FINAL

Total Maximum Daily Load (TMDL)
for
Buck Creek
Assessment Unit ID # AL03150201-0202-101
Pathogens (fecal coliform)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
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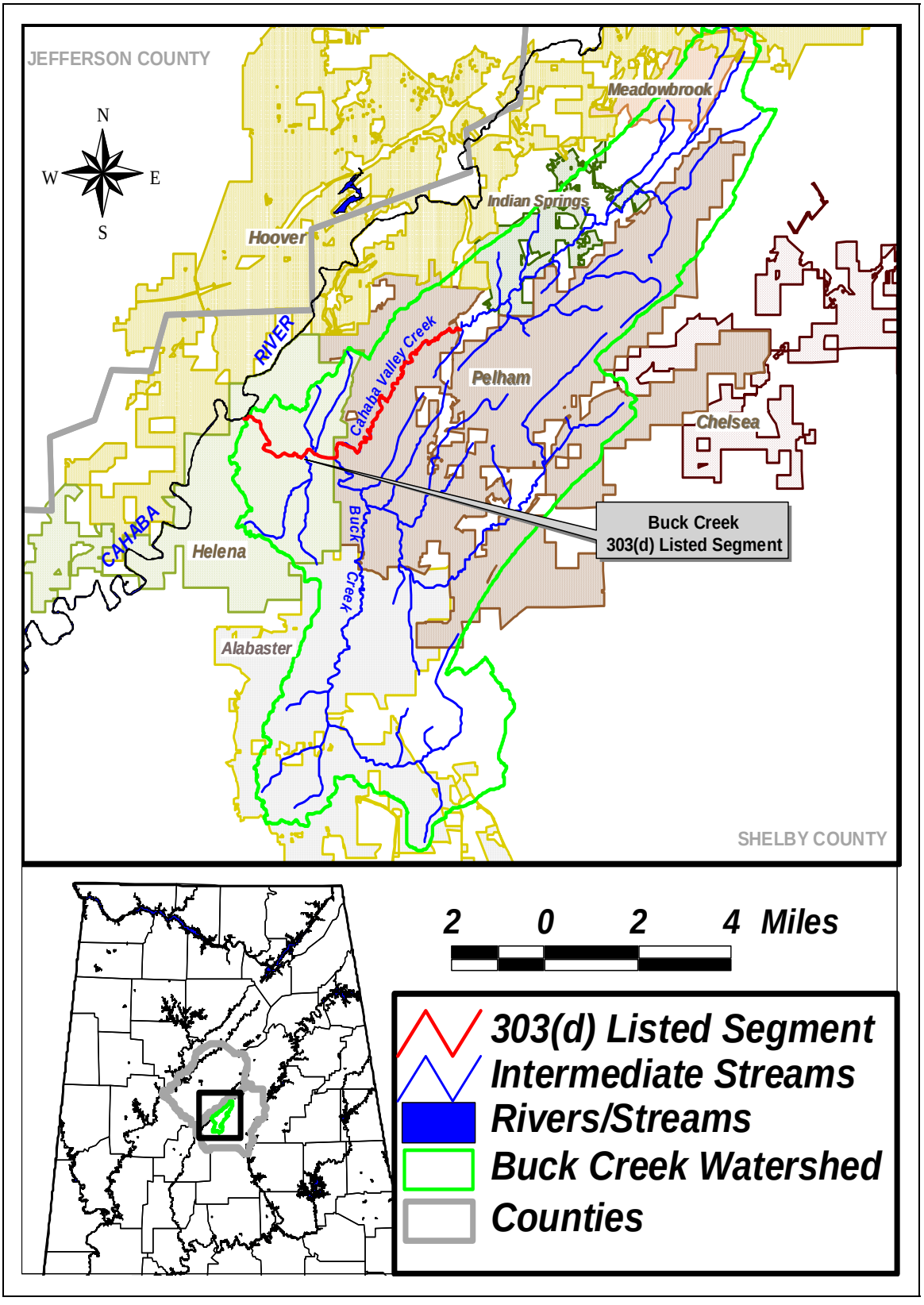
Figure I. §303(d) Listed Portion of Buck Creek in the Cahaba River Basin



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1.0 Executive Summary

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

Buck Creek is located in the Cahaba River basin in central Alabama. Buck Creek forms in western Shelby County and flows northwest into the Cahaba River staying on the western side of Shelby County. The pathogens listed portion of Buck Creek is from the Cahaba River upstream to Cahaba Valley Creek. This 2.9 mile segment was first placed on the State of Alabama's §303(d) use impairment list for pathogens in 2004. The source of the pathogens was listed as urban runoff/storm sewers. The listed segment of Buck Creek has the designated use classification of Fish and Wildlife (F&W). This segment of the Buck Creek also has a tributary, Cahaba Valley Creek, listed on the 2008 §303(d) list for pathogens. However, only the Buck Creek pathogen impairment will be addressed in this TMDL.

Data collected in 2003 by the Alabama Department of Environmental Management (ADEM) indicated Buck Creek was impaired by pathogens (fecal coliform). ADEM collected 16 samples at trend Station B-1 from March 2003 through October 2003. Four of those samples exceeded the 2000 colonies/100 mL single sample criterion for fecal coliform. Additionally, two out of two geometric mean concentrations in 2003 exceeded the 200 colonies/100 mL geometric mean criterion for fecal coliform. Trend Station B-1 was subsequently sampled by ADEM in 2004 through 2009 and only 1 out of 74 samples violated the singe sample criterion which was measured in January of 2009. In 2007, ADEM conducted follow-up intensive sampling on Buck Creek as part of Alabama's §303(d) monitoring program. As a result, three additional geometric mean sampling events were in violation of the geometric mean criterion of 200 colonies/100 mL. One in June 2007 at BUCS-4, and two in September 2007 at stations BKH-1 and BUCS-4.

A mass balance approach was used to calculate the fecal coliform TMDL for Buck Creek. The mass balance approach utilizes the conservation of mass principle. Total existing mass loads were calculated by multiplying the fecal coliform concentration times the corresponding stream flow. Mass loads were calculated for the highest geometric mean sample exceedance and the highest single sample exceedance. In the same manner, allowable loads were calculated for both the single sample criterion of 2000 col/100ml and the geometric mean criterion of 200 col/100ml. The TMDL was based on the violation that produced the highest percent reduction of fecal coliform loads necessary to achieve applicable water quality criteria, whether it be the single sample or geometric mean criterion. Table 1-1 shows the results of the fecal coliform TMDL and percent reductions for each criterion.

Table 1-1. 2007 Fecal Coliform Loads and Required Reductions

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	Reduction %
NPS Load Single Sample	1.22E+14	5.62E+13	6.56E+13	54%
NPS Load Geomean	2.86E+10	1.45E+10	1.40E+10	49%

From Table 1-1, compliance with the single sample criterion of 2000 col/100ml requires the greatest reduction in fecal coliform load. However the flow during this sampling exceeds the range of the other flow data. Therefore the TMDL will be based on the geometric mean criterion. The TMDL values for the geometric mean criterion are provided in Table 1-2 below.

Table 1-2. 2007 Coliform Loads and Required Reductions

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	Reduction %
Nonpoint Source	2.86E+10	1.45E+10	1.40E+10	49%
Point Source	5.69E+09	1.71E+11	0.00E+00	0%

Allowable loading was derived by taking the average streamflow which occurred at Station BUCS-4 on September 2007, and multiplying it times the fecal coliform geometric mean criterion target of 180 colonies/100 mL (200 colonies/100 mL – 10% Margin of Safety). Reductions needed in meeting allowable loading were then determined by subtracting allowable loading from existing loading. Table 1-2 summarizes the existing loads, allowable loads, and required reductions needed to meet applicable pathogen criteria for Buck Creek. Table 1-3 lists required TMDL pathogen loadings under critical streamflow conditions for Buck Creek.

Table 1-3. Fecal Coliform TMDL for Buck Creek

TMDL	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation(LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	(% reduction)	(col/day)	(col/day)	(% reduction)
1.87E+11	1.61E+09	1.71E+11	49%	0	1.45E+10	49%

a. There are no CAFOs in the Buck Creek watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLAs for WWTPs are expressed as a daily maximum. Future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.
c. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in fecal coliform loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for fecal coliform.

Compliance with the terms and conditions of existing and future NPDES sanitary and stormwater permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria and we are committed towards targeting the load reductions to improve water quality in the Buck Creek watershed. As additional data and/or information becomes available, it may become necessary to revise and/or modify the TMDL accordingly.

2.0 Basis for §303(d) Listing

2.1 Introduction

Section 303(d) of the Clean Water Act (CWA) as amended by the Water Quality Act of 1987 and EPA's Water Quality Planning and Management Regulations [(Title 40 of the Code of Federal Regulations (CFR), Part 130)] require states to identify waterbodies which are not meeting water quality standards applicable to their designated use classifications. The identified waters are prioritized based on severity of pollution with respect to designated use classifications. Total maximum daily loads (TMDLs) for all pollutants causing violation of applicable water quality standards are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality standards with seasonal variations and margins of safety. The TMDL process establishes the allowable loading of pollutants, or other quantifiable parameters for a waterbody, based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution from both point and non-point sources and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified the 2.9 mile segment of the Buck Creek from the Cahaba River to Cahaba Valley Creek in Shelby County as being impaired by pathogens (fecal coliform). The §303(d) listing was originally reported on Alabama's 2004 List of Impaired Waters, and subsequently included on the 2006 and 2008 lists. The source of the impairment is listed as urban runoff/storm sewers on the 2008 §303(d) list.

2.2 Problem Definition

Waterbody Impaired:	Buck Creek from Cahaba River to Cahaba Valley Creek.
Waterbody Length:	2.9 miles
Waterbody Drainage Area:	72.42 square miles

Water Quality Standard Violation:	Fecal Coliform (single sample) Fecal Coliform (geometric mean)
Pollutant of Concern:	Pathogens (fecal coliform)
Water Use Classification:	Fish and Wildlife

Usage Related to Classification:
The impaired segment of Buck Creek is classified as Fish and Wildlife. Usage of waters in this classification is described in ADEM Admin. Code R. 335-6-10-.09(5)(a), (b), (c), and (d).

(a) Best usage of waters: fishing, propagation of fish, aquatic life, and wildlife, and any other usage except for swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes.

(b) Conditions related to best usage: the waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.

(c) Other usage of waters: it is recognized that the waters may be used for incidental water contact and recreation during June through September, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.

(d) Conditions related to other usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming places and will be considered satisfactory for swimming and other whole body water-contact sports.

Fecal Coliform Criteria:
Criteria for acceptable bacteria levels for the Fish and Wildlife use classification are described in ADEM Admin. Code R. 335-6-10-.09(5)(e)7(i) and (ii) as follows:

7. Bacteria:

(i) In non-coastal waters, bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000 colonies/100 mL; nor exceed a maximum of 2,000 colonies/100 mL in any sample. In coastal waters, bacteria of the enterococci group shall not exceed a maximum of 275 colonies/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours.

(ii) For incidental water contact and recreation during June through September, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean fecal coliform organism density does not exceed 200 colonies/100 mL in non-coastal waters. In

coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 mL nor exceed a maximum of 158 colonies/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric bacterial coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water-contact sports.

Criteria Exceeded:
Water quality data collected by the Alabama Department of Environmental Management (ADEM) in 2003 was used for listing Buck Creek on Alabama's 2004 §303(d) list. At the time of the listing, waters in which less than or equal to 10% of the samples collected over a five year period exceed the single-sample maximum of 2000 colonies/100 mL were considered to comply with Alabama's water quality standard for fecal coliform bacteria. Geometric mean samples comprised of a least 5 samples collected over a thirty day period that were reported less than or equal to 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) were considered to comply with Alabama's water quality standard for fecal coliform bacteria. Waters in which greater than 10% of the samples exceed the single-sample maximum criterion of 2000 colonies/100 mL or any geometric mean sample that exceeded the geometric mean criterion of 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) were considered impaired and subsequently listed for pathogens (fecal coliform) on Alabama's §303(d) list.

ADEM collected data on Buck Creek for the period March 2003 through October 2003. According to the 2004 §303(d) list fact sheet, Buck Creek was listed as impaired based on two out of two geometric mean samples collected during 2003 exceeded the summer geometric mean criterion of 200 col/100 mL.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

For the purpose of this TMDL a geometric mean fecal coliform target of 180 colonies/100 mL will be used. This target was derived by using a 10% explicit margin of safety from the geometric mean concentration of 200 colonies/100 mL criterion. This target should not allow the geometric mean of 200 colonies/100 mL or the single sample maximum of 2000 colonies/100 mL to be exceeded.

3.2 Source Assessment

3.2.1 Point Sources in the Buck Creek Watershed

Continuous Point Sources

As of April 01, 2009, there are five NPDES permitted point sources within the Buck Creek watershed as presented in Table 3-1 below. Three of the facilities, Helena WWTP, Alabaster WWTP, and Pelham WWTP discharge to Buck Creek. North Shelby County WWTP and Oak Mountain State Park discharge upstream of the Buck Creek pathogen listed segment in the Cahaba Valley Creek watershed. The facility's NPDES permit stipulates a 200 colonies/100 mL monthly average and 2000 colonies/100 mL daily maximum fecal coliform limit for June through September along with a 1000 colonies/100 mL monthly average and 2000 colonies/100 mL daily maximum fecal coliform permit limit for October through May.

Any future NPDES regulated discharges that are considered by the Department to be a pathogen source will be required to meet the instream water quality criteria for pathogens at the point of discharge.

Table 3-1. Permitted NPDES dischargers in the Buck Creek Watershed

Type	NPDES #	Facility Name	Stream	Flow (MGD)
Municipal	AL0023116	Helena WWTP	Buck Creek	4.95
Municipal	AL0025828	Alabaster WWTP	Buck Creek	7.6
SPP	AL0050831	Oak Mountain State Park	UT to Dry Branch	0.085
Municipal	AL0054666	Pelham WWTP	Buck Creek	4.0
Municipal	AL0056251	North Shelby County WWTP	Cahaba Valley Creek	6.0

SPP = Semi-public/private

Non-Continuous Point Sources

A significant portion of the Buck Creek watershed is classified as a Municipal Separate Stormwater Sewer System (MS4) area and therefore must be addressed in the TMDL as part of the Wasteload Allocation (WLA). Portions of the Buck Creek watershed are within the boundary of the Birmingham-Jefferson County Area Phase I MS4 (ALS000001), and Birmingham-Shelby County Area Phase I MS4 (ALS000003). Figure 3-2 identifies the coverage areas of both Phase I MS4 areas in the Buck Creek watershed. Contributions from both MS4 Phase I areas that drain to the pathogen impaired segment of Buck Creek will be considered as point sources and allocated as MS4 WLAs in the TMDL.

Sanitary sewer overflows (SSOs) have the potential to severely impact water quality and can often result in the violation of water quality standards. It is the responsibility of the NPDES wastewater discharger, or collection system operator for non-permitted "collection only" systems, to ensure that releases do not occur. Unfortunately releases to surface waters from SSOs are not always preventable or reported. From review of ADEM files it was determined that numerous SSOs have potentially occurred in the Buck Creek watershed and therefore would be considered a source of pathogens to Buck Creek. Future NPDES regulated stormwater discharges will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

Figure 3-1. NPDES Permitted Point Sources in the Buck Creek Watershed

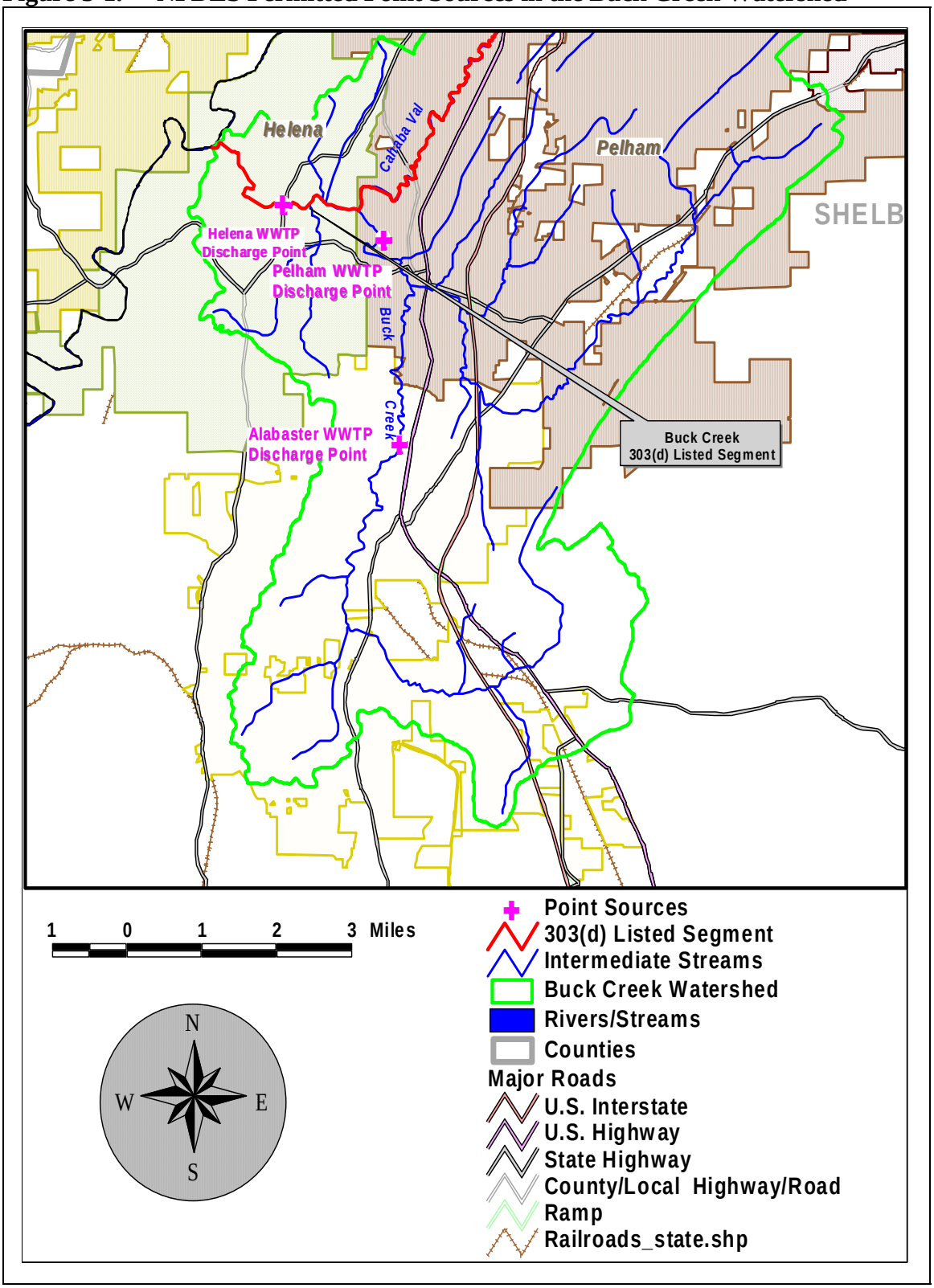
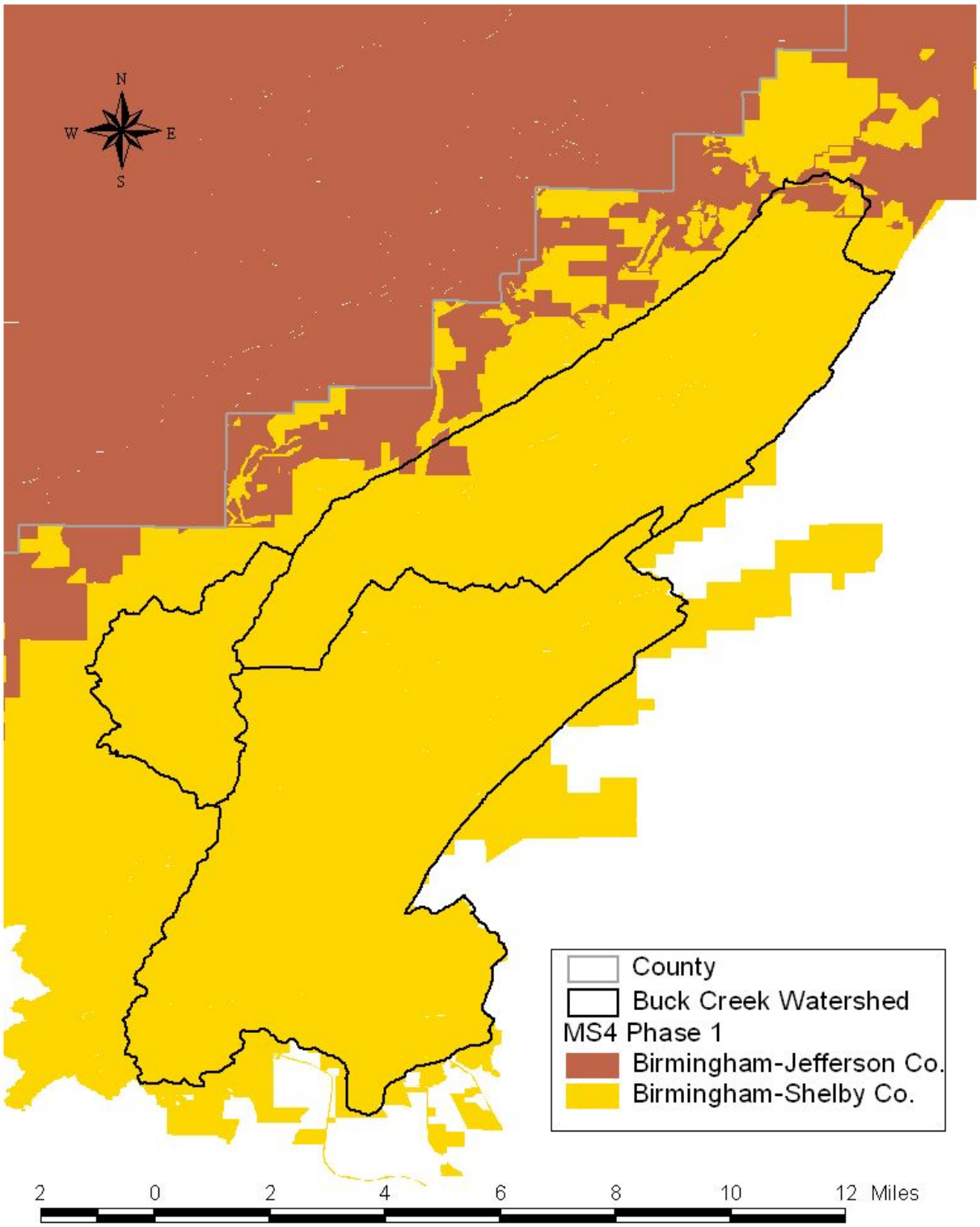


Figure 3-2. MS4 Areas in the Buck Creek Watershed



3.2.2 Nonpoint Sources in the Buck Creek Watershed

Nonpoint sources of fecal coliform bacteria do not have a defined discharge point, but rather, occur over the entire length of a stream or waterbody. On the land surface, fecal coliform bacteria can accumulate over time in the soil and then are washed off during rain events. As the runoff transports the sediment over the land surface, more fecal coliform bacteria are collected and carried to the stream or waterbody. Therefore, there is some net loading of fecal coliform bacteria into the stream is dictated by the watershed hydrology.

Agricultural land can be a source of fecal coliform bacteria. Runoff from pastures, animal feeding areas, improper land application of animal wastes, and animals with direct access to streams are all mechanisms that can contribute fecal coliform bacteria to waterbodies. To account for the potential influence from animals with direct access to stream reaches in the watershed, fecal coliform loads can be calculated as a direct source into the stream.

Fecal coliform bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, waterfowl, etc. Wildlife deposit feces onto land surfaces where it can be transported during rainfall events to nearby streams. Control of these sources is usually limited to land management BMPs and may be impracticable in most cases. As a result, forested areas are not specifically targeted in this TMDL.

Fecal coliform loading from urban areas is potentially attributable to multiple sources including storm water runoff, illicit discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, and domestic animals. Septic systems are common in unincorporated portions of the watershed and may be direct or indirect sources of bacterial pollution via ground and surface waters. Onsite septic systems have the potential to deliver fecal coliform bacteria to surface waters due to system failure and malfunction.

3.3 Land Use Assessment

The Buck Creek watershed is comprised of one 12-digit hydrologic unit codes (HUCs) (03150202-0202) in the Buck Creek catalogue unit (03150202). The total drainage area of the Buck Creek watershed is 72.42 square miles. Land use for the Buck Creek watershed was determined using ArcView with land use information derived from the 2001 National Land Cover Dataset (NLCD). Table 3-3 contains the land use areas for the Buck Creek watershed. Figure 3-3 is a map of land use within the Buck Creek.

In Buck Creek 6% of the land use is considered agricultural, 58% forested, and 36% developed and 1% other. Overall, 64% of the Buck Creek watershed is used for agriculture or silviculture with 37% of the land used for residential, commercial, or other uses. 6% of the Buck Creek watershed is used for agricultural purposes with cultivated crops (1%) and pasture/hay (5%).

Based on these statistics, the Buck Creek watershed can be considered mixed urban and rural. A large percentage of the land used for silviculture and agriculture can have significant nonpoint source impacts if it is not managed properly.

Table 3-2. 12-Digit HUCs in the Buck Creek Watershed

12 Digit HUC	12 Digit HUC Name
031502020202	Cahaba River – Buck Creek

Figure 3-3. Land Use Map for the Buck Creek Watershed

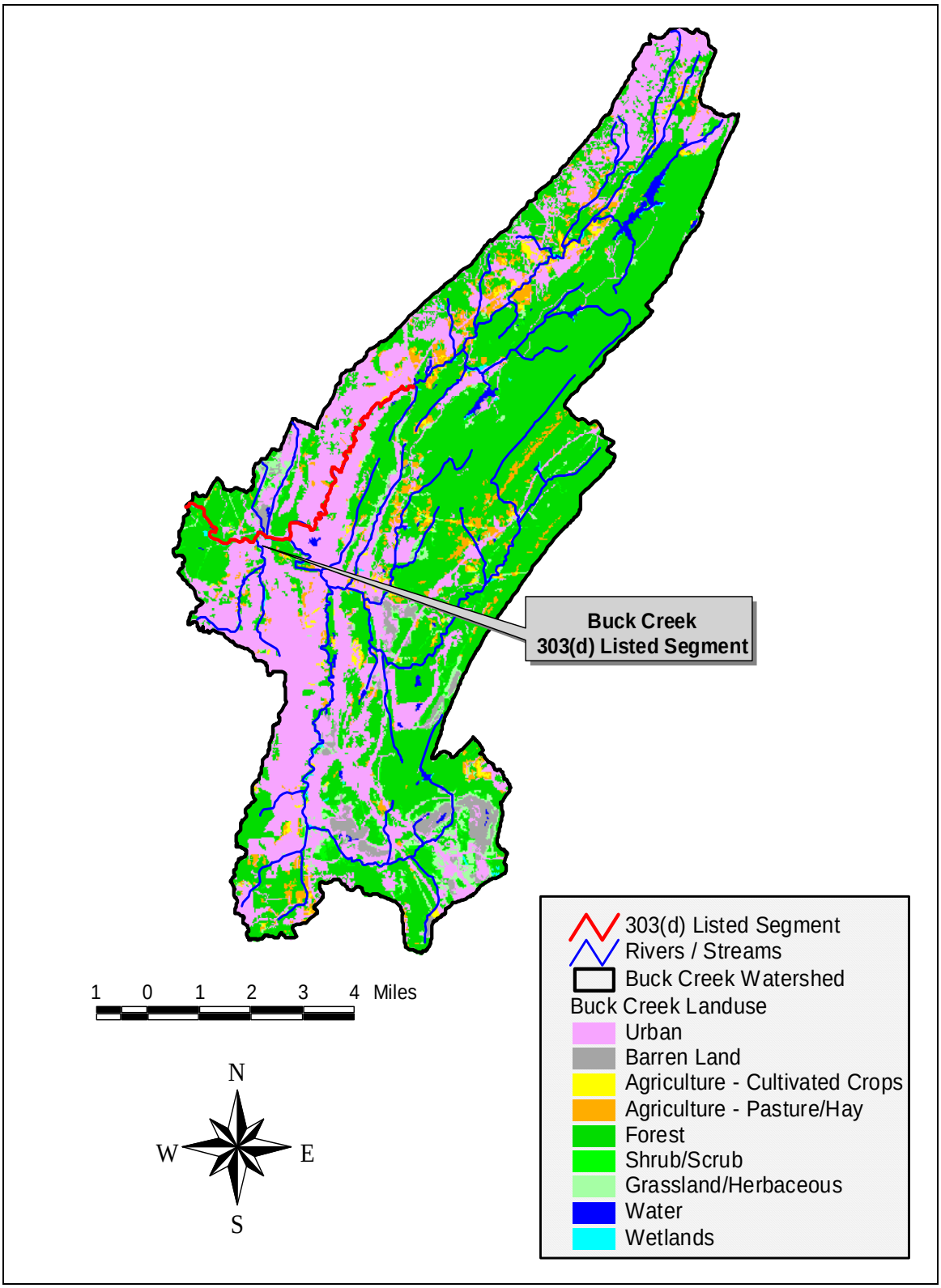


Table 3-3. Land Use Areas for the Buck Creek Watershed

Landuse (Square Miles / Percent)	Buck Creek Watershed						Combined Watershed Totals	
	Lower Buck Creek		Upper Buck Creek		Cahaba Valley Creek			
	Sq. Miles	Percent	Sq. Miles	Percent	Sq. Miles	Percent	Sq. Miles	Percent
Open Water	0.02	0.3%	0.22	0.6%	0.45	1.6%	0.69	1.0%
Urban	3.46	51.8%	11.64	30.3%	8.90	32.6%	24.00	33.1%
Barren or Mining	0.17	2.5%	1.56	4.1%	0.03	0.1%	1.76	2.4%
Tran	-	0.0%	-	0.0%	-	0.0%	-	0.0%
Agriculture - Cropland	0.02	0.3%	0.43	1.1%	0.35	1.3%	0.80	1.1%
Agriculture - Pasture	0.15	2.2%	1.79	4.7%	1.46	5.4%	3.40	4.7%
Forest	2.37	35.5%	19.76	51.4%	15.38	56.4%	37.51	51.8%
Upland Shrub Land	0.18	2.7%	1.13	2.9%	0.19	0.7%	1.50	2.1%
Grass Land	0.25	3.7%	1.81	4.7%	0.41	1.5%	2.47	3.4%
Wetlands	0.06	0.9%	0.12	0.3%	0.11	0.4%	0.29	0.4%
Total	**6.68**	**100.0%**	**38.46**	**100.0%**	**27.28**	**100.0%**	**72.42**	**100.0%**
Agriculture	0.17	2.5%	2.22	5.8%	1.81	6.6%	4.20	5.8%
Forest	2.86	42.8%	22.82	59.3%	16.09	59.0%	41.77	57.7%
Developed	3.63	54.3%	13.20	34.3%	8.93	32.7%	25.76	35.6%
Other	0.02	0.3%	0.22	0.6%	0.45	1.6%	0.69	1.0%
Total	**6.68**	**100.0%**	**38.46**	**100.0%**	**27.28**	**100.0%**	**72.42**	**100.0%**

3.4 Linkage Between Numeric Targets and Sources

The Buck Creek watershed is highly disturbed with approximately 36% of the drainage area classified as urban, 6% classified as agricultural and the remaining land use/cover being forest, shrub and woody wetlands. Fecal coliform loads from forests and wetlands tend to be low due to their filtering capabilities and are considered as natural or background conditions with respect to pollutant sources. Based on the watershed characteristics, it is believed that the most likely sources of pathogen loadings in the Buck Creek watershed are from activities in the MS4/urban areas and from agricultural activities. Such activities include leaking sewer pipes, illicit sewer connections, failing septic systems and urban runoff and runoff from pastures and animal feeding operations. From review of ADEM files it was determined that numerous sanitary sewer overflows (SSO) have potentially occurred in the Buck Creek watershed, which would be considered a likely source of pathogens.

It is not considered practicable to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for different nonpoint sources such as forest, agriculture, and septic systems. The loadings and reductions will only be calculated as a single total nonpoint source load and reduction.

3.5 Data Availability and Analysis

The pathogen impaired segment of Buck Creek was initially listed as a result of water quality data collected by ADEM from March 10, 2003 through October 8, 2003. Of 16 fecal coliform samples collected from one sampling station, B-1, four were found to have exceeded the single sample water quality criterion of 2000 colonies/100 mL. Of the two 30-day fecal coliform

geometric means that were calculated both exceeded the 30-day geometric mean water quality criterion of 200 colonies/100 mL which is applicable for the period June through September.

Station B-1 is an ADEM Trend Station as of 2003. B-1 has been sampled monthly from 2003 through 2009. Of the 73 samples collected from February 24, 2004 though January 6, 2009 there has been one violation reported. Two geometric mean concentrations from 2007 were less than the 30-day geometric mean water quality criterion of 200 colonies/100 mL

In 2007 ADEM conducted intensive sampling on Buck Creek at Stations BKH-1, BUCS-1, BUCS-3, and BUCS-4 as part of Alabama's §303(d) Monitoring Program. Station IDs, location descriptions and coordinates for all stations sampled during these periods are provided in Table 3-4 and with Figure 3-5 showing their locations in relation to the overall watershed.

Table 3-4 ADEM Sampling Stations on the Buck Creek

Years	Station ID	Station Location	Latitude	Longitude
2003, 2004, 2005, 2006, 2007, 2008	B-1	Buck Creek @ Hwy 26, Helena	33.296944	-86.842639
2007	BKH-1	Buck Creek @ Industrial Park Drive	33.29888	-86.83576
2007	BUCS-1	Buck Creek @ Shelby CR 52	33.285611	-86.81619
2007	BUCS-3	Buck Creek @ Shelby CR 44	33.243889	-86.822111
2007	BUCS-4	Buck Creek @ Keystone Road, off of CR 64	33.265389	-86.816278

Of fecal coliform samples collected by ADEM in 2007, none exceeded the single sample maximum criterion of 2000 colonies/100 mL.

Samples were also collected at minimal 24-hour time intervals over a 30-day period in order to determine geometric mean values which were then compared to the 30-day geometric mean criterion of 200 colonies/100 mL. Geometric mean concentrations were obtained for Stations BKH-1, BUCS-1, and BUCS-4 in July and September 2007. The resulting September 2007 geometric mean concentration obtained at Station BKH-1 was 252 colonies/100 mL. The resulting July 2007 geometric mean concentration obtained at Station BUCS-4 was 209 colonies/100 mL. The resulting September 2007 geometric mean concentration obtained at Station BUCS-4 was 354 colonies/100 mL. No other geometric mean samples were found to be greater than 200 colonies/100 mL. Spreadsheets of all related water quality data are provided in Appendix 7.2.

The 2004 though 2009 data will only be used for this assessment because it is less than 6 years old. Section 4.8.2 of ***Alabama's Water Quality Assessment and Listing Methodology*** provides the Department's rationale to use the most recent data to prepare a TMDL for an impaired waterbody when that data indicates a change in water quality has occurred.

Direct stream flow measurements or representative drainage area ratioed equivalent streamflows from USGS gauging stations are necessary when relating fecal coliform samples to total mass loading of fecal coliform. Actual streamflow measurements are not always feasible at the time of fecal coliform sampling due to unsafe or non-wadeable conditions. Direct streamflows could

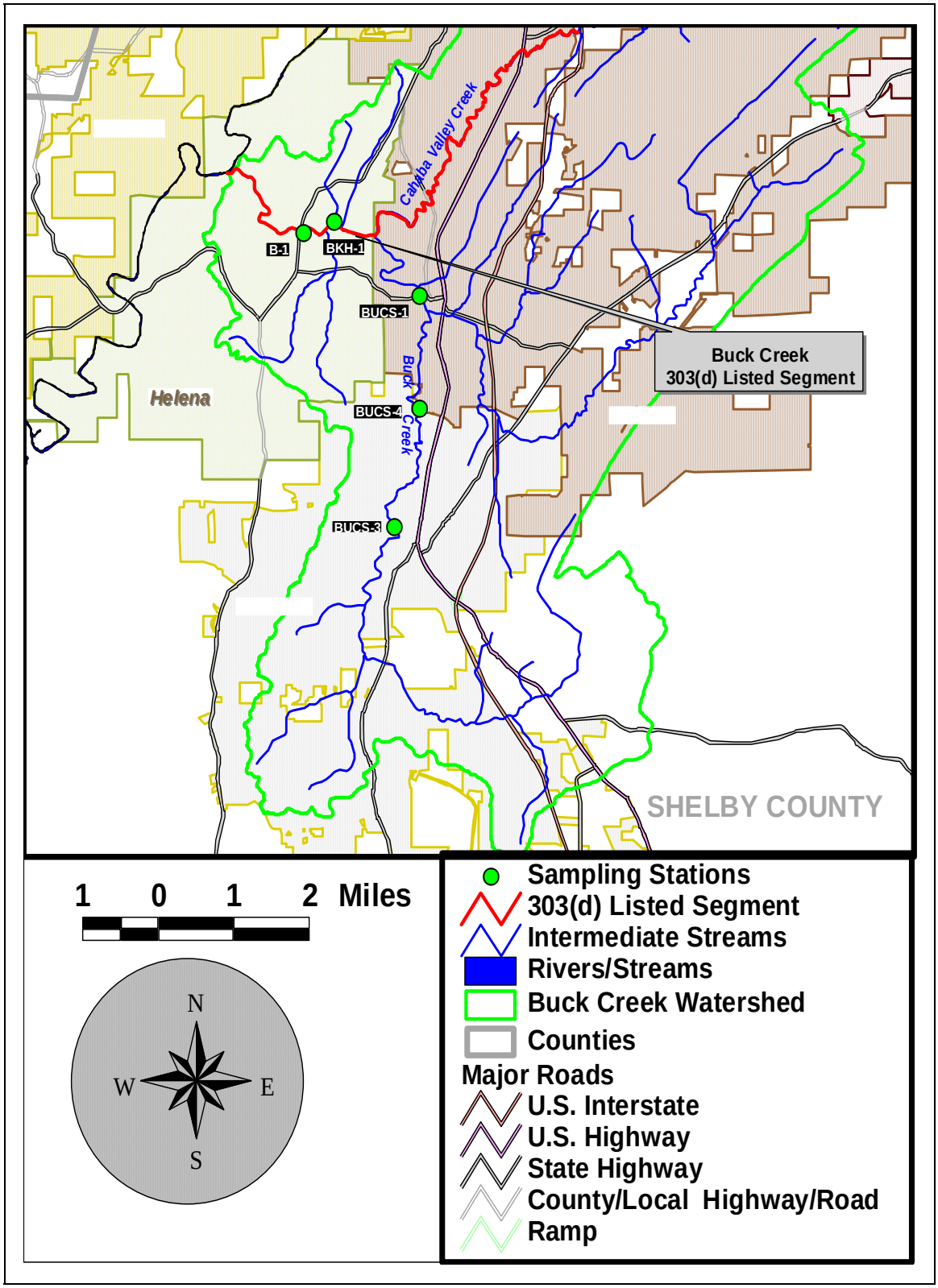
not be measured for all of the fecal coliform samples collected at B-1, BKH-1, BUCS-1, and BUCS-4 due to dangerous or non-wadeable conditions. United States Geological Survey (USGS) Gauge #0242354750 is a continuously recording gauge which provides real-time streamflow and stage measurements on Cahaba Valley Creek at Cross Creek Road. Missing streamflows were determined by ratioing the recorded USGS gauge flow to the drainage area of the fecal coliform sampling station when actual flow measurements were not possible.

Table 3-5. Drainage Areas of ADEM Sampling Stations on Buck Creek

Station ID	Drainage Area*
B-1	70.4
BKH-1	67.35
BUCS-1	37.1
BUCS-3	15.65
BUCS-4	33.46

*Drainage areas estimated using ArcView

Figure 3-4. Map of ADEM Sampling Stations



ADEM has also sampled Cahaba Valley Creek upstream of the Buck Creek pathogens listed segment at CHVS-1, CHVS-2, CHVS-3, CHVS-4, CHVS-5, CHVS-6, and CHVS-7 (Table 3-6). Cahaba Valley Creek is a major tributary to Buck Creek. The maximum single sample fecal coliform concentrations measured on Cahaba Valley Creek were 6000 colonies/100 mL at CHVS-3 on October 23, 2007 and 6000 colonies/100 mL at CHVS-2, CHVS-5, and CHVS-6 on September 15, 2008. In 2008, the maximum geometric mean event measured on Cahaba Valley Creek was 1967.5 colonies/100 mL at CHVS-6.

ADEM is concurrently developing a pathogens TMDL for Cahaba Valley Creek which is a tributary of Buck Creek. The pathogens TMDL for Cahaba Valley Creek requires a 91% reduction in fecal coliform loading. Therefore, it is expected that the established pathogen reductions for Cahaba Valley Creek will improve water quality conditions in Buck Creek downstream of the Cahaba Valley Creek confluence.

Table 3-6. ADEM Sampling Stations on Tributaries to the Buck Creek Pathogens Listed Segment

Years	Station ID	Station Location	Latitude	Longitude
2007, 2008	CHVS-1	Cahaba Valley Creek @ Indian Trail Road in Indian Springs, AL	33.34436	-86.75930
2008	CHVS-2	Cahaba Valley Creek @ Cross Creek Road in Pelham, AL	33.31333	-86.80638
2007, 2008	CHVS-3	Cahaba Valley Creek @ Bearden Rd in Pelham, AL	33.30222	-86.81336
2007, 2008	CHVS-4	Cahaba Valley Creek @ Hwy 31 in Pelham, AL	33.33004	-86.81336
2008	CHVS-5	Cahaba Valley Ck @ Bishop Ln in Indian Springs, AL	33.35780	-86.73770
2008	CHVS-6	Cahaba Valley Creek @ Palomino Rd near Indian Springs, AL	33.36304	-86.72648
2008	CHVS-7	Cahaba Valley Creek @ entrance to recreational park near Indian Springs, AL	33.36327	-86.72674

3.6 Critical Conditions

Critical conditions typically occur during the summer months. This can be explained by the nature and occurrence of summer storm events versus winter. Periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of fecal coliform bacteria into adjacent streams, resulting in abrupt increases of fecal coliform bacteria concentration. By comparison winter rain events, while more frequent, are typically less intense with a more gradual build-up and uniform loading of fecal coliform bacteria on the land surface.

The Buck Creek watershed generally follows the trends described above for the summer months of June through September. Figure 3-5 shows that a majority of the higher concentrations of fecal coliform occur in Buck Creek during higher stream flows. The same holds true for the geometric mean concentrations in Figure 3-6. The maximum geometric mean concentrations of 354 colonies/100 mL with a flow of 3.3 cfs at BUCS-4 will be used to estimate the TMDL pathogen loadings to Buck Creek under critical conditions.

3.7 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the analysis: 1) implicitly incorporate the MOS using conservative model assumptions to develop allocations, or 2) by explicitly specifying a portion of the TMDL as the MOS and using the remainder for allocations.

An explicit MOS was incorporated in this TMDL. The explicit MOS includes the uncertainty of the fecal coliform data used in this analysis and the uncertainty of selecting an appropriate critical condition from the existing fecal coliform loads. A margin of safety was applied to the TMDL by reducing the criterion concentration by ten percent and calculating a mass loading target with measured flow data. The summer geometric mean criteria was reduced by ten percent to achieve the target concentrations 180 colonies/100 mL.

Figure 3-5. Buck Creek Single Sample Fecal Coliform Data (2007 and 2008)

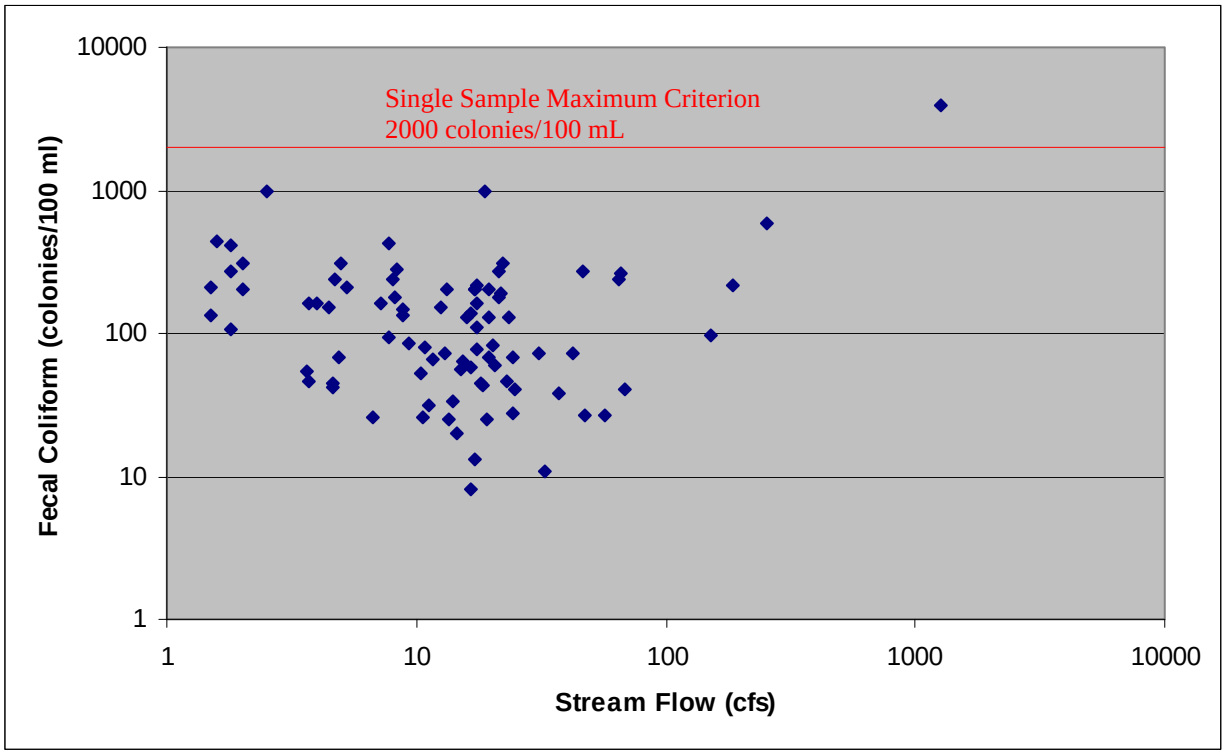
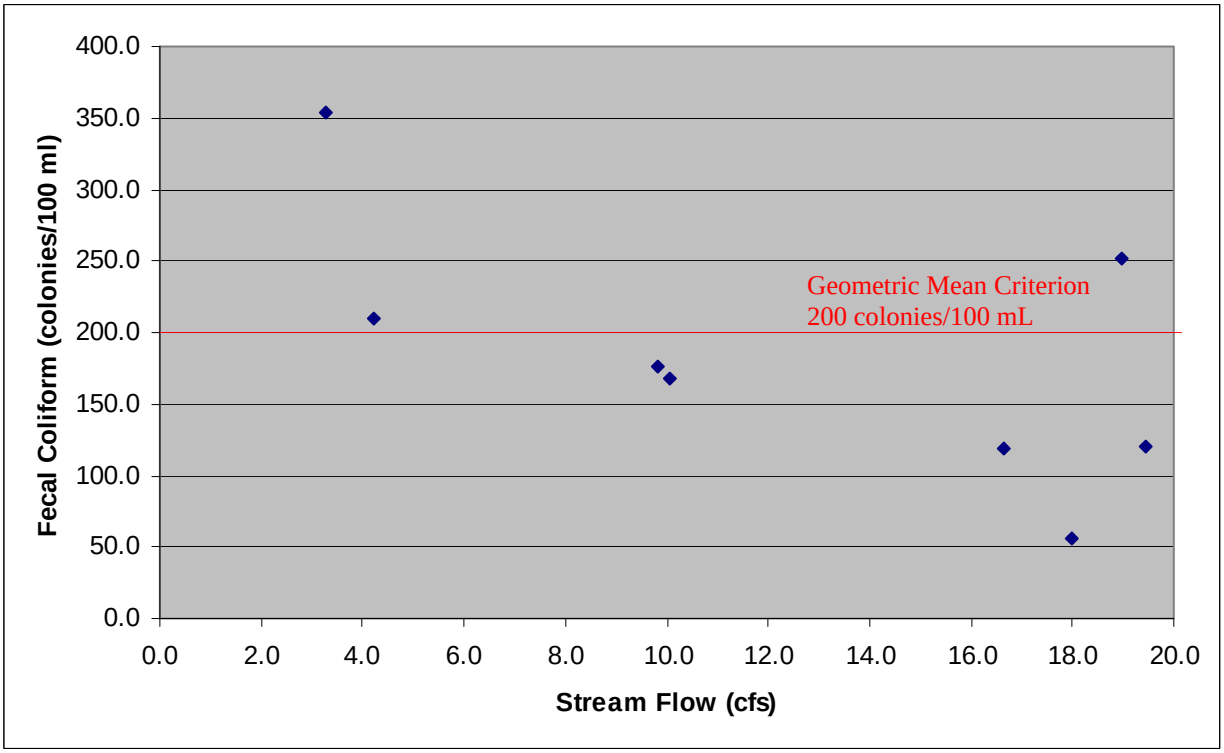


Figure 3-6. Buck Creek Geometric Mean Fecal Coliform Data (2007 and 2008)



4.0 TMDL Development

4.1 Definition of a TMDL

A total maximum daily load (TMDL) is the sum of individual wasteload allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS). The margin of safety can be included either explicitly or implicitly and accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. As discussed earlier, the MOS is explicit in this TMDL. A TMDL can be denoted by the equation:

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

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody while achieving water quality standards under critical conditions. For some pollutants, TMDLs are expressed on a mass loading basis (e.g. pounds per day). However, for pathogens, TMDL loads are typically expressed in terms of organism counts per day (colonies/day), in accordance with 40 CFR 130.2(i).

4.2 Load Calculations

A mass balance approach was used to calculate the pathogen TMDL for Buck Creek. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the fecal coliform concentration times the stream flow.

Existing Conditions

The **single sample** mass loading was calculated by multiplying the highest single sample exceedance concentration of 3,900 colonies/100 ml times the estimated flow for that day. This concentration was calculated based on measurements at B-1 on January 6, 2009 and can be found in Table 7-5, Appendix 7.2. The estimated stream flow, determined by the drainage area ratio of stream flows estimated from USGS Gage 0242354750, for that sampling event was 1276 cfs. The product of these two values and a conversion factor gives the total mass loading (colonies per day) of fecal coliform to Buck Creek under a single sample exceedance conditions.

$$\frac{1276\,\text{ft}^3}{\text{s}} \times \frac{3900\,\text{colonies}}{100\,\text{mL}} \times \frac{24465755 \quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.22 \times 10^{14}\,\text{colonies}}{\text{day}}$$

The **geometric mean** mass loading was calculated by multiplying the highest geometric mean sample exceedance concentration of 354 colonies/100 ml times the average flow for all five of the fecal coliform measurements. This concentration was calculated based on measurements at BUCS-4 on August 10, 11, 13, 20, and 24, 2008 and can be found in Table 7-8, Appendix 7.2. The average stream flow, determined by field measurements during the sampling of the stream. Average flow estimated from for these five sampling events was 3.3 cfs. The product of these two values and a conversion factor gives the total mass loading of fecal coliform to Buck Creek under geometric mean exceedance conditions.

$$\frac{3.3\,\text{ft}^3}{\text{s}} \times \frac{354\,\text{colonies}}{100\,\text{mL}} \times \frac{24465755 \quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.86 \times 10^{10}\ \text{colonies}}{\text{day}}$$

The second load represents the loading allowable from NPDES point sources in the watershed, the WLA. Since the exceedance condition is based on the September 2007 conditions, the loading from NPDES point sources in September 2007 must be determined. A list of NPDES permitted point sources that discharged within the Buck Creek watershed in September 2007 is located in Table 4-1. Five facilities actively discharging in September 2007 were Helena WWTP, Alabaster WWTP, Pelham WWTP, North Shelby County WWTP and the Oak Mountain State Park.

Table 4-1 NPDES Point Sources Permitted during September 2007

Type	NPDES #	Facility Name	Stream	Flow (MGD)
Municipal	AL0023116	Helena WWTP	Buck Creek	4.95
Municipal	AL0025828	Alabaster WWTP	Buck Creek	7.6
SPP	AL0050831	Oak Mountain State Park	UT to Dry Branch	0.085
Municipal	AL0054666	Pelham WWTP	Buck Creek	4.0
Municipal	AL0056251	North Shelby County WWTP	Cahaba Valley Creek	6.0

SPP = Semi-public/private

$WWTP_{WLA}$ loading during the violation period in September 2007 includes five point sources, Helena WWTP, Alabaster WWTP, Pelham WWTP, North Shelby County WWTP and the Oak Mountain State Park. The discharge monitoring report (DMR) for September 2007 for the Helena WWTP shows an average flowrate of 1.38 million gallons per day (MGD) and an average fecal coliform concentration of 18 colonies/100 mL, with a maximum flowrate of 1.54 MGD and a maximum fecal coliform concentration of 283 colonies/100 mL. The mass loading from the Helena WWTP during September 2007 was calculated as follows:

$$\frac{1.38 \times 10^6\,\text{gal}}{\text{day}} \times \frac{3785.41\,\text{mL}}{\text{gal}} \times \frac{18\ \text{colonies}}{100\,\text{mL}} = \frac{9.40 \times 10^8\,\text{colonies}}{\text{day}}$$

The September 2007 DMR for the Alabaster WWTP shows an average flowrate of 2.10 million gallons per day (MGD) and an average fecal coliform concentration of 3 colonies/100 mL, with a maximum flowrate of 3.34 MGD and a maximum fecal coliform concentration of 29 colonies/100 mL. The mass loading from the Alabaster WWTP during September 2007 was calculated as follows:

$$\frac{2.10 \times 10^6\,\text{gal}}{\text{day}} \times \frac{3785.41\,\text{mL}}{\text{gal}} \times \frac{3\ \text{colonies}}{100\,\text{mL}} = \frac{2.38 \times 10^8\,\text{colonies}}{\text{day}}$$

The September 2007 DMR for the Pelham WWTP shows an average flowrate of 2.11 million gallons per day (MGD) and an average fecal coliform concentration of 1 colonies/100 mL, with a

maximum flowrate of 3.40 MGD and a maximum fecal coliform concentration of 30 colonies/100 mL. The mass loading from the Pelham during September 2007 was calculated as follows:

$$\frac{2.11\times10^{6}\,\text{gal}}{\text{day}}\times\frac{3785.41\,\text{mL}}{\text{gal}}\times\frac{1\ \text{colonies}}{100\,\text{mL}}=\frac{7.99\times10^{7}\ \text{colonies}}{\text{day}}$$

The September 2007 DMR for the North Shelby County WWTP shows an average flowrate of 1.578 million gallons per day (MGD) and an average fecal coliform concentration of 74 colonies/100 mL, with a maximum flowrate of 1.785 MGD and a maximum fecal coliform concentration of 320 colonies/100 mL. The mass loading from the North Shelby County WWTP during September 2007 was calculated as follows:

$$\frac{1.578\times10^{6}\,\text{gal}}{\text{day}}\times\frac{3785.41\,\text{mL}}{\text{gal}}\times\frac{74\ \text{colonies}}{100\,\text{mL}}=\frac{4.42\times10^{9}\ \text{colonies}}{\text{day}}$$

The September 2007 DMR for the Oak Mountain State Park shows an average flowrate of 0.010 million gallons per day (MGD) and an average fecal coliform concentration of 16 colonies/100 mL, with a maximum flowrate of 0.015 MGD and a maximum fecal coliform concentration of 85 colonies/100 mL. The mass loading from the Oak Mountain State Park during September 2007 was calculated as follows:

$$\frac{1.00\times10^{4}\,\text{gal}}{\text{day}}\times\frac{3785.41\,\text{mL}}{\text{gal}}\times\frac{16\ \text{colonies}}{100\,\text{mL}}=\frac{6.06\times10^{6}\ \text{colonies}}{\text{day}}$$

The total mass loading for Helena WWTP, Alabaster WWTP, Pelham WWTP, North Shelby County WWTP and Oak Mountain State Park during September 2007 was:

$$\frac{9.40\times10^{8}\,\text{colonies}}{\text{day}}+\frac{2.38\times10^{8}\ \text{colonies}}{\text{day}}+\frac{7.99\times10^{7}\,\textit{colonies}}{\textit{day}}+\frac{4.42\times10^{9}\,\textit{colonies}}{\textit{day}}$$
$$+\frac{6.06\times10^{6}\,\textit{colonies}}{\textit{day}}=\frac{5.69\times10^{9}\ \text{colonies}}{\text{day}}$$

Table 4-2 NPDES Point Sources included in the WLA Portion of the TMDL

Type	NPDES #	Facility Name	Stream	Flow (MGD)
Municipal	AL0023116	Helena WWTP	Buck Creek	4.95
Municipal	AL0025828	Alabaster WWTP	Buck Creek	7.6
SPP	AL0050831	Oak Mountain State Park	UT to Dry Branch	0.085
Municipal	AL0054666	Pelham WWTP	Buck Creek	4.0
Municipal	AL0056251	North Shelby County WWTP	Cahaba Valley Creek	6.0

SPP = Semi-public/private

Allowable Conditions

The **allowable loads** to the watershed were calculated under the same physical conditions as discussed above for the single sample and the geometric mean criterion. This is done by taking the product of the flow used for the violation event times the conversion factor times the allowable concentration which are as follows:

For the **single sample** fecal concentration of 1800 colonies/100 mL. The allowable fecal coliform loading is:

$$\frac{1276\ \text{ft}^3}{\text{s}} \times \frac{1800\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{5.62 \times 10^{13}\ \text{colonies}}{\text{day}}$$

The explicit margin of safety of 200 colonies/100 mL equals a daily loading of:

$$\frac{1276\,\text{ft}^3}{\text{s}} \times \frac{200\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{6.24 \times 10^{12}\ \text{colonies}}{\text{day}}$$

For the **geometric mean** fecal concentration of 180 colonies/100 mL. The allowable fecal coliform loading is:

$$\frac{3.3\,\text{ft}^3}{\text{s}} \times \frac{180\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.45 \times 10^{10}\ \text{colonies}}{\text{day}}$$

The explicit margin of safety of 20 colonies/100 mL equals a daily loading of:

$$\frac{3.3\,\text{ft}^3}{\text{s}} \times \frac{20\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.61 \times 10^{9}\ \text{colonies}}{\text{day}}$$

$WWTP_{WLA}$ allowable loading includes five point sources, Helena WWTP, Alabaster WWTP, Pelham WWTP, North Shelby County WWTP and the Oak Mountain State Park. Helena WWTP has a permitted wasteflow of 4.95 million gallons per day (MGD) and monthly average effluent fecal coliform concentration of 200 colonies/100 mL. Allowable mass loading from Helena WWTP:

$$\frac{4.95 \times 10^{6}\,\text{gal}}{\text{day}} \times \frac{3785.41\,\text{mL}}{\text{gal}} \times \frac{200\ \text{colonies}}{100\,\text{mL}} = \frac{3.75 \times 10^{10}\ \text{colonies}}{\text{day}}$$

Alabaster WWTP has a permitted wasteflow of 7.6 million gallons per day (MGD) and monthly average effluent fecal coliform concentration of 200 colonies/100 mL. Allowable mass loading from Alabaster WWTP:

$$\frac{7.60\times10^{6}\,\text{gal}}{\text{day}}\times\frac{3785.41\,\text{mL}}{\text{gal}}\times\frac{200\ \text{colonies}}{100\,\text{mL}}=\frac{5.75\times10^{10}\,\text{colonies}}{\text{day}}$$

Pelham WWTP has a permitted wasteflow of 4.00 million gallons per day (MGD) and monthly average effluent fecal coliform concentration of 200 colonies/100 mL. Allowable mass loading from Pelham WWTP:

$$\frac{4.00\times10^{6}\,\text{gal}}{\text{day}}\times\frac{3785.41\,\text{mL}}{\text{gal}}\times\frac{200\ \text{colonies}}{100\,\text{mL}}=\frac{3.03\times10^{10}\,\text{colonies}}{\text{day}}$$

North Shelby County WWTP has a permitted wasteflow of 6.00 million gallons per day (MGD) and monthly average effluent fecal coliform concentration of 200 colonies/100 mL. Allowable mass loading from North Shelby County WWTP:

$$\frac{6.00\times10^{6}\,\text{gal}}{\text{day}}\times\frac{3785.41\,\text{mL}}{\text{gal}}\times\frac{200\ \text{colonies}}{100\,\text{mL}}=\frac{4.54\times10^{10}\,\text{colonies}}{\text{day}}$$

Oak Mountain State Park has a permitted wasteflow of 0.085 million gallons per day (MGD) and monthly average effluent fecal coliform concentration of 200 colonies/100 mL. Allowable mass loading from Oak Mountain State Park:

$$\frac{0.085\times10^{6}\,\text{gal}}{\text{day}}\times\frac{3785.41\,\text{mL}}{\text{gal}}\times\frac{200\ \text{colonies}}{100\,\text{mL}}=\frac{6.44\times10^{8}\,\text{colonies}}{\text{day}}$$

The total combined allowable mass loading from Helena WWTP, Alabaster WWTP, Pelham WWTP, North Shelby County WWTP and Oak Mountain State Park is as follows:

$$\frac{3.75\times10^{10}\,\text{colonies}}{\text{day}}+\frac{5.75\times10^{10}\ \text{colonies}}{\text{day}}+\frac{3.03\times10^{10}\,\textit{colonies}}{\textit{day}}+\frac{4.54\times10^{10}\,\textit{colonies}}{\textit{day}}$$
$$+\frac{6.44\times10^{8}\,\textit{colonies}}{\textit{day}}=\frac{1.71\times10^{11}\,\text{colonies}}{\text{day}}$$

The difference in the pathogen loading between the existing conditions (violation event) and the allowable conditions converted to a percent reduction represents the total load reduction needed to achieve the fecal coliform water quality criteria. The TMDL was calculated as the total daily fecal coliform load to Buck Creek as evaluated at Station BUCS-4. Table 4-3 shows the results of the fecal coliform TMDL and percent reductions for each criterion

Table 4-3. 2007 Fecal Coliform Loads and Required Reductions

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	Reduction %
NPS Load Single Sample	1.22E+14	5.62E+13	6.56E+13	54%
NPS Load Geomean	2.86E+10	1.45E+10	1.40E+10	49%

From Table 4-4, compliance with the single sample criterion of 2000 col/100ml requires the greatest reduction in fecal coliform load. However the flow of 1276 cfs during this sampling exceeds the range of the other flow data. Therefore the TMDL will be based on the geometric mean criterion. The TMDL values for the geometric mean criterion are provided in Table 4-4 below. The TMDL, WLA, LA and MOS values necessary to achieve the applicable fecal coliform criteria are provided in Table 4-5 below.

Table 4-4 2007 Coliform Loads and Required Reductions

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	Reduction %
Nonpoint Source	2.86E+10	1.45E+10	1.40E+10	49%
Point Source	5.69E+09	1.71E+11	0.00E+00	0%

Allowable loading was derived by taking the average streamflow which occurred at Station BUCS-4 in September 2007 and multiplying it times the fecal coliform geometric mean criterion target of 180 colonies/100 mL (200 colonies/100 mL – 10% Margin of Safety). Reductions needed in meeting allowable loading were then determined by subtracting allowable loading from existing loading. Table 4-4 summarizes the existing loads, allowable loads, and required reductions needed to meet applicable pathogen criteria for Buck Creek. Table 4-5 lists required TMDL pathogen loadings under critical streamflow conditions for Buck Creek.

Table 4-5. Fecal Coliform TMDL Buck Creek

TMDL	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation(LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	(% reduction)	(col/day)	(col/day)	(% reduction)
1.87E+11	1.61E+09	1.71E+11	49%	0	1.45E+10	49%

a. There are no CAFOs in the Buck Creek watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLAs for WWTPs are expressed as a daily maximum. Future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.
c. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in fecal coliform loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for fecal coliform.

Compliance with the terms and conditions of existing and future NPDES sanitary and stormwater permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria and we are committed towards targeting the load reductions to improve water quality in the Buck Creek watershed. As additional data and/or information becomes available, it may become necessary to revise and/or modify the TMDL accordingly.

4.3 TMDL Summary

Buck Creek was placed on Alabama's §303(d) list in 2004 based on data collected by ADEM in 2003. In 2007, ADEM collected additional water quality data which confirmed the pathogen impairment and provided the basis for TMDL development. Additional trend monitoring data has been collected from 2004 though 2009.

A mass balance approach was used to calculate the fecal coliform TMDL for Buck Creek. Based on the TMDL analysis, it was determined that a 49% reduction in fecal coliform loading was necessary to achieve compliance with applicable water quality standards.

Compliance with the terms and conditions of existing and future NPDES sanitary and stormwater permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria and we are committed towards targeting the load reductions to improve water quality in the Buck Creek watershed. As additional data and/or information becomes available, it may become necessary to revise and/or modify the TMDL accordingly.

5.0 Follow Up Monitoring

ADEM has adopted a basin approach to water quality management; an approach that divides Alabama's fourteen major river basins into five groups. Each year, the ADEM water quality resources are concentrated in one of the five basin groups. One goal is to continue to monitor §303(d) listed waters. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices in the watershed. This monitoring will occur in each basin according the schedule shown.

Table 5-1. §303(d) Follow Up Monitoring Schedule

River Basin Group	Year to be Monitored
Tennessee	2009
Alabama / Coosa / Tallapoosa	2010
Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee	2011
Black Warrior / Cahaba	2012
Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia	2013
Tennessee	2014

6.0 Public Participation

As part of the public participation process, this TMDL was placed on public notice and made available for review and comment. The public notice was prepared and published in the four major daily newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who have requested to be on ADEM's postal and electronic mailing distributions. In addition, the public notice and subject TMDL was made available on ADEM's Website: www.adem.state.al.us. The public can also request paper or electronic copies of the TMDL by contacting Mr. Chris Johnson at 334-271-7827 or cljohnson@adem.state.al.us. The public was given an opportunity to review the TMDL and submit comments to the Department in writing. At the end of the public review period, all written comments received during the public notice period became part of the administrative record. ADEM considered all comments received by the public prior to finalization of this TMDL and subsequent submission to EPA Region 4 for final review and approval.

Appendix 7.1

References

ADEM Administrative Code, 2007. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2007. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's §303(d) Monitoring Program. 2007, and 2008. ADEM.

Alabama's Ambient/Trend Monitoring Program. 2003, 2004, 2005, 2006, 2007, and 2008. ADEM

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, January 2008.

Alabama's §303(d) Lists. 2004, 2006, and 2008 §303(d) List. ADEM.

U.S. Census Bureau, 2007. Table 3: Estimates of Population Change for Counties of Alabama and County Rankings: July 1, 2005 to July 1, 2006 (CO-EST2006-03-01). Population Division, March 22, 2007

United States Environmental Protection Agency, 1991. Guidance for Water Quality-Based Decisions: The TMDL Process. Office of Water. EPA 440/4-91-001.

United States Environmental Protection Agency, PCS website. http://www.epa.gov/enviro/html/pcs/index.html

Appendix 7.2

Water Quality Data

Table 7-1. Pathogen Data Collected by ADEM at Stations B-1 in 2003

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
B-1	3/10/2003	11:30	5.9		225.5	116	---	OK		
B-1	4/8/2003	9:50	21.7		335.5	2080	---	VIOLATION		
B-1	5/7/2003	10:45			360.3	12500	---	VIOLATION		
B-1	6/9/2003	12:30	2.2	118	99.0	290	---	OK		
B-1	6/12/2003	10:10	77.6		198.0	1900	---	OK		
B-1	6/16/2003	11:00	11.4		118.3	1900	---	OK	1856.4	VIOLATION
B-1	6/19/2003	9:15	124		530.8	16200	---	VIOLATION		
B-1	6/23/2003	12:00	9.5		137.5	1300	---	OK		
B-1	7/29/2003	10:05	12.3	65.4	57.8	230	---	OK		
B-1	8/7/2003	9:45	17.1		137.5	3400	---	VIOLATION		
B-1	9/15/2003	12:00	4.2	51.5	38.5	280	---	OK		
B-1	9/18/2003	11:35	1	38.5	38.5	84	---	OK		
B-1	9/22/2003	12:15	69.1		184.3	620	G	OK	292.0	VIOLATION
B-1	9/25/2003	11:50	3.9	55.4	35.8	700	---	OK		
B-1	9/29/2003	11:30	1.9	37.4	33.0	208	---	OK		
B-1	10/8/2003	9:45	1.9	51.4	30.3	100	---	OK		

G - The actual number was probably greater than the number reported

Table 7-2. Pathogen Data Collected by ADEM at Stations B-1 in 2004

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
B-1	2/24/2004	12:25	4.8		88.0	1	L	OK		
B-1	3/17/2004	13:00	6.2	96.8	74.3	92	---	OK		
B-1	4/21/2004	9:50	5.9	72.2	63.3	140	---	OK		
B-1	5/12/2004	10:50	0	60.7	85.3	212	---	OK		
B-1	6/3/2004	11:30	11.1	49.4	38.5	600	G	OK		
B-1	6/15/2004	11:45	9.3	58.1	60.5	1	<MDL	OK		
B-1	6/21/2004	11:00	1.2	34.9	13.8	600	G	OK	73.6	OK
B-1	6/22/2004	9:45	0.2	36	25.9	600	G	OK		
B-1	6/24/2004	10:35	195	55.4	30.3	10	---	OK		
B-1	6/30/2004	9:40	13.8		55.0	400	---	OK		
B-1	7/19/2004	9:50	27.3	45.9	55.0	220	---	OK		
B-1	8/2/2004	10:25	4.1	38.9	35.8	17	---	OK		
B-1	9/2/2004	10:10	13	27.5	22.0	120	---	OK		
B-1	9/22/2004	11:10	8.8		82.5	140	---	OK		
B-1	9/27/2004	11:35	8.9	52.6	55.0	148	---	OK	123.7	OK
B-1	9/28/2004	10:15	9.2	68	52.3	108	---	OK		
B-1	9/29/2004	10:15	9.4	41.7	52.3	108	---	OK		
B-1	10/14/2004	11:05	3.4	34.1	30.3	55	---	OK		

G - The actual number was probably greater than the number reported
<MDL - Less Than Method Detection Limits
L - The actual number was probably less than the number reported

Table 7-3. Pathogen Data Collected by ADEM at Stations B-1 in 2005 and 2006

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
B1	3/23/2005	10:50	289		354.8	1200	T	OK		
B1	4/12/2005	10:00	9.55		176.0	164	---	OK		
B1	5/11/2005	12:45	2.54	72.9	52.3	43	---	OK		
B1	6/16/2005	11:20	10.5	139.8	143.0	140	---	OK		
B1	7/20/2005	11:45	44.9	145.8	101.8	600	T	OK		
B1	8/11/2005	12:10	6.61	76.9	49.5	112	---	OK		
B1	9/29/2005	10:15	6.57	66.8	55.0	140	---	OK		
B1	10/13/2005	10:45	6.26	36.3	27.5	77	---	OK		
B1	11/16/2005	10:40	8.65	39.6	93.5	600	T	OK		
B1	12/13/2005	11:10	4.6	39.4	25.6	600	T	OK		
B1	1/25/2006	11:30	11.7		376.8	128	---	OK		
B1	2/15/2006	12:45	3.04	170.8	145.8	40	---	OK		
B1	3/23/2006	10:45	13		343.8	128		OK		
B-1	4/20/2006	10:40	225		104.5	600	T	OK		
B-1	5/17/2006	10:30	10.6	101.4	88.0	260		OK		
B-1	6/29/2006	10:00	6.31	48	27.5	58		OK		
B-1	7/26/2006	11:45	21.2	32.5	26.1	160		OK		
B1	8/24/2006	11:30	87.7	50.2	49.5	420		OK		
B-1	9/26/2006	12:00	36.9	56.9	38.5	440		OK		
B1	10/11/2006	11:30	6.86		26.7	25		OK		
B-1	11/7/2006	11:30	7.39	153	96.3	80		OK		
B-1	12/6/2006	11:45	3.17	32.1	30.3	14		OK		
B-1	1/24/2007	12:00	4.31	114	115.5	64		OK		
B-1	2/22/2007	10:30	0.91	65.4	60.5	236		OK		

T - Value reported is less than criteria of detection

Table 7-4. Pathogen Data Collected by ADEM at Stations B-1 in 2007

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
B-1	3/21/2007	11:00	0.78	56.8	35.8	27		OK		
B-1	4/11/2007	12:15	2.8	42.1	30.3	72		OK		
B-1	5/16/2007	11:00	6.82	25	19.5	41	J	OK		
B-1	6/18/2007	12:00	5.48	18.5	13.5	43		OK		
B-1	6/20/2007	11:45	8.38	18	14.9	44		OK		
B-1	6/25/2007	11:12	6.63	14.4	13.8	20	J	OK	56.1	OK
B-1	7/9/2007	11:04	9.73	21.7	25.3	190		OK		
B-1	7/12/2007	11:19	5.61	17.4	23.9	77		OK		
B-1	7/18/2007	12:00	4.6	19	16.8	25		OK		
B-1	8/15/2007	11:15	4.2	14.1	11.6	33		OK		
B-1	8/27/2007	10:32	5.32	17.3	14.9	200		OK		
B-1	9/10/2007	10:40	11.9	17.2	15.4	200		OK		
B-1	9/12/2007	11:00	8.7	20.5	15.7	60	J	OK		
B-1	9/13/2007	10:19	11.2	20.2	33.0	83		OK	121.0	OK
B-1	9/20/2007	11:07	10.6	19.6	16.0	130		OK		
B-1	9/24/2007	10:28	7.7	19.7	15.7	200		OK		
B1	10/17/2007	11:30	4.74	13.4	12.1	25		OK		
B-1	11/13/2007	11:30	3.95	17.2	11.3	13	J	OK		
B-1	12/11/2007	11:20	3.24	16.4	30.3	8	J	OK		
B-1	2/12/2008	11:20	1.79	32.7	35.8	11	J	OK		
B-1	1/22/2008	12:45	7.35	56	30.3		X	-		

J - Result is a estimate
X - Sampled, but analysis lost

Table 7-5. Pathogen Data Collected by ADEM at Station B-1 in 2008

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
B-1	3/11/2008			150.9	123.8	96		OK		
B-1	4/8/2008			187.2	187.0	220		OK		
B-1	5/6/2008			68.3	41.3	40		OK		
B-1	6/3/2008			46.5	41.3	270		OK		
B-1	7/8/2008			24.2	16.2	28		OK		
B-1	8/5/2008			23.2	14.0	46		OK		
B-1	9/9/2008			66.3	24.5	260		OK		
B-1	10/1/2008			31.1	14.6	72		OK		
B-1	11/18/2008			37	18.7	38		OK		
B-1	12/16/2008			254.6	217.3	580		OK		
B-1	1/6/2009				1276.0	3900		VIOLATION		

Table 7-6. Pathogen Data Collected by ADEM at station BKH-1 in 2007

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
BKH-1	3/22/2007	10:10	2.84	47.6	34.2	27		OK		
BKH-1	4/10/2007	10:00	1.62	23.6	28.9	128		OK		
BKH-1	5/15/2007	9:20	4.34	16.6	15.8	58		OK		
BKH-1	6/14/2007	10:15	4.88	15.2	14.7	56	J	OK		
BKH-1	6/20/2007	11:03	6.1	17.4	14.2	110		OK		
BKH-1	6/25/2007	10:37	5.57	11.7	13.2	65	G	OK	118.9	OK
BKH-1	7/9/2007	10:19	8.46	21.4	24.2	270		OK		
BKH-1	7/12/2007	10:50	7.41	17.5	22.9	220		OK		
BKH-1	7/17/2007	9:45	5.71	15.5	34.2	64	J	OK		
BKH-1	8/14/2007	9:40	3.96	10.7	11.0	26		OK		
BKH-1	8/27/2007	10:03	6.38	12.9	14.2	73		OK		
BKH-1	9/10/2007	10:14	12	15.9	14.7	130		OK		
BKH-1	9/11/2007	10:00	8.92	16.5	14.7	140		OK		
BKH-1	9/13/2007	9:49	11.4	18.7	31.6	1000	G	OK	252.0	VIOLATION
BKH-1	9/20/2007	10:38	10.1	21.5	15.3	180		OK		
BKH-1	9/24/2007	9:55	10.1	22.3	15.0	310		OK		
BKH-1	10/16/2007	10:00	6.9	10.8	11.3	80		OK		

G - The actual number was probably greater than the number reported
J - Result is a estimate

Table 7-7. Pathogen Data Collected by ADEM at station BUCS-1 and BUCS-3 in 2007

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
BUCS-1	3/22/2007	10:45	5.67	24.4	18.8	68	J	OK		
BUCS-1	4/10/2007	10:45	2.98	19.7	15.9	68	J	OK		
BUCS-1	5/15/2007	10:00	10.3	4.7	8.7	240		OK		
BUCS-1	6/14/2007	11:00	7.66	9.4	8.1	84		OK		
BUCS-1	6/20/2007	10:18	6.16		7.8	420		OK		
BUCS-1	6/25/2007	10:09	6.1		7.2	160		OK	176.1	OK
BUCS-1	7/9/2007	9:56	9.41		13.3	200		OK		
BUCS-1	7/12/2007	10:30	8.87		12.6	150		OK		
BUCS-1	7/17/2007	10:30	9.61	6.7	18.8	26		OK		
BUCS-1	8/14/2007	10:15	6.26	4.6	6.1	44		OK		
BUCS-1	8/27/2007	9:47	7.57		7.8	93		OK		
BUCS-1	9/10/2007	9:54	17		8.1	240		OK		
BUCS-1	9/11/2007	10:45	12.3	4.9	8.1	68	J	OK		
BUCS-1	9/13/2007	9:32	16.4		17.4	160		OK	167.4	OK
BUCS-1	9/20/2007	10:17	22.1		8.4	280		OK		
BUCS-1	9/24/2007	9:42	13		8.3	180		OK		
BUCS-1	10/16/2007	10:30	8.39	4.6	6.2	42		OK		
BUCS-3	3/22/2007	12:20	2.35	11.3	7.9	31		OK		
BUCS-3	4/10/2007	12:20	1.9	3.7	6.7	46		OK		
BUCS-3	5/15/2007	11:25	28.6		3.7	55		OK		

J - Result is a estimate

Table 7-8. Pathogen Data Collected by ADEM at Station BUCS-4 in 2007

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
BUCS-4	3/22/2007	11:40	3.5	10.4	17.0	52	J	OK		
BUCS-4	4/10/2007	11:30	2.32	8.9	14.4	148		OK		
BUCS-4	5/15/2007	11:40	3.51	3.7	7.8	160		OK		
BUCS-4	6/14/2007	11:45	6.11	8.8	7.3	132		OK		
BUCS-4	6/20/2007	9:23	4.63	4.5	7.1	150		OK		
BUCS-4	6/25/2007	9:32	5.01	4	6.5	160		OK	209.4	VIOLATION
BUCS-4	7/9/2007	9:05	5.08	1.8	12.0	410		OK		
BUCS-4	7/12/2007	9:48	5.45	2	11.4	310		OK		
BUCS-4	7/17/2007	11:00	7.69	1.8	17.0	270		OK		
BUCS-4	8/14/2007	11:00	15.1	1.5	5.5	132		OK		
BUCS-4	8/27/2007	9:10	2.44	1.5	7.1	210		OK		
BUCS-4	9/10/2007	9:23	4.07	1.6	7.3	440		OK		
BUCS-4	9/11/2007	11:30	10.3	5	7.3	310		OK		
BUCS-4	9/13/2007	9:01	5.01	5.3	15.7	210		OK	354.0	VIOLATION
BUCS-4	9/20/2007	9:49	4.72	2	7.6	200		OK		
BUCS-4	9/24/2007	9:05	3.68	2.5	7.5	970		OK		
BUCS-4	10/16/2007	11:30	6.8	1.8	5.6	108		OK		

J - Result is a estimate

Table 7-9. Pathogen Data Collected by ADEM at Station CHVS-1 in 2007

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
CHVS - 1	3/27/2007	11:15	7.94	5.4	7.4	42		OK		
CHVS - 1	4/17/2007	11:20	7.73	4.2	6.2	52	J	OK		
CHVS - 1	5/22/2007	11:00	7.16	3.6	3.2	55		OK		
CHVS-1	6/7/2007	10:51	11.2	3.3	2.7	150		OK		
CHVS-1	6/12/2007	10:29	14.3	3.7	2.8	90		OK		
CHVS-1	6/14/2007	10:25	12	3.7	3.5	130		OK	86.3	OK
CHVS-1	6/18/2007	10:24	12.6	2.6	3.0	70		OK		
CHVS - 1	6/20/2007	11:30	8.6	2.4	3.3	28	J	OK		
CHVS-1	6/21/2007	10:59	14.2	2.5	3.0	120		OK		
CHVS-1	7/5/2007	14:15	10.8	2.9	4.6	64	J	OK		
CHVS-1	8/21/2007	10:40	8.32	2.3	2.7	188		OK		
CHVS-1	8/27/2007	12:01	9.89	2.1	3.3	230		OK		
CHVS-1	9/10/2007	12:08	6.82	2.8	3.5	120		OK		
CHVS-1	9/13/2007	11:53	5.54	2.6	7.4	110		OK		
CHVS - 1	9/18/2007	10:30	6.91	6.5	4.1	270		OK	207.5	VIOLATION
CHVS-1	9/20/2007	12:36	6.5	4.1	3.6	540		OK		
CHVS-1	9/24/2007	11:54	5.57	4.3	3.5	200		OK		
CHVS - 1	10/23/2007	11:00	25	10.4	30.4	2000		OK		

J - Result is a estimate

Table 7-10. Pathogen Data Collected by ADEM at Station CHVS-3 in 2007

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
CHVS - 3	3/27/2007	9:45	2.78	15.5	12.5	56		OK		
CHVS - 3	4/17/2007	10:00	2.31	9.8	10.4	60	J	OK		
CHVS - 3	5/22/2007	9:30	3.8	7.3	5.4	212		OK		
CHVS-3	6/7/2007	9:54	5.68	6	4.6	220		OK	200.5	VIOLATION
CHVS-3	6/12/2007	9:39	6.01	5	4.7	240		OK		
CHVS-3	6/14/2007	9:28	7.42	7.1	5.8	380		OK		
CHVS-3	6/18/2007	9:18	6.91	5.3	5.1	230		OK		
CHVS - 3	6/20/2007	10:30	7.41	5.4	5.6	64	J	OK		
CHVS-3	6/21/2007	9:38	6.07	4.9	5.0	220		OK		
CHVS-3	7/5/2007	11:20	5.74	5.9	7.8	80		OK		
CHVS-3	8/21/2007	9:30	6.98	4.5	4.6	144		OK		
CHVS-3	8/27/2007	11:07	7.07	4.6	5.6	440		OK		
CHVS-3	9/10/2007	11:18	6.84	5	5.8	320		OK	281.7	VIOLATION
CHVS-3	9/13/2007	11:24	6.05	2.5	12.5	250		OK		
CHVS - 3	9/18/2007	9:30	8.33	8.5	6.9	360		OK		
CHVS-3	9/20/2007	11:39	7.5	7.8	6.1	280		OK		
CHVS-3	9/24/2007	11:00	6.06	7.2	6.0	220		OK		
CHVS - 3	10/23/2007	10:00	51.3	45.2	51.2	6000	G	VIOLATION		

G - The actual number was probably greater than the number reported
J - Result is a estimate

Table 7-11. Pathogen Data Collected by ADEM at Station CHVS-4 in 2007

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
CHVS - 4	3/27/2007	10:30	3.28	14	11.2	104		OK		
CHVS - 4	4/17/2007	10:50	1.78	10.1	9.3	51		OK		
CHVS - 4	5/22/2007	10:15	2.09	7.4	4.9	80		OK		
CHVS-4	6/7/2007	10:26	4.31	5.3	4.1	87		OK	131.2	OK
CHVS-4	6/12/2007	10:07	3.8	5	4.2	130		OK		
CHVS-4	6/14/2007	9:56	4.37	5	5.2	460		OK		
CHVS-4	6/18/2007	9:55	2.99	5.5	4.6	70		OK		
CHVS - 4	6/20/2007	11:00	2.29	6.7	5.0	56	J	OK		
CHVS-4	6/21/2007	10:23	2.3	5.7	4.5	250		OK		
CHVS-4	7/5/2007	12:30	3.03	6.7	7.0	92		OK		
CHVS-4	8/21/2007	10:00	3.42	4.1	4.1	104		OK		
CHVS-4	8/27/2007	11:33	3.37	6.3	5.0	400		OK		
CHVS-4	9/10/2007	11:42	3.6	6.4	5.2	180		OK	159.9	OK
CHVS-4	9/13/2007	10:57	3.62	6.8	11.2	80	J	OK		
CHVS - 4	9/18/2007	10:00	4.39	8.9	6.2	220		OK		
CHVS-4	9/20/2007	12:07	4	10	5.4	110		OK		
CHVS-4	9/24/2007	11:26	3.94	8	5.3	300		OK		
CHVS - 4	10/23/2007	10:30	43.6	21.1	45.7	2700		VIOLATION		

J - Result is a estimate

Table 7-12. Pathogen Data Collected by ADEM at Station CHVS-1 and CHVS-2 in 2008

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
CHVS-1	6/30/2008		4		4.6	220		OK		
CHVS-1	7/2/2008		3.2		3.3	56		OK		
CHVS-1	7/14/2008		4.1		4.8	84		OK	94.1	OK
CHVS-1	7/17/2008		5.3		4.6	54		OK		
CHVS-1	7/28/2008		4.8		3.5	132		OK		
CHVS-1	8/25/2008		14.8		69.4	2300		VIOLATION		
CHVS-1	9/2/2008		13.4		8.7	212		OK		
CHVS-1	9/15/2008		16.4		26.7	5800		VIOLATION	596.7	VIOLATION
CHVS-1	9/18/2008		7		3.9	176		OK		
CHVS-1	9/22/2008		5.1		3.2	152		OK		
CHVS-2	6/30/2008		8.3		7.4	350		OK		
CHVS-2	7/2/2008		6.6		5.3	132		OK		
CHVS-2	7/14/2008		11		7.8	220		OK	226.9	VIOLATION
CHVS-2	7/17/2008		9.5		7.4	160		OK		
CHVS-2	7/28/2008		3.2		5.6	370		OK		
CHVS-2	8/25/2008		19		112.0	2200		VIOLATION		
CHVS-2	9/2/2008		12		14.0	228		OK		
CHVS-2	9/15/2008		45		43.0	6000		VIOLATION	806.9	VIOLATION
CHVS-2	9/18/2008		8.3		6.3	490		OK		
CHVS-2	9/22/2008		6.4		5.2	232		OK		

Table 7-13. Pathogen Data Collected by ADEM at Station CHVS-5 and CHVS-6 in 2008

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
CHVS-5	6/30/2008		3.4		3.4	600		OK		
CHVS-5	7/2/2008		2.9		2.5	168		OK		
CHVS-5	7/14/2008		2.5		3.6	180		OK	224.9	VIOLATION
CHVS-5	7/17/2008		3.4		3.4	144		OK		
CHVS-5	7/28/2008		3.3		2.6	220		OK		
CHVS-5	8/25/2008		10.2		52.1	3200		VIOLATION		
CHVS-5	9/2/2008		9.7		6.5	450		OK		
CHVS-5	9/15/2008		8.7		20.0	6000		VIOLATION	826.1	VIOLATION
CHVS-5	9/18/2008		5.4		2.9	210		OK		
CHVS-5	9/22/2008		3.6		2.4	212		OK		
CHVS-6	6/30/2008				3.0	600		OK		
CHVS-6	7/2/2008				2.2	1200		OK		
CHVS-6	7/14/2008				3.2	1200		OK	1026.6	VIOLATION
CHVS-6	7/17/2008				3.0	1200		OK		
CHVS-6	7/28/2008				2.3	1100		OK		
CHVS-6	8/25/2008		8		46.2	3500		VIOLATION		
CHVS-6	9/2/2008		8.1		5.8	1200		OK		
CHVS-6	9/15/2008		7.2		17.7	6000		VIOLATION	1967.5	VIOLATION
CHVS-6	9/18/2008		3.3		2.6	780		OK		
CHVS-6	9/22/2008		2.4		2.1	1500		OK		

Table 7-14. Pathogen Data Collected by ADEM at Station CHVS-7-1 in 2008

Station ID	Date	Time	Turbidity (NTU)	Stream Flow (CFS)	USGS Flow from DA ratio (CFS)	Fecal Coliform (col/100ml)	Fecal Coliform oor*	Daily Criterion	Fecal Geomean (col/100ml)	30-Day Geometric Mean Criterion
CHVS-7	6/30/2008		2.1		3.0	152		OK	80.3	OK
CHVS-7	7/2/2008				2.2	84		OK		
CHVS-7	7/14/2008		1.1		3.2	56		OK		
CHVS-7	7/17/2008				3.0	53		OK		
CHVS-7	7/28/2008				2.3	88		OK		
CHVS-7	8/25/2008		8.8		46.2	800		OK	293.5	VIOLATION
CHVS-7	9/2/2008		7		5.8	92		OK		
CHVS-7	9/15/2008		3.4		17.7	2200		VIOLATION		
CHVS-7	9/18/2008		3.4		2.6	160		OK		
CHVS-7	9/22/2008		1.9		2.1	84		OK		