

Bacterial TMDL Implementation

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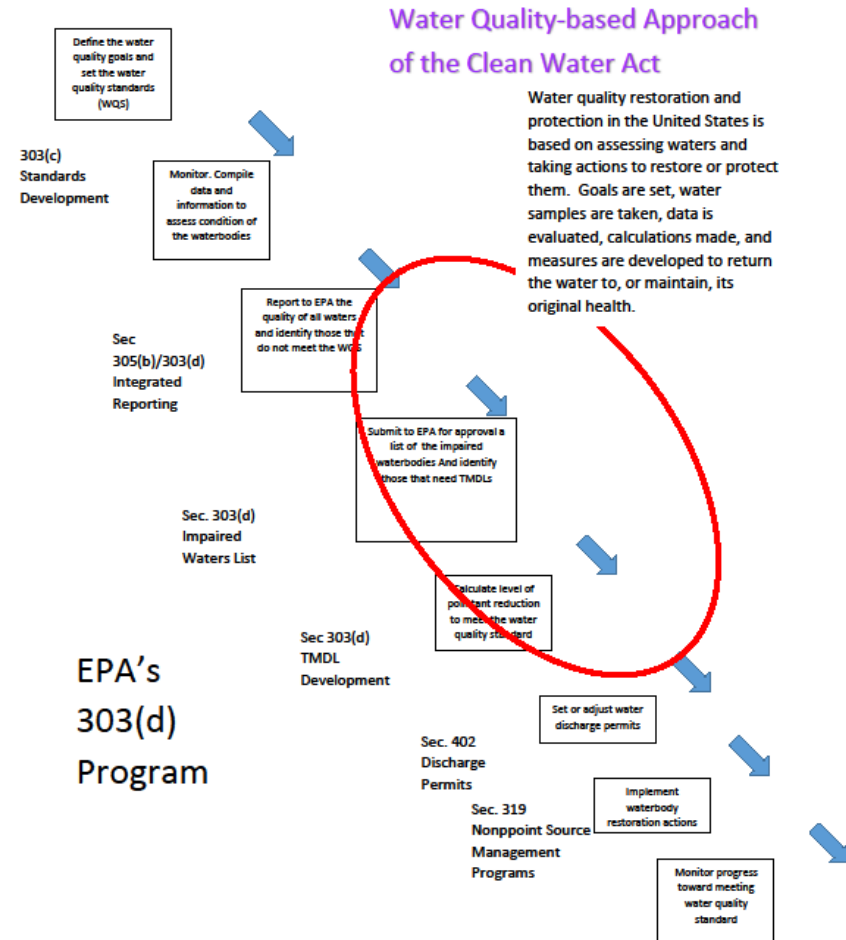
Municipal Discharge & Stormwater Permits Section, DEQ

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Total Maximum Daily Loads (TMDLs)

- What is a TMDL?
 - Calculation of maximum amount of pollutant allowed to enter waterbody so that waterbody will meet water quality standards for pollutant.
 - Determines pollutant reduction target and allocates necessary load reductions necessary to the source(s) of the pollutant.
 - Account for seasonal variations in water quality
- TMDL Components
 - Wasteload Allocations (WLA) – Point Sources
 - Industrial Dischargers
 - Municipal Wastewater Treatment Facilities (POTWs)
 - Some Stormwater Discharges – MS4s (OKR04), Industrial (OKR05), Construction (OKR10)
 - Load Allocations (LA) – Non-point Sources
 - All Other Sources
 - Natural Background
 - Margin of Safety (MOS)
 - Accounts for uncertainty in predicting how well pollutant reductions will result in meeting water quality standards.

Total Maximum Daily Loads (TMDLs)



TMDL Development

- How Are TMDLs Developed?
 - Developed using a range of techniques, from simple mass balance calculations to complex water quality modeling approaches.
 - Degree of analysis varies based on a variety of factors including the waterbody type, complexity of flow conditions and pollutant causing the impairment.
- Five Basic Steps
 - Identify/select the pollutant(s) to consider.
 - Estimate waterbody's assimilative capacity (i.e., loading capacity).
 - Estimate pollutant loading from all sources to the waterbody.
 - Analyze current pollutant load and determine needed reductions to meet assimilative capacity.
 - Allocate (with a margin of safety) allowable pollutant load among different pollutant sources such that water quality standards are achieved.
- EPA Approval
- Public Participation

TMDL Implementation

- **Wasteload Allocations – Point Sources**
 - Implemented through National Pollutant Discharge Elimination System (NPDES) permits under CWA section 402.
 - Section 402 requires that point source discharges be controlled by including water quality-based effluent limits in permits issued to point source entities.
 - Overseen by DEQ.
- **Load Allocations – Non-point Sources**
 - Implemented through variety of programs at state, local and federal level.
 - Primarily non-regulatory or incentive-based (e.g., a cost-share program).
 - EPA section 319 program provides grant money to states to fund specific projects aimed at reducing nonpoint source pollution.
 - Overseen by Conservation Commission.
- **Bacteria TMDL Implementation**
 - *E. coli* and Enterococci used as indicators in WLAs.
 - *E. coli* generally preferred for implementation.
 - Fecal coliform no longer used; older fecal coliform TMDLs will not be implemented.

Bacteria TMDL Implementation – Individual Permits

- For impaired/TMDL waters, *E. coli* criteria applied year-round
- During recreation period (May-Sept), primary criteria applied at end-of-pipe
 - 126/100 mL monthly geometric mean
 - 406/100 mL daily maximum for streams, or
 - 235/100 mL daily maximum for lakes
- During non-recreation period (Oct-Apr), secondary criteria applied at end-of-pipe
 - 630/100 mL monthly geometric mean
 - 2030/100 mL daily maximum for streams, or
 - 1175/100 mL daily maximum for lakes
- Disinfection (chlorine or UV)
- Lagoon systems with >120 days holding time may be able to meet
 - If not, must add disinfection

Bacteria TMDL Implementation – OKR05 Industrial Stormwater General Permit

- New discharger/new source
 - Must prevent all exposure to stormwater of pollutant(s) of concern (POC(s)), or
 - Provide appropriate technical information or other documentation to support claim that pollutant(s) of concern not present at site.
- If discharge located within one mile of impaired water and TMDL is established for pollutant(s) likely to be discharged by facility
 - Must meet requirements of TMDL within timeframes established in TMDL.
 - Monitoring and reporting of discharge may also be required.
- SWP3 requirements
 - List specific stormwater controls/BMPs used to meet TMDL requirements.
 - Evaluate BMPs at least once per year to assess effectiveness in reducing discharge of POC(s).
 - If BMP determined ineffective, implement alternative BMP within one year.
 - Monitor pollutant(s) for which WLA has been established for facility at frequency established in TMDL, or minimum of once per year.
 - Monitoring data to be used by permittee as screening data to evaluate BMP effectiveness.
 - DEQ may use data to demonstrate noncompliance with implementing effective BMPs.
 - DEQ will not use data for stream assessment or TMDL purposes.

Bacteria TMDL Implementation – Draft OKR10 Construction Stormwater General Permit

- Must meet requirements of TMDL within timeframes established in TMDL.
- Monitoring and reporting of discharge may also be required.
- Site is considered a “high priority” construction site.
 - Increased minimum required natural buffer width (100 ft vs. 50 ft).
 - Install sediment basin/impoundment for common drainage location that serves area of 5 or more acres (vs. 10 acres).
 - Install stabilization measures within 7 days (vs. 14 days)
 - Conduct site inspections every 7 days (vs. 14 days) and within 24 hours of storm event.
- SWP3 Requirements
 - Identify whether stormwater is discharged into waterbody with approved TMDL.
 - Describe how SWP3 is consistent with TMDL.
 - Describe and implement measures necessary to meet TMDL requirements.
 - Include information on whether stormwater discharges would affect water quality of receiving water.
 - Describe how BMPs and other controls selected for site will reduce and avoid discharges of POCs.

Bacteria TMDL Implementation – OKR04 Small MS4 General Permit

- Discharge(s) must be consistent with TMDL.
- Must incorporate into SWMP any conditions necessary to ensure discharges are consistent with assumptions and requirements of TMDL.
- Must evaluate existing SWMP in relation to TMDL reduction goals – implement any modifications within 2 years.
 - Provide list of approved TMDLs applicable to MS4 discharge(s).
 - Provide WLA for each POC assigned to MS4 discharge(s), as well as any other TMDL limitations, conditions, monitoring or other requirements.
 - Identify potential significant sources of POCs entering discharge(s).
 - Identify opportunities to address POCs and implement those changes. Provide justification for any changes.
 - At minimum, expand or modify existing public education, illicit discharge detection and elimination (IDDE), dry weather field study (DWFS), existing ordinances or other regulatory mechanisms, enforcement procedures to address reduction or control of POCs.

Bacteria TMDL Implementation – OKR04 Small MS4 General Permit

- TMDL Pollutant Reduction Plan
 - Develop individual plan or participate in coordinated regional plan.
 - Develop specific list of BMPs used to meet TMDL requirements.
 - Evaluate BMPs at least once per year to monitor or assess progress or effectiveness in reducing discharge of POCs. Include results in annual report.
 - If selected BMP doesn't achieve measurable goal or reduce discharge of POCs, implement alternative BMP within 3 years.
 - Implement specific schedule of compliance with each TMDL to ensure that WLA will be met within timeframes established in TMDL.
 - Specify annual pollutant load reductions and BMPs to demonstrate progress toward and ultimately achieve measurable goal.
 - Include interim milestones that shall be evaluated every 3 years.
 - If achieve compliance with WLA, must at minimum continue to implement BMPs that are equivalent to those in effect at time of compliance.

Bacteria TMDL Implementation – OKR04 Small MS4 General Permit

- TMDL Pollutant Reduction Plan – Bacteria
 - Must include list of BMPs addressing areas below and implement as appropriate:
 - Sanitary sewer system
 - On-site sewage facilities
 - Illicit discharges and dumping
 - Animal sources
 - Residential education programs
 - Must include these BMPs under each associated Minimum Control Measure (MCM)

Bacteria TMDL Implementation – OKR04 Small MS4 General Permit

- TMDL Pollutant Monitoring Plan
 - Develop individual plan or participate in coordinated regional plan.
 - Design plan to establish effectiveness of selected BMPs and demonstrate progress toward achieving TMDL reduction goals and eventual attainment of water quality standards.
- TMDL Baseline Monitoring Plan (Optional)
 - Develop individual plan or participate in coordinated regional plan.
 - Design plan to determine existing levels of POCs in MS4 discharge(s) and identify high priority areas which may benefit from targeted BMPs.
- Minimum Monitoring Requirements
 - Detailed description of program goals, monitoring plan, and sampling/analytical methods.
 - List and map of selected TMDL pollutant monitoring sites/stations.
 - Frequency of data collection at each site/station.
 - Parameters to be measured relevant to TMDL.
 - Quality Assurance Project Plan.

Bacteria TMDL Implementation – OKR04 Small MS4 General Permit

- Annual Report
 - Include TMDL implementation report.
 - Status and actions taken to implement TMDL pollutant reduction plan and monitoring program.
 - Relevant actions taken that affect MS4 stormwater discharges to TMDL waterbody.
 - Status of any applicable TMDL implementation schedule milestones.
 - Evaluation of effectiveness of pollutant reduction plan and monitoring program.
 - Evaluation of MS4 pollutant load contributions and reductions to demonstrate consistency with TMDL and progress toward TMDL reduction goals.
 - Evaluation of implemented BMPs to monitor or assess progress or effectiveness in reducing discharge of POCs.
 - Summary of any SWMP revisions made to address new or revised TMDLs.

Basin	TMDL Report	Identified MS4 Sources	
1: Middle Arkansas – Verdigris - Neosho	Neosho River Basin Bacteria TMDLs - 2008	Miami	
	Lower Bird Creek Watershed Bacteria TMDLs - 2011	Catoosa Broken Arrow Owasso	Tulsa Tulsa County
	Arkansas River and Verdigris River Area - Bacteria and Turbidity TMDLs - 2012	Bixby Broken Arrow Claremore Coweta Jenks	Muskogee Sand Springs Sapulpa Tulsa
	Arkansas River and Haikey Creek Bacteria TMDLs – 2008	Bixby Broken Arrow	Tulsa Tulsa County
5: Canadian – North Canadian – Deep Fork	North Canadian River Area Bacteria TMDLs - 2010	Choctaw Del City Midwest City Moore Mustang Nicoma Park	Oklahoma City ODOT Spencer Tinker AFB Yukon
6: Cimarron – Upper Arkansas	Cimarron River Area Bacteria and Turbidity TMDLs – 2012	Oklahoma City/ODOT The Village	
	Salt Fork of the Arkansas River Area Bacteria and Turbidity TMDLs – 2011	Ponca City	

- TMDLs scheduled to take effect June 1, 2022.

TMDL Implementation Schedule

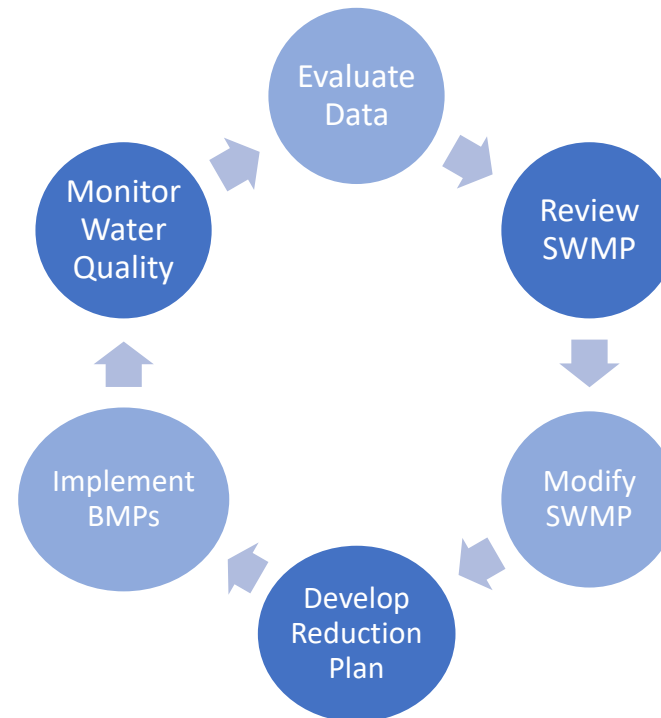
	Option A	Option B
SWMP Review and Evaluation	No more than 2 years from TMDL effective date – June 1, 2024	No more than 2 years from TMDL effective date – June 1, 2024
TMDL Pollutant Baseline Monitoring Plan	--	No more than 3 years from TMDL effective date – June 1, 2025
TMDL Pollutant Reduction Plan	No more than 3 years from TMDL effective date – June 1, 2025	No more than 5 years after implementing baseline monitoring – June 1, 2030
TMDL Pollutant Monitoring Plan	No more than 3 years from TMDL effective date – June 1, 2025	No more than 5 years after implementing baseline monitoring – June 1, 2030

Bacteria TMDL Implementation - Guidance

- Early 2020 – DEQ set up workgroups to develop guidance for TMDL implementation
 - Internal – Representatives from Municipal/Stormwater Permitting and Watershed Planning Sections – met quarterly.
 - External – Representatives from DEQ, OKC, Tulsa, Moore, Norman MS4s, GCSA – met monthly.
- Initial focus on Bacteria TMDL implementation for MS4s.
- Goals
 - Clarify monitoring requirements/expectations for MS4s in regard to Bacterial TMDLs
 - Develop various monitoring methods/options appropriate for each category of MS4
 - Phase I
 - Phase II, Categories 1-3
 - Develop guidance document(s) as needed

- Bacteria TMDL implementation Guide for MS4s - Draft

Iterative Process for Addressing Bacteria Sources



Bacteria TMDL Implementation Guide for MS4s

Bacteria TMDL Implementation Guide for MS4s

- Introduction
 - MS4 Program Background
 - TMDL Program Background
 - Recommended Approach
 - Financial Assistance Opportunities
 - Coordinating with DEQ
- Understanding the TMDL Watershed
 - Causes of Bacteria Impairment
 - Compiling and Evaluating Existing Data
 - GIS Data Collection
 - Identifying Implementation Partners
 - Maps on the Table and Walk the Watershed Event

Bacteria TMDL Implementation Guide for MS4s

- Reviewing the SWMP
 - Public Education and Involvement
 - Industrial Site Stormwater Runoff Control
 - IDDE and DWFS Program
 - Construction Site Stormwater Runoff Control
 - Post-Construction Management
 - Pollution Prevention and Good Housekeeping

Bacteria TMDL Implementation Guide for MS4s

- Developing a Pollutant Reduction Plan
 - Nonstructural Controls
 - Inspection and Maintenance Programs
 - Public Education and Outreach
 - Ordinances
 - Fats, Oils and Grease (FOG) Program
 - Root Cause Program
 - Structural Controls
 - Describes roughly 30 structural BMPs that address bacteria

Bacteria TMDL Implementation Guide for MS4s

- Developing a Monitoring Plan
 - Purpose
 - Monitoring Considerations and Source Control
 - Monitoring Strategies
 - Selecting Water Quality Sampling Station Locations
 - Trend Monitoring
 - Triggered Follow-up Monitoring
 - Intensive Source Identification Monitoring
 - Microbial Source Tracking
 - CCTV, Dye Traces, and Smoke Tests
 - Wildlife Surveys, etc.
 - Evaluating Results

Bacteria TMDL Implementation – Fact Sheets

- Fact Sheets – 1-2 pages - Draft
 - Oklahoma’s Water Quality and Bacteria
 - Bacteria Sources in Stormwater
 - Bacteria TMDL Summaries by Watershed
 - Guide to TMDL Implementation for MS4s
 - FAQs About TMDLs for MS4s
 - Guide to TMDL Monitoring for MS4s
 - Monitoring Cheat Sheet for Bacteria TMDLs

OKLAHOMA DEPARTMENT OF
ENVIRONMENTAL QUALITY'S

Monitoring Cheat Sheet

FOR BACTERIAL TMDLS

The assessment and identification of bacterial sources are complicated by many variables inherent in the use of indicator organisms and by the dynamic nature of microbial populations in various substrates and environmental conditions. This guide is designed to help you decide which method(s) will work best with your MS4's available resources.

There are 4 different monitoring methods which can be used to meet the requirements of the OKR04 General Permit for Phase II MS4s. These methods are:

- BMP assessment
- WQS
- TMDL WLA
- TMDL PRG

Each method has different advantages which may or may not be well-suited for your MS4 watershed(s). Please keep in mind that the requirements outlined here represent the minimum requirements. In order to obtain more comprehensive data on the discharges from your MS4, you may need to increase the number of monitoring sites, monitoring frequency, or extend the monitoring period. There is no single measure that can be used to identify bacteria sources, and a monitoring plan should use multiple tools to determine the likely sources in the watershed(s). The results of these assessment methods will provide the basis for selecting management actions and developing and documenting the TMDL implementation plan.

ABBREVIATIONS

BMP	best management practice
MS4	municipal separate storm sewer system
PBCR	primary body contact recreation
PRG	percent reduction goal
TMDL	total maximum daily load
WLA	wasteload allocation
WQS	water quality standard

METHOD	CRITERIA	LOCATIONS	CONSIDERATIONS	REQUIREMENTS
BMP ASSESSMENT	While specific criteria will vary depending on conditions within the MS4, BMPs should be effective at removing bacteria.	BMP influent and effluent	<ul style="list-style-type: none"> only applicable for structural BMPs well suited for large, regional BMPs does not address non-structural BMPs may need to be used in conjunction with other monitoring methods 	<p>Number of Sites 2 (influent and effluent)</p> <p>Monitoring period year round</p> <p>Frequency at least one discharge event per month (unless no discharges occur)</p>
WQS	For PBCR, the geometric mean of samples should not exceed <ul style="list-style-type: none"> 126 colonies/100 mL <i>Escherichia coli</i> (<i>E. coli</i>), or 33 colonies/100 mL for <i>Enterococci</i>. 	receiving waters	<ul style="list-style-type: none"> results may be used for surface water assessment(s) criteria can be difficult to meet due to the inclusion of non-MS4 discharges difficult to evaluate MS4-specific impacts 	<p>Number of Sites a single monitoring site shall be considered representative of no more than 10 stream miles for wadable* streams (no more than 25 stream miles for non-wadeable streams)</p> <p>Monitoring period recreational period (May 1 – September 30)</p> <p>Frequency 10 samples per year</p> <p>* "Wadable" means a stream or segment thereof, at least 10 percent of which under seasonal base flow conditions is: (1) less than 1.25 meters deep at its thalweg, and (2) has an instantaneous discharge of less than 10 cubic feet per second, or has a velocity of less than 10 centimeters per second.</p>
TMDL WLA	WLAs (WLA_MS4) are specified in the TMDL report.	MS4 discharge points	<ul style="list-style-type: none"> easier to evaluate MS4-specific impacts may be easier to meet since non-MS4 discharges are not included need to have reliable in-stream flow measurements (stations may be expensive to install if USGS stations are not available) 	
TMDL PRG	PRGs are specified in the TMDL report.			