



# Menomonee River Watershed, Wisconsin

Menomonee River Watershed-Based MS4 Permit

## Overview

The Menomonee River watershed is approximately 135 square miles and covers much of the southern portion of the Milwaukee River basin. The watershed spans four counties and more than a dozen municipalities. As part of the Milwaukee metro area, the land use is predominantly urban and suburban, especially in the watershed’s southern half. The Menomonee River watershed has over 75 miles of streams and rivers, many of which are impaired. Impairments for aquatic toxicity are common, with phosphorus, sediment, and bacteria frequently cited as pollutants of concern.

Given the highly urbanized nature of the watershed, efforts to restore the Menomonee River have focused on point sources. In particular, municipal separate storm sewer systems (MS4s) were identified as a primary source of pollutants. In 2011, watershed partners (collectively, the Menomonee River Watershed Permittees) united to develop a framework for a watershed-based approach that would address discharges from their MS4. Wisconsin Department of Natural Resources (DNR) then incorporated the framework into a watershed-based MS4 permit in 2012 and renewed in 2020. The permit takes advantage of opportunities to collaborate, while still requiring specific activities from each municipality to protect and restore water quality in the watershed.

This case study examines the 2020 multisource watershed-based permit, Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-S065404-2, which is the renewal of the original

### Watershed

Menomonee River Watershed, Wisconsin

### Key Water Quality Concerns

Total phosphorus, total suspended solids, fecal coliform, and chloride

### Stakeholder Involvement Techniques

- Workgroup meetings to develop watershed-based permit framework.
- Permit requirements for public comment for annual reports, Storm Water Management Plan revisions, adoption of ordinances, and Total Maximum Daily Load reduction benchmark development.
- Permit requirements for public education and outreach

### Case Study Issues of Interest

#### Type of Point Sources



Municipal Separate Storm Sewer System Discharges

#### Type of Watershed-Based Permit or Approach



Multisource Watershed-Based Permit

#### Highlighted Approach(es)



Implementation of Total Maximum Daily Loads (TMDLs) or Other Watershed Pollutant Reduction Goals

watershed permit. The permit implements the 2018 Milwaukee River total maximum daily loads (TMDLs).

## Background

As noted above, the Menomonee River watershed is heavily urbanized. Like many urban watersheds, the water bodies are impaired due to a variety of issues. Impairments for aquatic toxicity (both acute and chronic) are common, as are impairments to recreation and for degraded biological communities. Water quality studies indicated that phosphorus is a primary cause. Bacteria (typically fecal coliform or *E. coli*) is also linked to impairments, while sediment (through erosion and sedimentation) is a vector for transporting phosphorus and degrades habitat. Chloride is another commonly identified pollutant; the impacts of using salts and deicers for winter road management is a growing concern for many water bodies.

The TMDLs were developed for the Milwaukee River basin, which includes the Menomonee River watershed. DNR typically manages TMDL development, but in this case, several watershed partners had already assembled water quality data and developed watershed models. MMSD and the Southeastern Wisconsin Regional Planning Commission led a team in developing a “third-party” TMDL supported by grant funding from EPA. This TMDL identified the primary sources of phosphorus, sediment, and bacteria and established wasteload allocations for permitted sources, which DNR then incorporated into WPDES permits. While the TMDLs recognized that implementation and demonstrating compliance could be accomplished on a more collaborative basis, group or watershed-based permits assigned individual wasteload allocations for municipal permittees.

The approach for addressing MS4 discharges in the Menomonee River has evolved over the last decade. Prior to 2011, eight of the municipalities in the Menomonee River watershed held a joint MS4 permit that covered their political boundaries (i.e., not the watershed boundaries). Many other municipalities in the watershed had their own MS4 permit. Using the joint MS4 permit as a starting point and informed by the parallel development of TMDLs to address impairments in the Milwaukee River basin, the Milwaukee Metropolitan Sewerage District (MMSD) convened a workgroup and developed a framework for a watershed-based permit to address urban stormwater discharges in the watershed. Using the framework, DNR issued the Menomonee River Watershed MS4 Permit in 2012. DNR and MMSD finalized development of phosphorus, sediment, and bacteria TMDLs for the Milwaukee River in 2018. The permit was revised in 2020 to incorporate the applicable TMDL wasteload allocations.

## Permit Strategy

In 2011, MMSD was awarded a grant from EPA to develop the framework for a watershed-based MS4 permit for the Menomonee River watershed. Through a collaborative, stakeholder-driven process, localities in the watershed—along with MMSD, DNR, the Southeastern Wisconsin Regional Planning Commission (SEWRPC), and several non-governmental organizations—formed a workgroup to develop a framework for the watershed-based permit.

The workgroup developed this framework using the principles of several recent efforts in the watershed, including an update to the regional water quality management plan, a vision plan for MMSD’s facilities, and a watershed restoration plan. These documents provided recommendations for watershed improvements that were incorporated into specific permit conditions that could be applied at the watershed scale. The workgroup also utilized EPA’s August 2007 *Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Technical Guidance*. Lastly, the TMDLs for the Milwaukee River were also under development at this time, and the workgroup considered information from that process as it became available.

The workgroup met numerous times during this process. Smaller groups also met periodically to preview certain topics for the larger workgroup, such as the details of the watershed-based permit or education and outreach issues. Several questions proved to be driving factors in the discussions, such as:

- Is a watershed-based approach better than the current permitting approach?
- How can the permit be structured to include communities that are in more than one watershed?
- What are the economic benefits to municipalities?
- Can water quality trading be included in the permit?<sup>1</sup>

Next, the workgroup studied water quality data for the Menomonee River watershed. Consistent with the ongoing TMDLs, phosphorus and bacteria were found to frequently exceed the water quality standards. The data for suspended sediment were less conclusive; mean concentrations of total suspended solids were generally fairly low. But the results varied considerably for individual samples, with some as high as two orders of magnitude larger than the average concentration. Given the relationship of sediment to other pollutants, and the presence of several sediment impairments, suspended sediment remained a pollutant of concern.

Over the course of nearly a dozen meetings, the workgroup developed an annotated draft of a watershed-based permit and fact sheet for DNR, as well as an informational sheet for elected officials, a list of incentives for MS4s to participate in the permit, and other materials. The resulting final permit from DNR encourages the localities to identify common goals and share resources, while still working to make progress within each individual municipality. The workgroup had also conducted significant outreach to MS4s in the watershed; 11 of the possible 18 localities were interested in participating, covering nearly 90 percent of the watershed area.<sup>2</sup> Perhaps most importantly, the workgroup achieved consensus on the approach. By soliciting and including the needs of the participating municipalities, the chances of success for the watershed-based permit greatly increase.

DNR issued the first watershed-based permit in 2012. In 2018, DNR and MMSD finalized the Milwaukee River TMDLs, which included wasteload allocations for phosphorus, sediment, and bacteria. In 2020, DNR renewed the watershed-based permit and incorporated the pollutant reductions needed to meet the 2018 TMDLs into the permit.

## Permit Components

The permit has two categories of requirements: individual and shared. Individual responsibilities are those that apply to a specific municipality. Some individual responsibilities apply to all permittees, while others are targeted to one or more individual permittees. Shared responsibilities are permit conditions that the municipalities may work collaboratively to fulfill.

The following are examples of individual responsibilities included in the permit:

- “The permittee shall have a written stormwater management program (SWMP) that describes in detail how the permittee intends to comply with the permit requirements for each minimum control measure.” (Permit Section II)

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<sup>1</sup> See *Development of a Framework for a Watershed-Based Municipal Stormwater Permit for the Menomonee River watershed* (SEWRPC 2013, p. 7) for more detailed information about how these questions were discussed and resolved within the workgroup.

<sup>2</sup> The localities that did not participate had relatively small land areas and were already members of other watershed permit groups.

- Each MS4, excluding Milwaukee County, must by September 30, 2021 “[c]onduct a survey or use other appropriate methods to identify their education needs...[and] [s]ubmit a list of prioritized storm water education needs for their community including the methods and rationale used for prioritization.” By September 30, 2023, each permittee must “provide education and outreach within the MS4 boundary for at least one prioritized education topic[,] [d]evelop metrics that will be used for measuring progress after the education event has been held[, and] [s]ubmit as part of the permit application (due September 30, 2024), a summary of the results of the education efforts and planned targeted education for the next permit term.” (Permit Section II.B)
- “The Village of Butler shall: Complete at least two water quantity or quality projects.” (Permit Section III.B.2.a)
- “The City of Greenfield shall: Update the City’s stormwater website to provide additional educational material and promote usage of rain barrels.” (Permit Section III.B.5.a)
- “The City of West Allis shall:... Develop and implement a green infrastructure plan for City parking lots. The City shall implement green infrastructure on three lots during the permit term.” (Permit Section III.B.9.b)

The following are examples of shared responsibilities and opportunities for cooperation included in the permit:

- “The Menomonee River Watershed Permittees shall implement a written public education and outreach program to increase the awareness of how the combined actions of human behavior influence stormwater pollution and its effects on the environment.” (Permit Section II.A)
- “The Menomonee River Watershed Permittees’ implementation of one or more of the conditions of this permit may incorporate cooperative efforts with other MS4 regulated permittees or efforts by other groups or organizations if the shared responsibility is approved by the Department.” (Permit Section I.D.2)
- “Where appropriate, completion of a benchmark may incorporate cooperative efforts with other entities regulated or not by this permit on the condition that requirements defined in section I.D.2. of this permit are upheld.” (Permit Section III.B)

By including both types of requirements, the permit accomplishes the dual goals of leveraging common tasks and pooling resources while still maintaining enough specificity to achieve individual goals within each community. Permittees have opportunities to collaborate, while ensuring that pollution reductions are equitable and progress is being made in all parts of the watershed. The structure of the permit also provides an opportunity for permittees to assist others in their individual efforts. For example, when required to address fecal coliform loading within their individual municipality, individual permittees worked together to share their knowledge, experiences, challenges, and advice, which helped each permittee implement practices within their own municipality.

## Collaborative Education and Outreach Programs

A significant shared responsibility within the permit is to develop and implement a public education and outreach program, with an emphasis on how human behavior affects stormwater. The outreach program must address nine topics:

- Illicit Discharge Detection and Elimination
- Household Hazardous Waste Disposal/Pet Waste Management/Vehicle Washing
- Yard Waste Management/Pesticide and Fertilizer Application
- Stream and Shoreline Management
- Residential Infiltration
- Construction Sites and Post-Construction Storm Water Management

- Pollution Prevention
- Green Infrastructure/Low Impact Development
- Snow and Ice Control

For each topic, the outreach program must identify the pollutants of concern, the target audience, and other key information. All the topics must be addressed at least once in the permit term, and at least three topics must be addressed each year.

To facilitate the education and outreach program, the municipalities have partnered with the non-government organization Southeastern Wisconsin Watersheds Trust, which created the [Respect Our Waters](#) campaign. The campaign is multifaceted and has tips for homeowners and businesses for reducing stormwater pollution. The campaign website provides general watershed-level educational material and specific how-to videos for certain best management practices (BMPs). It also serves as a hub for the MS4 communities by posting information on reporting, links to training courses, and providing flyers for public events.

#### Individual Outreach Requirements

In addition to the collaborative education and outreach activities, each municipality must also implement targeted outreach within their own jurisdiction. Each MS4 must conduct a survey or other mechanism to identify and prioritize local needs for stormwater education. The municipality is then required to address at least one of these priority topics within the permit term. Each municipality must submit documentation of this effort, including metrics on measuring progress and plans for subsequent educational efforts, as part of its next permit renewal application.

The municipalities are encouraged to further develop programs unique to their individual jurisdiction and to work with municipalities that are not Menomonee River watershed permittees.

### TMDL Load Reductions

To meet the load reductions in the TMDLs, each municipality is required to complete several analyses. These include:

- A pair of reports (due midway through the permit term) that include a detailed map of the MS4 area, analyses of pollutant loadings for each subwatershed, a summary of all structural and nonstructural BMPs, a description of the methodology for measuring progress toward meeting the TMDL requirements, and other information.
- A document updating the pollution reduction benchmarks (see text box) for phosphorus and sediment when BMP implementation is not achieving the needed reductions.
- An inventory of suspected sources of fecal coliform entering the MS4, as identified by the illicit discharge program. The municipality must subsequently develop a plan to eliminate sources of bacteria, including prioritizing activities, proposed BMPs, projected costs, and a proposed schedule.

#### Benchmarks

The TMDLs called for significant reductions in sediment and nutrient loading. In many subwatersheds, the percent reduction needed to restore water quality was over 70 percent. To allow municipalities enough time to develop a strategy to achieve those reductions, while also demonstrating “reasonable assurance” that the TMDLs are being implemented, DNR and the permittees developed the idea of benchmarks. DNR asked each municipality to identify specific activities, or benchmarks, that they would complete within the permit term. (Note that some of these benchmarks are the same activities listed above as individual responsibilities.) Each municipality must also update their benchmarks for phosphorus and sediment, as well as bacteria, prior to the next permit renewal. This iterative approach incorporates the concepts of adaptive management, an important addition for a long-term project.

As noted above, each municipality also has individual requirements specific to their MS4. Examples include completing specific BMPs (many are already identified in the municipalities' planning documents), developing maintenance programs, performing studies to inform future decisions, and conducting outreach and education activities.

## Post-Construction Stormwater Management

In addition to standard language to develop and implement a post-construction stormwater program (including an ordinance, adherence to state design criteria, plan reviews, and more), the permit has two additional requirements:

- Develop a system to track the installation and maintenance of all post-construction BMPs, whether on public or private land. The system will ensure that long-term maintenance is performed, allowing the BMPs to continue to be credited toward meeting the load reductions of the TMDLs.
- Review existing ordinances for construction, design, landscaping, and other related topics to identify barriers to the implementation of green infrastructure within the MS4 area. Once barriers have been identified, each municipality is required to revise their ordinance accordingly. Removing barriers will provide developers and landowners with more options to comply with post-construction requirements.

## Winter Road Management

Each municipality is required to develop a winter roads management program. The use of road salts has been linked to elevated chloride levels in many watersheds and is a growing concern for aquatic life, as well as public health. Drinking water authorities monitor sodium levels out of concern for cardiac patients. Salt removal is also expensive, especially at the scale of an entire drinking water facility. But public safety is also a paramount concern—keeping the roads safe during the winter is critical to driver safety and keeping the local economy moving. Protecting water quality while also ensuring public safety is a complex balancing act for managers. Therefore, winter road management in the Menomonee River watershed involves the use of BMPs, such as calibrating application equipment, tracking salt usage, and educating the public on sound use of salts and deicers.

## Permit Effectiveness

### Environmental Benefits

Although it is too early to tell if the watershed-based permit has improved water quality, DNR anticipates that implementing the permit will help achieve the TMDL wasteload allocations and attainment of water quality standards in the watershed.

### Benefits to the Permittee

The workgroup identified a number of benefits to participating in the watershed-based permit, including:

- Collaborative watershed projects that could meet multiple goals.
- Improved targeting of illicit discharges.
- Cooperative public outreach efforts.
- Joint annual reporting.
- Ability to address water quality without limitations inherent in trading.
- Improved priority ranking for grant applications.

The initial workgroup identified potential challenges associated with a watershed-based approach, including accounting for MS4s located in more than one watershed, implementing the six minimum measures required for regulated small MS4s in a large group permit, and overcoming political hurdles, as well as possible statutory changes required for this approach. The workgroup also needed to figure out how to write specific permit conditions in situations requiring collaboration and joint compliance.

Most of the anticipated challenges identified by the initial workgroup were not significant barriers to implementation. However, some individual permittees experienced political hurdles when evaluating collaborative efforts because of the perception that they would be spending funds to address stormwater outside their individual jurisdiction. Unfortunately, many of these hurdles were perceived to be too large to overcome. As collaboration continues to be fostered through this group structure and potential projects must be evaluated for permit compliance, it may be possible to overcome these hurdles in the future.

The watershed-based permit has resulted in increased collaboration between permittees. The level of collaboration among this group of permittees is unique and a key benefit of the watershed-based permitting approach. In addition to working together on compliance activities, the permittees meet periodically to discuss how things are going, the challenges they are facing, and what strategies are working. They also share implementation information (e.g., monitoring for bacteria) and their experiences working with consultants.

## Benefits to the Permitting Authority

The watershed-based permit has led to efficiencies for DNR in permitting, compliance determinations, and providing assistance to permittees. For example, DNR staff are able to talk to the group of permittees about permitting issues at the same time, rather than individually. DNR can also review annual reports and other submissions required by the permit concurrently.

The permit has also led to improvements in TMDL implementation. It was the first permit in the state to incorporate TMDL wasteload allocations for bacteria. The permittees shared their implementation challenges and suggestions for improving the permit conditions with DNR staff. Using this information, DNR modified the conditions in subsequent permits issued to other permittees subject to the TMDL.

## Lessons Learned

Samantha Katt of DNR shared her lessons learned from developing and implementing the watershed-based permit.

According to Ms. Katt, one of the challenges of developing the watershed-based permit was writing permit conditions (e.g., outfall screening, illicit discharge detection and elimination, bacteria TMDL implementation projects) that are appropriate for 13 municipalities with varying sizes, landscapes (rural, suburban, and urban), and resources. In developing the permit conditions, DNR strived to achieve fairness among permittees, while also recognizing that the requirements necessary for each permittee to reduce pollutants in the discharge from their systems to the “maximum extent practicable”<sup>3</sup> would vary.

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<sup>3</sup> The federal regulations require that permits for discharges from small MS4s include requirements to reduce pollutants in discharges to the maximum extent practicable to protect water quality and satisfy the Clean Water Act’s water quality requirements. (40 CFR 122.34(a))

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With such a large group of permittees, she also found it challenging to ensure all permittees understood the permit conditions, especially those related to the bacteria TMDL. While DNR held meetings with the full group of permittees, it also met with individual permittees to ensure their understanding. The individual meetings also provided an opportunity for permittees to voice concerns they did not feel comfortable sharing in the large group setting.

Ms. Katt believes the watershed-based permitting approach used in the Menomonee River watershed could be applied in other watersheds. Wisconsin DNR has developed similar watershed-based permits for MS4 permittees, including:

- WPDES Permit No. WI-S058416, which provides coverage for 22 permittees comprising the Madison Area Municipal Stormwater Partnership.
- WPDES Permit No. WI-S061557, which provides coverage for the city of Mequon and village of Thiensville.
- WPDES Permit No. WI-S061565, which provides coverage for seven permittees comprising the North Shore Group.

DNR is considering encouraging other MS4 permittees to apply for watershed-based permits, which could provide for enhanced collaboration opportunities and efficient use of resources.



## Resources

Hahn, M. SEWRPC. February 27, 2014. *Watersheds Know No Political Boundaries: A Look into the Benefits and Challenges of Watershed-Based Stormwater Permitting in Southeastern Wisconsin*. 2014 Government Affairs Seminar. [http://cswea.org/wp-content/uploads/2017/09/1015-WBP\\_pres\\_to\\_2014\\_Wis\\_Govt\\_Affairs\\_Seminar\\_00216265\\_Michael\\_Hahn.pdf](http://cswea.org/wp-content/uploads/2017/09/1015-WBP_pres_to_2014_Wis_Govt_Affairs_Seminar_00216265_Michael_Hahn.pdf).

SEWRPC. November 2007. *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds*. <http://www.sewrpc.org/SEWRPCFiles/Publications/TechRep/tr-039-part-01-water-quality-greater-mke-watersheds.pdf>.

SEWRPC. January 2013. *Development of a Framework for a Watershed-Based Municipal Stormwater Permit for the Menomonee River Watershed*. Memorandum Report No. 204. <http://www.sewrpc.org/SEWRPCFiles/Publications/mr/mr-204-framework-for-stormwater-permit-men-river-wshed.pdf>.

SEWRPC. *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds*. Amended May 2013. [http://www.sewrpc.org/SEWRPCFiles/Publications/pr/pr-050\\_part-1\\_water\\_quality\\_plan\\_for\\_greater\\_mke\\_watersheds.pdf](http://www.sewrpc.org/SEWRPCFiles/Publications/pr/pr-050_part-1_water_quality_plan_for_greater_mke_watersheds.pdf).

Southeastern Wisconsin Watershed Trust. *Respect Our Waters*. <https://www.respectourwaters.org/home-swwt>.

Southeastern Wisconsin Watershed Trust. April 28, 2020. *Menomonee Watershed Permit Adopted* [Press Release]. <https://www.swwtwater.org/news/2020/4/20/menomonee-watershed-permit-adopted>.

EPA. December 2003. *Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance*. EPA 833-B-03-004. [https://www.epa.gov/sites/default/files/2015-09/documents/watershedpermitting\\_finalguidance.pdf](https://www.epa.gov/sites/default/files/2015-09/documents/watershedpermitting_finalguidance.pdf).

EPA. August 2007. *Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Technical Guidance*. EPA 833-B-07-004. [https://www.epa.gov/sites/default/files/2015-09/documents/watershed\\_techguidance\\_entire.pdf](https://www.epa.gov/sites/default/files/2015-09/documents/watershed_techguidance_entire.pdf).

Wisconsin DNR. August 2010. *Menomonee River Watershed: 2010 Water Quality Management Plan Update*. DNR Publication WT-950. <http://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=107575784>.

Wisconsin DNR. September 2, 2014. *Watershed Permitting Guidance*. Guidance Number 3400-2014-01. <https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=102211149>.

Wisconsin DNR and MMSD. March 19, 2018. *Total Maximum Daily Loads for Total Phosphorus, Total Suspended Solids, and Fecal Coliform: Milwaukee River Basin, Wisconsin*. Final Report. CDM Smith. <https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=158809714>.

Wisconsin DNR. *General Permit to Discharge Under the Wisconsin Pollutant Discharge Elimination System*. WPDES Permit Number WI-S065404-2. Issued March 31, 2020. <https://static1.squarespace.com/static/559c28c9e4b07d366b83acd7/t/5e8649d0b1b8041a19220d00/1585859028897/Menomonee+Permit+Final+Signed+4-1-2020.pdf>.

Wisconsin DNR. April 2020. *Wisconsin Pollutant Discharge Elimination System Permit for Municipal Separate Storm Sewer System, Permit No. WI-S065404-2: Fact Sheet – April 2020*. <https://static1.squarespace.com/static/559c28c9e4b07d366b83acd7/t/5e864a2cade1e20a647d2a98/1585859116953/Menomonee+Permit+Fact+Sheet+Final+4-1-2020.pdf>.



Wisconsin DNR. *Wisconsin's Water Quality Report to Congress*.  
<https://dnr.wisconsin.gov/topic/SurfaceWater/Congress.html>.

Wisconsin DNR. *Water Condition Viewer*.  
[https://dnrmaps.wi.gov/H5/?viewer=Water Condition Viewer](https://dnrmaps.wi.gov/H5/?viewer=Water%20Condition%20Viewer).

Wisconsin DNR. *Watershed – Menomonee River (M103)*.  
<https://dnr.wi.gov/water/watershedDetail.aspx?code=MI03&Name=Menomonee%20River>.

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**Permit Type:**

Multisource watershed-based permit

**Permit Information:**

**Permit:**

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**Fact Sheet:**

<https://static1.squarespace.com/static/559c28c9e4b07d366b83acd7/t/5e864a2cade1e20a647d2a98/1585859116953/Menomonee+Permit+Fact+Sheet+Final+4-1-2020.pdf>

**Pollutants of Concern in Watershed:**

Total phosphorus, total suspended solids, fecal coliform, and chloride

**Pollutants Addressed in Permit:**

Total phosphorus, total suspended solids, fecal coliform, and salt/deicers

**Permit Issued:**

March 31, 2020