Alabama Department of Environmental Management

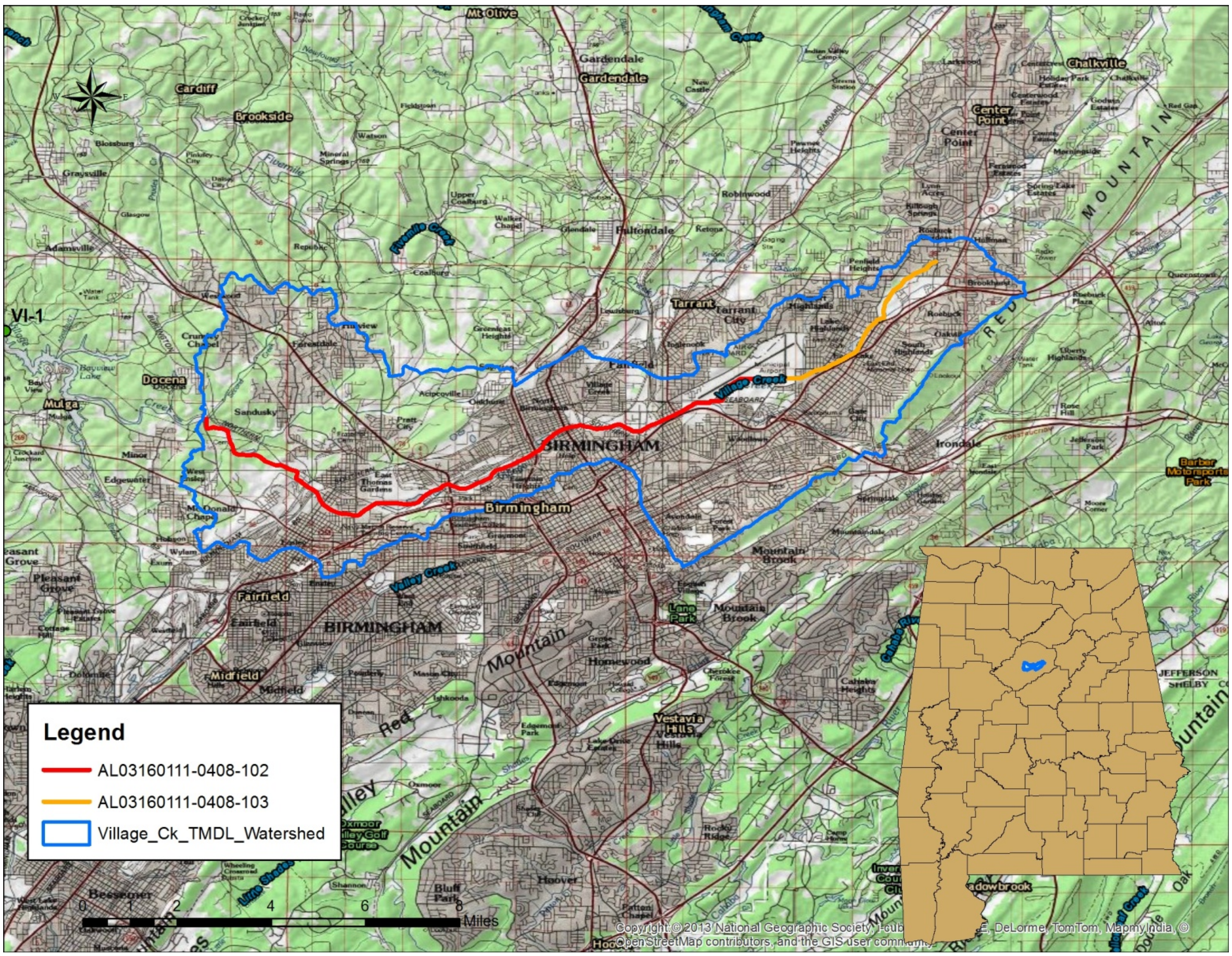
Final
Total Maximum Daily Load (TMDL)
For
Village Creek

Assessment Unit ID # AL03160111-0408-102
Assessment Unit ID # AL03160111-0408-103

Pathogens (E. coli)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
August 2015

Figure 1-1 Village Creek Watershed



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1.0 Executive Summary

Section §303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the Total Maximum Daily Load (TMDL) for pollutants causing the use impairment. A TMDL is the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

The Village Creek watershed is located in the Black Warrior River basin in Jefferson County, Alabama. The watershed is located in the upper portion of Birmingham and is dominated by urban development, which results in an effluent-dominated stream network.

Two segments of Village Creek are currently listed on Alabama's §303(d) list as impaired for pathogens. The impaired segments span a total of 16.64 miles and drain 52.2 square miles from the confluence of Second Creek to its source. These two segments, AL03160111-0408-102 (Second Creek to Woodlawn Bridge) and AL03160111-0408-103 (Woodlawn Bridge to its source) were originally placed on the §303(d) list in 2006 for pathogens. Neither segment is meeting water quality standards for pathogens; therefore, both segments will be covered in this report.

In 2014, §303(d) sampling studies were performed by ADEM on Village Creek to further assess the water quality of the impaired stream. For purposes of this TMDL, the 2014 data will be used to assess the water quality of Village Creek because it was collected less than six years ago and provides the best picture of the current water quality of the stream. The January 2014 edition of *Alabama's Water Quality Assessment and Listing Methodology* section 4.8.2, prepared by ADEM, provides the rationale for the Department 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. Also, as a result of the Alabama Environmental Management Commission's (EMC) adoption of the Escherichia coli (E. coli) criteria as the new bacterial indicator, this TMDL will be developed using E. coli data collected. The 2014 bacterial data is listed in Appendix 7.2, in Tables 7-1 through Table 7-7 for reference. In 2014, ADEM collected a total of 98 samples from seven different stations. According to the data, Village Creek is not meeting the pathogen criteria applicable to its use classification. Therefore, a TMDL will be developed for pathogens (E. coli) for the upper portion of Village Creek.

A mass balance approach was used for calculating the pathogen TMDL for Village Creek. The mass balance approach utilizes the conservation of mass principle. Existing loads were calculated by multiplying the E. coli concentration times the respective in-stream flows and a conversion factor. The mass loading was calculated using the single or geometric mean sample exceedance event which resulted in the highest percent reduction. In this case, it was determined that the highest percent reduction was calculated for a geometric mean violation of 665.84 colonies/100mL measured between 6/9/2014-6/26/2014 at station VLGJ-2 for segment AL03160111-0408-102 and a geometric mean violation of 659.3 colonies/100mL at station

VLGJ-1 for segment AL03160111-0408-103. The violations resulted in reductions of 26% and 25%, respectively.

The existing pathogen loading for this TMDL was calculated using the geometric mean exceedance at station VLGJ-2 (6/9/2014 - 6/26/2014) with a mean value of 665.84 colonies/100mL. This concentration was then multiplied by the average flow of the five samples and a conversion factor. The allowable loading, defined by the geometric mean criterion including a margin of safety, was calculated using the same average flow times the E. coli geometric mean target of 493.2 colonies/100mL (548 colonies/100mL – 10% Margin of Safety). The reduction required to meet the allowable loading was then calculated by subtracting the allowable loading from the existing loading and then dividing by the existing loading. This violation calls for a reduction of 26%.

Table 1-1 is a summary of the estimated existing load, allowable load, and percent reduction for the single sample criterion and the geometric mean criterion for segment AL03160111-0408-102 at station VLGJ-2. Table 1-2 is a summary of the estimated existing load, allowable load, and percent reduction for the single sample criterion and the geometric mean criterion for segment AL03160111-0408-103 at station VLGJ-1. Table 1-3 provides the details of the TMDL along with the corresponding reductions for Village Creek, which are protective of E. coli water quality standards year round.

Table 1-1 E. coli Load and Required Reduction for AL03160111-0408-102 at VLGJ-2

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Nonpoint Source Load - Single Sample	1.03E+12	9.64E+11	6.6E+10	6%
Nonpoint Source Load - Geometric Mean	3.17E+11	2.35E+11	8.20E+10	26%
Point Source Load[a]	2.68E+09	2.49E+12	0	0%

a. PS loads and load reductions are based on permit limits during the month of the highest instream E. coli exceedance.

Table 1-2 E. coli Load and Required Reduction for AL03160111-0408-103 at VLGJ-1

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Nonpoint Source Load - Single Sample	3.66E+11	4.16E+11	0	0%
Nonpoint Source Load - Geometric Mean	1.58E+11	1.18E+11	3.98E+10	25%
Point Source Load[a]	2.68E+09	2.49E+12	0	0%

a. PS loads and load reductions are based on permit limits during the month of the highest in-stream E. coli exceedance.

Table 1-3 E. coli TMDL for Village Creek

TMDL[e]	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)
2.75E+12	2.61E+10	2.49E+12	26%	0	2.35E+11	26%

a. There are no CAFOs in the Village Creek watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. Future WWTPs must meet the applicable in-stream 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 E. coli loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for E. coli.
e. TMDL was established using the geometric mean criterion of 548 colonies/100ml.

Compliance with the terms and conditions of existing and future NPDES 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 to targeting the load reductions to improve water quality in the Village Creek watershed. As additional data and/or information become 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 and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the total maximum daily load (TMDL) for pollutants causing use impairment. The TMDL process establishes the allowable loading of pollutants 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 and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified two segments of Village Creek, from the Second Creek confluence to the Woodlawn Bridge and from the Woodlawn Bridge to its source in Jefferson County, as being impaired by Pathogens (E. coli) and Pesticides (Dieldrin). The pathogen §303(d) listing was originally reported on Alabama's 2006 List of Impaired Waters based on ADEM data collected in 2002 and 2004, and the pesticides §303(d) listing was based on USGS data collected in 2000 and 2001. The listings have subsequently been included on the 2004, 2006, 2008, 2010, 2012 and 2014 lists. The source of the pathogens impairment is listed on the 2014 §303(d) list as collection system failure and urban runoff/storm sewers.

2.2 Problem Definition

Waterbody Impaired:	Village Creek – From Second Creek to Woodlawn Bridge Village Creek – From Woodlawn Bridge to Its source
Water Quality Standard Violation:	Pathogens (Geomean Max, E. coli)
Pollutant of Concern:	Pathogens (E. coli)
Water Use Classifications:	Limited Warmwater Fishery

Usage Related to Classification:
The two impaired segments (AL03160111-0408-102 and AL03160111-0408-103) are classified as Limited Warmwater Fishery (LWF). Usage of waters in this classification is described in ADEM Admin. Code R. 335-6-10-.09(6)(a), (b), (c), and (d) as shown below:

(a) The provisions of the Fish and Wildlife water use classification at rule 335-6-10-.09(5) shall apply to the Limited Warmwater Fishery water use classification, except as noted below. Unless alternative criteria for a given parameter are provided in paragraph (e) below, the applicable Fish and Wildlife criteria at paragraph 10-.09(5)(e) shall apply year-round. At the time the Department proposes to assign the Limited Warmwater Fishery classification to a specific waterbody, the Department may apply criteria from other classifications within this chapter if necessary to protect a documented, legitimate existing use.

(b) Best usage of waters (May through November): agricultural irrigation, livestock watering, industrial cooling and process water supplies, and any other usage, except fishing, bathing, recreational activities, including water-contact sports, or as a source of water supply for drinking or food-processing purposes.

(c) Conditions related to best usage (May through November):

1. The waters will be suitable for agricultural irrigation, livestock watering, and industrial cooling waters. The waters will be usable after special treatment, as may be needed under each particular circumstance, for industrial process water supplies. The waters will also be suitable for other uses for which waters of lower quality will be satisfactory.

2. This category includes watercourses in which natural flow is intermittent, or under certain conditions non-existent, and which may receive treated wastes from existing municipalities and industries. In such instances, recognition is given to the lack of opportunity for mixture of the treated wastes with the receiving stream for purposes of compliance. It is also understood in considering waters for this classification that urban runoff or natural conditions may impact any waters so classified.

(d) Other usage of waters: none recognized.

E. coli Criteria:
Criteria for acceptable bacteria levels for the LWF use classification are described in ADEM Admin. Code R. 335-6-10-.09(6)(e)3 as follows:

3. Bacteria: In non-coastal waters, bacteria of the E. coli group shall not exceed a geometric mean of 548 colonies/100 ml; nor exceed a maximum of 2,507 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.

Criteria Exceeded:
Segment AL03160111-0408-102 (Village Creek from Second Creek to Woodlawn Bridge) and Segment AL03160111-0408-103 (Village Creek from Woodlawn Bridge to its source) were listed in 2006 based on fecal coliform data collected by ADEM from 2002 & 2004 and from USGS in 2000-2001. At the time of the listings, the binomial distribution function was employed to calculate the number of exceedances of the single-sample maximum criterion of 2,000 colonies/100 mL for pathogens in each range of sample sizes collected over a six year period needed to say with 90% confidence that the criterion is exceeded in more than 10% of the population represented by the available samples. Waters in which the number of samples collected over a six year period exceeding the single-sample maximum of 2,000 colonies/100 mL or a geometric mean less than or equal to 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) in at least five samples collected in a thirty day period is less than or equal to the allowable exceedances for that sample size were considered to comply with Alabama's water quality standard for pathogens. Waters in which the number of samples collected over a six year period exceeding the single-sample maximum of 2000 colonies/100 mL or a geometric mean greater than 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) in at least five samples collected in a thirty day period is greater than the allowable exceedances for that sample size were considered impaired and listed for pathogens on Alabama's §303(d) list.

Starting in 2002, ADEM began collecting samples from Village Creek on Segment AL03160111-0408-102 and Segment AL03160111-0408-103. From 2002-2004, 40 fecal coliform samples were collected at VI-3, VLGJ-1, VLGJ-2, VLGJ-3 and VLGJ-4. Of the 40 samples collected, 9 samples exceeded the fecal coliform criteria. These exceedances were the basis for listing these segments on the §303(d) list.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

On December 11, 2009, the Alabama EMC adopted the E. coli criteria as the bacterial indicator to assess the levels of bacteria in freshwater. Prior to the adoption of the E. coli criteria, the fecal coliform criteria were used by ADEM as the bacterial indicator for freshwater. The E. coli criteria were recommended by the EPA as a better correlation to swimming and incidental water contact-associated health effects than fecal coliform in the 1986 publication *Quality Criteria for Water* (EPA 440/5-86-001). As a result of this bacterial indicator change, this TMDL will be developed from E. coli data collected at stations VLGJ-1 and VLGJ-2, even though the data that prompted the listing of Village Creek was based on fecal coliform criteria.

The impaired segments of Village Creek are classified as Limited Warmwater Fishery. For the purpose of this TMDL, a geometric mean E. coli target of 493.2 colonies/100 mL will be used. This target was derived by using a 10% explicit margin of safety from the geometric mean maximum of 548 colonies/100 mL criterion. This target is considered protective of water quality standards and should not allow the geometric mean of 548 colonies/100 mL to be exceeded.

3.2 Source Assessment

3.2.1 Point Sources in the Village Creek Watershed

A point source can be defined as a discernible, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source contributions can typically be attributed to municipal wastewater facilities, illicit discharges, and leaking sewer systems in urban areas. Municipal wastewater treatment facilities are permitted through the National Pollutant Discharge Elimination System (NPDES) process administered by ADEM. In urban settings, sewer lines typically run parallel to streams in the floodplain. If a leaking sewer line is present, high concentrations of E. coli can flow into the stream or leach into the groundwater. Illicit discharges are found at facilities that are discharging E. coli bacteria when not permitted, or when the E. coli criterion established in the issued NPDES permit is not being upheld.

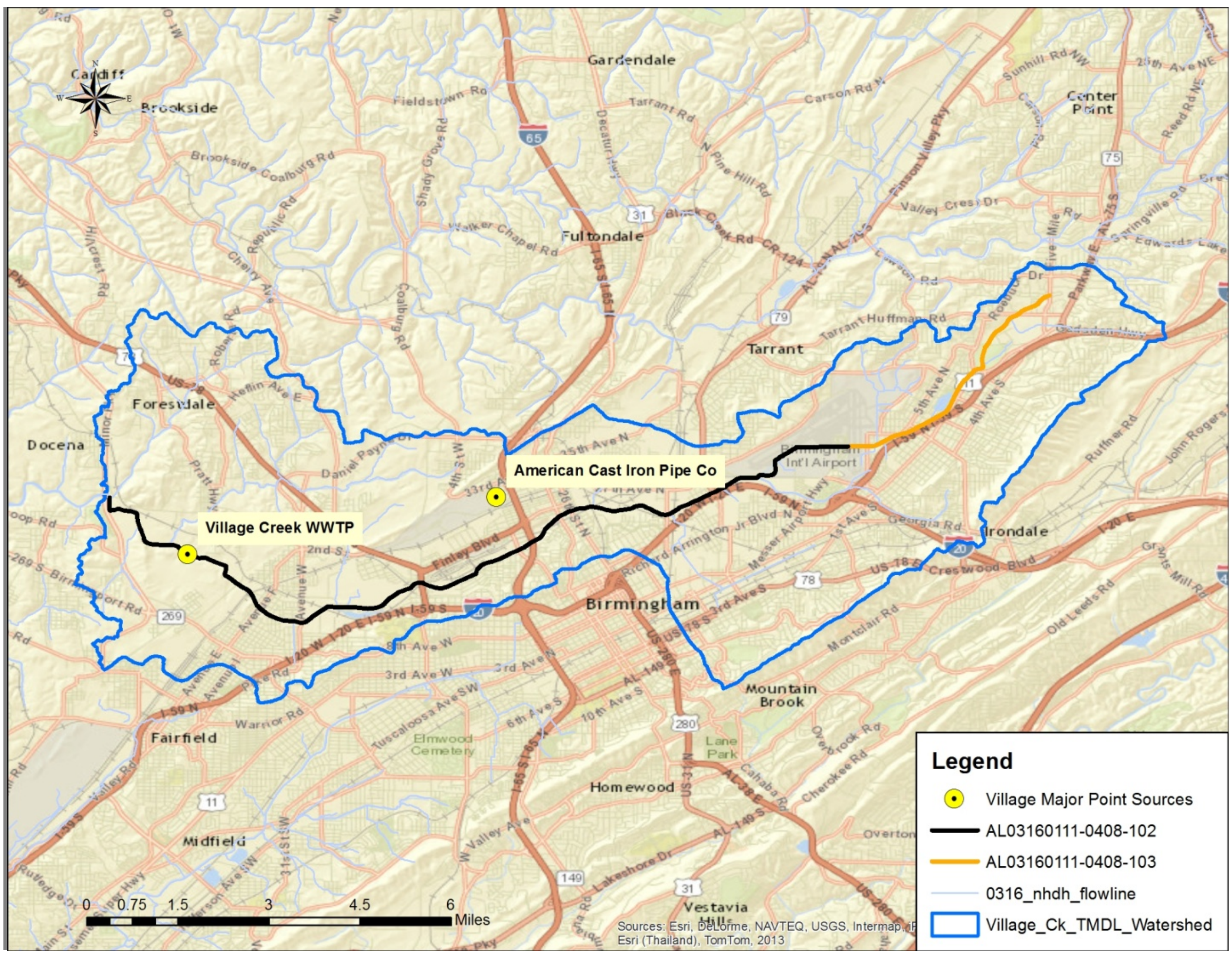
3.2.1.1 Continuous Point Source Discharges (NPDES)

There are multiple NPDES permitted facilities in the Village Creek watershed. There are two major (≥1.0 MGD) NPDES permitted point source discharges, and there are three minor (<1.0 MGD) NPDES permitted point source discharges. There is only one municipal facility in the watershed, and all of the other permitted facilities are industrial discharges. The single municipal facility is the only major facility that currently has an E. coli permit limit, and none of the minor facilities have an E. coli limit. The industrial facilities are not expected to contribute to the pathogens impairment in Village Creek due to the nature of their processes. Village Creek WWTP has a monthly average E. coli limit of 548 colonies/100 mL and a daily maximum E. coli limit of 2507 colonies/100 mL. A list of all of the major facilities is shown in Table 3-1, and Figure 3-1 shows the locations of these facilities.

Table 3-1 List of Major (≥1.0 MGD) NPDES Permitted Dischargers in the Village Creek Watershed

Facility Name	NPDES Permit Number	Latitude	Longitude	Major/Minor	Design Flow (MGD)	Receiving Stream
Village Creek WWTP	AL0023647	33.5339	-86.9061	Major	120.0	Village Creek
American Cast Iron Pipe Co	AL0029378	33.5475	-86.8325	Major	1.27	Village Creek

Figure 3-1 Locations of Major (≥1.0 MGD) NPDES Permitted Dischargers in the Village Creek Watershed



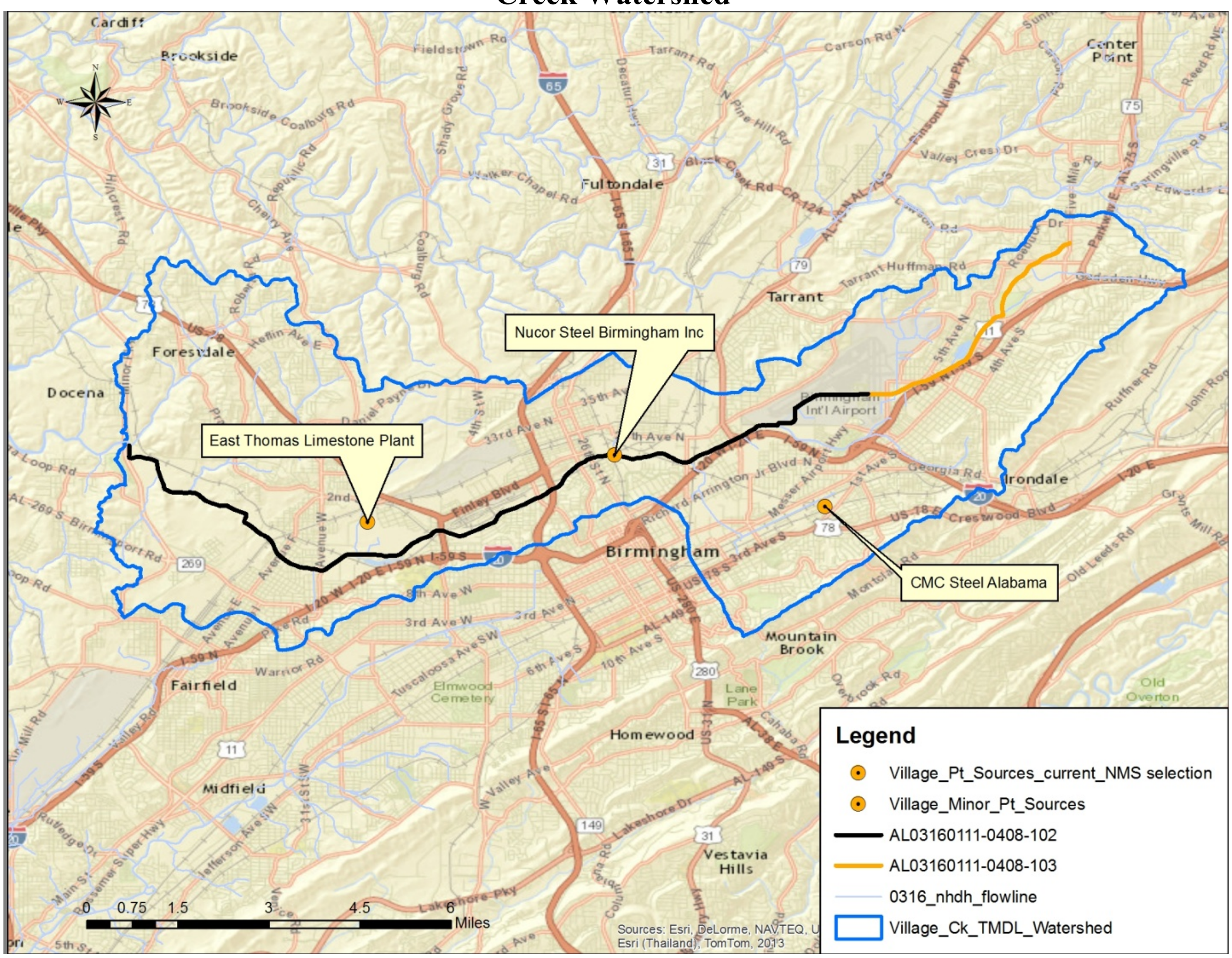
A complete list of all of the continuous minor facilities is shown in Table 3-2, and Figure 3-2 shows the locations of these facilities.

Table 3-2 List of Continuous Minor (<1.0 MGD) NPDES Permitted Dischargers in the Village Creek Watershed

Facility Name	NPDES Permit Number	Latitude	Longitude	Major/Minor	Design Flow (MGD)	Receiving Stream
CMC Steel Alabama	AL0001554	33.54814	-86.76077	Minor	0.38	Unnamed Tributary to Village Creek
East Thomas Limestone Plant*	AL0025194	33.5247	-86.8544	Minor	4.90	Village Creek
Nucor Steel Birmingham	AL0003735	33.545	-86.8091	Minor	0.158	Village Creek

*As a result of the classification process for mining permits, this facility is considered a minor point source. Effluent is a combination of treated process water and stormwater.

Figure 3-2 Locations of Minor (<1.0 MGD) NPDES Permitted Dischargers in the Village Creek Watershed



3.2.1.2 Non-Continuous Point Source Discharges (NPDES)

There are currently six individual NPDES stormwater discharge permits within the Village Creek watershed. Included in the total are permits for two Metalplate Galvanizing LP plants that have been drafted and not yet finalized. A description of each facility is below and a complete list of the non-continuous minor facilities is shown in Table 3-3.

Nexeo Solutions (AL0021695) is a facility that currently operates as a bulk storage, packaging, and distributor of industrial chemicals and solvents; no manufacturing takes place at the facility. The current NPDES permit covers stormwater only into Village Creek. The sanitary waste from this facility is disposed of through the Jefferson County sewer system.

Industrial Chemicals Inc (AL0031721) is a facility that includes packaging and storage of various liquids including acids, bases, solvents, peroxides, oils, and water treatment chemicals in pails, drums, intermediate bulk containers and bulk storage tanks. Packaging and storage of dry products include carbonates, sulfates, and borates in bags and tote sacks. Compressed gases are stored in steel cylinders. The current NPDES permit covers stormwater only into Village Creek.

Metalplate Galvanizing LP – Plants 1 and 2 (AL0080403 & AL0080411) are both listed as facilities that perform hot-dip galvanizing of steel. The sanitary waste from these facilities is disposed of through the Jefferson County sewer system.

Diversified NonFerrous Technologies, Inc. (AL0080527) is a facility that repairs and restores high current electrical equipment. Wrought copper and alloy cast parts are either bought or produced as needed for such restorations. Activities involved include machining, forming, and welding. All of the process water associated with these tasks is in a closed loop and therefore the facility only has a stormwater discharge. The sanitary waste from this facility is disposed of through the Jefferson County sewer system.

Western International Gas and Cylinders Inc (AL0081957) is a manufacturer and leading wholesale supplier of acetylene. This facility is a multiple cylinder and bulk fill plant. The secondary activity conducted at the facility is the manufacture of acetylene (~20%) gas. The facility manufactures acetylene from calcium carbide and water. Acetylene production produces lime, which is slurried and stored in ponds. The process water is recirculated from the ponds back into the manufacturing process; therefore, no process water is discharged.

These facilities are not considered to be a source of pathogens due to the lack of process discharges and the nature of their processes. No E. coli loading to Village Creek will be attributed to these facilities, nor will they receive an allocation in this TMDL.

Table 3-3 List of Non-Continuous Minor (<1.0 MGD) NPDES Permitted Dischargers in the Village Creek Watershed

Facility Name	NPDES Permit Number	Latitude	Longitude	Major/Minor	Design Flow (MGD)	Receiving Stream
Nexeo Solutions	AL0021695	33.553	-86.7848	Minor	Stormwater	Village Creek
Industrial Chemicals Inc	AL0031721	33.5171	-86.8714	Minor	Stormwater	Village Creek
Metalplate Galvanizing LP – Plant 1*	AL0080403	33.5367	-86.7714	Minor	Stormwater	Village Creek
Metalplate Galvanizing LP – Plant 2*	AL0080411	33.5408	-86.7847	Minor	Stormwater	Village Creek
Diversified NonFerrous Technologies, Inc.	AL0080527	33.5467	-86.8227	Minor	Stormwater	Village Creek
Western International Gas & Cylinders Inc.	AL0081957	33.56194	-86.8411	Minor	0.50	Unnamed Tributary to Village Creek

*Draft permit written in 2010

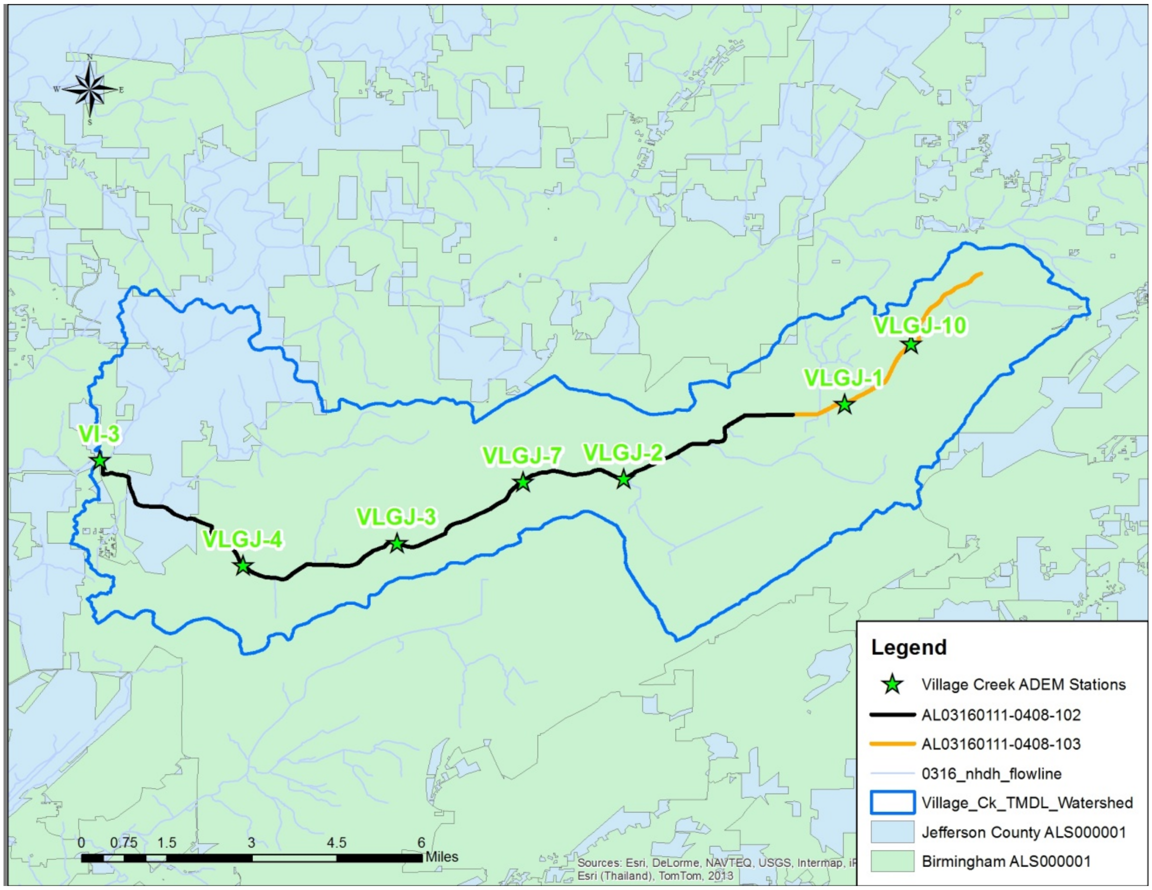
Municipal Separate Storm Sewer Systems (MS4s)

A significant portion of the Village 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). The entire Village Creek watershed is within the boundary of the Birmingham-Jefferson Co. Area Phase I MS4 (ALS000001), and Figure 3-3 identifies the coverage of the Phase I MS4 area. Contributions from the Phase I MS4 area drain to the pathogen impaired segments of the Village Creek watershed and will be considered as a point source 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 the 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 Village Creek watershed and therefore would be considered a source of pathogens to Village Creek.

Future NPDES regulated stormwater discharges will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

Figure 3-3 Phase I MS4 Areas in the Village Creek Watershed



3.2.2 Nonpoint Sources in the Village Creek Watershed

Nonpoint sources of E. coli bacteria do not have a defined discharge point, but rather occur over the entire length of a stream or waterbody. On the land surface, E. coli bacteria can accumulate over time and be washed into streams or waterbodies during rain events. Therefore, there is some net loading of E. coli bacteria into streams as dictated by the watershed hydrology.

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

E. coli bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, beaver, and waterfowl. 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.

E. coli 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, sewer overflows due to I & I (infiltration and inflow), 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 E. coli bacteria to surface waters due to system failure and malfunction.

3.3 Land Use Assessment

Land use for the Village Creek watershed was determined using ArcMap with land use datasets derived for the 2011 National Land Cover Dataset (NLCD). Figure 3-4 displays the land use areas for the Village Creek watershed. Table 3-3 depicts the primary land uses in the Village Creek watershed. Figure 3-5 shows the grouped land uses in the Village Creek watershed.

The majority of the Village Creek watershed is developed land at 82%. The remaining land use is approximately 17% forested, 1% agricultural lands and less than 1% open water. Developed land includes both commercial and residential land uses and is contained mostly within the City of Birmingham.

Figure 3-4 Land Use Map for the Village Creek Watershed

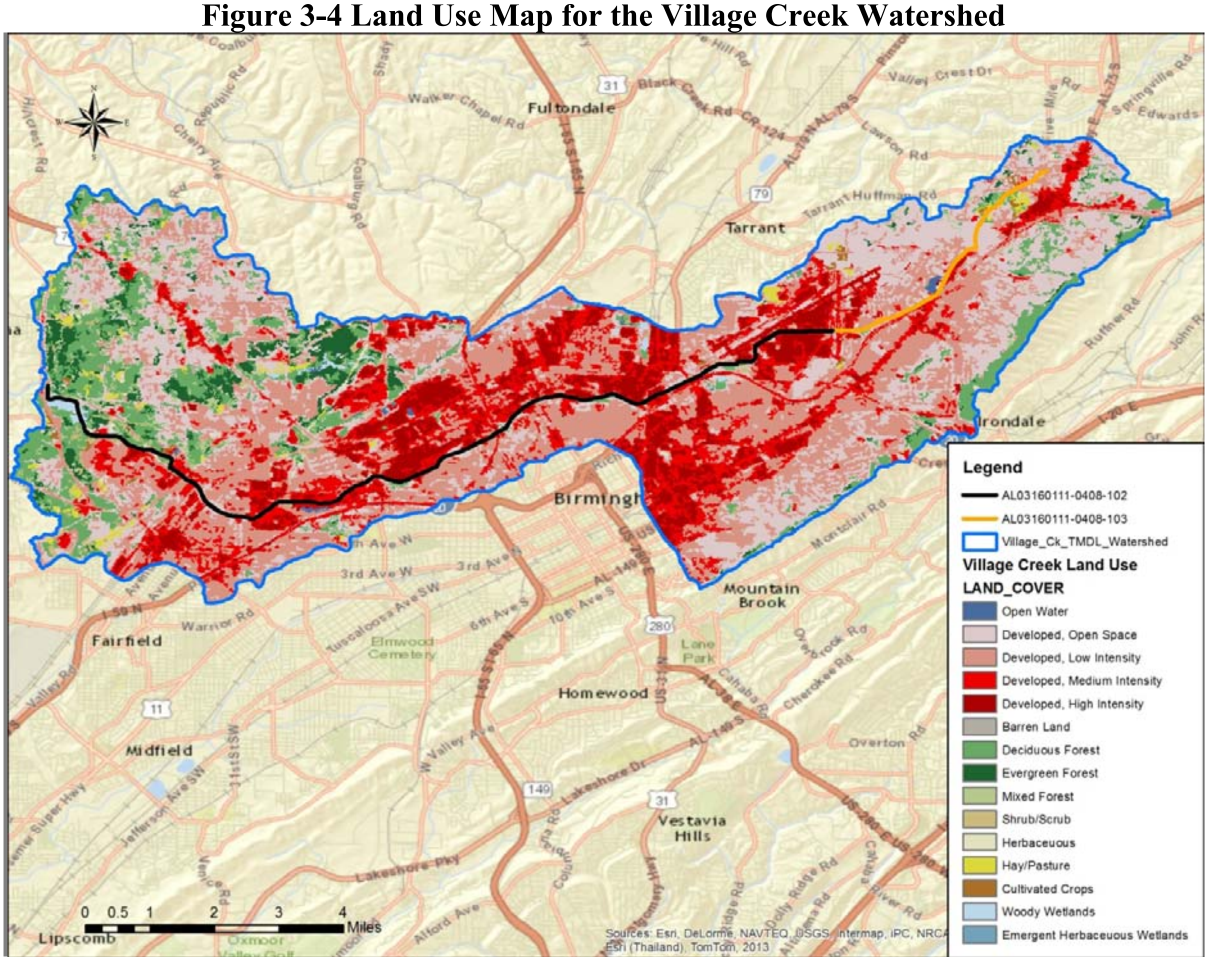
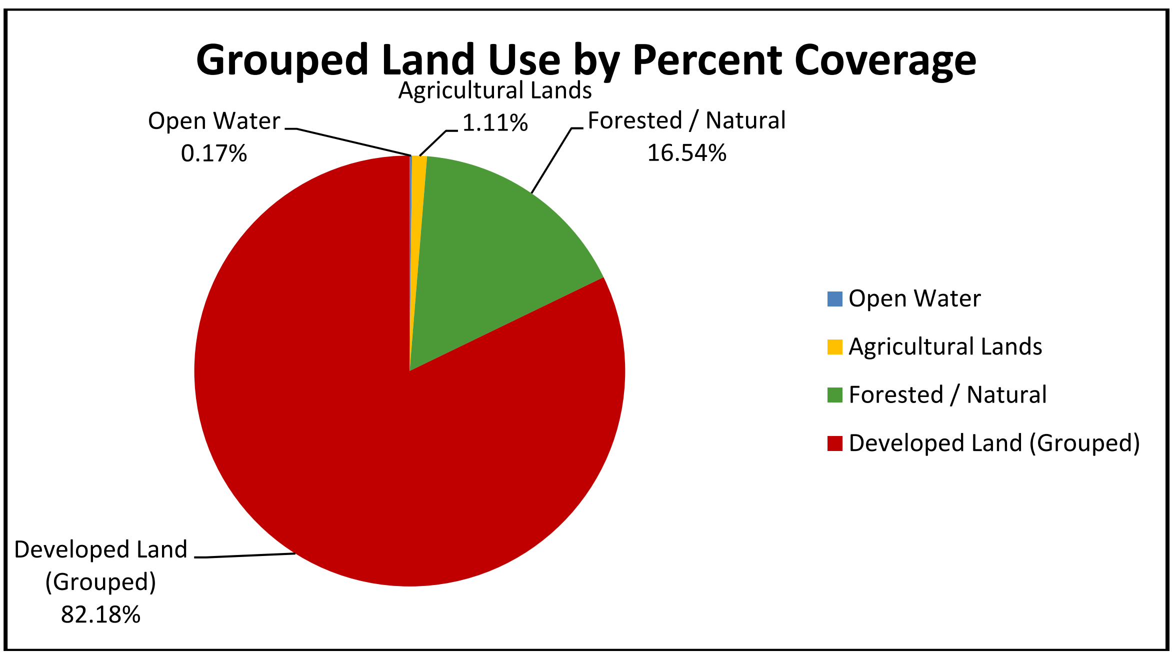


Table 3-4 Land Use Areas for the Village Creek Watershed

Class Description	Miles²	Acres	Percent
Open Water	0.09	57.16	0.17%
Developed, Open Space	12.76	8165.60	24.44%
Developed, Low Intensity	17.22	11020.76	32.98%
Developed, Medium Intensity	8.18	5232.58	15.66%
Developed, High Intensity	4.73	3029.32	9.07%
Barren Land	0.02	9.79	0.03%
Deciduous Forest	5.04	3223.71	9.65%
Evergreen Forest	1.82	1162.80	3.48%
Mixed Forest	0.88	560.27	1.68%
Shrub/Scrub	0.43	272.02	0.80%
Herbaceous	0.25	157.69	0.47%
Hay/Pasture	0.45	286.47	0.86%
Cultivated Crops	0.13	84.07	0.25%
Woody Wetlands	0.23	148.80	0.45%
Emergent Herbaceous Wetlands	0.002	1.56	0.004%
TOTALS →	**52.21**	**33412.60**	**100.00%**
Cumulative Class Description	**Miles²**	**Acres**	**Percent**
Open Water	0.09	57.16	0.17%
Agricultural Lands	0.58	370.55	1.11%
Forested / Natural	8.64	5526.84	16.54%
Developed Land (Grouped)	42.90	27458.05	82.18%
TOTALS →	**52.21**	**33412.60**	**100.00%**

Figure 3-5 Graph of Primary Land Uses in the Village Creek Watershed



3.4 Linkage Between Numerical Targets and Sources

The Village Creek watershed has two main land uses, namely forested/natural and developed land. Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most likely sources of pathogen loadings in Village Creek are from urban run-off from rain events, unpermitted discharges of wastewater, failing septic systems and sewer overflows. As can be seen in Figure 3-4, most of the impaired segments run directly though the developed areas of the watershed. It is not considered a logical approach to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for the various nonpoint sources. The loadings and reductions will only be calculated as a single total nonpoint source load and reduction.

3.5 Data Availability and Analysis

In 2014, ADEM collected monthly water quality data from Village Creek at multiple stations along the impaired segments. Segment AL03160111-0408-102 has four stations (VLGJ-2, VLGJ-3, VLGJ-4 & VLGJ-7) where monthly water quality data was collected and one trend station (VI-3) which is sampled three times a year. In 2014, there were 16 E. coli samples collected at each monthly station. Of those four stations, there were zero single sample violations and one geometric mean sample violation. This exceedance is shown in Table 3-5. Segment AL03160111-0408-102 has two stations (VLGJ-1 & VLGJ-10) where monthly water quality data was collected. In 2014, there were 15 E. coli samples collected at VLGJ-1 and 16 E. coli samples collected at VLGJ-10. Of the two stations, there were zero single sample violations and one geometric mean violation. This exceedance is shown in Table 3-6.

Table 3-5 E. coli Exceedances on Village Creek Segment AL03160111-0408-102

Station ID	Visit Date	E Coli (col/100mL)	E Coli Dc	Geometric Mean (col/100mL)	Flow Measured	Flow (cfs)
VLGJ-2	6/9/2014	920.8		665.84	YES-ADEM	20.8131
VLGJ-2	6/16/2014	261.3			YES-ADEM	25.3811
VLGJ-2	6/19/2014	547.5			YES-ADEM	18.0323
VLGJ-2	6/23/2014	410.6			YES-ADEM	15.6827
VLGJ-2	6/26/2014	2419.6			YES-ADEM	17.4565

Exceedances shown in red

Table 3-6 E. coli Exceedances on Village Creek Segment AL03160111-0408-103

Station ID	Visit Date	E Coli (col/100 mL)	E Coli Dc	Geometric Mean (col/100 mL)	Flow Measured	Flow (cfs)
VLGJ-1	6/9/2014	1203.3		659.30	YES-ADEM	10.5404
VLGJ-1	6/16/2014	275.5			YES-ADEM	10.1626
VLGJ-1	6/19/2014	686.7			YES-ADEM	10.0497
VLGJ-1	6/23/2014	275.5			YES-ADEM	10.6907
VLGJ-1	6/26/2014	1986.3			YES-ADEM	7.5294

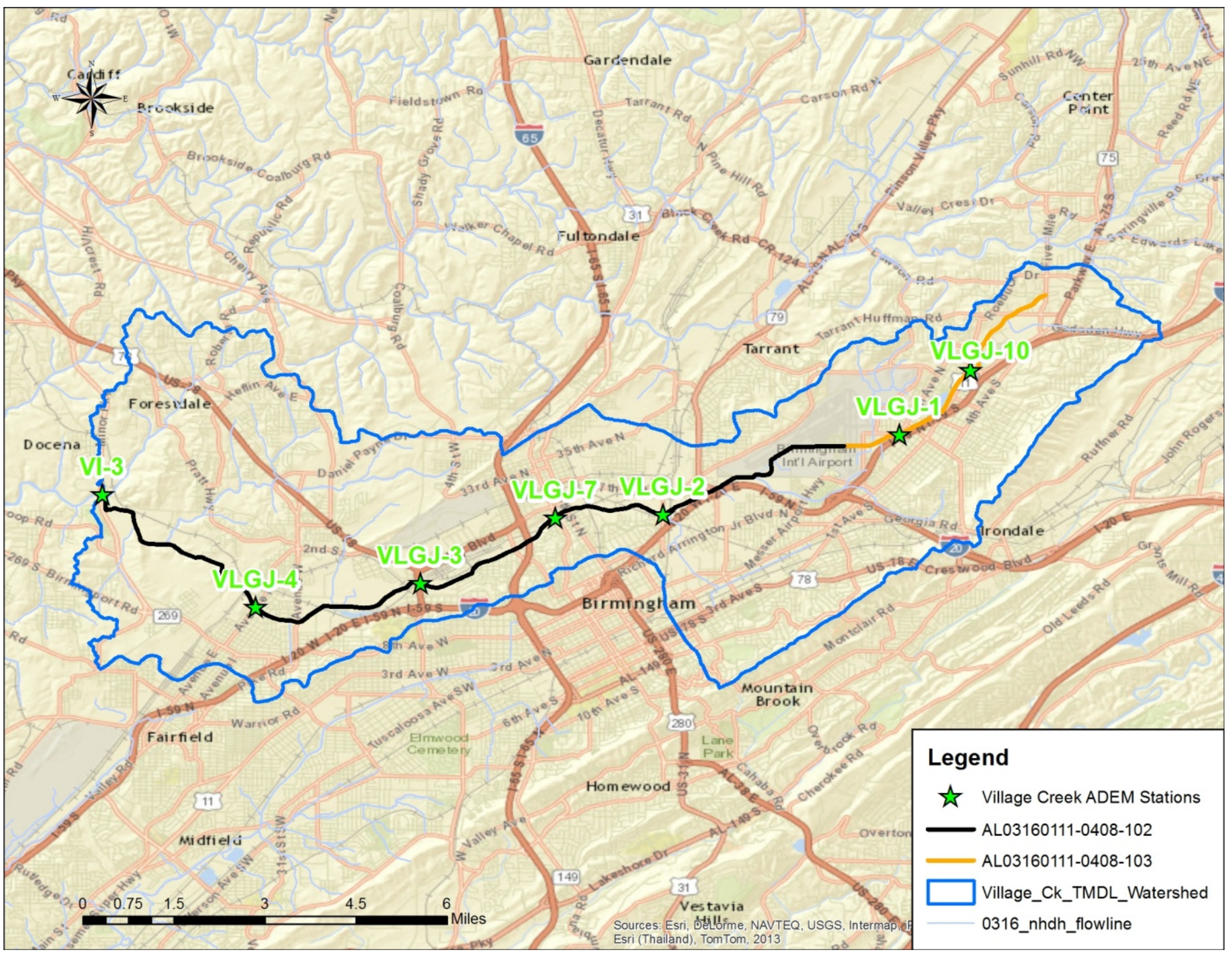
Exceedances shown in red

Table 3-7 ADEM Sampling Stations on Village Creek

Station	Local Name	Station Description	Latitude	Longitude
VI-3	Village Creek	Village Cr Jefferson Co Rd 65	33.547974°	-86.925667°
VLGJ-1	Village Creek	Village Cr 75th Street North in Birmingham	33.562347°	-86.735498°
VLGJ-2	Village Creek	Village Cr Vanderbilt Rd	33.543302°	-86.791911°
VLGJ-3	Village Creek	Village Cr RR Bridge U_S of Arkedelphia Rd "US Hwy 78"	33.52683°	-86.849729°
VLGJ-4	Village Creek	Village Cr Avenue F in Ensley	33.521205°	-86.889061°
VLGJ-7	Village Creek	Village Creek at 24th Street	33.5425°	-86.8175°
VLGJ-10	Village Creek	Village Creek at intersection of West Blvd and 1st Ave N	33.57771°	-86.7183°

*Note: Not all of ADEM's sampling stations on Village Creek are shown in the table above. Only the stations referenced in this report are shown.

Figure 3-6 Map of ADEM Sampling Stations on Village Creek



*Note: Not all of ADEM's sampling stations are shown in the map above. Only the stations referenced in this report are shown.

3.6 Critical Conditions

Summer months (June-September) are generally considered critical conditions. This can be explained by the nature of storm events in the summer versus the winter. In summer, periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of E. coli bacteria into streams, resulting in spikes of E. coli bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of E. coli bacteria on the land surface, resulting in a more uniform loading rate.

The impaired portion of the Village Creek watershed generally follows the trends described above for the summer months of June through September. The critical condition for this pathogen TMDL was taken to be the one with the highest E. coli geometric mean exceedance value. That value was 665.84 colonies/100mL and occurred between June 9, 2014, and June 26, 2014, at VLGJ-2. An average flow of 19.47 cfs was calculated for VLGJ-2 at the time of the sample collections.

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.

Both an explicit and implicit MOS were incorporated into this TMDL. The MOS accounts for the uncertainty associated with the limited availability of E. coli data used in this analysis. An explicit MOS was applied to the TMDL by reducing the target geometric mean criterion concentration by ten percent and calculating a mass loading target with measured flow data. The geometric mean maximum value of 548 colonies/100 mL was reduced by 10% to 493.2 colonies/100 mL. An implicit MOS was also incorporated in the TMDL by basing the existing condition on the highest measured E. coli concentration that was collected during critical conditions.

4.0 TMDL Development

4.1 Definition of a TMDL

A Total Maximum Daily Load (TMDL) is the sum of individual wasteload allocations (WLAs) for point sources, 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 both implicit and 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 Village Creek. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the E. coli concentration times the in-stream flow times a conversion factor. Existing 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 and geometric mean criterion. The TMDL was based on the violation that produced the highest percent reduction of E. coli loads necessary to achieve applicable water quality criteria, whether it was the single sample or geometric mean sample.

4.2.1 Existing Conditions

The **single sample** mass loading was calculated by multiplying the highest single sample E. coli concentration of 2419.6 colonies/100 mL times the measured flow at the time the sample was taken. This concentration was based on the measurement at VLGJ-2 on June 26, 2014. This measurement can be found in Appendix 7.2, Table 7-4. The product of the concentration, measured flow, and a conversion factor gives the total mass loading (colonies per day) of E. coli to Village Creek under a single sample condition. Sample calculations below only show the calculations for the highest value at VLGJ-2.

$$\frac{17.46\ \text{ft}^3}{\text{s}} \times \frac{2419.6\ \text{colonies}}{100\,\text{mL}} \times \frac{24{,}465{,}755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.03 \times 10^{12}\ \text{colonies}}{\text{day}}$$

The **geometric mean** mass loading was calculated by multiplying the highest geometric mean exceedance concentration of 665.84 colonies/100 mL times the average flow of the five samples. This concentration was calculated based on measurements at VLGJ-2 between June 9, 2014, and June 26, 2014, and can be found in Appendix 7.2, Table 7-2. The average stream flow was determined to be 19.47 cfs. The product of these two values times the conversion factor gives the total mass loading (colonies per day) of E. coli to Village Creek under the geometric mean exceedance condition. Sample calculations are shown below.

$$\frac{19.47\ \text{ft}^3}{\text{s}} \times \frac{665.84\ \text{colonies}}{100\,\text{mL}} \times \frac{24{,}465{,}755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.17 \times 10^{11}\ \text{colonies}}{\text{day}}$$

The existing loading for the WLA portion of this TMDL was calculated using Discharge Monitoring Reports (DMRs) from the NPDES permitted facilities. Since the highest exceedance happened in June 2014, the loading from the NPDES point sources in June 2014 was used. The monthly average flow from each facility as reported on their DMRs was multiplied by the reported monthly average E. coli loading. The product of these two values and a conversion factor gives the total mass loading (colonies per day) of E. coli for each facility. These loadings are then added together to get the total existing loading for the WLA portion of this TMDL. A sample calculation from one of the facilities is shown below. Complete results are shown in Appendix 7.3, Table 7-8.

$$\frac{16.0 \times 10^6\ gal.}{day} \times \frac{4.0\ colonies}{100\ mL} \times \frac{3{,}785.41\ mL}{gal.} = \frac{2.42 \times 10^9 colonies}{day}$$

4.2.2 Allowable Conditions

The **allowable load** to the watershed was calculated under the same physical conditions as discussed above for the single sample and geometric mean criteria. This is done by taking the product of the average/measured flow used for the violation event times the conversion factor times the allowable concentration.

For the **single sample** E. coli target concentration of 2,256.3 colonies/100mL, the allowable E. coli loading is:

$$\frac{17.46\ \mathrm{ft}^3}{\mathrm{s}} \times \frac{2256.3\ \mathrm{colonies}}{100\,\mathrm{mL}} \times \frac{24{,}465{,}755\quad 100\,\mathrm{mL} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{9.64 \times 10^{11}\ \mathrm{colonies}}{\mathrm{day}}$$

The explicit margin of safety of 250.7 colonies/100 mL equals a daily loading of:

$$\frac{17.46\ \mathrm{ft}^3}{\mathrm{s}} \times \frac{250.7\ \mathrm{colonies}}{100\,\mathrm{mL}} \times \frac{24{,}465{,}755\quad 100\,\mathrm{mL} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{1.07 \times 10^{11}\ \mathrm{colonies}}{\mathrm{day}}$$

For the **geometric mean** E. coli target concentration of 493.2 colonies/100 mL, the allowable E. coli loading is:

$$\frac{19.47\ \mathrm{ft}^3}{\mathrm{s}} \times \frac{493.2\ \mathrm{colonies}}{100\,\mathrm{mL}} \times \frac{24{,}465{,}755\quad 100\,\mathrm{mL} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{2.35 \times 10^{11}\ \mathrm{colonies}}{\mathrm{day}}$$

The explicit margin of safety of 54.8 colonies/100 mL equals a daily loading of:

$$\frac{19.47\ \mathrm{ft}^3}{\mathrm{s}} \times \frac{54.8\ \mathrm{colonies}}{100\,\mathrm{mL}} \times \frac{24{,}465{,}755\quad 100\,\mathrm{mL} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{2.61 \times 10^{10}\ \mathrm{colonies}}{\mathrm{day}}$$

The allowable loading for the WLA portion of this TMDL was calculated by multiplying the design flow for each facility in the watershed by the in-stream geometric mean E. coli criterion. This value was then multiplied by a conversion factor to come up with the appropriate loading. This process was completed for each contributing facility in the watershed, and then all of the loadings were added together to obtain the total allowable loading. A sample calculation of one facility is shown below. Complete results are shown in Appendix 7.3, Table 7-8.

$$\frac{120.0 \times 10^{6}\text{gal.}}{\text{day}} \times \frac{548\text{ colonies}}{100\text{ mL}} \times \frac{3785.41\text{ mL}}{\text{gal.}} = \frac{2.49 \times 10^{12}\text{colonies}}{\text{day}}$$

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 E. coli water quality criterion. The TMDL was calculated as the total daily E. coli load to Village Creek as evaluated at stations VLGJ-1 and VLGJ-2.

Table 4-1 and Table 4-2 are summaries of the estimated existing loads, allowable loads, and percent reductions for both the geometric mean and single sample criterion for each impaired segment. Table 4-3 provides the details of the TMDL along with the corresponding reductions for Village Creek, which are protective of E. coli water quality standards year round.

Table 4-1 E. coli Load and Required Reduction for AL03160111-0408-102 at VLGJ-2

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Nonpoint Source - Load Single Sample	1.03E+12	9.64E+11	6.6E+10	6%
Nonpoint Source - Load Geometric Mean	3.17E+11	2.35E+11	8.20E+10	26%
Point Source Load[a]	2.68E+09	2.49E+12	0	0%

a. PS loads and load reductions are based on permit limits during the month of the highest in-stream E. coli exceedance.

Table 4-2 E. coli Load and Required Reduction for AL03160111-0408-103 at VLGJ-1

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Nonpoint Source - Load Single Sample	3.66E+11	4.16E+11	0	0%
Nonpoint Source - Load Geometric Mean	1.58E+11	1.18E+11	3.98E+10	25%
Point Source Load[a]	2.68E+09	2.49E+12	0	0%

a. PS loads and load reductions are based on permit limits during the month of the highest in-stream E. coli exceedance.

From Table 4-1, compliance with the geometric mean criterion of 548 colonies/100 mL requires the greatest reduction (26%) in the E. coli load. The TMDL, WLA, LA, and MOS values necessary to achieve the applicable E. coli criterion are provided in Table 4-3 below.

Table 4-3 E. coli TMDL for Village Creek

TMDL[e]	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)
2.75E+12	2.61E+10	2.49E+12	26%	0	2.35E+11	26%

a. There are no CAFOs in the Village Creek watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. Future WWTPs must meet the applicable in-stream 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 E. coli loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for E. coli.
e. TMDL was established using the geometric mean criterion of 548 colonies/100ml.

4.3 TMDL Summary

Village Creek was placed on Alabama's §303(d) list for a pathogens impairment in 2006 based on data collected by ADEM in 2002 and 2004. In 2014, ADEM collected additional water quality data using the newly adopted pathogen impairment criteria, with E. coli serving as the primary pathogen indicator. The data collected by ADEM in 2014 confirmed the pathogen impairment and provided the basis for TMDL development.

A mass balance approach was used to calculate the E. coli TMDL for Village Creek. Based on the TMDL analysis, it was determined that a 26% reduction in E. coli 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 to targeting the load reductions to improve water quality in the Village Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

5.0 Follow Up Monitoring

ADEM has adopted a statewide approach to water quality management. Each year, ADEM's water quality resources are divided among multiple priorities statewide including §303(d) listed waterbodies, waterbodies with active TMDLs, and other waterbodies as determined by the Department. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices and load reductions in the watershed.

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 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 could also request paper or electronic copies of the TMDL by contacting Ms. Kimberly Minton at 334-271-7826 or kminton@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 have become part of the administrative record. ADEM has 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.

7.0 Appendices

7.1 References

ADEM Administrative Code, 2010. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2010. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's §303(d) Monitoring Program. 2014. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, January 2014.

Alabama's §303(d) List and Fact Sheet. 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012 & 2014. ADEM.

Alabama Department of Environmental Management (ADEM) Laboratory QA Manual, Chapter 5, Table 5-2: ADEM Laboratory Qualifier Codes and, June 13, 2005.

Cleland, Bruce. "TMDL Development from the "Bottom Up" – Part III: Duration Curves and Wet-weather Assessments." Washington, D.C.: America's Clean Water Foundation, September 15, 2003.

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, 1986. Quality Criteria for Water. Office of Water. EPA 440/4-91-001.

7.2 Water Quality Data

Table 7-1 E. coli Data for Station VI-3

Station ID	Activity Date	Flow CFS	Flow Measured	Flow Stage	E Coli	E Coli Dc	E Coli Geomean
VI-3	5/20/2014	87	YES-USGS	NORMAL	209.8		
VI-3	7/10/2014	40	YES-USGS	NORMAL	74.3		
VI-3	9/10/2014	50	YES-USGS	NORMAL	119.8		

Table 7-2 E. coli Data for Station VLGJ-1

Station ID	Activity Date	Flow CFS	Flow Measured	Flow Stage	E Coli	E Coli Dc	E Coli Geomean
VLGJ-1	3/20/2014	12.8568	YES-ADEM	NORMAL	129.6		
VLGJ-1	4/16/2014	20.1562	YES-ADEM	NORMAL	290.9		
VLGJ-1	5/21/2014	10.7673	YES-ADEM	NORMAL	435.2		
VLGJ-1	6/9/2014	10.5404	YES-ADEM	NORMAL	1203.3		659.30
VLGJ-1	6/16/2014	10.1626	YES-ADEM	NORMAL	275.5		
VLGJ-1	6/19/2014	10.0497	YES-ADEM	NORMAL	686.7		
VLGJ-1	6/23/2014	10.6907	YES-ADEM	NORMAL	275.5		
VLGJ-1	6/26/2014	7.5294	YES-ADEM	NORMAL	1986.3		
VLGJ-1	7/17/2014	9.6839	YES-ADEM	NORMAL	866.4		
VLGJ-1	8/4/2014	7.5326	YES-ADEM	NORMAL	127.4		369.34
VLGJ-1	8/11/2014	6.0879	YES-ADEM	NORMAL	727		
VLGJ-1	8/18/2014	6.077	YES-ADEM	NORMAL	344.1		
VLGJ-1	8/20/2014	5.5895	YES-ADEM	NORMAL	866.4		
VLGJ-1	8/26/2014	8.4453	YES-ADEM	NORMAL	248.9		
VLGJ-1	10/16/2014	5.5728	YES-ADEM	LOW	1299.7		

Exceedances are highlighted in red

Table 7-3 E. coli Data for Station VLGJ-10

Station ID	Activity Date	Flow CFS	Flow Measured	Flow Stage	E Coli	E Coli Dc	E Coli Geomean
VLGJ-10	3/20/2014	11.0548	YES-ADEM	NORMAL	410.6		
VLGJ-10	4/16/2014	15.4334	YES-ADEM	ABOVE NORMAL	67.7		
VLGJ-10	5/21/2014	7.2928	YES-ADEM	NORMAL	86		
VLGJ-10	6/9/2014	6.8622	YES-ADEM	NORMAL	206.4		85.48
VLGJ-10	6/16/2014	4.7972	YES-ADEM	NORMAL	141.4		
VLGJ-10	6/19/2014	6.2437	YES-ADEM	NORMAL	68.9		
VLGJ-10	6/23/2014	5.208	YES-ADEM	NORMAL	24.3		
VLGJ-10	6/26/2014	5.224	YES-ADEM	NORMAL	93.4		
VLGJ-10	7/17/2014	4.8835	YES-ADEM	NORMAL	59.4		
VLGJ-10	8/4/2014	3.8847	YES-ADEM	NORMAL	68.3		104.84
VLGJ-10	8/11/2014	7.2071	YES-ADEM	NORMAL	261.3		
VLGJ-10	8/18/2014	4.5281	YES-ADEM	NORMAL	124.6		
VLGJ-10	8/20/2014	5.0125	YES-ADEM	NORMAL	139.6		
VLGJ-10	8/26/2014	4.5998	YES-ADEM	NORMAL	40.8		
VLGJ-10	9/17/2014	3.7222	YES-ADEM	NORMAL	31.3		
VLGJ-10	10/16/2014	4.0355	YES-ADEM	NORMAL	77.1		

Table 7-4 E. coli Data for Station VLGJ-2

Station ID	Activity Date	Flow CFS	Flow Measured	Flow Stage	E Coli	E Coli Dc	E Coli Geomean
VLGJ-2	3/20/2014	28.9123	YES-ADEM	NORMAL	61.3		
VLGJ-2	4/16/2014	56.9055	YES-ADEM	NORMAL	290.9		
VLGJ-2	5/21/2014	21.5111	YES-ADEM	NORMAL	727		
VLGJ-2	6/9/2014	20.8131	YES-ADEM	NORMAL	920.8		665.84
VLGJ-2	6/16/2014	25.3811	YES-ADEM	NORMAL	261.3		
VLGJ-2	6/19/2014	18.0323	YES-ADEM	NORMAL	547.5		
VLGJ-2	6/23/2014	15.6827	YES-ADEM	NORMAL	410.6		
VLGJ-2	6/26/2014	17.4565	YES-ADEM	NORMAL	2419.6		
VLGJ-2	7/17/2014	14.5136	YES-ADEM	NORMAL	146.7		
VLGJ-2	8/4/2014	13.2112	YES-ADEM	NORMAL	178.9		194.06
VLGJ-2	8/11/2014	14.9383	YES-ADEM	NORMAL	172.2		
VLGJ-2	8/18/2014	12.5089	YES-ADEM	NORMAL	160.7		
VLGJ-2	8/20/2014	15.4406	YES-ADEM	NORMAL	410.6		
VLGJ-2	8/26/2014	11.551	YES-ADEM	NORMAL	135.4		
VLGJ-2	9/17/2014	13.4278	YES-ADEM	NORMAL	179.3		
VLGJ-2	10/16/2014	16.3685	YES-ADEM	LOW	261.3		

Exceedances are highlighted in red

Table 7-5 E. coli Data for Station VLGJ-3

Station ID	Activity Date	Flow CFS	Flow Measured	Flow Stage	E Coli	E Coli Dc	E Coli Geomean
VLGJ-3	3/19/2014	48.3353	YES-ADEM	NORMAL	141.4		
VLGJ-3	4/17/2014	64.5894	YES-ADEM	NORMAL	172.5		
VLGJ-3	5/20/2014	26.7319	YES-ADEM	NORMAL	156.5		
VLGJ-3	6/9/2014	30.0238	YES-ADEM	NORMAL	387.3		282.65
VLGJ-3	6/16/2014	31.7487	YES-ADEM	NORMAL	206.3		
VLGJ-3	6/18/2014	45.5288	YES-ADEM	NORMAL	613.1		
VLGJ-3	6/23/2014	21.3165	YES-ADEM	NORMAL	75.4		
VLGJ-3	6/26/2014	42.7976	YES-ADEM	NORMAL	488.4		
VLGJ-3	7/16/2014	20.9913	YES-ADEM	NORMAL	298.7		
VLGJ-3	8/4/2014	15.2341	YES-ADEM	NORMAL	44.3		101.15
VLGJ-3	8/11/2014	17.7333	YES-ADEM	NORMAL	214.3		
VLGJ-3	8/18/2014	13.9937	YES-ADEM	NORMAL	95.9		
VLGJ-3	8/21/2014	9.8906	YES-ADEM	NORMAL	178.9		
VLGJ-3	8/26/2014	15.6556	YES-ADEM	NORMAL	65		
VLGJ-3	9/16/2014	12.8123	YES-ADEM	NORMAL	104.3		
VLGJ-3	10/15/2014	32.1962	YES-ADEM	NORMAL	248.1		

Table 7-6 E. coli Data for Station VLGJ-4

Station ID	Activity Date	Flow CFS	Flow Measured	Flow Stage	E Coli	E Coli Dc	E Coli Geomean
VLGJ-4	3/19/2014	65.7475	YES-ADEM	NORMAL	1413.6		
VLGJ-4	4/17/2014	75.5192	YES-ADEM	NORMAL	98.8		
VLGJ-4	5/20/2014	42.6303	YES-ADEM	NORMAL	101.4		
VLGJ-4	6/9/2014	49.5678	YES-ADEM	NORMAL	547.5		251.59
VLGJ-4	6/16/2014	44.0243	YES-ADEM	NORMAL	98.8		
VLGJ-4	6/18/2014	65.8674	YES-ADEM	NORMAL	1986.3		
VLGJ-4	6/23/2014	32.9153	YES-ADEM	NORMAL	30.5		
VLGJ-4	6/26/2014	62.3368	YES-ADEM	NORMAL	307.6		
VLGJ-4	7/16/2014	33.5845	YES-ADEM	NORMAL	228.2		
VLGJ-4	8/4/2014	19.7412	YES-ADEM	NORMAL	10.9		36.95
VLGJ-4	8/11/2014	26.7568	YES-ADEM	NORMAL	79.8		
VLGJ-4	8/18/2014	15.1854	YES-ADEM	NORMAL	27.9		
VLGJ-4	8/21/2014	20.0897	YES-ADEM	NORMAL	115.3		
VLGJ-4	8/26/2014	15.5782	YES-ADEM	NORMAL	24.6		
VLGJ-4	9/16/2014	10.7917	YES-ADEM	NORMAL	56.5		
VLGJ-4	10/15/2014	44.1268	YES-ADEM	NORMAL	816.4		

Table 7-7 E. coli Data for Station VLGJ-7

Station ID	Activity Date	Flow CFS	Flow Measured	Flow Stage	E Coli	E Coli Dc	E Coli Geomean
VLGJ-7	3/19/2014		DATA COLLECTED BUT LOST	NORMAL	152.9		
VLGJ-7	4/17/2014	54.7943	YES-ADEM	NORMAL	96		
VLGJ-7	5/20/2014	23.0667	YES-ADEM	NORMAL	190.4		
VLGJ-7	6/9/2014	27.938	YES-ADEM	NORMAL	410.6		
VLGJ-7	6/16/2014	28.4407	YES-ADEM	NORMAL	325.5		
VLGJ-7	6/18/2014	32.2439	YES-ADEM	NORMAL	648.8		498.95
VLGJ-7	6/23/2014	22.7563	YES-ADEM	NORMAL	387.3		
VLGJ-7	6/26/2014	22.1713	YES-ADEM	NORMAL	920.8		
VLGJ-7	7/16/2014	20.7736	YES-ADEM	NORMAL	240		
VLGJ-7	8/4/2014	11.0797	YES-ADEM	NORMAL	158.5		
VLGJ-7	8/11/2014	16.1117	YES-ADEM	NORMAL	290.9		
VLGJ-7	8/18/2014	10.2616	YES-ADEM	NORMAL	159.7		211.78
VLGJ-7	8/21/2014	8.9421	YES-ADEM	NORMAL	290.9		
VLGJ-7	8/26/2014	11.2984	YES-ADEM	NORMAL	198.9		
VLGJ-7	9/16/2014	9.8901	YES-ADEM	NORMAL	178.9		
VLGJ-7	10/15/2014	25.3404	YES-ADEM	NORMAL	325.5		

7.3 Water Quality Calculations

Table 7-8 Point Source Summary of Existing and Allowable Loading

Facility Name	Permit Number	Major/Minor	Conversion Factor (mL/gal)	DMR Flow (gal/day)[a]	DMR E. Coli Loading (col/100mL)[b]	Existing Load (col/day)	Design/Application Flow (gal/day)	Bacterial Limit (col/100mL)	Allowable Load (col/day)[d]
Village Creek WWTP – Outfall 001	AL0023647	Major	3785.41	1.60E+07	4.0	2.42E+09	6.00E+07	548	1.24E+12
Village Creek WWTP – Outfall 002	AL0023647	Major	3785.41	6.90E+06	1.0	2.61E+08	6.00E+07	548	1.24E+12
American Cast Iron Pipe Co	AL0029378	Major	3785.41	1.84E+06	N/A	N/A	1.27E+06	N/A	N/A[e]
CMC Steel Alabama	AL0001554	Minor	3785.41	7.34E+05	N/A	N/A	3.80E+05	N/A	N/A[e]
Nucor Steel Birmingham	AL0003735	Minor	3785.41	9.40E+04	N/A	N/A	1.58E+05	N/A	N/A[e]
Nexeo Solutions	AL0021695	Minor	3785.41	1.60E+04	N/A	N/A	Stormwater	N/A	N/A[e]
East Thomas Limestone Plant	AL0025194	Minor	3785.41	1.03E+07	N/A	N/A	4.60E+06	N/A	N/A[e]
Industrial Chemicals Inc	AL0031721	Minor	3785.41	1.00E+04	N/A	N/A	Stormwater	N/A	N/A[e]
Metalplate Galvanizing LP – Plant 1	AL0080403	Minor	3785.41	N/A	N/A	N/A	Stormwater	N/A	N/A[e]
Metalplate Galvanizing LP – Plant 2	AL0080411	Minor	3785.41	N/A	N/A	N/A	Stormwater	N/A	N/A[e]
Diversified NonFerrous Technologies, Inc.	AL0080527	Minor	3785.41	ND[c]	N/A	N/A	Stormwater	N/A	N/A[e]
Western International Gas & Cylinders Inc.	AL0081957	Minor	3785.41	1.66E+04	N/A	N/A	Stormwater	N/A	N/A[e]
ND = No Discharge					**Total**	**2.68E+09**		**Total:**	**2.49E+12**

a. Monthly average flows from June 2014 DMRs were used for DMR Flows unless otherwise noted
b. Monthly Average Bacterial load from June 2014 DMRs were used for DMR Bacterial Loadings
c. Diversified NonFerrous Technologies, Inc. reported a no discharge on their June 2014 DMR
d. The units for the Allowable Load for TMDL are E. coli col./day and are based off of the E. coli geometric mean criteria of 548 col./100mL. This number will be used in the TMDL calculation.
e. Facility is not considered to be a source of pathogens due to the nature of the process. No E. coli loading to Village Creek will be attributed to the facility, nor will it receive an allocation in this TMDL.

7.4 Village Creek Watershed Photos

Photo 7-1 VLGJ-1 Looking Upstream

Photo 7-2 VLGJ-1 Looking Downstream

Photo 7-3 VLGJ-2 Looking Upstream

Photo 7-4 VLGJ-2 Looking Downstream