+08	4.80E+09	1.41E+08	3.53E+09	1.41E+08
October	7.57E+09	1.41E+08	4.12E+09	1.41E+08	4.77E+09	1.41E+08	3.51E+09	1.41E+08
November	6.64E+09	1.41E+08	3.61E+09	1.41E+08	4.18E+09	1.41E+08	3.08E+09	1.41E+08
December	6.49E+09	1.41E+08	3.53E+09	1.41E+08	4.08E+09	1.41E+08	3.01E+09	1.41E+08

URBAN AND FOREST - ACQOP & SQOLIM (Data Editor\PERLND\PQAL\QUAL-INPUT\ACQOP & SQOLIM)

ACQOP for all months

	Urb & Bar	For & Wet
03170002014	7.18E+06	3.52E+07
03170002015	7.18E+06	3.52E+07
03170002016	7.18E+06	3.52E+07
03170002017	7.18E+06	3.52E+07
03170002018	7.18E+06	3.52E+07
03170002019	7.18E+06	3.52E+07
03170002020	7.18E+06	3.52E+07
03170002021	0.00E+00	3.52E+07
03170002022	7.18E+06	3.52E+07

SQOLIM for all months

	Urb & Bar	For & Wet
03170002014	2.87E+07	1.41E+08
03170002015	2.87E+07	1.41E+08
03170002016	2.87E+07	1.41E+08
03170002017	2.87E+07	1.41E+08
03170002018	2.87E+07	1.41E+08
03170002019	2.87E+07	1.41E+08
03170002020	2.87E+07	1.41E+08
03170002021	0.00E+00	1.41E+08
03170002022	2.87E+07	1.41E+08

POINT SOURCES FOR EACH SUBWATERSHED (Point Sources\Loads)

	Cattle in Streams		Septic Tanks		Dischargers		Fresh Water	Total		Total Input	
	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Flow (cfs)	Fecal (#/hr)	Flow (cfs)	Fecal (#/hr)
03170002023	1.22E-03	4.68E+10	1.59E-01	1.62E+09	0.00E+00	0.00E+00	6.00E+00	6.16E+00	4.84E+10	0.00E+00	4.84E+10
03170002024	6.78E-05	2.59E+09	1.12E-02	1.14E+08	2.30E-03	2.40E+07	0.00E+00	1.36E-02	2.73E+09	0.00E+00	2.99E+10
03170002025	2.93E-04	1.12E+10	4.44E-02	4.51E+08	0.00E+00	0.00E+00	0.00E+00	4.47E-02	1.17E+10	0.00E+00	0.00E+00
03170002026	3.90E-04	1.49E+10	5.96E-02	6.06E+08	0.00E+00	0.00E+00	0.00E+00	6.00E-02	1.55E+10	0.00E+00	0.00E+00
03170002027	3.14E-04	1.20E+10	4.39E-02	4.47E+08	0.00E+00	0.00E+00	0.00E+00	4.42E-02	1.25E+10	0.00E+00	1.25E+10
03170003001	2.63E-04	1.00E+10	5.28E-02	5.37E+08	0.00E+00	0.00E+00	0.00E+00	5.31E-02	1.06E+10	0.00E+00	1.06E+10
03170003002	1.00E-03	3.83E+10	1.57E-01	1.60E+09	1.13E+00	2.30E+08	0.00E+00	1.28E+00	4.02E+10	1.40E+00	7.13E+10
03170003003	4.45E-05	1.70E+09	6.20E-03	6.31E+07	0.00E+00	0.00E+00	0.00E+00	6.24E-03	1.76E+09	0.00E+00	1.76E+09
03170003004	7.85E-04	3.00E+10	1.10E-01	1.12E+09	0.00E+00	0.00E+00	0.00E+00	1.11E-01	3.11E+10	0.00E+00	0.00E+00

LANDUSE AREAS (for verification purposes only)

SUBSHED	CROPLAND	FOREST	URBAN	PASTURE	TOTAL
03170002023	1619	89811	448	24687	**15382**
03170002024	0	7678	128	1732	**39391**
03170002025	823	26824	330	6131	**53540**
03170002026	570	40127	290	6295	**80090**
03170002027	224	26454	312	9510	**23791**
03170003001	26009	33218	588	4244	**64059**
03170003002	114316	129775	1566	33545	**279201**
03170003003	2812	3656	44	1368	**7879**
03170003004	64333	71575	211	19385	**155504**
TOTAL	**210706**	**429118**	**3917**	**106896**	**750636**

SCENARIOS

Source	% Reduced*
Cattle Access	0
Septic Failure	0
Pastureland	0

* Changing the % Reduced will change only the values on this sheet

Dischargers Effluent Concetration Level = 200

(enter concentration used for current run, i.e. estimated for modeling period, maximum currently permitted, maximum reccommended permitted, etc…)

PASTURELAND AND CROPLAND - ACCUM (Data Editor\PERLND\PQAL\Monthly Input\MON-ACCUM)

Monthly Input - ACCUM

	03170002023		03170002024		03170002025		03170002026		03170002027	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	9.25E+08	3.52E+07	7.96E+08	#DIV/0!	9.15E+08	3.52E+07	1.18E+09	3.52E+07	6.38E+08	3.52E+07
February	9.27E+08	3.52E+07	8.05E+08	#DIV/0!	9.20E+08	3.52E+07	1.19E+09	3.52E+07	6.41E+08	3.52E+07
March	9.25E+08	3.52E+07	7.96E+08	#DIV/0!	9.15E+08	3.52E+07	1.18E+09	3.52E+07	6.38E+08	3.52E+07
April	1.54E+09	3.52E+07	9.49E+08	#DIV/0!	1.32E+09	3.52E+07	1.67E+09	3.52E+07	1.52E+09	3.52E+07
May	1.52E+09	3.52E+07	9.42E+08	#DIV/0!	1.31E+09	3.52E+07	1.65E+09	3.52E+07	1.49E+09	3.52E+07
June	1.50E+09	3.52E+07	8.49E+08	#DIV/0!	1.26E+09	3.52E+07	1.58E+09	3.52E+07	1.48E+09	3.52E+07
July	1.48E+09	3.52E+07	8.45E+08	#DIV/0!	1.24E+09	3.52E+07	1.57E+09	3.52E+07	1.45E+09	3.52E+07
August	1.48E+09	3.52E+07	8.45E+08	#DIV/0!	1.24E+09	3.52E+07	1.57E+09	3.52E+07	1.45E+09	3.52E+07
September	1.53E+09	3.52E+07	9.17E+08	#DIV/0!	1.30E+09	3.52E+07	1.64E+09	3.52E+07	1.51E+09	3.52E+07
October	1.51E+09	3.52E+07	9.10E+08	#DIV/0!	1.29E+09	3.52E+07	1.63E+09	3.52E+07	1.47E+09	3.52E+07
November	9.25E+08	3.52E+07	7.99E+08	#DIV/0!	9.17E+08	3.52E+07	1.18E+09	3.52E+07	6.39E+08	3.52E+07
December	9.19E+08	3.52E+07	7.81E+08	#DIV/0!	9.06E+08	3.52E+07	1.17E+09	3.52E+07	6.32E+08	3.52E+07

	03170003001		03170003002		03170003003		03170003004	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	1.25E+09	3.52E+07	5.86E+08	3.52E+07	6.27E+08	3.52E+07	7.73E+08	3.52E+07
February	1.26E+09	3.52E+07	5.89E+08	3.52E+07	6.29E+08	3.52E+07	7.77E+08	3.52E+07
March	1.25E+09	3.52E+07	5.86E+08	3.52E+07	6.27E+08	3.52E+07	7.73E+08	3.52E+07
April	1.97E+09	3.52E+07	1.06E+09	3.52E+07	1.49E+09	3.52E+07	1.85E+09	3.52E+07
May	1.95E+09	3.52E+07	1.04E+09	3.52E+07	1.46E+09	3.52E+07	1.81E+09	3.52E+07
June	1.80E+09	3.52E+07	1.02E+09	3.52E+07	1.45E+09	3.52E+07	1.80E+09	3.52E+07
July	1.78E+09	3.52E+07	1.01E+09	3.52E+07	1.43E+09	3.52E+07	1.77E+09	3.52E+07
August	1.78E+09	3.52E+07	1.01E+09	3.52E+07	1.43E+09	3.52E+07	1.77E+09	3.52E+07
September	1.92E+09	3.52E+07	1.05E+09	3.52E+07	1.48E+09	3.52E+07	1.83E+09	3.52E+07
October	1.89E+09	3.52E+07	1.03E+09	3.52E+07	1.44E+09	3.52E+07	1.79E+09	3.52E+07
November	1.25E+09	3.52E+07	5.87E+08	3.52E+07	6.27E+08	3.52E+07	7.74E+08	3.52E+07
December	1.22E+09	3.52E+07	5.80E+08	3.52E+07	6.22E+08	3.52E+07	7.67E+08	3.52E+07

PASTURELAND AND CROPLAND - SQOLIM (Data Editor\PERLND\PQAL\Monthly Input\MON-SQOLIM)

Monthly Input - SQOLIM

	03170002023		03170002024		03170002025		03170002026		03170002027	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	3.70E+09	1.41E+08	3.19E+09	#DIV/0!	3.66E+09	1.41E+08	4.73E+09	1.41E+08	2.55E+09	1.41E+08
February	3.71E+09	1.41E+08	3.22E+09	#DIV/0!	3.68E+09	1.41E+08	4.76E+09	1.41E+08	2.56E+09	1.41E+08
March	3.70E+09	1.41E+08	3.19E+09	#DIV/0!	3.66E+09	1.41E+08	4.73E+09	1.41E+08	2.55E+09	1.41E+08
April	6.18E+09	1.41E+08	3.80E+09	#DIV/0!	5.28E+09	1.41E+08	6.69E+09	1.41E+08	6.06E+09	1.41E+08
May	6.09E+09	1.41E+08	3.77E+09	#DIV/0!	5.23E+09	1.41E+08	6.62E+09	1.41E+08	5.95E+09	1.41E+08
June	6.00E+09	1.41E+08	3.40E+09	#DIV/0!	5.03E+09	1.41E+08	6.32E+09	1.41E+08	5.93E+09	1.41E+08
July	5.92E+09	1.41E+08	3.38E+09	#DIV/0!	4.98E+09	1.41E+08	6.26E+09	1.41E+08	5.82E+09	1.41E+08
August	5.92E+09	1.41E+08	3.38E+09	#DIV/0!	4.98E+09	1.41E+08	6.26E+09	1.41E+08	5.82E+09	1.41E+08
September	6.13E+09	1.41E+08	3.67E+09	#DIV/0!	5.21E+09	1.41E+08	6.58E+09	1.41E+08	6.02E+09	1.41E+08
October	6.04E+09	1.41E+08	3.64E+09	#DIV/0!	5.14E+09	1.41E+08	6.50E+09	1.41E+08	5.88E+09	1.41E+08
November	3.70E+09	1.41E+08	3.20E+09	#DIV/0!	3.67E+09	1.41E+08	4.74E+09	1.41E+08	2.55E+09	1.41E+08
December	3.68E+09	1.41E+08	3.12E+09	#DIV/0!	3.62E+09	1.41E+08	4.67E+09	1.41E+08	2.53E+09	1.41E+08

	03170003001		03170003002		03170003003		03170003004	
	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland	Pastureland	Cropland
January	4.99E+09	1.41E+08	2.34E+09	1.41E+08	2.51E+09	1.41E+08	3.09E+09	1.41E+08
February	5.04E+09	1.41E+08	2.36E+09	1.41E+08	2.52E+09	1.41E+08	3.11E+09	1.41E+08
March	4.99E+09	1.41E+08	2.34E+09	1.41E+08	2.51E+09	1.41E+08	3.09E+09	1.41E+08
April	7.90E+09	1.41E+08	4.24E+09	1.41E+08	5.94E+09	1.41E+08	7.38E+09	1.41E+08
May	7.79E+09	1.41E+08	4.18E+09	1.41E+08	5.83E+09	1.41E+08	7.24E+09	1.41E+08
June	7.21E+09	1.41E+08	4.09E+09	1.41E+08	5.82E+09	1.41E+08	7.22E+09	1.41E+08
July	7.12E+09	1.41E+08	4.03E+09	1.41E+08	5.71E+09	1.41E+08	7.08E+09	1.41E+08
August	7.12E+09	1.41E+08	4.03E+09	1.41E+08	5.71E+09	1.41E+08	7.08E+09	1.41E+08
September	7.68E+09	1.41E+08	4.19E+09	1.41E+08	5.90E+09	1.41E+08	7.33E+09	1.41E+08
October	7.56E+09	1.41E+08	4.12E+09	1.41E+08	5.77E+09	1.41E+08	7.16E+09	1.41E+08
November	5.01E+09	1.41E+08	2.35E+09	1.41E+08	2.51E+09	1.41E+08	3.10E+09	1.41E+08
December	4.88E+09	1.41E+08	2.32E+09	1.41E+08	2.49E+09	1.41E+08	3.07E+09	1.41E+08

URBAN AND FOREST - ACQOP & SQOLIM (Data Editor\PERLND\PQAL\QUAL-INPUT\ACQOP & SQOLIM)

ACQOP for all months

	Urb & Bar	For & Wet
03170002023	7.18E+06	3.52E+07
03170002024	7.18E+06	3.52E+07
03170002025	7.18E+06	3.52E+07
03170002026	7.18E+06	3.52E+07
03170002027	7.18E+06	3.52E+07
03170003001	7.18E+06	3.52E+07
03170003002	7.18E+06	3.52E+07
03170003003	7.18E+06	3.52E+07
03170003004	7.18E+06	3.52E+07

SQOLIM for all months

	Urb & Bar	For & Wet
03170002023	2.87E+07	1.41E+08
03170002024	2.87E+07	1.41E+08
03170002025	2.87E+07	1.41E+08
03170002026	2.87E+07	1.41E+08
03170002027	2.87E+07	1.41E+08
03170003001	2.87E+07	1.41E+08
03170003002	2.87E+07	1.41E+08
03170003003	2.87E+07	1.41E+08
03170003004	2.87E+07	1.41E+08

These data accessed from the following references are used in the remaining worksheets.

From ASAE

Animal	Total Manure prod (lb/day per 1,000 lb animal)	Typical Animal Mass (lb)	Manure prod per animal (lb/day)	Fecal Coliform (#/day E10 per 1,000 lb animal)	Fecal Coliform (#/day)	Manure prod (lb/yr)	Fecal Coliform (#/day)
Beef cow	40	794	32	13	1.03E+11	11587	5.71E+10
Dairy cow	86	1411	121	7.2	1.02E+11	44290	1.83E+11
Hog	84	134	11	8	1.08E+10	4123	1.08E+10
Sheep	40	60	2	20	1.19E+10	869	1.19E+10
Chicken	64	4	0	3.4	1.35E+08	93	1.35E+08
Broiler	85	2	0	3.4	6.75E+07	62	6.75E+07
Turkey	47	15	1	0.62	9.29E+07	257	9.29E+07
Duck	110	3	0	81	2.50E+09	124	2.50E+09

From Metcalf & Eddy

Estimated Fecal Coliform Production Rates by Animal

Animal	#/day	Reference
Cow	5.40E+09	Metcalf & Eddy, 1991 pg. 101
Hog	8.90E+09	Metcalf & Eddy, 1991
Sheep	1.80E+10	Metcalf & Eddy, 1991
Chicken	2.40E+08	Metcalf & Eddy, 1991
Turkey	1.30E+08	Metcalf & Eddy, 1991
Duck	1.10E+10	Metcalf & Eddy, 1991
Deer	5.00E+08	BPJ
Geese	4.90E+10	LIRPB, 1982

From: Horner, 1992

Fecal Coliform Loading Rates by Landuse

	median #/ha-y	#/acre/day
Road	1.80E+08	2.00E+05
Commercial	5.60E+09	6.21E+06
Single family low density	9.30E+09	1.03E+07
Single family high density	1.50E+10	1.66E+07
Multifamily residential	2.10E+10	2.33E+07

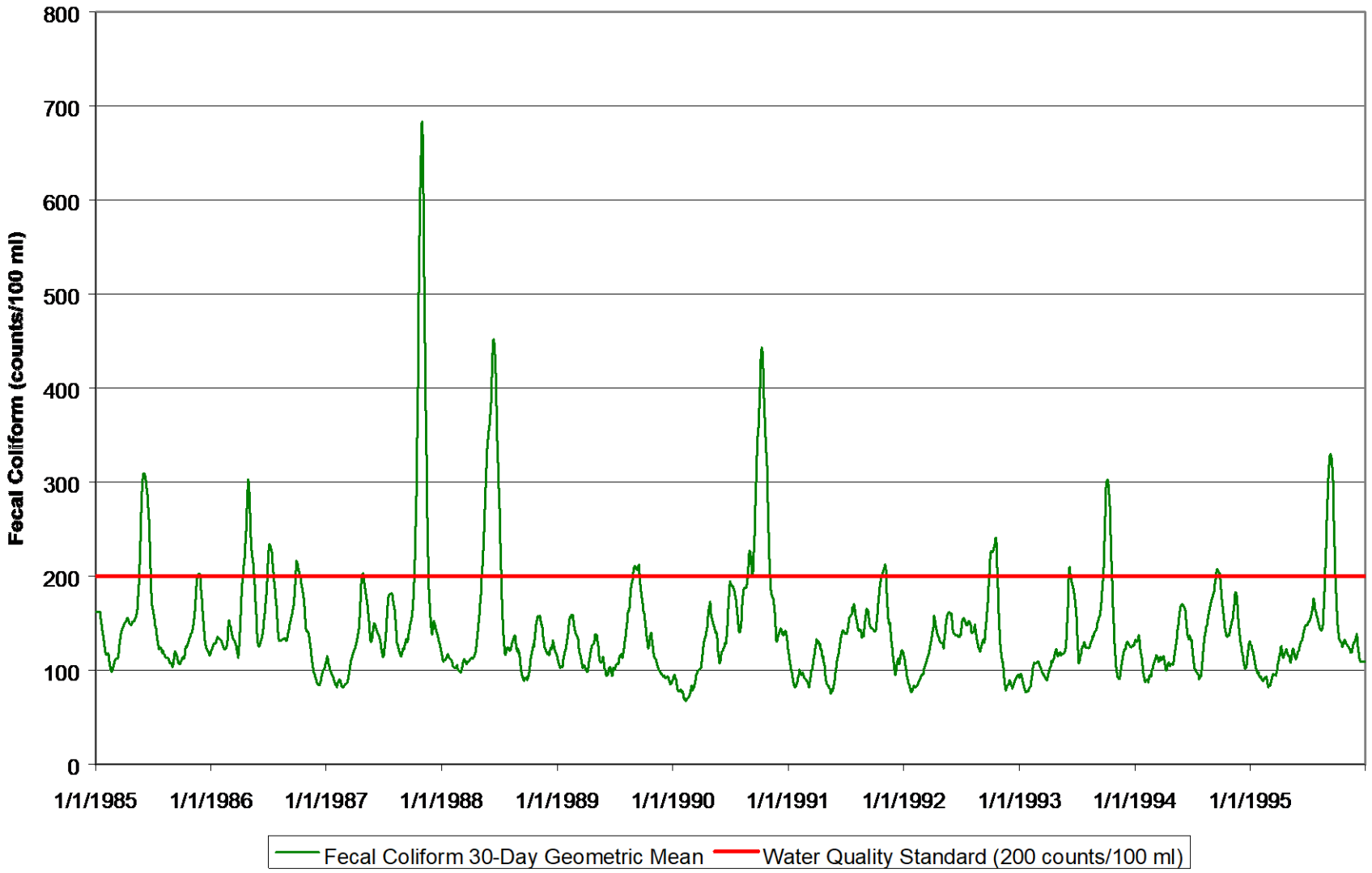
APPENDIX B

This appendix contains printouts of the various model run results. All fecal coliform graphs represent an 11-year time period, from January 1, 1985, to December 31, 1995. Graph B-1 shows the modeled fecal coliform 30-day geometric mean for the impaired segment with the current fecal coliform estimated loading. Graph B-2 shows the modeled fecal coliform 30-day geometric mean for the impaired segment with the reduction scenario estimated loading. Graphs B-3 and B-4 are similar to the previous graphs for the evaluated segment that is upstream of the impaired segment. Graphs B-5, B-6, and B-7 show the computer generated flow, in cubic feet per second, through the impaired segment compared to the actual USGS gage readings from the Chickasawhay River near Leakesville.

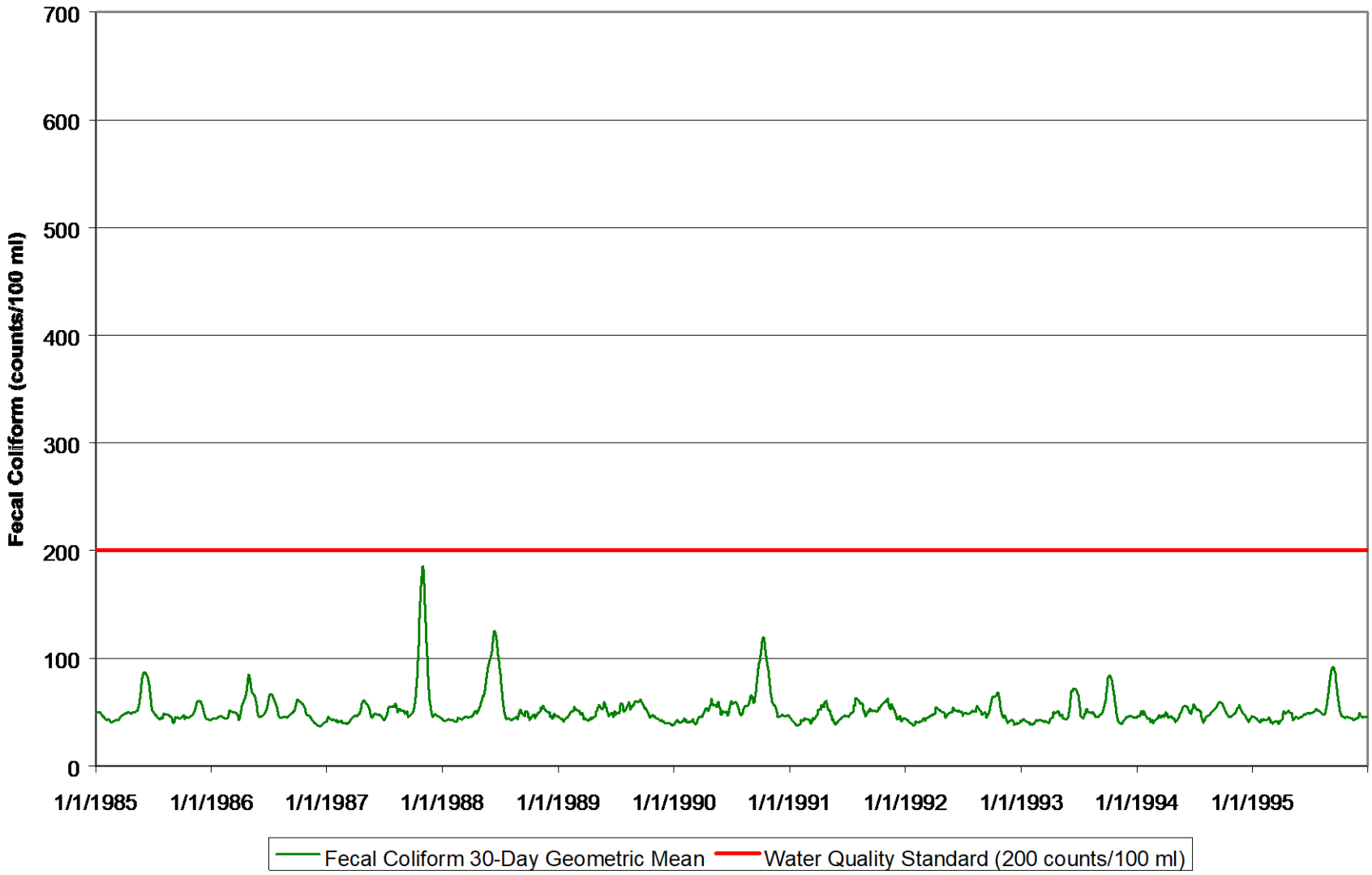
The TMDL calculated in this report represents the maximum fecal coliform load that can be assimilated by the waterbody segment during the critical 30-day period that will maintain water quality standards. The calculation of this TMDL is based on the critical hydrologic flow condition that occurred during the modeled time span. The graphs showing the 30-day geometric mean of instream fecal coliform concentrations representing the allocated loading scenario (Graph B2 and B4) were used to identify the critical condition. The TMDL calculation includes the sum of the loads from all identified point and nonpoint sources applied or discharged within the modeled watershed.

An individual TMDL calculation was prepared for each waterbody segment and drainage area included in this report. The numerical values for the wasteload allocation (point sources) and load allocation (nonpoint sources) for each waterbody segment or drainage area can be found on the waterbody segment identification pages at the beginning of this report.

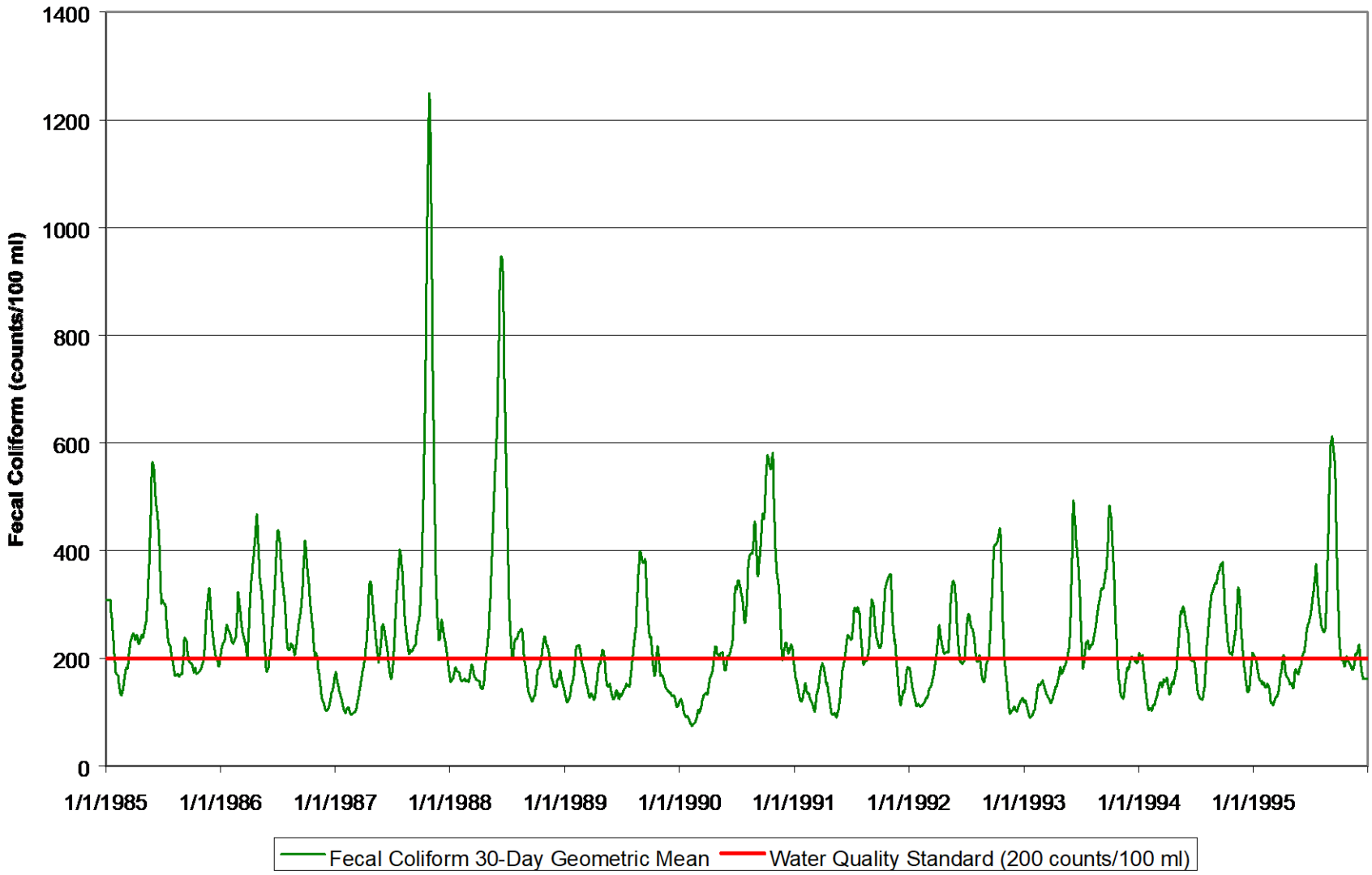
Graph B-1 Impaired Segment - Fecal Coliform Concentrations Under Existing Conditions



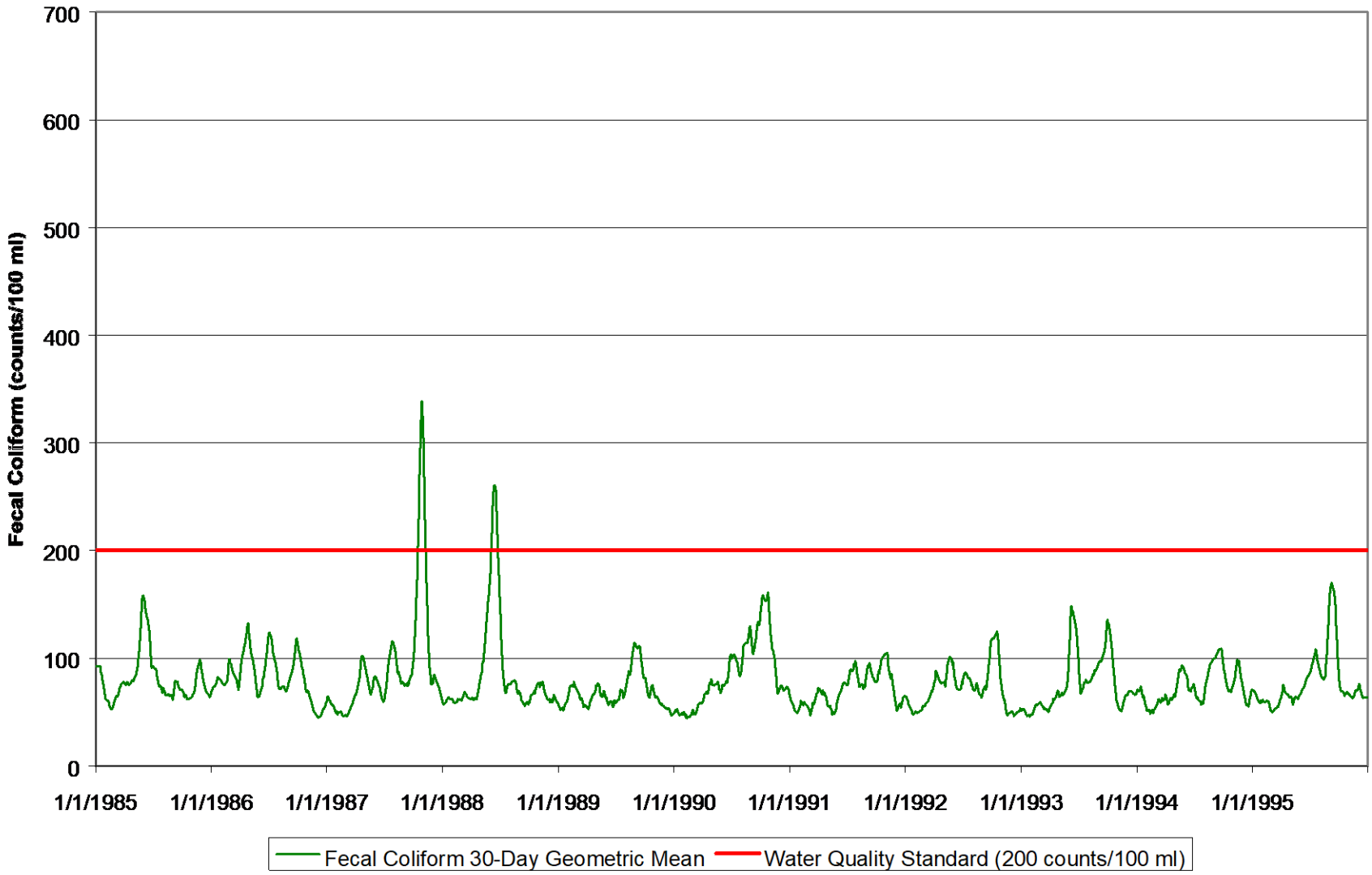
Graph B-2 Impaired Segment - Fecal Coliform Concentrations After Reduction Scenario



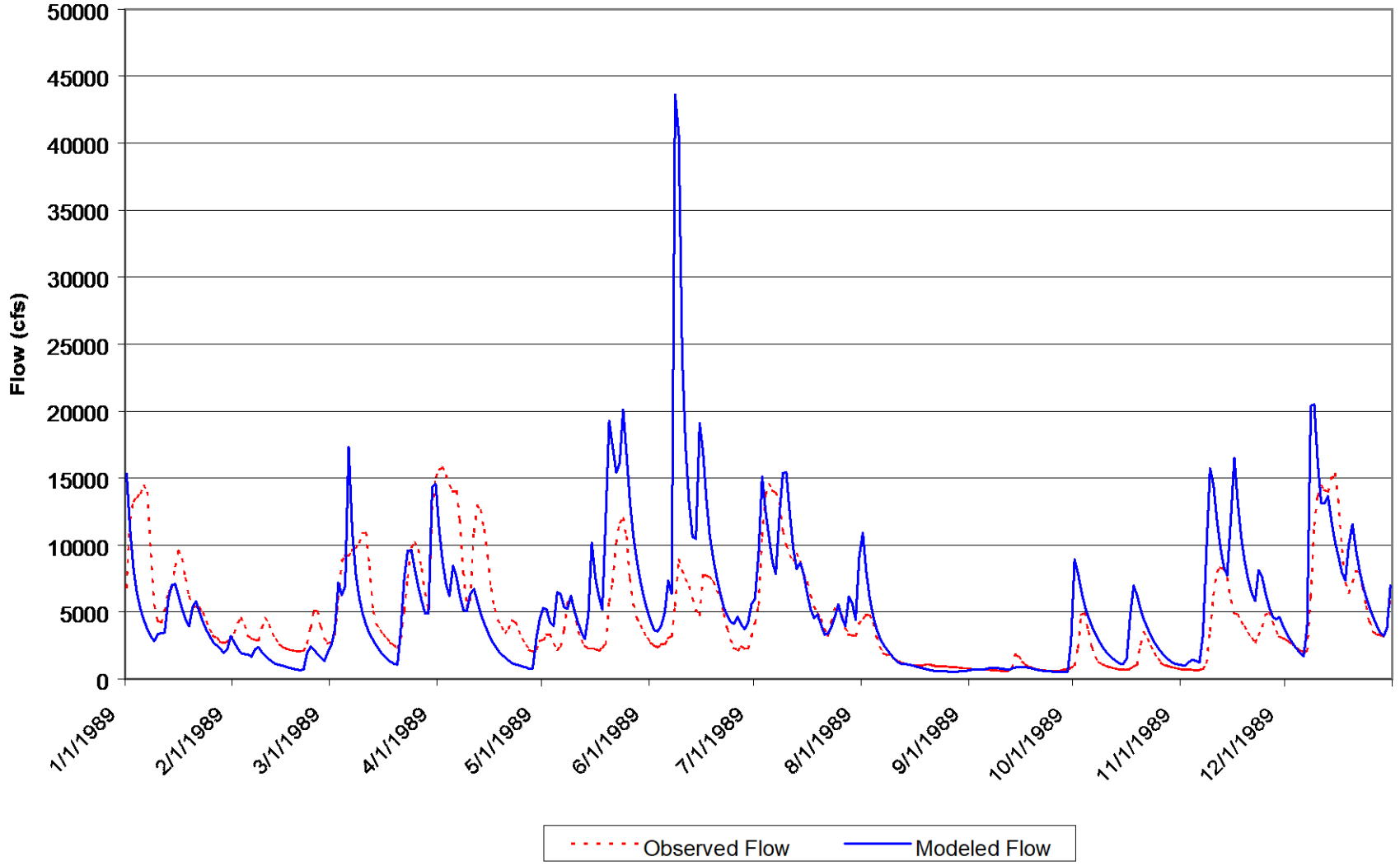
Graph B-3 Evaluated Segment - Fecal Coliform Concentrations Under Existing Conditions



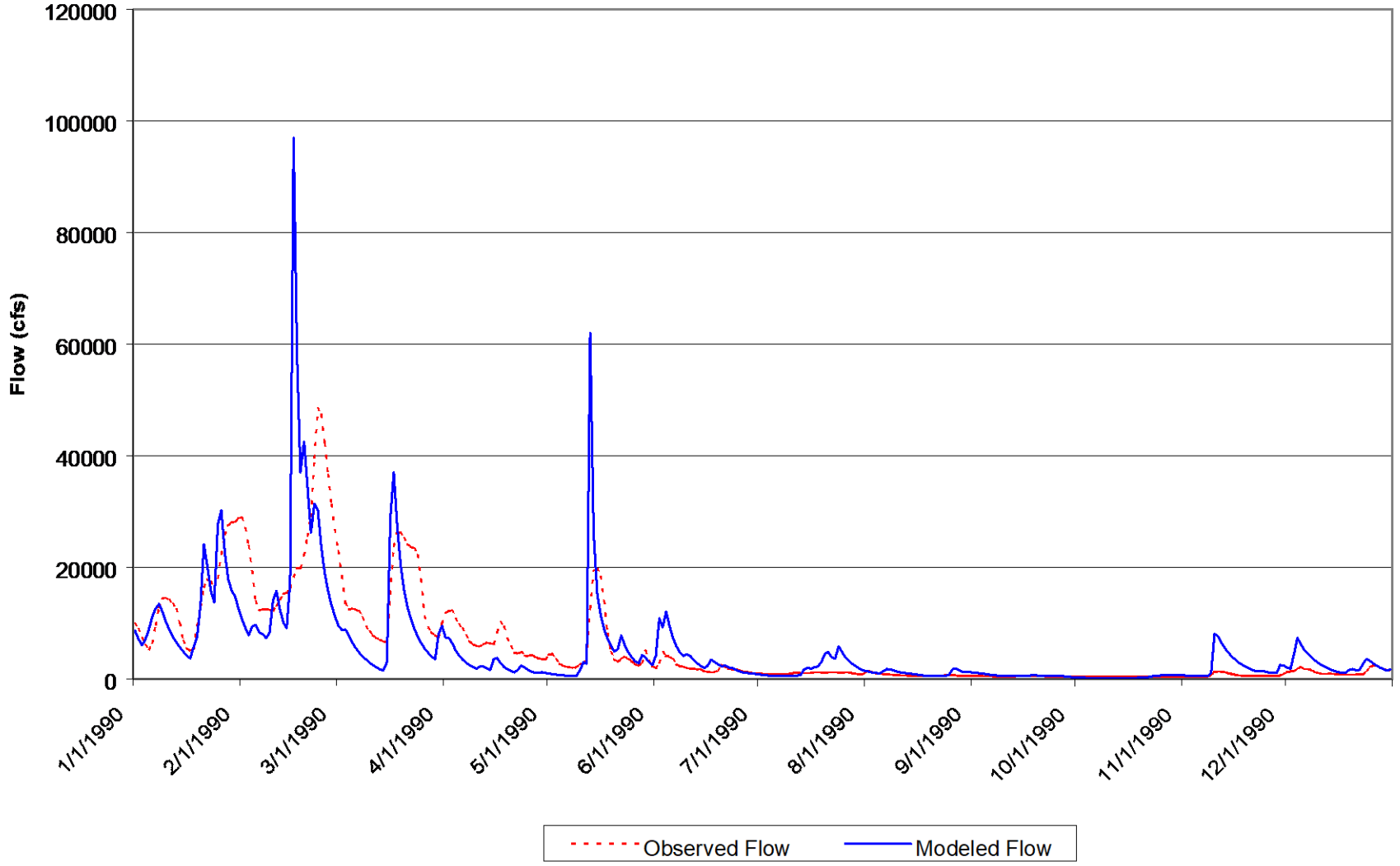
Graph B-4 Evaluated Segment - Fecal Coliform Concentrations After Reduction Scenario



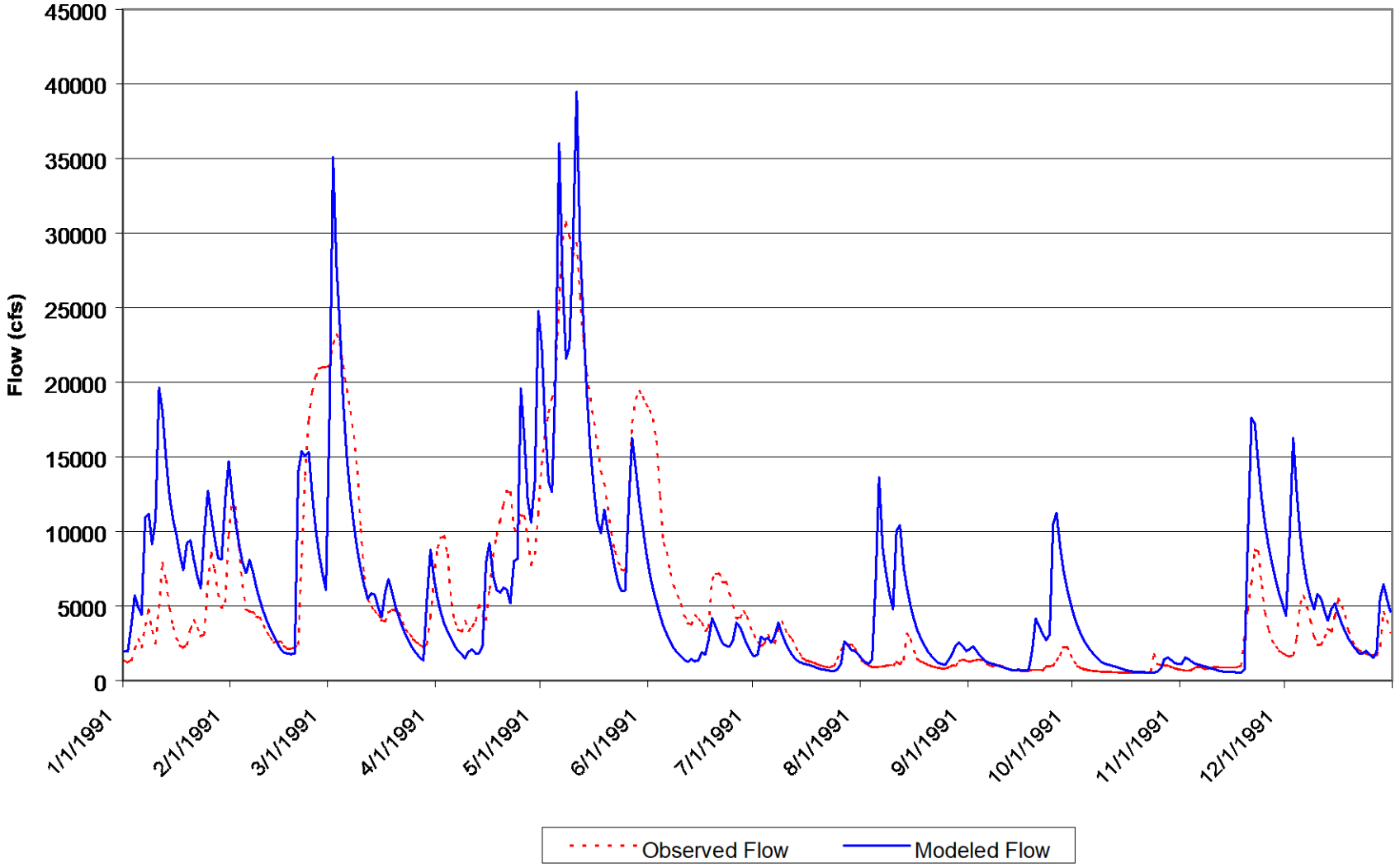
Graph B-5 Daily Flow Comparison between USGS Gage 02478500 and Impaired Segment for 1989



Graph B-6 Daily Flow Comparison between USGS Gage 02478500 and Impaired Segment for 1990



Graph B-7 Daily Flow Comparison between USGS Gage 02478500 and Impaired Segment for 1991



REFERENCES

Horner, 1992. Water Quality Criteria/Pollutant Loading Estimation/Treatment Effectiveness Estimation. In R.W. Beck and Associates. Covington Master Drainage Plan. King County Surface Water Management Division, Seattle, Wa.

Horsley & Whitten, Inc. 1996. Identification and Evaluation of Nutrient Bacterial Loadings to Maquoit Bay, Brunswick, and Freeport, Maine. Casco Bay Estuary Project.

Metccalf and Eddy. 1991. *Wastewater Engineering: Treatment, Disposal, Reuse*. 3rd Edition. McGraw-Hill, Inc., New York.

MDEQ. 1994. *Wastewater Regulations for National Pollutant Discharge Elimination System (NPDES) Permits, Underground Injection Control (UIC) Permits, State Permits, Water Quality Based Effluent Limitations and Water Quality Certification.* Office of Pollution Control.

MDEQ. 1995. *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Costal Waters*. Office of Pollution Control.

MDEQ. 1998. *Mississippi List of Waterbodies, Pursuant to Section 303(d) of the Clean Water Act*. Office of Pollution Control.

USEPA. 1998. *Better Assessment Science Integrating Point and Nonpoint Sources, BASINS, Version 2.0 User's Manual*. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

DEFINITIONS

Ambient stations: a network of fixed monitoring stations established for systematic water quality sampling at regular intervals, and for uniform parametric coverage over a long-term period.

Assimilative capacity: the capacity of a body of water or soil-plant system to receive wastewater effluents or sludge without violating the provisions of the State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters and Water Quality regulations.

Background: the condition of waters in the absence of man-induced alterations based on the best scientific information available to MDEQ. The establishment of natural background for an altered waterbody may be based upon a similar, unaltered or least impaired, waterbody or on historical pre-alteration data.

Calibrated model: a model in which reaction rates and inputs are significantly based on actual measurements using data from surveys on the receiving waterbody.

Critical Condition: hydrologic and atmospheric conditions in which the pollutants causing impairment of a waterbody have their greatest potential for adverse effects.

Daily discharge: the "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily average" is calculated as the average.

Designated Use: use specified in water quality standards for each waterbody or segment regardless of actual attainment.

Discharge monitoring report: report of effluent characteristics submitted by a NPDES Permitted facility.

Effluent standards and limitations: all State or Federal effluent standards and limitations on quantities, rates, and concentrations of chemical, physical, biological, and other constituents to which a waste or wastewater discharge may be subject under the Federal Act or the State law. This includes, but is not limited to, effluent limitations, standards of performance, toxic effluent standards and prohibitions, pretreatment standards, and schedules of compliance.

Effluent: treated wastewater flowing out of the treatment facilities.

Fecal coliform bacteria: a group of bacteria that normally live within the intestines of mammals, including humans. Fecal coliform bacteria are used as an indicator of the presence of pathogenic organisms in natural water.

Geometric mean: the *n*th root of the product of *n* numbers. A 30-day geometric mean is the 30^{th}

root of the product of 30 numbers.

Impaired Waterbody: any waterbody that does not attain water quality standards due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment.

Land Surface Runoff: water that flows into the receiving stream after application by rainfall or irrigation. It is a transport method for nonpoint source pollution from the land surface to the receiving stream.

Load allocation (LA): the portion of a receiving water's loading capacity attributed to or assigned to nonpoint sources (NPS) or background sources of a pollutant. The load allocation is the value assigned to the summation of all cattle and land applied fecal coliform that enter a receiving waterbody. It also contains a portion of the contribution from septic tanks.

Loading: the total amount of pollutants entering a stream from one or multiple sources.

Nonpoint Source: pollution that is in runoff from the land. Rainfall, snowmelt, and other water that does not evaporate become surface runoff and either drains into surface waters or soaks into the soil and finds its way into groundwater. This surface water may contain pollutants that come from land use activities such as agriculture; construction; silviculture; surface mining; disposal of wastewater; hydrologic modifications; and urban development.

NPDES permit: an individual or general permit issued by the Mississippi Environmental Quality Permit Board pursuant to regulations adopted by the Mississippi Commission on Environmental Quality under Mississippi Code Annotated (as amended) §§ 49-17-17 and 49-17-29 for discharges into State waters.

Point Source: pollution loads discharged at a specific location from pipes, outfalls, and conveyance channels from either wastewater treatment plants or industrial waste treatment facilities. Point sources can also include pollutant loads contributed by tributaries to the main receiving stream.

Pollution: contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the State, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance, or leak into any waters of the State, unless in compliance with a valid permit issued by the Permit Board.

Publicly Owned Treatment Works (POTW): a waste treatment facility owned and/or operated by a public body or a privately owned treatment works which accepts discharges which would otherwise be subject to Federal Pretreatment Requirements.

Scientific Notation (Exponential Notation): mathematical method in which very large numbers or very small numbers are expressed in a more concise form. The notation is based on powers of ten. Numbers in scientific notation are expressed as the following: *4.16 x 10^(+b)* and *4.16 x 10^(-b) [same as 4.16E4 or4.16E-4]*. In this case, *b* is always a positive, real number. The *10^(+b)* tells us that the decimal point is *b* places to the right of where it is shown. The *10^(-b)*

tells us that the decimal point is *b* places to the left of where it is shown.
For example: $2.7X10^{4} = 2.7E+4 = 27000$ and $2.7X10^{-4} = 2.7E-4 = 0.00027$.

Sigma (Σ): shorthand way to express taking the sum of a series of numbers. For example, the sum or total of three amounts 24, 123, 16, ($\mathbf{d}_1$, $\mathbf{d}_2$, $\mathbf{d}_3$) respectively could be shown as:

$$\sum_{i=1}^{3} d_i = d_1+d_2+d_3 = 24 + 123 + 16 = 163$$

Total Maximum Daily Load or TMDL: the calculated maximum permissible pollutant loading to a waterbody at which water quality standards can be maintained.

Regression Coefficient: an expression of the functional relationship between two correlated variables that is often empirically determined from data, and is used to predict values of one variable when given values of the other variable.

Waste: sewage, industrial wastes, oil field wastes, and all other liquid, gaseous, solid, radioactive, or other substances which may pollute or tend to pollute any waters of the State.

Wasteload allocation (WLA): the portion of a receiving water's loading capacity attributed to or assigned to point sources of a pollutant. It also contains a portion of the contribution from septic tanks

Water Quality Standards: the criteria and requirements set forth in *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters*. Water quality standards are standards composed of designated present and future most beneficial uses (classification of waters), the numerical and narrative criteria applied to the specific water uses or classification, and the Mississippi antidegradation policy.

Water quality criteria: elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports the present and future most beneficial uses.

Waters of the State: all waters within the jurisdiction of this State, including all streams, lakes, ponds, wetlands, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, situated wholly or partly within or bordering upon the State, and such coastal waters as are within the jurisdiction of the State, except lakes, ponds, or other surface waters which are wholly landlocked and privately owned, and which are not regulated under the Federal Clean Water Act (33 U.S.C.1251 et seq.).

Watershed: the area of land draining into a stream at a given location.

ABBREVIATIONS

7Q10.....Seven-Day Average Low Stream Flow with a Ten-Year Occurrence Period

BASINS ..... Better Assessment Science Integrating Point and Nonpoint Sources

BMP .....Best Management Practice

CWA .....Clean Water Act

DMR ..... Discharge Monitoring Report

EPA.....Environmental Protection Agency

GIS ..... Geographic Information System

HUC .....Hydrologic Unit Code

LA .....Load Allocation

MARIS..... State of Mississippi Automated Information System

MDEQ..... Mississippi Department of Environmental Quality

MOS..... Margin of Safety

NRCS .....National Resource Conservation Service

NPDES..... National Pollution Discharge Elimination System

NPSM.....Nonpoint Source Model

RF(3) ..... Reach File 3

USGS ..... United States Geological Survey

WLA .....Waste Load Allocation