

Total Maximum Daily Load (TMDL)  
Monitoring Plan  
In the  
Ft. Loudoun Lake Watershed (HUC06010201)



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THE CITY OF ALCOA, TENNESSEE  
PUBLIC **WORKS** & ENGINEERING DEPARTMENT

*"Quality Services for a Quality Community"*

Table of Contents

1.0 Introduction ..... 3  
2.0 TMDL Monitoring Requirements..... 4  
3.0 Monitoring – Current ..... 7  
4.0 TMDL Long Plan Goals..... 12

## 1.0 Introduction

The Total Maximum Daily Load (TMDL) Program came about as a result of the requirements set by the 1972 Clean Water Act. The Environmental Protection Agency (EPA) is required throughout the States to identify polluted waters, determine the source of pollution, and establish a schedule for clean-up plans for polluted waters. In laymen's term, *"a TMDL is essentially a "Pollution budget" designed to restore the health of a polluted water body."*<sup>1</sup>

Section 303(d) of the Clean Water Act required states to create a list of impaired waters and develop TMDL's for each water body for pollutants of concern.

As a result of these TMDL's, all regulated municipal separate storm sewer programs (MS4's) under the National Pollutant Discharge Elimination System Phase I and II within the 12-digit HUC Watts Bar/Fort Loudon watershed are required to develop and implement a monitoring program for pollutants of concern and to perform visual stream surveys / assessments to evaluate biological integrity.

The Watts Bar/Fort Loudon watershed Total Maximum Daily Load (TMDL) for Siltation and Habitat Alteration (February 1, 2006) and the (TMDL) fore E. Coli in the Fort Loudoun Lake Watershed (January 12, 2017) have been developed from 303(d) listed waters which includes the City of Alcoa and its planning region.

## 2.0 TMDL Monitoring Requirements

### Biological I Benthic Monitoring- Siltation and/or Nutrients

The Fort Loudoun Watershed TMDL states that *"the waters shall not be modified through the addition of pollutants or through physical alteration to the extent that the diversity and/or productivity of aquatic biota within the receiving waters are substantially decreased or adversely affected, except as allowed under 0400-40-03-.06.*

*"interpretation of this provision for any stream which (a) has at least 80% of the upstream catchment area contained within a single bioregion, (b) is of the appropriate stream order specified for the bioregion and (c) contains the habitat (riffle or rooted bank) specified for the bioregion, may be made using the most current revision ( the Department 's Quality System Standard Operating Procedure for Macroinvertebrate Stream Surveys and/or other scientifically defensible methods. Interpretations of this provision for all other streams, plus large rivers, reservoirs, and wetlands, may be made using Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (EPA/841-B-99-002) and/or other scientifically defensible methods. Effects to biological populations will be measured by comparisons to upstream conditions or to appropriately selected reference sites in the same bioregion if upstream conditions are determined to be degraded." 2*

#### *Single Habitat Semi-Quantitative Macroinvertebrate Sampling*

- A) The sampling will be performed using the following Semi-Quantitative Riffle Kick (SQKICK) method. A one square meter kick net with a 500-micron mesh will be placed downstream from a riffle where two kicks will be performed. If the stream is less than one-meter wide, the Modified SQKICK method will be applied, using an 18-inch wide single-handle rectangular net and by performing four single kicks. A composite sample of debris from both kicks will be collected and preserved on ice.
- B) These semi-quantitative samples will then be reduced to 200 +/- 20 percent organisms subsample by using a gridded pick subsampler and collecting the organisms from at least four randomly selected grid cells, as described in Section 7.3 of *Laboratory Processing for Afacroinvertebrate Samples* in EPA's *Rapid Bioassessment Protocols for Use in Wadable Streams and Rivers* (EPA 841-B-99-002).

- C) The semi-quantitative subsamples will be preserved and sent to a state approved lab for sorting and identification.
  
- D) All organisms will be identified to the genus level. Using the raw benthic data from the semi-quantitative subsamples' identification, the laboratory will calculate a numerical value for each of the following seven biometrics listed in Protocol K of the QSSOP:
  - i. EPT (Ephemeroptera Plecoptera Trichoptera Richness)
  - ii. TR (Taza Richness)
  - iii. % OC (Percent oligochaetes and chironomids)
  - iv. % EPT (EPT abundance)
  - v. NCBI (North Carolina Biotic Index)
  - vi. % Dominant (Percent contribution of the single most dominant taxon)
  - vii. % Clingers (Percent contribution of organisms that build fixed retreats or have adaptations to attach to surfaces in flowing water).
  
- E) The laboratory will provide a summary of the benthic analysis and the seven biometrics in a written report.
  
- G) The following information will be recorded at each station during the biological monitoring:
  - Water temperature (°C)
  - Dissolved Oxygen (mg/l)
  - pH (S.U.)
  - Conductivity (umhos)
  - Stream Flow (CFS)

#### *Habitat Assessment*

A habitat assessment will be performed at each biological sampling station. The High Gradient Habitat Assessment Forms found in Appendix A-1 of EPA's *Rapid Bioassessment Protocols for Use in Wadable Streams and Rivers* (EPA 841-B-99-002) will be used in conjunction with the riffle kick collections.

#### *Chemical Monitoring- Pathogens*

The Fort Loudoun Lake Watershed E. coli TMDL (January 12, 2017) is taken and derived from the State of Tennessee Water Quality Standards, Chapter 0400-40-03, General Water Quality Criteria, January 2019 for recreation use classification (most stringent):

*"The concentration of the E. coli group shall not exceed 126 colony forming units per 100 mL, as a geometric mean based on a minimum of 5 samples collected from a given sampling site over a period of not more than 30 consecutive days with individual samples being collected at intervals of not less than 12 hours. For the purposes of determining the geometric mean, individual samples having an E. coli concentration of less than 1 per 100 mL shall be considered as having a concentration of 1 per 100 mL. In addition, the concentration of the E. coli group in any individual sample taken from a lake, reservoir, State Scenic River, Exceptional Tennessee Water or Outstanding national Resource Water (ONRW) (0400-40-03-.06) shall not exceed 487 colony forming units per 100 mL. The concentration of the E. coli group in any individual sample taken*

*from any other water body shall not exceed 941 colony forming units per 100 ml. "*<sup>3</sup>

All chemical monitoring shall meet state testing protocols.

*Visual Stream Assessment - Siltation / Habitat Alteration & Pathogens*

The siltation / habitat alteration and the pathogen TMDL require stream surveys or visual assessment component to satisfy necessary requirements. There have been several visual assessment methodologies used around the United States. After reviewing and discussing the different protocols with the Knoxville EFO and other local stormwater programs we have decided to follow the Stream Corridor Assessment (SCA) Survey Protocols by the Maryland Department of Natural Resources, September 2001.

*"The Stream Corridor Assessment (SCA) survey is designed to provide a method which can be used to both rapidly assess the general physical condition of a stream system and identify the location of a variety of common environmental problems within the stream's corridors. It is intended to be a tool that can help resource managers identify not only the location of environmental problems but also restoration opportunities that exist within a drainage network. Potential environmental problems identified as part of the SCA survey include erosion sites, inadequate stream buffers, fish migration blockages, exposed or discharging pipes, channelized stream sections, trash dumping sites, in or near stream construction and unusual conditions. "*<sup>4</sup>

*"The SCA survey has four main objectives:*

- 1. To provide a list of observable environmental problems present within a stream system and along its riparian corridor.*
- 2. To provide sufficient information on each problem so that a preliminary determination of both the severity and correctability of a problem can be made.*
- 3. To provide sufficient information so that restoration efforts can be prioritized.*
- 4. To provide a quick assessment of both in-and near-stream habitat conditions so that comparative assessments can be made of the condition of different stream segments.*

*It is important to note that SCA is not intended to be a detailed scientific survey of a stream system, nor will it replace the more standard chemical and biological surveys. Instead SCA is intended to provide a rapid method of examining an entire drainage network so future monitoring, management and/or conservation efforts can be better targeted. The survey was developed because most existing scientific surveys are time consuming, expensive to do on a wide scale and often collect information for a relatively small section of stream at any one time. In contrast, the SCA survey is designed so that teams of two or three individuals will be able to survey an average of two to three stream miles per day, at a relatively low cost. "*<sup>4</sup>

### 3.0 Current Monitoring

In accordance with section 4.6.1.1.1 of the Small Municipal Separate Storm Sewer System Permit (TNS075132), the city has chosen Option 1 for the analytical monitoring and visual stream survey of the stream segments listed in the “2022 List of Impaired and Threatened Waters in Tennessee” (303d list).

There are 7 segments listed on the referenced 2022 303(d) list as shown in the Nutrient/Siltation and Pathogen TMDL's for the Watts Bar/Fort Loudon Watershed within the City of Alcoa. They are Brown Creek, Pistol Creek, Springfield Branch, Russell Branch, Polecat Creek, Culton Creek, and an unnamed tributary to Lackey Creek. See Table 3.0 for more detail:

Table 3.0 - 2022 303(d) Listed Streams

HUC-12 Number	Waterbody ID	Waterbody Segment Name	Nutrients TMDL	Pathogen TMDL	Siltation TMDL
060102010205	06010201090_0100	Unnamed Trib to Lackey Creek	NO	NO	YES
060102010108	06010201026_0400	Pistol Creek (Little River to headwaters)	NO	YES	YES
060102010108	06010201026_0430	Culton Creek	YES	YES	YES
060102010108	06010201026_0410	Springfield Branch (Pistol Creek to headwaters)	YES	YES	NO
060102010110	060102011983_1000	Polecat Creek	NO	YES	NO
060102010110	06010201026_0500	Russell Branch Creek (Little River to headwaters)	NO	YES	NO
060102010108	06010201026_0420	Brown Creek	YES	YES	YES

*Siltation and/or Nutrient TMDL Requirements*

1. The city is required to perform Biological / Benthic Monitoring and Visuals Assessments as shown on the 303(d) list within the TMDL document as approved by EPA.
2. Biological/ benthic monitoring is required at one location for each 303(d) listed segment per HUC-12, within our jurisdictional area.
3. Semi-Quantitative Single Habitat (SQSH) Report shall meet the requirements of section 4.6.1.3 of TDEC MS4 Permit.
4. Visually Assess 303(d) listed impaired stream segments immediately upstream and downstream at any location where a MS4's stormwater system directly affects the waterbody for the listed impairment.
5. Biological / Benthic Monitoring and Visual Assessments must be completed within one (1) year of start for each individual HUC-12 every Five (5) years.

*Pathogen. TMDL Requirements*

1. Chemical monitoring is required at one location for each 303(d) listed segment per HUC-12, within our jurisdictional area.
2. Visually Assess 303(d) listed impaired stream segments immediately upstream and downstream at any location where a MS4's stormwater system directly affects the waterbody for the listed impairment.
3. Chemical Monitoring and Visual Assessments must be completed within one (1) year of start for each individual HUC-12 every Five (5) years.

The City had developed a five (5) year monitoring plan as specified from the TDEC meetings and TMDL interpretation. The monitoring plan begun July 1, 2008. This timeline will coincide with that 5-year NPDES Ph. II permit cycle beginning in July 2008 and helped facilitate the integration of the TMDL monitoring requirements. ***This plan has been updated for the current NPDES Ph. II permit cycle effective on September 1, 2022. The listed impaired stream segments that have been updated to include (Pistol Creek, Culton Creek, Springfield Branch, Russell Branch, Polecat Creek, Brown Creek, and an Unnamed Tributary to Lackey Creek) will require the appropriate sampling / assessments per each TMDL.***

The city will be responsible for benthic monitoring, chemical testing and visual assessments for the listed segments.

It is anticipated that the City will contract the biological/benthic monitoring, pathogen monitoring and visual assessment to a qualified consultant.

Figure 4.1 shows (HUC-12 number 060102010108 - includes Brown Creek, Pistol Creek, Culton Creek, and Springfield Branch) and (HUC-12 number 060102010110 - includes Russell Branch and Polecat Creek) and (HUC-12 number 060102010205- includes the unnamed tributary to Lackey Creek) and the proposed sampling locations. Table 4.2 lists the proposed monitoring site locations.

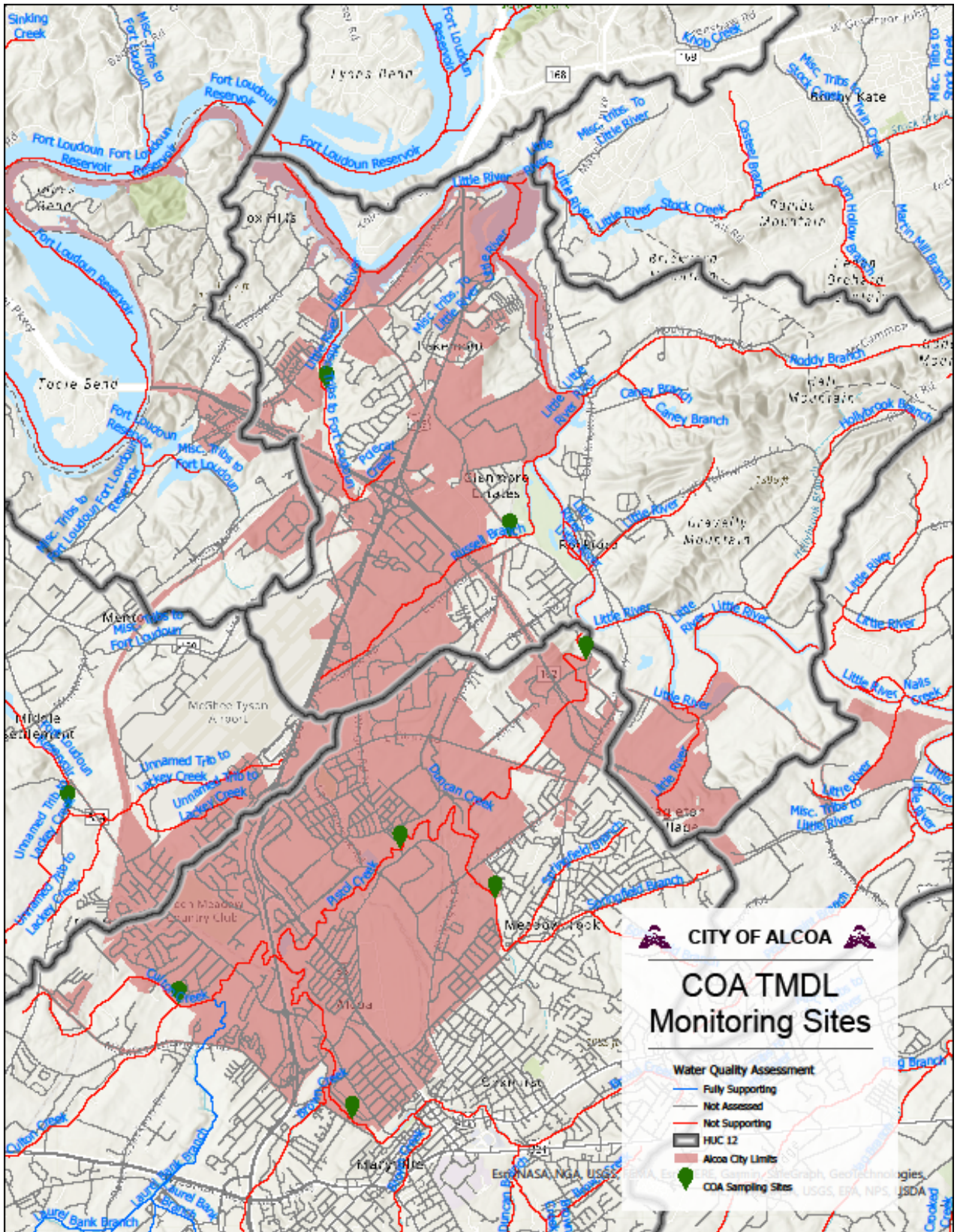


Table 4.2 Proposed Monitoring Locations

Index	TVA Map Code	TDEC_ID	Waterbody	Stream Mile	Monitoring Location
1	N/A	N/A	Brown Branch	9.0	Alcoa-Maryville City Limits Lat: 35°45'34" Long: -83°58'44"
2	PC2	PISTO004.3BT	Pistol Creek	4.4	Wright Road Bridge Lat: 35°47'33" Long: 83°58'15"
3	PC1	N/A	Pistol Creek	0.4	Near Clayton Homes Lat: 35°48'55" Long: -83°56'32"
4	PC6	SPRIN000.3BT	Springfield Branch	0.6	Fletcher Road Lat: 35°47'10" Long: -83°57'24"
5	N/A	CULTO001.5BT	Culton Ck	1.5	Mildred Drive behind house #1218 Lat: 35°42'49" Long: -84°00'15"
6	N/A	RUSSE000.9BT	Russell Branch	0.9	100 Yards U/S Singleton Rd Lat: 35°49'50" Long: -83°57'12"
7	N/A	POLEC001.0BT	Polecat CK	1	40 yds u/s RR bridge off Pearly Smith Rd. Lat: 35°50'57" Long: -83°58'50"
8	N/A	N/A	Unnamed Trib to Lackey Creek	0.32	Between the old bridge and the New Bridge on Proffitt Springs Road Lat: 35°47'54" Long: -84°01'15"

#### **4.0 TMDL Long Term Goals**

The primary goal of the monitoring plan is to comply with the current TMDL requirements in order to adequately assess the load reduction requirements set forth. We believe that this plan is a good beginning point to determine problem locations and to obtain an overall "feel" for impaired stream segments. More specifically, the Plan will be used to look for "obvious source locations" of pollutants and determine additional local problem areas that will require attention to achieve overall watershed goals.

As our stormwater program matures, potential opportunities will be realized, thus allowing the use of more sophisticated best managed practices which will permit the City of Alcoa to effectively focus efforts to address specific problems. This long-term effort should allow these impaired streams to be eventually de-listed from the 303(d) list.

REFERENCES:

- 1 EPA Final TMDL Rule: Fulfilling the Goals of the Clean Water Act (EPA 841-F-00-008) July 2000
- 2 TDEC TMDL for Siltation and Habitat Alteration in the Ft. Loudoun Lake Watershed (HUC 06010201), approved February 1, 2006
- 3 TDEC TMDL for E. Coli in the Ft. Loudoun Lake Watershed (HUC 06010201), approved January 12, 2017
- 4 Maryland Department of Natural Resources. Stream Corridor Assessment Survey Protocol, September 2001