Final

Total Maximum Daily Load (TMDL)
for
Turkey Branch

Assessment Unit ID Number:
AL03160205-0204-402

Pathogens (*E. coli*)

Baldwin County

Alabama Department of Environmental Management
Water Quality Branch
Water Division
June 2025

Figure 1: Turkey Branch watershed

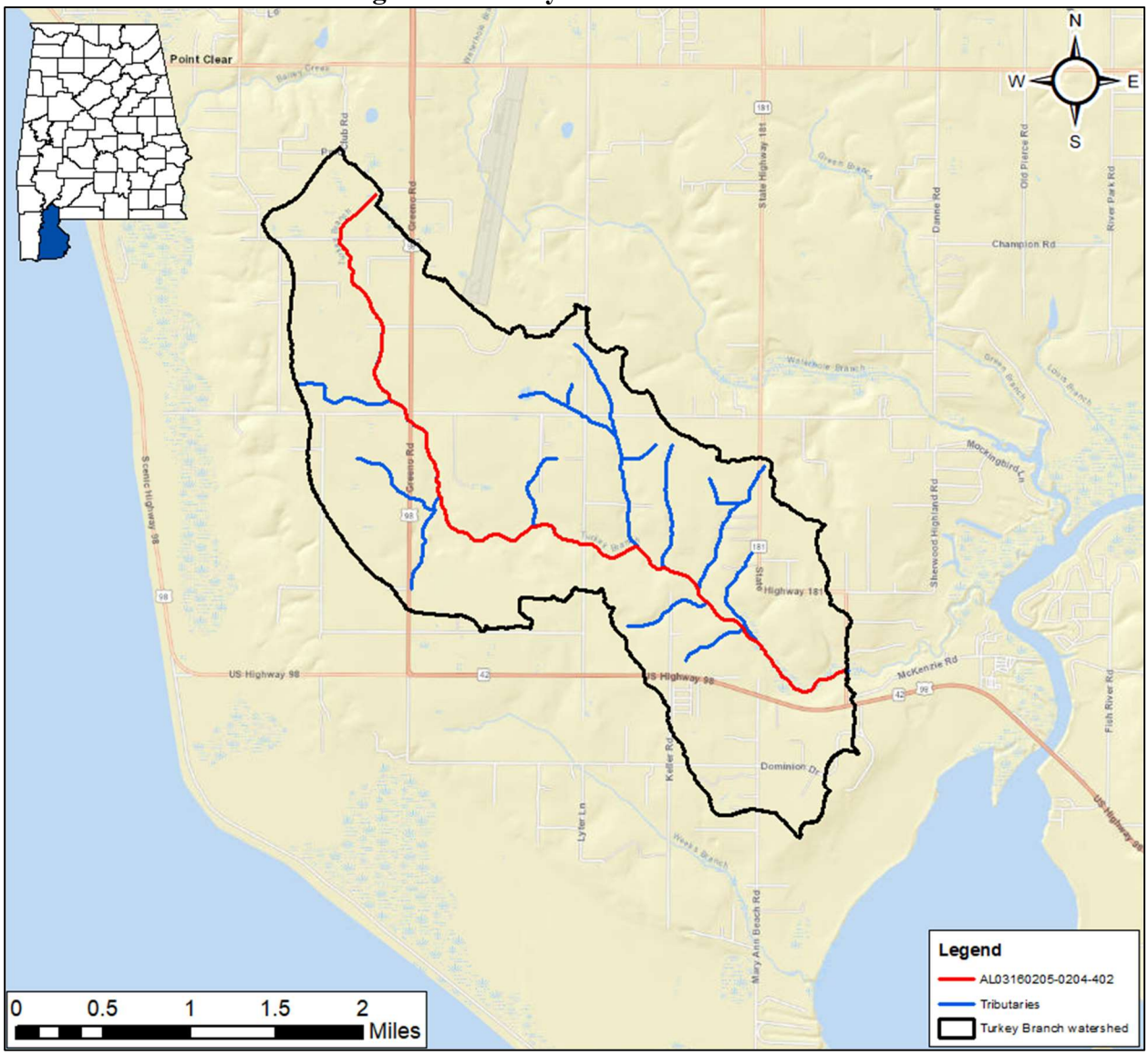


Table of Contents

List of Figures

List of Tables

1.0 Executive Summary

Section 303(d) of the Clean Water Act and the Environmental Protection Agency (EPA) 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).

Turkey Branch, from Baldwin County Road 181 to its source, is currently included on Alabama's §303(d) list as impaired for pathogens (*E. coli*). The Turkey Branch headwaters form near Point Clear in Baldwin County, and it flows for approximately 6.69 miles before it merges with Fish River. There are two segments of Turkey Branch currently listed as impaired: AL03160205-0204-401 and AL03160205-0204-402. The lower segment of Turkey Branch (AL03160205-0204-401) is currently impaired for metals (mercury). The upper segment of Turkey Branch (AL03160205-0204-402) is currently impaired for pathogens (*E. coli*) and metals (mercury). The upper and lower segments of Turkey Branch are both assigned a use classification of Swimming and Other Whole Body Water-Contact Sports/Fish and Wildlife (Swimming/F&W). This TMDL only addresses the pathogens impairment for AL03160205-0204-402 (upper segment).

Turkey Branch was originally included on the §303(d) list for pathogens (*E. coli*) in 2018. Turkey Branch was sampled in 2016 and was found to exceed the applicable bacteriological criterion in five out of the eight samples taken at ADEM station TURB-1. Due to these exceedances, follow-up sampling was conducted at TURB-1 to verify the impairment and provide data for TMDL development.

Follow-up sampling on Turkey Branch was performed by ADEM in 2023 to further assess the water quality of the impaired stream. For purposes of this TMDL, the 2023 data will be used because it is the most current data and provides the best picture of the current water quality conditions of the stream. The 2024 edition of *Alabama's Water Quality Assessment and Listing Methodology*, prepared by ADEM, provides the rationale for the Department to use the most recent data to prepare a TMDL for an impaired waterbody. ADEM collected 15 samples from Turkey Branch in 2023. According to the data, Turkey Branch was not meeting the pathogen criteria applicable to its use classification of Swimming/F&W. Therefore, this TMDL has been developed for pathogens (*E. coli*) for Turkey Branch (AL03160205-0204-402).

A mass balance approach was used for calculating the pathogen TMDL for Turkey Branch. The mass balance approach utilizes the conservation of mass principle. The TMDL was calculated using the single sample or geometric mean sample exceedance event that resulted in the highest percent reduction. Existing loads were calculated by multiplying the *E. coli* concentrations times the respective in-stream flows and a conversion factor. In the same manner as existing loads were calculated, allowable loads were calculated for the single sample *E. coli* target of 211.5 colonies/100 ml (235 colonies/100 ml – 10% Margin of Safety) and geometric mean *E. coli* target of 113.4 colonies/100 ml (126 colonies/100 ml – 10% Margin of Safety).

Tables 1 lists the TMDL for the impaired segment, defined as the maximum allowable *E. coli* loading under critical conditions for Turkey Branch.

Table 1: *E. coli* TMDL for Turkey Branch (AL03160205-0204-402)

TMDL[a]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[b]			Load Allocation (LA)	
		WWTPs[c]	Stormwater (MS4s and other NPDES sources)[d]	Leaking Collection Systems[e]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
4.17E+10	4.17E+9	NA	89%	0	3.75E+10	89%

NA = Not Applicable
a. TMDL was established using the single sample criterion of 235 colonies/100ml.
b. Future CAFOs in the watershed will be assigned a waste load allocation (WLA) of zero.
c. Future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.
d. Current and future MS4 areas and other National Pollutant Discharge Elimination System (NPDES) stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis.
e. 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*.

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 Turkey Branch 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 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 one segment of Turkey Branch, totaling 5.16 miles, as impaired for pathogens (*E. coli*). The §303(d) listing was originally reported on Alabama's 2018 List of Impaired Waters based on data collected from 2016 and has been included on all subsequent lists. Pasture grazing is listed as the potential source of the impairment on the 2024 §303(d) list.

2.2 Problem Definition

Waterbody Impaired:	Turkey Branch - from Baldwin County Road 181 to its source
Impaired Reach Length:	5.16 miles
Impaired Drainage Area:	5.79 square miles
Water Quality Standard Violation:	Pathogens (Single Sample Maximum)
Pollutant of Concern:	Pathogens (*E. coli*)
Water Use Classification:	Swimming and Other Whole Body Water-Contact Sports/Fish and Wildlife (Swimming/F&W)

Usage Related to Classification:
The pathogen-impaired segment is classified as Swimming/F&W. Usage of waters in the Swimming classification is described in ADEM Admin. Code R. 335-6-10-.09(3)(a) and (b).

(a) Best usage of waters: swimming and other whole body water-contact sports.

(b) Conditions related to best usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming areas and will be considered satisfactory for swimming and other whole body water-contact sports. The quality of waters will also be suitable for the propagation of fish, wildlife and aquatic life. The quality of salt waters and estuarine waters to which this classification is assigned will be suitable for the propagation and harvesting of shrimp and crabs.

Usage of waters in the F&W 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.

(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 year-round and whole body water-contact recreation during the months of May through October, 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 areas and will be considered satisfactory for swimming and other whole body water-contact sports.

E. coli Criteria:

Criteria for acceptable bacteria levels for the Swimming classification are described in ADEM Admin. Code R. 335-6-10-.09(3)(c)6(i), (ii), and (iii) as follows:

6. Bacteria:

(i) 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.

(ii) In all other areas, 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 E. coli organism density does not exceed 126 colonies/100 ml nor exceed a maximum of 235 colonies/100 ml in any sample 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 104 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 mean bacterial 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.

(iii) The policy of nondegradation of high quality waters shall be stringently applied to bacterial quality of recreational waters.

Criteria for acceptable bacteria levels for the F&W 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 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.

(ii) For incidental water contact and whole body water-contact recreation during the months of May through October, 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 E. coli organism density does not exceed 126 colonies/100 ml nor exceed a

maximum of 298 colonies/100 ml in any sample 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:
The segment of Turkey Branch from Baldwin County Road 181 to its source was placed on the 2018 §303(d) list for pathogens (*E. coli*) based on data collected at station TURB-1 in 2016. There were five exceedances out of eight samples at this station. The impaired segment of Turkey Branch is classified as Swimming/F&W. The Swimming criteria are applicable since they are the more stringent of the two use classifications. The data used for the original listing can be found in Appendix 7.2

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

For this TMDL, a single sample maximum *E. coli* target of 211.5 colonies/100 ml will be used. This target was derived by using a 10% explicit margin of safety from the single sample maximum criterion of 235 colonies/100 ml. This target is considered protective of water quality standards and should not allow the single sample maximum of 235 colonies/100 ml to be exceeded. In addition, a geometric mean target of 113.4 colonies/100 ml will be used for a series of at least five samples taken no less than 24 hours apart over the course of 30 days. This target was also derived by using a 10% explicit margin of safety from the geometric mean criterion of 126 colonies/100 ml. This target is considered protective of water quality standards and should not allow the geometric mean criterion to be exceeded.

3.2 Source Assessment

3.2.1 Point Sources in the Turkey Branch 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 bacteria can flow into the stream or leach into the groundwater. Illicit discharges

are found at facilities that are discharging bacteria when not permitted, or when the pathogens criterion established in the issued NPDES permit is not being upheld.

Continuous Point Sources

There are currently no continuous NPDES-permitted facilities in the Turkey Branch watershed. Any future NPDES-regulated continuous discharges that are considered by the Department to be a pathogen source will be required to meet the in-stream water quality criteria for pathogens at the point of discharge.

Non-Continuous Point Sources

There are currently several NPDES non-continuous discharge permits within the Turkey Branch watershed, including some construction sites and one asphalt facility. These facilities are not required to monitor for *E. coli* and are not considered to be a source of pathogens due to the nature of their processes. No *E. coli* loading to the Turkey Branch watershed will be attributed to these facilities, and they will not receive an allocation in this TMDL.

Urban areas designated as part of the Municipal Separate Storm Sewer System (MS4) program are regulated by NPDES, and as such, are considered to be point sources by EPA and receive waste load allocations (WLAs) in TMDLs. The EPA defines an MS4 as *"a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):*

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law);
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a combined sewer; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

During rain events in an urbanized watershed, stormwater runoff has the potential to collect pollutants which are transported through MS4 systems before discharging into state waters. Therefore, in 1990 the EPA developed the NPDES stormwater program, which promulgated rules, in two different phases, in order to address the potential negative water quality effects associated with stormwater runoff. In 1990, the EPA issued Phase I regulations under the NPDES stormwater program, which required both medium and large cities and also counties with populations of 100,000 or more to obtain NPDES permit coverage specifically for their stormwater discharges. In 1999, the second phase of the NPDES stormwater program amended existing regulations in addition to requiring NPDES permits for stormwater discharges from certain small MS4 systems.

There is one Phase II MS4 permit within the Turkey Branch watershed. Contributions from the Phase II MS4 areas drain to the pathogen-impaired segment of Turkey Branch and will be allocated as an MS4 WLA in the TMDL. Table 2 below lists the current MS4 permit contained within the Turkey Branch watershed. Current and future MS4s will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation of BMPs on a case-by-case basis.

Table 2: Phase II MS4 permit in the Turkey Branch watershed

Permit Number	Name	Phase
ALR040040	City of Fairhope	II

The Turkey Branch watershed currently contains no Voluntary Animal Feeding Operations (AFOs)/Concentrated Animal Feeding Operations (CAFOs). The ADEM AFO/CAFO rules prohibit discharges of pollutants from the facilities and their associated waste land application activities. As a result, future AFOs/CAFOs will receive a waste load allocation of zero.

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

There are currently no registered sites in the Turkey Creek watershed where land application of by-products for beneficial use is present. Beneficial use sites are regulated by ADEM's Land Division and are required to implement appropriate BMPs and agronomic application rates to protect the environment.

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 found that one facility reported two SSOs on September 17, 2020, within the Turkey Branch watershed. Due to the low number of SSOs reported within the Turkey Branch watershed, it is unlikely that SSOs are a significant contributor to the pathogen impairment. The reported SSOs can be seen in Appendix 7.3.

3.2.2 Nonpoint Sources in the Turkey Branch Watershed

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

Agricultural land can be a source of *E. coli* 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 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, turkey, waterfowl, etc. Wildlife will 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 developed areas is potentially attributable to multiple sources including stormwater runoff, unpermitted discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, and domestic animals. On-site 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 due to system failures and malfunctions.

3.3 Land Use Assessment

Land use for the Turkey Branch watershed was determined using ArcMap with land use datasets derived from the 2021 National Land Cover Dataset (NLCD). Figure 2 displays the land use areas within the watershed. Table 3 depicts the primary land uses in the Turkey Branch watershed.

The major land use in the Turkey Branch watershed is agriculture, which makes up 71.53% of the total watershed area. Forested and developed land uses are a distant second and third at 17.80% and 10.49%, respectively. The remaining 0.18% of the land area consists of open water.

Figure 2: Land use in the Turkey Branch watershed

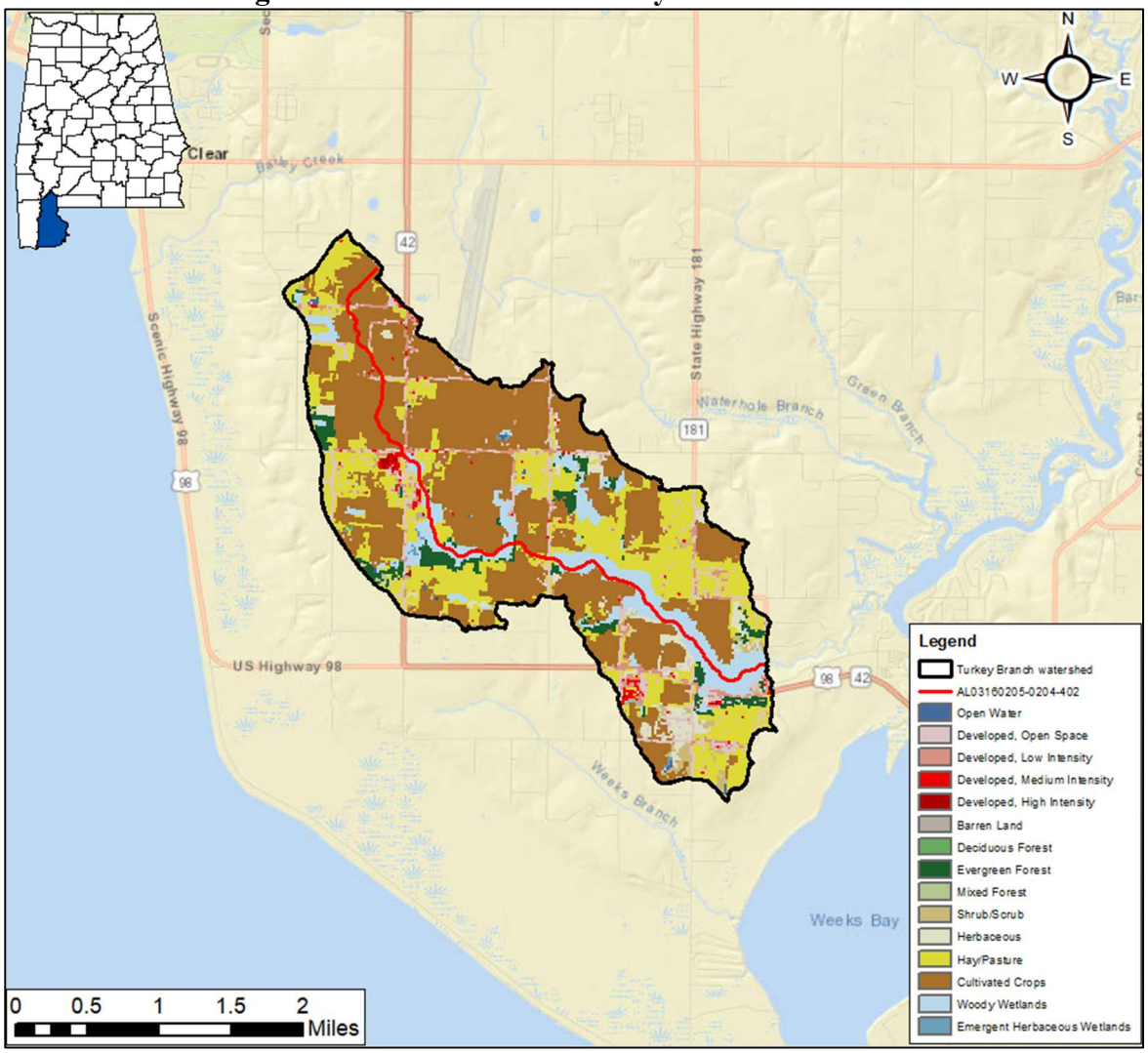
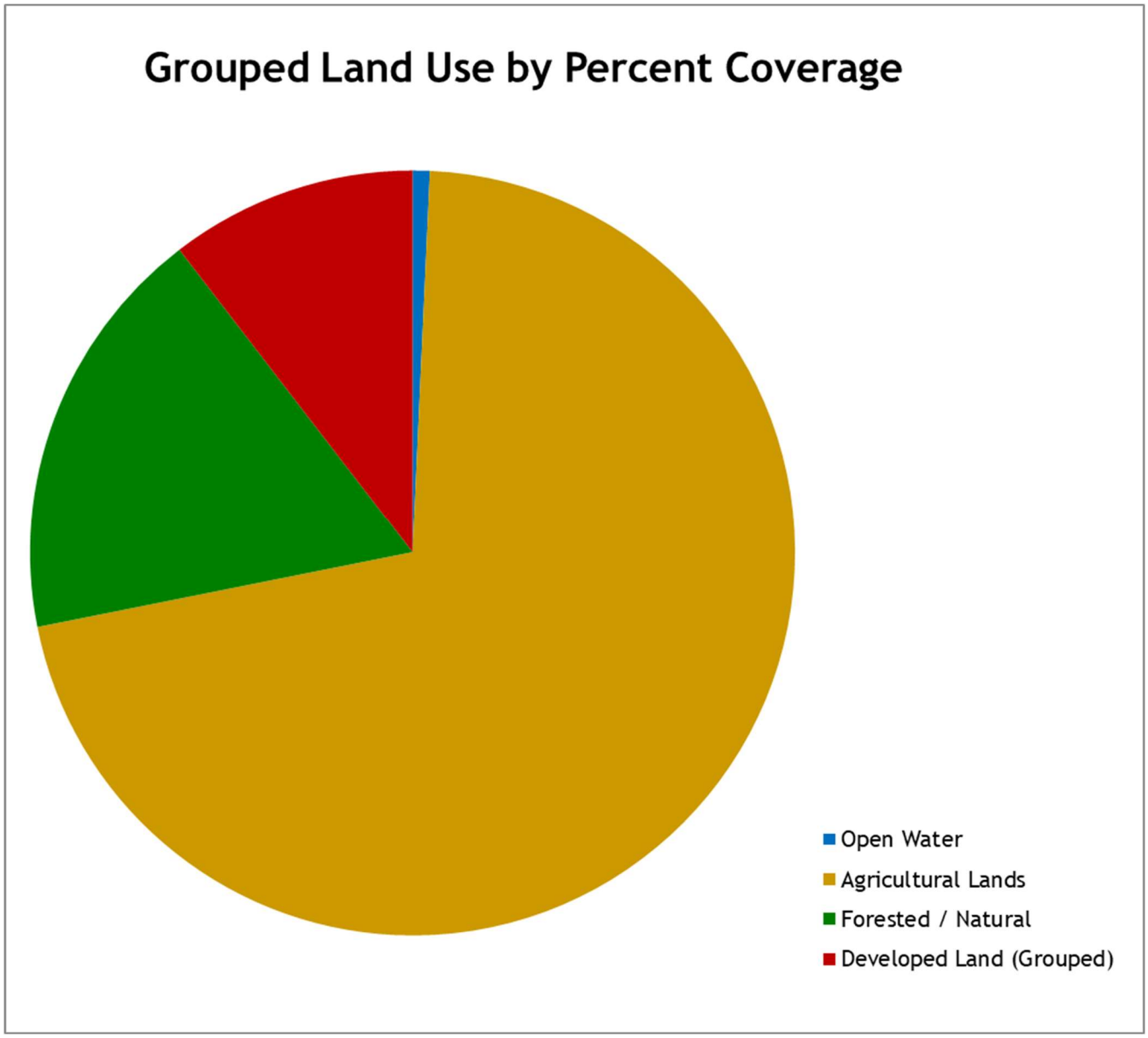


Table 3: Land use (2021) in the Turkey Branch watershed

Land Use	Miles^2	Acres	Percent
Open Water	0.01	6.67	0.18%
Developed, Open Space	0.36	231.51	6.25%
Developed, Low Intensity	0.17	110.75	2.99%
Developed, Medium Intensity	0.05	33.58	0.91%
Developed, High Intensity	0.01	6.23	0.17%
Barren Land	0.01	6.23	0.17%
Deciduous Forest	0.00	1.56	0.04%
Evergreen Forest	0.21	134.77	3.64%
Mixed Forest	0.01	6.00	0.16%
Shrub/Scrub	0.07	42.26	1.14%
Herbaceous	0.16	101.86	2.75%
Hay/Pasture	1.42	910.26	24.59%
Cultivated Crops	2.72	1738.28	46.95%
Woody Wetlands	0.57	365.84	9.88%
Emergent Herbaceous Wetlands	0.01	6.67	0.18%
Totals→	**5.79**	**3702.43**	**100.00%**
Class Description	**Miles^2**	**Acres**	**Percent**
Open Water	0.01	6.67	0.18%
Agricultural Lands	4.14	2648.5	71.53%
Forested/Natural	1.03	658.96	17.80%
Developed Land (Grouped)	0.61	388.3	10.49%
Totals→	**5.79**	**3702.43**	**100.00%**

Figure 3: Pie graph of land use in the Turkey Branch watershed



3.4 Linkage between Numeric Targets and Sources

The predominant land usage in the Turkey Branch watershed is agriculture. Forested/natural and developed lands make up most of the remaining land use. Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most probable sources of pathogen loadings within the watershed are agricultural land applications (pasture grazing), failing septic tanks, and urban runoff. 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

During 2023, ADEM collected data from station TURB-1 on the pathogen impaired segment of Turkey Branch. Fifteen *E. coli* samples were collected in 2023, and there was one single sample exceedance. There were no geometric mean sampling exceedances for Turkey Branch in 2023. Table 4 and Figure 4 show the location of the ADEM station on Turkey Branch. The 2023 data can be seen below in Table 5.

Table 4: ADEM sampling station in the Turkey Brach watershed

Station	Local Name	Latitude	Longitude
TURB-1	Turkey Branch	30.42191°	-87.84393°

Figure 4: ADEM sampling station in the Turkey Branch watershed

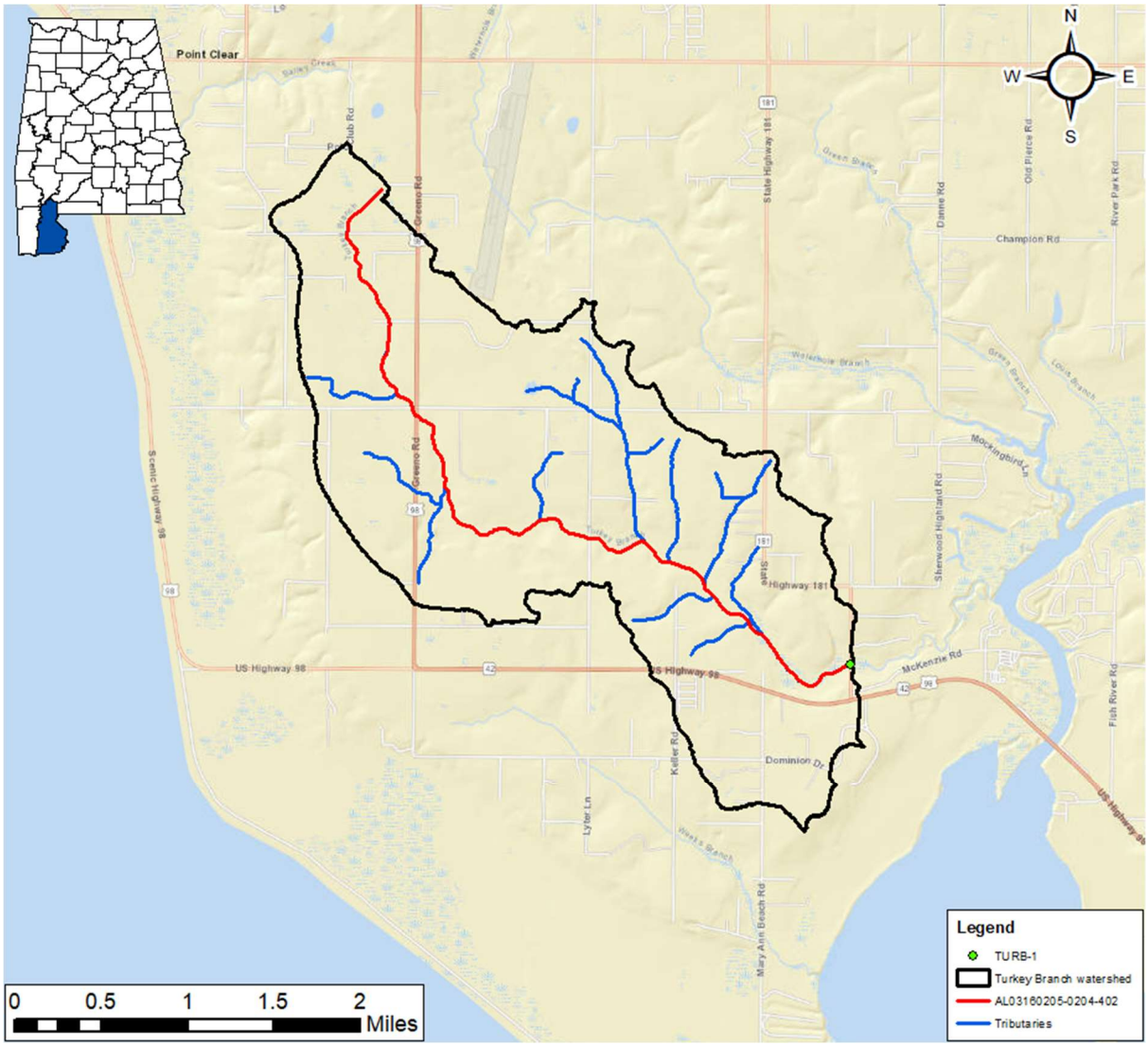


Table 5: 2023 *E. coli* data from TURB-1

TURB-1					
Visit Date	***E. coli* (col/100 mL)**	***E. coli* Criterion (col/100 mL)**	**Geometric Mean (col/100 mL)**	**Geometric Mean Criterion (col/100 mL)**	**Flow (cfs)***
3/7/2023	80	235	-		8.09
4/18/2023	110	235	-		7.85
5/18/2023	86	235	67.8	126	7.71
5/25/2023	2000	235			7.25
5/31/2023	58	235			6.77
6/13/2023	12	235			6.63
6/14/2023	12	235			6.45
7/12/2023	75	235	45.4	126	14.44
8/1/2023	46	235			7.71
8/3/2023	42	235			7.29
8/7/2023	39	235			7.12
8/9/2023	34	235			6.80
8/14/2023	57	235	-		6.35
9/12/2023	58	235	-		7.12
10/5/2023	130	235	-		6.84

*These flows were calculated using data from USGS 02378300 and a drainage area ratio.

3.6 Critical Conditions/Seasonal Variation

Critical conditions typically occur during the summer months (May-October). 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 bacteria into streams, resulting in spikes of bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of bacteria on the land surface, resulting in a more uniform loading rate.

Turkey Branch generally follows the trends described above for the summer months of May through October. The critical condition for this pathogen TMDL was taken to be the one with the highest *E. coli* single sample exceedance value. For the impaired portion of Turkey Branch, that value was 2000 colonies/100ml and occurred on May 25, 2023, at TURB-1. The use of the highest exceedance to calculate the TMDL is expected to be protective of water quality in Turkey Branch year-round.

3.7 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the TMDL analysis: 1) by implicitly incorporating 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.

The MOS accounts for the uncertainty associated with the limited availability of data used in this analysis. An explicit MOS was applied to the TMDL by reducing the appropriate target criterion concentration by ten percent and calculating a mass loading target with measured or calculated flow data. The single sample *E. coli* maximum criterion of 235 colonies/100 ml was reduced by 10% to 211.5 colonies/100 ml, while the geometric mean criterion was reduced in the same fashion to 113.4 colonies/100 ml.

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 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 *E. coli* TMDL for Turkey Branch. 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 single sample exceedance. In the same manner, allowable loads were calculated for the single sample criterion of 235 col/100 mL. There were no exceedances of the geometric mean criterion. The TMDL was based on the violation that produced the highest calculated percent reduction to achieve applicable water quality criteria. TURB-1 was chosen as the station representing the impaired segment (AL03160205-0204-402) of Turkey Branch.

Existing Conditions

The single sample mass loading was calculated by multiplying the highest *E. coli* single sample exceedance concentration by the flow on the day of the exceedance. The highest exceedance at TURB-1 was on May 25, 2023. The flow was not measured on this date due to braided/swamp conditions. Therefore, flow from a nearby United States Geological Survey (USGS) station was chosen to estimate the flow at TURB-1. The chosen gauge was USGS 02378300 (Magnolia River near Foley, AL). The flow was calculated by multiplying the flow from USGS 02378300 on May 25, 2023 (20.8 ft^3/s) by the ratio of the drainage areas at TURB-1 and the USGS gauge. The product of the estimated flow, pathogen concentration, and conversion factor gives the total mass loading (colonies per day) of *E. coli* to Turkey Branch under the single sample exceedance condition. Below is the existing condition calculation for TURB-1.

TURB-1:

$$\frac{7.25\ ft^3}{s} \times \frac{2000\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{3.55 \times 10^{11}\ colonies}{day}$$

Allowable Conditions

The **allowable load** to the watershed was calculated under the same physical conditions as discussed above for the single sample criterion. This was done by taking the product of the flow and the allowable concentration. This value was then multiplied by the conversion factor to calculate the allowable load for Turkey Branch. These calculations can be seen below.

TURB-1:

For the **single sample** *E. coli* target concentration of 211.5 colonies/100 ml, the allowable *E. coli* loading is:

$$\frac{7.25\ ft^3}{s} \times \frac{211.5\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{3.75 \times 10^{10}\ colonies}{day}$$

The explicit margin of safety of 23.5 colonies/100 ml equals a daily loading of:

$$\frac{7.25\ ft^3}{s} \times \frac{23.5\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{4.17 \times 10^{9}\ colonies}{day}$$

The difference 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 criteria. The TMDL was calculated as the total daily *E. coli* load to Turkey Branch as evaluated at station TURB-1. Table 6 shows the existing and allowable *E. coli* loads and required reduction at this station.

Table 6: *E. coli* loads and required reduction at TURB-1

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	3.55E+11	3.75E+10	3.17E+11	89%

The TMDL, WLA, LA and MOS values necessary to achieve the applicable *E. coli* criteria are provided in Table 7 below.

Table 7: *E. coli* TMDL for Turkey Branch (AL03160205-0204-402)

TMDL[a]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[b]			Load Allocation (LA)	
		WWTPs[c]	Stormwater (MS4s and other NPDES sources)[d]	Leaking Collection Systems[e]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
4.17E+10	4.17E+9	NA	89%	0	3.75E+10	89%

NA = Not Applicable
a. TMDL was established using the single sample criterion of 235 colonies/100ml.
b. Future CAFOs in the watershed will be assigned a waste load allocation (WLA) of zero.
c. Future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.
d. Current and future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis.
e. 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*.

4.3 TMDL Summary

Turkey Branch was placed on Alabama's §303(d) list for pathogens in 2018 based on data collected in 2016. Additional data collected by ADEM during 2023 confirmed the pathogen impairment and provided the basis for TMDL development.

A mass balance approach was used to calculate the *E. coli* TMDL for Turkey Branch. Based on the TMDL analysis, it was determined that an *E. coli* reduction of 89% for AL03160205-0204-402 is necessary to achieve compliance with applicable water quality standards.

Compliance with the terms and conditions of existing and future NPDES sanitary and storm water 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 will be implemented through voluntary measures/best management practices (BMPs). Cooperation and active participation by the general

public and various other groups is critical to successful implementation of TMDLs. Local citizen-led and implemented management measures offer the most efficient and comprehensive avenue for reduction of loading rates from nonpoint sources. Therefore, TMDL implementation activities for nonpoint sources will be coordinated through interaction with local entities and may be eligible for CWA §319 grants through the Department's Nonpoint Source Unit.

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 Turkey Branch 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 basin approach to water quality monitoring, an approach that divides Alabama's sixteen major river basins into three groups. Each year, ADEM's water quality resources are concentrated in one of the three basin groups and are divided among multiple priorities 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. This monitoring will occur in each basin according the schedule shown in Table 8.

Table 8: Follow-up monitoring schedule

River Basin Group	Years to be Monitored
Coosa, Escatawpa, Tennessee (Guntersville), Tombigbee	2025/2028
Alabama, Cahaba, Mobile, Tallapoosa, Tennessee (Bear and Pickwick)	2026/2029
Black Warrior, Blackwater, Chattahoochee, Chipola, Choctawhatchee, Escambia, Perdido, Tennessee (Wheeler and Elk), Yellow	2027/2030

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 four 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 were made available on ADEM's website: www.adem.alabama.gov. The public could also request paper or electronic copies of the TMDL by contacting Ms. Kimberly Minton at 334-271-7826 or kminton@adem.alabama.gov. 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 final completion of this TMDL and subsequent submission to EPA Region 4 for final approval.

7.0 Appendices

7.1 References

ADEM Administrative Code, 2021. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2021. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's Monitoring Program. 2016, 2023. ADEM.

Alabama Department of Environmental Management (ADEM), *Alabama's Water Quality Assessment and Listing Methodology*, January 2024.

Alabama's §303(d) List and Fact Sheet. 2018-2024. ADEM.

Alabama Department of Environmental Management (ADEM) Laboratory QA Manual, Chapter 3: Definitions, January 24, 2022.

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 9: 2016 *E. coli* listing data for station TURB-1

TURB-1	
Visit Date	***E. coli* (col/100 mL)**
3/8/2016	500
4/5/2016	330
5/4/2016	310
6/9/2016	130
7/21/2016	270
8/18/2016	500
9/14/2016	230
10/6/2016	200

7.3 Sanitary Sewer Overflows (SSOs) in the Turkey Branch Watershed

Table 10: SSOs from Fairhope WWTP (AL0020842)

SSO Began	Estimated Release Volume (gallons)	Duration (hours)
9/17/2020	1,000-10,000	53
9/17/2020	1,000-10,000	48

7.4 Turkey Branch Photographs

At station TURB-1, looking upstream (9/14/2016)

At station TURB-1, looking downstream (9/14/2016)

At station TURB-1, looking upstream (05/25/2023)

At station TURB-1, looking downstream (05/25/2023)