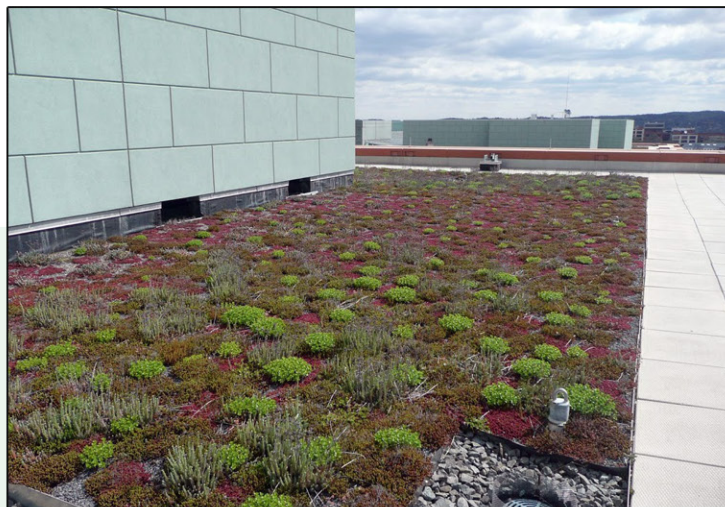


# Post-Construction Performance Standards & Water Quality-Based Requirements

## A Compendium of Permitting Approaches

---

EPA 833-R-14-003  
June 2014



U.S. Environmental Protection Agency  
Office of Water  
Water Permits Division

## Contents

Introduction .....	1
Section A. Numeric Post-Construction Standards in MS4 Permits .....	3
Section B. Water Quality-Based Effluent Limits in MS4 Permits .....	13
1. Listing of applicable TMDLS, WLAS, and the affected MS4s .....	14
2. Numeric limits and other quantifiable approaches for the specific pollutants of concern .....	15
3. Required implementation of specific stormwater controls or management measures.....	20
4. Other types of water quality-based requirements.....	24
4.1 Permitting Authority Review and Approval of TMDL Plans .....	24
4.2 Monitoring/Modeling Requirements .....	29
4.3 TMDL-Related Annual Reporting Requirements .....	33
5. Requirements for discharges to impaired waters prior to TMDL approval .....	35

# Introduction

Although much progress has been made since the first stormwater regulations were promulgated in 1990, significant challenges remain in protecting waterbodies from the impact of stormwater discharges. Urban-related stormwater has been identified as the source of impairment for tens of thousands of miles of rivers, streams, and coastal shorelines, as well as hundreds of thousands of acres of lakes, reservoirs and ponds in the United States. These impairments are largely due to the expansion of the built environment, which removes vegetation, alters the natural infiltration capability of the land, generates the discharge of pollutants, and leads to stream erosion.

National Pollutant Discharge Elimination System (NPDES) permitting authorities are employing a variety of different requirements in their municipal separate storm sewer system (MS4) permits to combat these problems. Permitting authorities have included numeric performance and/or design standards in MS4 permits to control discharges from new development and redevelopment. In addition, numeric effluent limitations have been expressed as water quality-based effluent limits (WQBELs) for specific pollutant parameters based on applicable wasteload allocations (WLAs) or other water quality objectives. Many permits also include requirements for the MS4 to implement specific management measures that are consistent with approved Total Maximum Daily Loads (TMDLs) or with the need to protect impaired waters prior to TMDL development.

To develop this compendium, the U.S. Environmental Protection Agency (EPA) reviewed all state and EPA-issued individual and general MS4 final permits issued up to June 2014. The review focused on MS4 permitting approaches that incorporated retention-based post-construction standards. It also focused on permitting approaches that directly implement TMDLs through numeric requirements or pollutant-specific management measures, or a combination of both. MS4 permits were also reviewed to determine how permitting authorities measured progress of implementation of WQBEL requirements through such measures as review and approval of implementation plans, monitoring/modeling, and reporting

## MS4 Permit Universe

250 individual MS4 permits cover approximately 855 Phase I MS4s.

54 general MS4 permits cover approximately 6,589 Phase II MS4s.

100 individual MS4 permits cover approximately 106 Phase II MS4s.

3 watershed MS4 permits cover approximately 3 Phase I and 40 Phase II MS4s.

*Regulated MS4s are typically cities, counties, towns, and villages; however, Phase II MS4s also include nontraditional MS4s such as public universities, departments of transportation, hospitals and prisons.*

*The universe of the Phase II MS4 program changes every 10 years according to the U.S. Census Bureau definition of urbanized area.*



requirements. Finally, MS4 permit approaches were identified that dealt with discharges to impaired waters prior to TMDL approval.

This compendium presents examples of different permitting approaches that EPA found in its nationwide review by describing, and in some cases excerpting, language from permits. The compendium is divided into two major sections. Section A provides examples of permits that implement numeric post-construction performance and/or design standards, and Section B presents different permitting approaches to address impaired waters and TMDLs. Note that a number of the permits identified in the compendium are featured in more than one of the categories.



**Parking island bioretention**  
**Stafford County, Virginia**  
*(Credit: Abby Hall/EPA)*

EPA notes that this compendium is intended to serve as a snapshot of permitting approaches. EPA anticipates that as permits are reissued in the coming months and years, the information in this compendium will need to be updated to include new examples or modified information. EPA has an interest in ensuring the accuracy of the information contained in this document, and therefore welcomes input on any aspect of this compendium at any time. The Agency will update the compendium as needed based on the comments received. EPA notes that the inclusion of any particular permit example should not be read as an Agency endorsement of the entire approach taken in that permit. In addition, this document does not impose any new legally binding requirements on EPA, states, or the regulated community, and does not confer legal rights or impose legal obligations upon any member of the public. EPA made every attempt to ensure the accuracy of the examples included in this document; however, in the event of a conflict between this compendium and any statute, regulation, or permit, the statute, regulation or permit controls. For more information about the NDPES Stormwater Program visit [www.epa.gov/npdes/stormwater](http://www.epa.gov/npdes/stormwater).

## Section A. Numeric Post-Construction Standards in MS4 Permits

Many states have developed performance and/or design standards to control post-construction stormwater discharges from newly developed and redeveloped sites. MS4 permits in 33 states have conditions implementing numeric performance standards. A comprehensive list of state standards for post-construction stormwater standards is provided at

[www.epa.gov/npdes/pubs/sw\\_state\\_summary\\_standards.pdf](http://www.epa.gov/npdes/pubs/sw_state_summary_standards.pdf).



**Parking lot bioretention**  
(Credit: Abby Hall/EPA)

Many states have implemented numeric, retention-based performance standards for newly developed and redeveloped sites. These standards typically require or encourage using infiltration, evapotranspiration, or harvest practices to control a specified volume of stormwater. Volume retention is critical to reduce pollutant loads of all water quality parameters and to reduce erosion of the receiving waterbody. It also provides multiple community benefits by treating stormwater as a resource. Retention-based performance standards have been expressed in various ways. Some retention standards have been expressed as a volume of rainfall, a percentile storm event, or a ground water recharge volume that must be retained. The following permits are examples of MS4 permits that implement such standards (listed by EPA Region).

### REGION 1 Connecticut

The 2013 Phase I City of Stamford, Connecticut, MS4 permit requires that the permittee incorporate the use of runoff reduction and low impact development (LID) practices into their land use regulations to meet a goal of maintaining post-development runoff conditions similar to pre-development runoff conditions. Specifically, for all new development and redevelopment sites with a currently developed effective impervious cover of less than 40%,

the applicant must design the site to retain the entire water quality volume for the site. For redevelopment of sites with an effective impervious cover of 40% or more, a developer shall design the site to retain on-site half the water quality volume for the site. In the *2004 Connecticut Stormwater Quality Manual*, the recommended water quality volume is the runoff volume for 90% of the average annual storm events, which is equivalent to the runoff associated with the first inch of rainfall. Any new Stamford MS4 discharge that is within 500 feet of the tidal wetland must discharge through a system designed to retain the volume of stormwater runoff generated by one inch of rainfall from the MS4 within the discharge's drainage area. See Section 6.A.3.a.iii.

Permit available upon request: [Chris.Stone@ct.gov](mailto:Chris.Stone@ct.gov)

## Vermont

The [2012 Vermont general permit](#) for discharges from small MS4s requires permittees to implement and enforce the requirements in the *2002 Vermont Stormwater Management Manual* for new development and redevelopment. The manual includes a ground water recharge volume standard that is determined as a function of annual pre-development recharge for a given soil group, average annual rainfall volume, and amount of impervious cover at a site. The ground water recharge standard can be met by one of two methods, or a combination of both. The first is designated as the percent volume method, and is based on infiltrating the recharge volume using one or more approved structural stormwater treatment practices. The second method is designated as the percent area method, and is based on draining runoff from some or all of the site impervious area through one or more approved nonstructural stormwater treatment practices. The manual also includes a water quality treatment standard that requires water quality treatment of 90% of annual storms based on removing total suspended solids (TSS) and total phosphorus (TP). The State of Vermont directly regulates post-construction stormwater runoff from activities that result in creation of new or expansion of existing impervious surface of more than an acre; regardless of whether the site discharges to an MS4 or directly to a waterbody. Consequently, the MS4 program must only regulate those sites that fall below the impervious cover threshold but disturb at least one acre of land or less if it is a part of a common plan of development. See Section IV.H.5.e.

## REGION 2

### New Jersey

The [2009 New Jersey general permit](#) for discharges from small MS4s requires permittees to implement and enforce a program to address stormwater runoff from new development and redevelopment and adopt ordinances according to state stormwater management rule, N.J.A.C. 7:8-4, to control stormwater from nonresidential development and redevelopment projects. In

addition, the permittee must ensure that any residential development and redevelopment projects that are subject to the Residential Site Improvement Standards for stormwater management (N.J.A.C. 5:21-7) comply with those standards. The New Jersey standard for ground water recharge requires that 100% of the average annual pre-construction ground water recharge volume for the site is maintained. For the purpose of calculating runoff coefficients and ground water recharge, there is a presumption that the pre-construction condition of a site or portion thereof is a wooded land use with good hydrologic condition. This ground water recharge requirement does not apply to previously developed portions of sites in urban redevelopment areas. The New Jersey standard for water quality provides that stormwater management measures are to be designed to reduce the post-construction load of TSS in stormwater runoff generated from the water quality design storm by 80% of the anticipated load from the developed site, expressed as an annual average. See Part I.F.3.

## New York

The [2010 New York general permit](#) for discharges from small MS4s requires permittees to develop and implement a program to address stormwater runoff from new development and redevelopment that ensures projects meet applicable standards in the *New York State Stormwater Management Design Manual*. The New York standard for new development requires runoff reduction be met by infiltration, ground water recharge, reuse, recycle, or evaporation of 100% of the post-development water quality volume unless specific physical site limitations prohibit or limit the use of infiltration or ground water recharge. This runoff reduction requirement is designed to replicate pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, and discharge volume. The water quality volume is calculated based on the amount of runoff equivalent to 90% rain event and the percent of impervious cover created at a site. This requirement can be accomplished by applying on-site green infrastructure techniques, standard stormwater management practices with runoff reduction capacity, and effective site planning. Redevelopment projects are encouraged to comply with the runoff reduction standard; however, it is not a requirement. Instead, alternative sizing criteria and stormwater management controls have been developed for redevelopment activities. See Parts VII.A.5 and VIII.A.5.

## REGION 3

### West Virginia

The [2009 West Virginia general permit](#) for discharges from small MS4s requires permittees to implement and enforce site design standards for all new development and redevelopment disturbing one acre or more. The site design standards require management measures that keep and manage on-site the first inch of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation. This first inch of rainfall must be 100% managed with no discharge

to surface waters, unless one of the two alternatives specified in the permit, off-site mitigation and payment in lieu, are met. See Part II.C.B.5.a.ii.

## Washington, DC

The [2011 District of Columbia](#) Phase I MS4 (DC MS4) permit requires the design, construction, and maintenance of stormwater controls to achieve on-site retention of 1.2 inches of stormwater from a 24-hour storm with a 72-hour antecedent dry period through evapotranspiration, infiltration and/or stormwater harvesting and use for new development and redevelopment projects greater than or equal to 5,000 square feet. See Section 4.1.1.

## Maryland

Maryland has two general permits, one for [municipalities](#) and one for [state and federal agencies](#), for discharges from small MS4s that require that stormwater management for new development and redevelopment be addressed for any proposed project that disturbs 5,000 square feet or more of earth. Because Maryland has a stormwater management program in place that regulates new development and redevelopment projects, the state considers compliance with the state statute to be compliance with this minimum control measure, this general permit, and federal regulations. Permittees shall comply with all state and local laws, regulations, ordinances, and procedures relating to stormwater management. In addition, permittees must implement and comply with the principles, methods, and practices found in the *2000 Maryland Stormwater Design Manual*, Volumes 1 and 2. The manual specifies that environmental site design (ESD) shall be implemented to the maximum extent practicable (MEP) to mimic pre-development conditions. The standard for characterizing pre-development runoff characteristics for new development projects is woods in good hydrologic condition. ESD practices are to be used to the MEP to meet the required water quality volume and the ground water recharge volume. The *water quality volume* is defined as the runoff volume from the 1-inch rain event in the Maryland Eastern Rainfall Zone and 0.9 inch in the Maryland Western Rainfall Zone. The manual includes a redevelopment policy that provides flexibility and alternative requirements for sites with more than 40% impervious area. See Part III.E.

The [Phase I MS4 permits in Maryland](#) [Anne Arundel County (2014), Charles County (2002), Carroll County (2005), Frederick County (2002), Harford County (2004), Howard County (2005), Montgomery County (2010), Prince George's County (2014), City of Baltimore (2013), and Baltimore County (2013)] also require by reference that the permittee implement the stormwater management design policies, principles, methods, and practices found in the *2000 Maryland Stormwater Design Manual* or other innovative stormwater management technologies approved by MDE. See Part III.E.1.



## Delaware

The [2013 New Castle County, Delaware](#), MS4 permit requires permittees to implement a program to address stormwater from post-development sites as prescribed under the Delaware Sediment and Stormwater regulations. In general, the Delaware Sediment and Stormwater regulations require stormwater controls sized according to the Resource Protection Event. The design parameter for the Resource Protection Event shall be the annualized runoff volume (RPv) produced by a storm having a 99% probability of occurring annually (i.e., the 1-year event) based on post-developed conditions. For new development, the RPv shall be reduced to an equivalent 0% effective imperviousness. For redevelopment, the RPv shall be reduced to an equivalent 70% of the existing effective imperviousness. The RPv shall be further reduced to an equivalent wooded condition for any existing meadow or wooded areas within the limit of disturbance based on the 2007 Delaware Land Use/Land Cover data. See Part II.A.4.

## REGION 4

### Tennessee

The [2010 Tennessee general permit](#) for discharges from small MS4s requires for new development and redevelopment projects greater than or equal to one acre, management measures that are designed, built, and maintained to infiltrate, evapotranspire, harvest and/or use, at a minimum, the first inch of every rainfall event preceded by 72 hours of no measurable precipitation. This first inch of rainfall must be 100% managed with no stormwater runoff being discharged to surface waters. See Section 4.2.5.2.1.

The [2011 Phase I City of Chattanooga, Tennessee](#), and the [2012 Phase I City of Nashville, Tennessee](#), MS4 permits include runoff reduction standards which require, in combination or alone, management measures that are designed, built, and maintained to infiltrate, evapotranspire, harvest, and/or use, at a minimum, the first inch of every rainfall event preceded by 72 hours of no measurable precipitation. The permittee may develop incentive standards for redevelopment and/or to increase use of green infrastructure best management practices (BMPs) while allowing flexibility for developers and designers to meet development standards. Such incentive standards are subject to certain criteria and may not exceed a maximum reduction of 50% of the required volume. For projects that cannot meet 100% of the runoff reduction requirement, the remainder must be treated prior to discharge with a technology documented to remove 80% TSS. See Section 3.2.5.2.

### Kentucky

The [2011 Phase I Louisville and Jefferson County, Kentucky](#), MS4 permit requires the development of an ordinance that requires water quality control measures to infiltrate,

evapotranspire, harvest, and reuse at least the equivalent runoff produced from an 80th percentile storm (e.g., 0.75 inches). See Part II.B.5.

## REGION 5

### Minnesota

The [2013 Minnesota general permit](#) for discharges from small MS4s requires permittees to develop and implement a post-construction stormwater management program that requires new development projects to meet a standard of no net increase from pre-project conditions of stormwater discharge volume, TSS, and TP. Redevelopment projects are required to meet a standard of a net reduction from pre-project conditions of stormwater discharge volume, TSS, and TP. See Part III.D.5.



**Parking lot tree pit in Maplewood, Minnesota**  
(Credit: Alisha Goldstein/EPA)

### Wisconsin

The [2014 Wisconsin general permit](#) for discharges from small MS4s requires permittees to implement a program for new development and redevelopment that includes an ordinance or other regulatory mechanism that establishes post-construction performance standards equivalent to those contained in Wisconsin's administrative code NR 151.122 through 151.126, and 151.242 through 151.246. The infiltration performance standard in Wisconsin's code is based on the imperviousness of the site. For example, sites with low imperviousness or development with less than 40% connected imperviousness such as parks, cemeteries, and low-density residential development, must infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 90% of the pre-development infiltration volume, based on an average annual rainfall. For sites with 40%–80% connected

**Wisconsin** also has a numeric standard that applies to the entire MS4 not only to new development and redevelopment:

The [2014 Wisconsin general permit](#) for discharges from small MS4 requires permittees to meet at minimum a 20% reduction in the annual average mass of TSS discharging from the MS4 to surface waters of the state as compared to implementing no stormwater management controls. Source area controls, structural stormwater management practices, and nonstructural control practices implemented to achieve the 20% reduction in TSS shall be maintained. See Section 2.7.1

imperviousness, such as medium- and high-density residential, multi-family development, industrial and institutional development, and office parks, the post-development infiltration volume shall be at least 75% of the pre-development infiltration volume. For sites greater than 80% connected imperviousness, such as commercial strip malls, shopping centers, and commercial downtowns, the post-development infiltration volume shall be at least 60% of the pre-development infiltration volume. See Section 2.5.

## REGION 6

### New Mexico

The [2012 Phase I MS4 permit for the City of Albuquerque, Albuquerque Metropolitan Arroyo Flood Control Authority \(AMAFCA\), New Mexico Department of Transportation \(NMDOT\), and University of New Mexico \(UNM\)](#) requires the implementation and enforcement, via ordinance and/or other enforceable mechanism(s), of site design standards that capture the 90th percentile storm event runoff to ensure the hydrology associated with new development and redevelopment sites mimic the pre-development hydrology of the previously undeveloped site. See Part I.C.5.b.

## REGION 8

### Montana

The [2009 Montana general permit](#) for discharges from small MS4s requires, for new development and redevelopment projects greater than or equal to one acre, the implementation of LID practices that infiltrate, evapotranspire, or capture for reuse the runoff generated from the first 0.5 inches of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation. See Part II.B.5.

## REGION 9

### California

The [2013 California general permit](#) for discharges from small MS4s requires that new development and redevelopment projects are designed to evapotranspire, infiltrate, harvest and use, and biotreat stormwater to meet at least one of the following hydraulic sizing design criteria: volumetric criteria (approximately the 85th percentile 24-hour storm runoff event or the volume of annual runoff required to achieve 80% or more capture) or flow-based criteria (the flow of runoff produced from a rain event equal to at least 0.2 inches per hour intensity; or the flow of runoff produced from a rain event equal to at least two times the 85th percentile hourly rainfall intensity). See Section E.12.e.ii.c.

## Los Angeles County, CA

The [2012 Los Angeles County MS4 permit](#) requires that each permittee shall require applicable new development and redevelopment projects to retain on-site the stormwater quality design volume defined as the runoff from: (1) the 0.75-inch, 24-hour rain event or (2) the 85th percentile, 24-hour rain event, whichever is greater. When evaluating the potential for on-site retention, each permittee shall consider the maximum potential for evapotranspiration from green roofs and rainfall harvest and use. Alternative compliance measures are allowed where meeting the standard is shown to be technically infeasible or where a project has been determined to provide an opportunity to replenish regional groundwater supplies at an off-site location. Alternative compliance measures include on-site biofiltration, off-site infiltration, a proposed ground water replenishment project, an off-site retrofit project such as green streets, parking lot retrofits, green roofs, and rainfall harvest and use, or participate in a regional stormwater mitigation program. The permittee must also require applicable new development and redevelopment projects within natural drainage systems to implement hydrologic control measures, to minimize changes in post-development hydrologic stormwater runoff discharge rates, velocities, and duration. This shall be achieved by maintaining the project's pre-project stormwater runoff flow rates and durations. See Part VI.D.7.c.

## San Francisco, CA

The [2009 San Francisco Bay Regional Water Board Municipal Permit](#) requires permittees to require applicable new development and redevelopment projects to treat 100% of the design storm runoff with LID treatment measures (harvesting and reuse, infiltration, evapotranspiration, or biotreatment) on-site or with LID treatment measures at an alternate stormwater treatment facility. The design storm is defined to meet at least one of the following hydraulic sizing design criteria: (1) volume hydraulic design basis (treat stormwater runoff equal to approximately the 85th percentile 24-hour storm runoff event or the volume of annual runoff required to achieve 80% or more capture); (2) flow hydraulic design basis (treat (a) 10% of the 50-year peak flowrate; (b) the flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity; or (c) the flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity); or (3) combination flow and volume design basis (treat at least 80% of the total runoff over the life of the project). See Sections C.3.c and C.3.d.

## San Diego, CA

The [2013 San Diego Regional MS4 permit](#) requires the permittee to require applicable new development and redevelopment projects to implement LID BMPs that are designed to retain (i.e. intercept, store, infiltrate, evaporate, and evapotranspire) on-site the pollutants contained



in the volume of stormwater runoff produced from a 24-hour, 85th percentile storm event (design capture volume), with the potential to implement off-site alternative compliance projects that will have a greater overall water quality benefit for the watershed than if the project were to implement structural BMPs on-site. In addition, the permittee must require implementation of on-site BMPs to manage hydromodification that may be caused by stormwater runoff discharged from a project as follows: (1) post-project runoff conditions (flow rates and durations) must not exceed pre-development runoff conditions by more than 10% (for the range of flows that result in increased potential for erosion, or degraded instream habitat downstream of the project); and (2) avoid critical sediment yield areas, or implement measures that allow critical coarse sediment to be discharged to receiving waters, such that there is no net impact to the receiving water. See Part II.E.3.c.

## REGION 10

### Anchorage, AK

The [2010 Anchorage, Alaska](#), individual MS4 permit requires that for new development and redevelopment projects that result in a land disturbance of 10,000 square feet or more, management measures that keep and manage the runoff generated from the first 0.52 inches of rainfall from a 24-hour event preceded by 48 hours of no measureable precipitation. The ordinance or regulatory mechanism must require that the first 0.52 inches of rainfall be 100% managed with no discharge to surface waters, except in circumstances described in the permit. Runoff volume reduction can be achieved by canopy interception, soil amendments, evapotranspiration, rainfall harvesting, engineered infiltration, extended filtration, and/or any combination of such practices. See Part II.B.2.

### Washington

The [2013 Western Washington general permit](#) for discharges from small MS4s and the 2013 Washington Phase I MS4 permit require permittees to implement LID performance standards for certain newly developed and redeveloped sites. The standard requires that stormwater discharges match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year flow to 50% of the 2-year flow. See Appendix I, Section 4.5.

### Oregon

The [2011 Phase I Portland, Oregon](#), MS4 permit requires new development and redevelopment projects that create or replace 500 square feet of impervious surface to capture and treat 80% of the annual average runoff volume, based on a documented local or regional rainfall

frequency and intensity. The program must prioritize and include LID, green infrastructure, or equivalent design and construction approaches. See Schedule A.4.f.

The [2010 Phase I Salem](#), 2010 Phase I Gresham/Fairview, 2010 Phase I Multnomah, 2011 Phase 1 Eugene, and the 2012 Phase I Clackamas County, Oregon, MS4 permits have the same standard, but it applies to new development and redevelopment projects of varying site size thresholds.

## Section B. Water Quality-Based Effluent Limits in MS4 Permits

This section presents examples of different types of permit requirements that are based on TMDLs or concern for impaired waters. The permits EPA reviewed showed that permitting authorities are taking a variety of different approaches to establishing WQBELs in their MS4 permits. Although some water quality-based requirements in these permits are in the form of numeric effluent limits, others are expressed as specific control measures that must be implemented to be consistent with applicable water quality standards or WLAs.



**Permeable pavement and bioretention in Albuquerque, New Mexico**  
(Photo courtesy of AridLID.org)

Overall, EPA found that nearly all MS4 permits include at least some language addressing impaired waters. For the purposes of presenting the different types of permitting approaches found in EPA's survey, this compendium organizes the examples into the following categories:

1. Listing of applicable TMDLs, WLAs, and/or the affected MS4s
2. Numeric effluent limits and other quantifiable approaches for the specific pollutants of concern<sup>1</sup>
3. Required implementation of specific stormwater controls or management measures
4. Other types of water quality-based requirements
  - a. Permitting Authority Review and Approval of TMDL Plans
  - b. Monitoring/Modeling Requirements
  - c. TMDL-Related Annual Reporting Requirements
5. Requirements for discharges to impaired waters prior to TMDL approval

<sup>1</sup> The use of the term *pollutant of concern* in this compendium refers to the pollutant parameter(s) for which a waterbody is listed as impaired under section 303(d) of the Clean Water Act or for which a TMDL has been approved or established by EPA.

## 1. Listing of applicable TMDLS, WLAS, and the affected MS4s

A first step in determining whether additional permit requirements are necessary as a result of an approved or established TMDL is to establish whether any TMDLs or WLAs apply to the MS4s being permitted. Although many permits have placed the responsibility for making this determination on the MS4 permittee, several permits have instead included information on which TMDLs and WLAs apply and which MS4s are affected directly in the permit. This approach reduces the amount of work required of the permittee in interpreting TMDL documents, and provides greater clarity for the permittee in understanding what water quality-related requirements may apply. The following are examples of this approach.

### General Permits California

The [2013 California small MS4 permit](#) includes tables showing applicable TMDLs, the MS4s covered by WLAs, the applicable WLA, and individualized TMDL implementation requirements for each affected MS4. See Attachment G.

### Minnesota

The Minnesota Pollution Control Agency includes on its website the [Master List MS4 Permit TMDLs Spreadsheet](#) that identifies TMDLs and associated WLAs that apply to its regulated MS4s. See the Permit tab.

### Washington

The [2013 Western Washington small MS4 permit](#) identifies each TMDL within the permit area and all affected MS4 permittees. See Appendix 2. The permit also states that “For applicable TMDLs not listed in Appendix 2, compliance with this Permit shall constitute compliance with the TMDL.” See Section S7.B.

### Individual Permits Anchorage, AK

The 2010 Anchorage, Alaska, MS4 permit fact sheet includes a list of completed TMDLs that identifies the pollutants of concern and percent reduction needed.

Contact state for permit.



## Menomonee Watershed, Wisconsin

The [2012 Menomonee Watershed Permit](#) for Milwaukee, Wisconsin, and 10 other MS4 permittees includes a table that lists all of the impaired waterbodies in the Menomonee River Watershed, the pollutants of concern, and the contributing MS4. See Table 1.

## Prince George's County, MD

The [2014 Prince George's County, Maryland, MS4 permit](#) provides an attachment, which includes a three-page list of EPA-approved TMDLs in the County. See Attachment B.

## 2. Numeric limits and other quantifiable approaches for the specific pollutants of concern

NPDES permits for MS4 discharges have included numeric effluent limitations for specific parameters based on an applicable TMDL WLA. Some examples of MS4 permits with numeric effluent limitations and other quantifiable approaches include the following.

### General Permits California

The [2013 California general permit](#) for discharges from small MS4s incorporates numeric WLAs that apply to individual small MS4s. Although the permit states that these numeric WLAs (for fecal coliform, sediment, and pesticides) apply to the named MS4s, it provides near-term actions, in the form of specific management measures, which constitute the bulk of what the permittee must do to be consistent with the WLAs. For example, for the Pajaro River TMDL and Implementation Plan for sediment, four MS4 permittees are prohibited from discharging sediment to the listed waterbodies in excess of the incorporated WLAs (Table 1). The allocations represent a 90% reduction in sediment loading to each waterbody from urban roads. See [Attachment G](#)—Region Specific Requirements, Regional Water Board Approved TMDLs—where urban runoff is listed as a source.

**Table 1. Pajaro River TMDL for Sediment**

Applicable MS4s	Major Subwatershed	Metric Tons of Sediment Per Year
City of Morgan Hill City of Gilroy City of Hollister City of Watsonville	Tres Pinos	1
	San Benito	100
	Llagas	787
	Uvas	139
	Upper Pajaro	161
	Corralitos	284
	Mount of Pajaro River	191

## Virginia

The [2013 Virginia general permit](#) for discharges from small MS4s requires permittees discharging to the Chesapeake Bay watershed to reduce loadings of nitrogen, phosphorus, and TSS from existing developed lands (pre-June 30, 2009) by 5% of its modeled share by the permit expiration date. The permit also requires a 5% offset of increased loads from new and grandfathered construction projects disturbing one or more acres for which an average land cover condition greater than 16% impervious cover was used in the design of post-development stormwater facilities. The general permit includes tables with loading rates to be used by the permittee to calculate required load reductions from existing sources. Load reductions are to be accomplished through the implementation of a Chesapeake Bay TMDL Action Plan that outlines the means and methods by which the permittee will achieve the required reductions. For this permit term, the permit states that compliance with these requirements “represents adequate progress for this state permit term towards achieving TMDL WLAs consistent with the assumptions and requirements of the TMDL.” See Sections I.C, I.C.2.a.5, Tables 3.a–3.d, I.C.2.a.7 and 8, and I.C.3. In the Watershed Implementation Plan for the Chesapeake Bay TMDL, Virginia committed to a phased approach to reducing nitrogen, phosphorus, and TSS from the MS4 and will include additional loading reductions in the next two permits terms.

## Individual Permits

### Arlington County, VA

The [2013 Arlington County, Virginia, MS4 permit](#) has the same pollutant reduction requirements for nitrogen, phosphorus, and TSS as the 2013 Virginia small MS4 general permit (described above). The Arlington County MS4 permit also requires the permittee to identify and submit to the state at least seven retrofit projects within its watershed retrofit plans that will be implemented within County rights-of-way or on County property within 60 months of permit issuance. The MS4 is also required to:

- Plant a minimum of 2,000 trees on County lands and develop a program to distribute a minimum of 2,000 trees to private property owners.
- Have funding to accommodate a minimum of 200 participants in the StormwaterWise Landscape program, which provides cost-sharing and technical assistance for the installation of small-scale BMPs to reduce stormwater runoff from private properties.

See Parts I.B.2.c and I.D.1.b.

## California Permits

### Lake Tahoe, CA

The [2011 Lake Tahoe, California, MS4 permit](#), covering the City of South Lake Tahoe, and portions of El Dorado County and Placer County in the Lake Tahoe Hydrologic Unit, requires each permittee to reduce fine sediment particle (FSP), TP and total nitrogen (TN) loads by 10%, 7%, and 8%, respectively, by September 30, 2016. These percentage reduction requirements were applied to each of the permittee's baseline load of FSP, TP, and TN to determine the maximum load allowance for each permittee to meet the 5-year load reduction requirements. See Section IV.B and Table IV.B.1.

### Los Angeles County, CA

The [2012 Los Angeles County, California, systemwide permit](#) requires permittees to comply with numeric WQBELs based on WLAs in approved TMDLs. The permit includes comprehensive provisions to achieve WLAs from applicable TMDLs, including interim and final WQBELs and corresponding compliance schedules consistent with the state-adopted TMDL Implementation Plan, compliance monitoring, and reporting requirements, and for each pollutant of concern. For example, Attachment L of the permit prescribes final and interim WQBELs that apply to MS4s discharging to the Santa Clara River. The attachment includes WQBELs for nitrogen, chloride, trash, and *E. coli* that are consistent with the WLAs from approved TMDLs for the Santa Clara River watershed.

For the interim WQBELs, the permit includes several alternatives from which the permittees can choose to demonstrate compliance. A permit can demonstrate compliance with the applicable interim WQBEL in any of the following ways:

- There are no violations of the interim WQBEL for the pollutant of concern at the permittee's applicable MS4 outfalls;
- There are no exceedances of the applicable receiving water limitation for the pollutant of concern in the receiving water at or downstream of the permittee's outfalls;
- There is no direct or indirect discharge from the permittee's MS4 to the receiving water subject to the interim WQBEL and/or the receiving water limitation for the pollutant of concern;
- The permittee has submitted and is fully implementing an approved Watershed Management Program (WMP) or an Enhanced Watershed Management Program (EWMP), which requires among other things that the permittee include multi-benefit regional projects that retain through infiltration or capture and reuse the stormwater

volume from the 85th percentile, 24-hour storm for the drainage areas tributary to these projects.

See Parts VI.C and E, and Attachments L – R.

## Orange County, CA

The [2009 Orange County, California, MS4 permit](#) establishes a number of different numeric WQBELs that affect MS4s discharging to certain watersheds. For instance, for MS4s discharging to the Newport Watershed, the permit requires compliance with WLAs for metals (cadmium, copper, lead, zinc, mercury, and chromium), organochlorine compounds, and selenium. See Section XVIII.B.4. Note that the original TMDLs for these constituents included no implementation plans or compliance schedules for attainment. During development of the modified TMDL, which will include an implementation plan, the permittees are required to continue working towards meeting the WLAs. In addition, for TMDLs with implementation plans, the permit includes WLAs that are required to be met as soon as 2013 (e.g., recreational standards for fecal coliform), but by no later than 2019 (e.g., shellfish standards for fecal coliform). See Section XVIII.C. Other numeric WLAs are required in Section XVIII.D for diazinon, chlorpyrifos, TN, TP, and sediment. Note that, according to the permitting authority, the WLAs for these constituents have already been achieved. Compliance with the WLAs is to be determined by receiving water monitoring. Where monitoring reveals that the WLAs are exceeded, the permittees are required to evaluate and submit to the permitting authority within 12 months of the exceedances a proposal for implementing additional BMPs. See Section XVIII.E.

## San Diego, CA

The [2013 San Diego Regional MS4 permit](#) contains numeric effluent limitations for diazinon, dissolved copper, TN, TP, lead, zinc, and indicator bacteria, which are consistent with applicable TMDL WLAs. The permit identifies for each applicable TMDL information about the TMDL (waterbodies, adoption dates); which MS4 co-permittees are affected; final compliance requirements (final compliance dates, receiving water and/or effluent limitations, BMP requirements, and final TMDL compliance determination); interim compliance requirements; and specific monitoring and assessment requirements. See Attachment E.

## San Francisco, CA

The [2009 San Francisco Bay Regional MS4 permit](#) requires the permittee to implement trash load reduction plans and actions to reduce trash loads from their MS4 by 40% by 2014, 70% by 2017, and 100% by 2022.



## Prince George's County, MD

The [2014 Prince George's County, Maryland, MS4 permit](#) requires the County to develop a work plan within one year to address the Anacostia Trash TMDL, which estimates that 170,628 pounds of trash will need to be removed annually. The work plan must include a detailed schedule, trash reduction benchmarks in years two and four, and methods of implementation. The County must also develop accounting methods to quantify annual trash reductions.

The permit also requires restoration plans for waters with approved TMDLs. The restoration plans must address the stormwater WLA for all EPA-approved TMDLs in the County. An annual TMDL assessment report is required to be submitted to the permitting authority. In addition, the permit requires the County, within the 5-year permit term, to achieve reductions in discharges consistent with the Chesapeake Bay TMDL by restoring 20% of the previously developed impervious land with little or no controls. See similar requirements in the [2014 Anne Arundel County, Maryland, MS4 permit](#) (Parts IV.E.2.a and VI.A).

Note that Maryland has five other Phase I MS4 permits [Charles County (2002), Carroll County (2005), Frederick County (2002), Harford County (2004), and Howard County (2005)] that are required during their current administratively extended permit term to restore 10% of the County's impervious surface area that was identified during the previous permit term. These permits also require permittees to begin to implement an additional 10% restoration during the permit term for a total goal of 20% restoration. The permit further requires monitoring to determine the effectiveness of the restoration efforts toward achieving water quality.

See Parts IV.D.4, IV.E, and VI.A. See similar requirements in Parts IV.E and VI of both the [2013 Baltimore County, Maryland, MS4 permit](#) and the [2013 Baltimore City, Maryland, MS4 permit](#).

## Honolulu, HI

The [2011 Honolulu City/County MS4 permit](#) requires compliance with the "urban source wasteload allocation" based on different TMDLs in table format including applicable allocations; existing loads; and reductions needed for TN, TP, and TSS. See Sections F.3.b and F.3.b.1 through F.3.b.6.

## Washington, DC

The [2011 DC MS4 permit](#) requires the permittee to remove 103,188 pounds of trash annually. Reductions must be made through a combination of the following approaches:

- Direct removal from waterbodies (e.g., stream cleanups, skimmers)
- Direct removal from the MS4 (e.g., catch basin cleanout, trash racks)

- Direct removal prior to entry to the MS4 (e.g., street sweeping)
- Prevention through additional disposal alternatives (e.g., public trash/recycling collection)
- Prevention through waste reduction practices, regulations, and/or incentives (e.g., bag fees)

The MS4 is also required to achieve the following numeric requirements:

- Implement retrofits for stormwater discharges from a minimum of 18,000,000 square feet of impervious surfaces during the permit term. A minimum of 1,500,000 square feet of this objective must be in transportation rights-of-way;
- Achieve a minimum net annual tree planting rate of 4,150 plantings annually within the DC MS4 area, with the objective of a District-wide urban tree canopy coverage of 40% by 2035. The annual total tree planting shall be calculated as a net increase, such that annual mortality is also included in the estimate. Trees must be planted in accordance with the Planting Specifications issued by the International Society of Arboriculture as appropriate to the site conditions; and
- Install at a minimum 350,000 square feet of green roofs on District properties during the term of the permit (including schools and school administration buildings).

See Sections 4.1.5.4, 4.1.6.2, 4.1.7.2, and 4.10.1.

### 3. Required implementation of specific stormwater controls or management measures

EPA found several examples of permits that require their MS4 permittees to implement specific BMPs or other management measures to ensure consistency with the applicable TMDLs. This approach provides both the permitting authority and the permittee with measurable performance measures that can be readily tracked, and it provides both parties with the ability to understand what actions constitute reasonable further progress towards achieving the TMDL and protecting water quality.

#### General Permits California

The [2013 California general permit](#) for discharges from small MS4s includes additional (narrative) stormwater control requirements that are deemed by the permitting authority to be consistent with applicable TMDLs. These requirements are individualized for each pollutant of concern, and different requirements apply to each impaired watershed and contributing MS4

dischargers. For instance, to be consistent with the Napa River pathogens WLA for municipal stormwater, the permit requires the six affected MS4s to educate the public about pathogen impacts and ways to reduce pathogen discharges, and to develop and implement programs to reduce/eliminate fecal coliform loading from pet wastes, among other requirements. See Attachment G.

## Minnesota

The [2013 Minnesota general permit](#) for discharges from small MS4s requires each regulated small MS4 to submit a compliance schedule with their permit application showing what BMPs will be implemented and when during the permit term to address applicable WLAs, and target dates for when the WLAs will be achieved. Note that the state provides public notice and an opportunity to comment on each permit application. See Section II.D.6.f.

## Pennsylvania

The [2013 Pennsylvania general permit](#) for discharges from small MS4s requires that permittees develop, submit for approval, and ensure implementation of an MS4 TMDL Plan that is designed to achieve pollutant reductions requirements of the applicable WLAs. The permit provides permittees with a list of nine alternative TMDL Control Measures for permittees to consider for reducing pollutants consistent with applicable WLAs. See Section II.F.1 (NOI Instructions).

## Washington

The [2013 Western Washington Phase II Municipal Stormwater Permit](#) includes tables that establish additional watershed-specific actions that are required of each named MS4. The actions are differentiated based on the applicable TMDL and pollutant of concern. See Appendix 2.

The [2014 Washington State Department of Transportation \(WDOT\) MS4 permit](#) includes specific mandated action items for WDOT that are associated with individual TMDLs. For example, to implement the *Hangman Creek Fecal Coliform, Temperature, TSS/Turbidity TMDL*, WDOT is required to take the following actions by deadlines specified in the permit:



**Street-side swale and pervious concrete sidewalk  
in Seattle, Washington**  
(Credit: Abby Hall/EPA)

- Within WDOT's right-of-way inside the TMDL boundary, identify illicit sources of bacteria and sediment discharges to the stormwater conveyance system. A priority list of stream crossings and stormwater discharge locations to Hangman Creek are identified;
- If stormwater discharges that transport bacteria over natural background levels to listed receiving waters are found from sources within WSDOT's right-of-way and control, WSDOT will apply BMPs from their Stormwater Management Program Plan (SWMPP) or perform remediation to correct bacteria discharges;
- To address TSS and turbidity, WSDOT will work to prevent sediment from entering area waterways along SR 27 (in upper watershed) and SR 195 rights-of-way. WSDOT will prioritize problem areas and work with individual property owners to prevent sediment from entering area waterways via WSDOT's MS4; and
- Evaluate whether stormwater discharges contribute to elevated temperature issued, and, if so, take steps to reduce the adverse thermal stormwater discharge impacts to Hangman Creek or its tributaries.

See Appendix 3 (Applicable TMDL Requirements).

## Individual Permits

### Denver, CO

The 2009 Denver, Colorado, MS4 permit identifies specific requirements that apply to discharges to Segment 14 of the Upper South Platte River Basin associated with WLAs from the approved *E. coli* TMDL. The permit requires the permittee to identify outfalls with dry weather flows and to identify outfalls of concern; to monitor priority outfalls of concern for flow rates and *E. coli* densities; to implement a system maintenance program for listed priority basins (which includes storm sewer cleaning and sanitary sewer investigations); to install markers at least 90% of storm drain inlets in areas with public access; and to conduct a public outreach program focused on sources that contribute *E. coli* loads to the MS4. See Part I.B.1.f.

The permit also requires the permittee to develop and implement new programs and BMPs, in addition to the activities described above, to reduce dry weather discharges of *E. coli* to the extent necessary so that by the end of the compliance period, dry weather discharges from MS4 outfalls of concern do not contribute to an exceedance of the *E. coli* standard (do not exceed an *E. coli* density of 126 cfu per 100 ml for a geometric mean of all samples collected at a specific outfall in a 30-day period). The permit includes a compliance schedule for meeting this requirement by November 30, 2018. See Part I.B.1.f.

Contact state for permit.

## Florida Phase I MS4 Permits

Florida's Phase I MS4 permits require permittees that discharge to waterbodies with an approved TMDL and a Basin Management Action Plan (BMAP) to comply with the provisions of the BMAP and report on the status of BMAP implementation with each annual report. For waterbodies with an approved TMDL, but no BMAP, the MS4 permittee is required to submit for review and approval a TMDL prioritization schedule within 6 months of the permit effective date. At a minimum, the highest priority TMDL is to have a plan to address the pollutant of concern by the end of the permit cycle. See, for example, Parts VIII. B.2 and B.3.a of the Pinellas and Miami-Dade permits.

Florida's permits also include specific requirements for fecal coliform TMDL waters that do not have a BMAP. In these cases, the MS4 permittee is required to develop and submit a bacterial pollution control plan with specific elements such as bacteria source tracking and a pet waste management program. The bacteria pollution control plan is to be implemented in accordance to the schedule within the approved plan. The permittees are required to submit a status report with each annual report. See, for example, Part VIII.B.4 of the Pinellas and Miami-Dade permits.

Contact state for permits.

## San Francisco, CA

The [2009 San Francisco Bay Regional Stormwater MS4 Permit](#) includes narrative and numeric WQBELs for trash, mercury, polychlorinated biphenyls, pesticides, copper, polybrominated diphenyl ether, and selenium. The permit requires interim milestones and pollutant-specific control measures that are consistent with the implementation actions identified in the applicable WLA. (For "urban stormwater," see pages 15–16 of the Basin Plan Amendments to the San Francisco Basin Water Quality Control Plan, [www.swrcb.ca.gov/sanfranciscobay/water\\_issues/programs/TMDLs/sfbaymercury/Adopted\\_BPA\\_080906.pdf](http://www.swrcb.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaymercury/Adopted_BPA_080906.pdf).) For example, the San Francisco Basin Water Quality Control Plan for mercury includes interim and final milestones of 120 kilograms per year (kg/yr) loading by February 2018 and 82 kg/yr by February 2028. The permit incorporates both the aggregate WLA and the interim loading milestone, as well as implementation requirements that are identified in the TMDL Implementation Plan, including requirements to:

- (1) Implement a mercury source control program;
- (2) Implement a monitoring system to quantify mercury loads and loads reduced;
- (3) Monitor methylmercury in discharges;



- (4) Conduct a fate and transport study; and
- (5) Develop an allocation sharing mechanism.

See Sections C-9 through C-14.

## 4. Other types of water quality-based requirements

A number of permits exhibit alternative means of ensuring consistency with applicable TMDLs, other than by adopting numeric requirements or implementing specific stormwater controls. The following permitting approaches are illustrative of these types of requirements.

### 4.1 Permitting Authority Review and Approval of TMDL Plans

Several permitting authorities require that their permittees develop a TMDL Plan (or the TMDL component of the overall stormwater management program [SWMP] document) and submit it for review and/or approval. The benefit of this type of approach is that through the permitting authority review there is an additional level of assurance that the proposed plan will be consistent with the assumptions and requirements of any available WLA in an approved TMDL.

#### General Permits Vermont

The [2012 Vermont general permit](#) for discharges from small MS4s requires permittees that discharge to a stormwater-impaired water with an approved TMDL to submit, within 3 years of the permit issuance date, a Flow Restoration Plan for state review and approval.

#### Pennsylvania

The [2013 Pennsylvania general permit](#) for discharges from small MS4s requires permittees discharging to impaired waters for which a TMDL has been approved to submit with their notice of intent (NOI) for review and approval by the permitting authority an MS4 TMDL Plan designed to achieve pollutant reductions consistent with the applicable WLA. The permit requires that

[P]ermittees must include the reductions in pollutant loads attained by implementation of control measures or BMPs, broken down measure by measure or BMP by BMP. Permittees must have physical pollutant removal measures installed on-the-ground in time for their successful operation to be documented in the periodic report or the progress report submitted at the end of the third year of coverage under this permit. Additional measurable substantial progress with installation of physical pollutant removal measures must be documented in the reports submitted with the next successive renewal NOI or application for a renewal permit.

A further description of these reports is found in the NOI Instructions. The permit also requires that MS4 TMDL Plans and Designs be signed and sealed by a professional engineer holding a valid license in good standing from the state. See Section II.F (NOI Instructions) and Part C.1 (Authorization to Discharge).

## Virginia

The [2013 Virginia general permit](#) for discharges from small MS4s requires that permittees discharging to the Chesapeake Bay watershed submit a Chesapeake Bay TMDL Action Plan within 24 months of the permit effective date for review and approval by the permitting authority. Unless specifically denied in writing by the department, TMDL Action Plans and updates developed in accordance with this section of the permit become effective and enforceable 90 days after the date received by the department. The Chesapeake Bay TMDL Action Plans must include the following:

- A review of the current MS4 program to identify new or modified legal authorities to meet these requirements;
- An estimate of the annual pollutant of concern loads discharged from the existing sources based loading rates specified in the permit;
- A determination of the total pollutant load reductions necessary to reduce the annual pollutant of concern loads from existing sources;
- The management practices and retrofit programs that will be utilized to meet the required load reductions and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting the reductions; and
- The means and methods to offset the increased loads from new sources that disturb one or more acres as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The permittee must use tables in the permit to develop the equivalent pollutant load for nitrogen and TSS. The permittee must offset 5% of the calculated increased load from these new sources during the permit cycle.

See Table 1 and Section I.C.2.

## Georgia

The [2012 Georgia general permit](#) for discharges from small MS4s requires existing permittees discharging to impaired waters with an approved TMDL to develop and submit for review and approval to the permitting authority an Impaired Waters Plan (for MS4s with a population of < 10,000) or a Monitoring and Implementation Plan (for MS4s with a population of > 10,000).

- The Impaired Waters Plan, which must be submitted by a specific date, must include a list of the impaired waters and the pollutant(s) of concern, a map showing the locations of the impaired waters and all MS4 outfalls discharging to those waters, BMPs that will be implemented to address each pollutant of concern, and a schedule for implementing the BMPs.
- The Monitoring and Implementation Plan, which also must be submitted by a specified date, must identify where wet weather monitoring will occur, sample type, frequency, schedule to begin monitoring, and a description of the BMPs that will be implemented to address each pollutant of concern.

See Sections 4.4.1 and 4.4.2.

## Minnesota

The [2013 Minnesota general permit](#) for discharges from small MS4s requires each applicant to submit its Stormwater Pollution Prevention Program (SWPPP) document to the permitting authority, including a compliance schedule for addressing applicable WLAs with the following required elements:

- Interim milestones, expressed as **BMPs** or progress toward implementation of **BMPs** to be achieved during the term of this permit
- Dates for implementation of interim milestones
- Strategies for continued **BMP** implementation beyond the term of this permit
- Target dates the **applicable WLA(s)** will be achieved

See Sections II.D.6 and III.E.

## California

The [2013 California general permit](#) for discharges from small MS4s requires some of its permittees, for specific TMDLs, to submit for review and approval a plan to minimize, control, and preferably prevent the discharge of the pollutant of concern.

## Individual Permits

### Arlington Country, VA

The [2013 Arlington County, Virginia, MS4 permit](#) has the same requirement as the 2013 Virginia small MS4 general permit to submit a Chesapeake Bay TMDL Action Plan within 24 months of the permit effective date for review and approval by the permitting authority (described above). See Part I.D.1.b.

### Denver, CO

The 2009 Denver, Colorado, MS4 permit identifies specific requirements that apply to discharges to Segment 14 of the Upper South Platte River basin associated with WLAs from the approved *E. coli* TMDL. The permit requires the permittee to submit to the state an *E. coli* control plan, which, among other things, must include requirements for the permittee to identify outfalls with dry weather flows and to identify outfalls of concern; to monitor priority outfalls of concern for flow rates and *E. coli* densities; to implement a system maintenance program for listed “priority basins” (which includes storm sewer cleaning and sanitary sewer investigations); to install markers for at least 90% of storm drain inlets in areas with public access; to conduct a public outreach program focused on sources that contribute *E. coli* loads to the MS4; and to develop and implement additional programs and BMPs as necessary to ensure that dry weather discharges from MS4 outfalls of concern by November 30, 2018, do not contribute to an exceedance of the *E. coli* standard (do not exceed an *E. coli* density of 126 cfu per 100 ml for a geometric mean of all samples collected at a specific outfall in a 30-day period). See Part I.B.1.f.

Contact state for permit.

### Los Angeles Country, CA

The [2012 Los Angeles County, California, systemwide permit](#) provides permittees with the option of demonstrating compliance with interim WQBELs by implementing a state-approved WMP or EWMP. The permit specifies what each WMP or EWMP must include to be approvable. For example, each EWMP must, among other things:

- Prioritize water quality issues resulting from stormwater/non-stormwater discharges to the receiving water within each Watershed Management Area;
- Identify and implement strategies, control measures, and BMPs to ensure that discharges (1) achieve applicable WQBELs; (2) do not cause or contribute to exceedances of receiving water limitations; and (3) do not include non-stormwater discharges that are prohibited;

- Execute an integrated monitoring program to determine progress towards achieving applicable limitations and/or action levels;
- Modify strategies, control measures, and BMPs as necessary based on analysis of monitoring data to ensure applicable WQBELs and receiving water limitations and other milestones are achieved in the required timeframes;
- Include multi-benefit regional projects to ensure that MS4 discharges achieve compliance with all final WQBELs and do not cause or contribute to exceedances of receiving water limitations by retaining through infiltration or capture and reuse the stormwater volume of the 85th percentile, 24-hour storm for the drainage areas tributary to the multi-benefit regional projects; and
- Maximize the effectiveness of funds through analysis of alternatives and section and sequencing of actions needed to address human health and water quality-related challenges and noncompliance.

The permittee is considered in compliance with the interim WQBELs if it:

- Provides timely notice of its intent to develop a WMP or EWMP;
- Meets all deadlines for development of the WMP or EWMP;
- For the area covered by the program, targets implementation of watershed control measures in its existing SWMP to address known contributions of pollutants from MS4 discharges that cause or contribute to exceedances of receiving water limitations;
- Demonstrates reasonable assurance (through a peer-reviewed quantitative modeling approach) that implementation of the actions/projects proposed in the WMP or EWMP will achieve WQBELs and receiving water limitations by required deadlines;
- Receives final approval of the WMP or EWMP;
- Fully implements its approved WMP or EWMP, including all proposed actions/projects, per the approved time schedules; and
- Periodically adapts its WMP or EWMP, when necessary, if monitoring data indicate that expected water quality outcomes are not being achieved.

See Parts VI.C and E, and Attachments L – R.

## Montgomery County, MD

The [2010 Montgomery County, Maryland, MS4 permit](#) requires the permittee to submit to the state for review and approval a plan for each EPA-approved TMDL for the portion of a

watershed covered by the permit. The plans must include the actions and deadlines to meet the required pollutant load reduction benchmarks and WLAs within the specified timeframe. See Part III.J.2.

## Prince George's Country, MD

The [2014 Prince George's County, Maryland, MS4](#) permit requires the permittee to submit for review and approval by the state a restoration plan for each WLA approved by EPA prior to the permit's effective date. The permit requires that each restoration plan: (1) include the final date for meeting applicable WLAs and a detailed schedule for implementing all structural and nonstructural measures necessary for meeting applicable WLAs; (2) provide detailed cost estimates for individual projects, programs, controls, and plan implementation; (3) evaluate and track implementation of restoration plans toward meeting established benchmarks, deadlines, and stormwater WLAs; and (4) develop an ongoing iterative process for focusing in on areas where the WLAs are not being met according to benchmarks and deadlines established as part of the County's watershed assessments. Note that in another section of the permit, the County is required to specify pollutant load reduction benchmarks for each watershed that demonstrate progress toward meeting all applicable stormwater WLAs. See Sections III.E.1.b.v and E.2.

## Washington, DC

The [2011 DC MS4 permit](#) requires the permittee to submit for review and approval no later than 30 months after the effective date of the permit modification a consolidated TMDL Implementation Plan to address all TMDL WLAs applicable to District waters, with a focus on 15 specific TMDLs affecting the MS4's discharge, but also to evaluate other pollutants of concern for which relevant WLAs exist. Further, the permittee is required to submit an annual updated Consolidated TMDL Implementation Plan to account for any new or revised TMDL WLAs. See Section 4.10.

## 4.2 Monitoring/Modeling Requirements

A number of permits are starting to require their MS4s, which are identified and assigned allocations in TMDLs, to monitor<sup>2</sup> for the associated pollutant(s) of concern or, in others, to model the effects of stormwater controls on the discharge of pollutant(s) of concern. Some of these requirements are specific to the pollutant parameter, while others dictate that the

---

<sup>2</sup> Note that while many Phase I MS4 permits include monitoring requirements, these have generally not been, until relatively recently, included for the purposes of implementing TMDLs.



permittee establish a monitoring program of its own to determine progress towards meeting applicable WLAs.

## General Permits

### California

The [2013 California general permit](#) for discharges from small MS4s includes tailored requirements for monitoring in certain watersheds. The permit specifies which permittees are affected by the tailored requirements, and the receiving streams where the monitoring must be performed. In some watersheds, the monitoring is intended to establish baseline pollutant loading information, while in a number of others, the monitoring program (which is submitted to the state as part of a Wasteload Allocation Attainment Program) is intended show whether the MS4's program is meeting interim targets or WLA-based limits. In a number of watersheds, in addition to the effluent monitoring requirements, permittees are required to submit a quantifiable numeric analysis demonstrating that the BMPs selected for implementation will likely achieve the applicable WLA according to the schedule for implementing the TMDL, based on modeling, published BMP pollutant removal performance estimates, best professional judgment, and/or other available tools. See, for example, the permit requirements for the San Lorenzo River TMDL for sediment in Appendix G. See Attachment G— Region Specific Requirements, Regional Water Board Approved TMDLs—where urban runoff is listed as a source.

### Georgia

The [2012 Georgia general permit](#) for discharges from small MS4s requires permittees with a population of > 10,000 that discharge to an impaired water either with or without an approved TMDL to implement a monitoring plan for all pollutants of concern. The monitoring plan, which must be submitted to the permitting authority for review and approval, is required to specify the sampling locations, sample type and frequency, implementation schedule, and the BMPs that will be implemented to control and reduce the pollutants of concern. Annual reports are required to include an assessment of the data trends for each pollutant of concern. The assessment must initially include a characterization of baseline conditions to determine the effectiveness of the BMPs employed and what, if any, additional adaptive BMP measures may be necessary to return the waters to comply with state water quality standards. See Section 4.4.2.

### Pennsylvania

The [2013 Pennsylvania general permit](#) for discharges from small MS4s requires permittees to report on the progress of implementation of applicable MS4 TMDL Plans by submitting to the

permitting authority either annual or progress reports. (Further description of reports found in NOI Instructions.) The permit requires the reports to include the reductions in pollutant load attained by implementation of the TMDL control measures and BMPs, broken down measure by measure and BMP by BMP. The report must demonstrate that measurable progress toward meeting the required pollutant load reductions are being achieved and are consistent with the conditions and assumptions of the applicable TMDL. See Section II.F.2 (NOI Instructions).

## Washington

The [2013 Western Washington small MS4 general permit](#) requires a number of its permittees to conduct discharge or surface water monitoring for fecal coliform and to electronically submit the results to the state. See Appendix 2.

## Individual Permits

### Atlanta, GA

Georgia's Phase I MS4 permits require MS4s to propose a monitoring and implementation plan for each pollutant of concern. The plan must include a map showing the monitoring locations and must specify the sample type and frequency. Each annual report shall include an assessment of the data trends for each pollutant of concern. The assessment shall initially include a characterization of baseline conditions to determine the effectiveness of the BMPs employed and what, if any, additional adaptive BMP measures may be necessary to return the waterbody to compliance with state water quality standards. See, for example, Part 3.3.7 of the Bibb County, GA MS4 permit and Part III.E. of the Atlanta, Georgia, permit.

Permits available upon request: [Frances.Carpenter@dnr.state.ga.us](mailto:Frances.Carpenter@dnr.state.ga.us)

### Nashville, TN

The [2012 Nashville, Tennessee, MS4 permit](#) includes specific monitoring instructions for waters impaired for siltation and/or habitat alteration, and pathogens. For example, for siltation and habitat alteration impairments, biological stream sampling must be performed utilizing the Semi-Quantitative Single Habitat Method (October 2006). For pathogen impairments, samples must be performed using methods identified in the permitting authority's *Quality System Standard Operating Procedure for Chemical and Bacteriological Sampling of Surface Waters* (December 2009), and they must include the collection of 5 samples and corresponding flow measurements, within a 30-day period and must be performed between June through September (Summer). The permit also requires Visual Stream Surveys and Impairment Inventories on streams impaired for siltation, habitat alteration, and pathogens immediately upstream and downstream of each MS4 outfall to identify and prioritize MS4 stream impairment sources. See 4.1 and 4.2.

## Florida Phase I Permits

Florida's Phase I MS4 permits require the MS4 for waterbodies with an approved TMDL, but without a BMAP, to submit to the state for review and approval a TMDL monitoring and assessment plan within one year. The permits specify the minimum elements of the plan, which include:

- Develop a table showing the annual loadings currently discharged from outfalls into waterbodies with an adopted TMDL;
- Rank the outfalls, based on total annual loading of the pollutant(s) of concern, discharging into each waterbody with an adopted TMDL; and
- Based on a review of sediment and biological monitoring results from the past, validate the results of the loading assessment that identifies the highest priority outfalls.

Once the monitoring and assessment plan is approved, the permits require storm event monitoring for a minimum of seven storm events at the top-ranked outfall identified in the plan to validate the estimates of annual pollutant loadings. A final report summarizing the results must be submitted for review and approval by the state. See, for example, Parts VIII.B.3.b and c of the 2013 Pinellas and 2011 Miami-Dade Phase I MS4 permits.

Contact state for permit.

## Prince George's County, MD

The [2014 Prince George's County, Maryland, MS4 permit](#) requires the permittee to conduct monitoring to track progress toward meeting TMDLs, specifically chemical, physical, and biological monitoring in the Bear Branch watershed and an assessment of the effectiveness of stormwater controls for stream channel protection in the Black Branch watershed. The permit includes specific protocols to be followed based on the type of monitoring. For each annual report, the permittee must submit information on the results of the monitoring as well as pollutant load reductions related to applicable WLAs. See Part IV.F and V.A. See also similar requirements in Part IV.F of the [2013 Baltimore County, MD MS4 permit](#).

## Tucson, AZ

The 2011 Tucson, Arizona, MS4 permit requires the MS4 to conduct monitoring at least two times during the first year of the permit to evaluate the effectiveness of control measures by comparing the phosphorus loads in stormwater with the applicable WLAs in the TMDL. The target value for ortho-phosphorus based on the WLA in the TMDL is 0.139 lbs/day minus the load contributed by the added ground water. See Part 6.2.

Contact state for permit.

### 4.3 TMDL-Related Annual Reporting Requirements

Several permits require MS4s that are subject to TMDLs to report on progress made towards implementing required management measures related to the TMDL. These approaches provide the permitting authority with data and other information that can be used to determine what kind of progress is being made towards achievement of the TMDL. The following are examples of this type of requirement.

#### General Permits

##### Arizona

The [2002 Arizona general permit](#) for discharges from small MS4s requires as part of the annual report for permittees to include a description and schedule for implementation of additional BMPs that may be necessary, based on monitoring results, to ensure compliance with applicable TMDLs. See Section V.G.1.f.

##### Arkansas

The [2009 Arkansas general permit](#) for discharges from small MS4s requires permittees to report on progress on program implementation and reducing the pollutant of concern and updates to measurable goals for the pollutant of concern reduction program elements. See Section 3.4.5.

##### California

The [2013 California general permit](#) for discharges from small MS4s requires permittees to report annually on the status of implementation of specific TMDL components. The report must include: (1) A description of BMPs implemented, including types, number, and locations; (2) An assessment of the effectiveness of implemented BMPs in progressing towards attainment of WLAs within the TMDLs' specified timeframes; (3) All monitoring data, including a statistical analysis of the data to assess progress towards attainment of WLAs within the TMDLs' specified timeframes; and (4) Based on results of the effectiveness assessment and monitoring, a description of the additional BMPs that will be implemented to attain WLAs within the TMDLs specified timeframes. See Section E.15.d.

##### Georgia

The [2012 Georgia general permit](#) for discharges from small MS4s requires MS4 permittees with populations over 10,000 that discharge to impaired waters with or without a TMDL to include an assessment of the data trends for each pollutant of concern in their annual reports. The initial annual report must also include a characterization of baseline conditions to determine

the effectiveness of the BMPs employed and what, if any, additional adaptive BMP measures may be necessary to return the waters to compliance with state water quality standards. See Section 4.4.2.

## Minnesota

The [2013 Minnesota general permit](#) for discharges from small MS4s requires the following to be included in the annual report: (1) a list of all BMPs being applied to achieve the applicable WLA (including a unique identifier and geographic coordinate); (2) stage of implementation for each BMP; (3) updated estimate of the cumulative reductions in loading achieved for each pollutant of concern; and (4) updated narrative describing any adaptive management strategies used for making progress to achieve applicable WLA. See Part III.E and IV.B. The state also provides specific [TMDL reporting forms](#) and training for using the forms.

## Nevada

The [2010 Nevada general permit](#) for discharges from small MS4s requires permittees to include in their annual reports an update on all control measures being implemented to address applicable WLAs, and estimated reductions of pollutants of concern. See Section II.B.2.e and f.

## Individual Permits

### Prince George's Country, MD

The [Prince George's County, Maryland, MS4 permit](#) requires the permittee to submit an annual TMDL assessment report that includes complete descriptions of the analytical methodology used to evaluate the effectiveness of the County's restoration plans toward achieving implementation of EPA-approved TMDLs. The County is also required to provide: (1) estimated net changes in pollutant load reductions from all completed water quality improvement projects, enhanced stormwater management programs, and alternative stormwater control initiatives; (2) a comparison of the net change in pollutant load reductions with the established benchmarks, deadlines, and applicable stormwater WLAs; (3) itemized costs for completed projects, programs, and initiatives to meet established pollutant reduction benchmarks and deadlines; (4) cost estimates for completing all projects, programs, and alternatives necessary for meeting applicable stormwater WLAs; and (5) a description of additional watershed restoration actions that can be enforced when benchmarks, deadlines, and applicable stormwater WLAs are not being met or when projected funding is inadequate. See Section III.E.4.

## 5. Requirements for discharges to impaired waters prior to TMDL approval

Several permits identified specific actions that must be taken to address impaired waters prior to completion of an approved TMDL. The following examples exhibited this approach.

### General Permits Arkansas

The [2009 Arkansas general permit](#) for discharges from small MS4s specifies required actions that must be taken by permittees that discharge to impaired waters for nutrients, bacteria, or other pollutants of concern prior to the completion of the TMDL. For instance, for bacteria impairments, the permittee is required to take the following actions:

- Within 1 year, identify potential significant sources of bacteria entering the MS4;
- Within 2 years, develop and implement a public education program to reduce the discharge of bacteria in municipal stormwater contributed by: (1) pets, recreation and exhibition livestock, and zoos; and (2) on-site wastewater treatment systems;
- Within 2 years, review results from the Illicit Discharge Detection and Elimination (IDDE) program and modify as necessary to prioritize the detection and elimination of discharges contributing bacteria to the MS4; and
- Include in annual reports updates to measurable goals for bacteria reduction program elements.

See Sections 3.4.5 and 3.4.5.2.

### California

The [2013 California general permit](#) for discharges from small MS4s requires permittees to implement additional procedures for discharges to impaired waters:

- For the construction site inventory, provide the location of the project with respect to all waterbodies listed as impaired for sediment and turbidity (Section E.10.a); and
- For the post-construction BMP condition assessment, the permittee is required to give higher priority for maintenance to BMPs designed to remove pollutants for which the receiving water is impaired (Section E.12.ii.b).

In addition, permittees that discharge to waters listed as impaired where urban runoff is listed as a source must consult with the permitting authority within one year of permit coverage to



assess whether monitoring is necessary and, if so, the appropriate monitoring plan. Section E.13.c.

## Georgia

The [2012 Georgia general permit](#) for discharges from small MS4s requires existing permittees discharging to impaired waters to develop and submit for review and approval to the permitting authority an Impaired Waters Plan (for MS4s with a population of < 10,000) or a Monitoring and Implementation Plan (for MS4s with a population of > 10,000).

- The Impaired Waters Plan, which must be submitted by a specific date, must include a list of the impaired waters and the pollutant(s) of concern, a map showing the locations of the impaired waters and all MS4 outfalls discharging to those waters, BMPs that will be implemented to address each pollutant of concern, and a schedule for implementing the BMPs.
- The Monitoring and Implementation Plan, which also must be submitted by a specified date, must identify where wet weather monitoring will occur, sample type, frequency, schedule to begin monitoring, and a description of the BMPs that will be implemented to address each pollutant of concern.

The permittee is also required to annually check whether an impaired water within its permitted area has been added to the latest 305(b)/303(d) list. Newly listed waters must be addressed in the plan and the SWMP must be revised accordingly. See Section 4.4.2.

## Individual Permits

### Baton Rouge, LA

The 2009 Baton Rouge, Louisiana, permit requires the MS4 to develop an Interim Pollutant Reduction Plan for discharges of a pollutant on a 303(d) list prior to completion of a TMDL. Specific activities and dates are specified when the pollutant is a nutrient constituent, for bacteria, or another pollutant (for example, identify potential sources of nutrient pollutant within 1 year, develop a public education program for residential/commercial uses of fertilizers within 2 years, develop a program to reduce discharge of nutrients from municipal facilities within 2 years, etc.). See Part II.B.1.

Contact state for permit.