

The attached “TMDL Guidance for MS4 Permits” was developed to provide direction to internal Department staff and Municipal Separate Storm Sewer System (MS4) permittees and their consultants. This guidance document helps to explain how Total Maximum Daily Load (TMDL) waste load allocations will be implemented within MS4 permits. The guidance also discusses how a MS4 permittee will be expected to model its MS4 service area and storm water management measures to show compliance with TMDL requirements.

This guidance was developed by a team of Department staff with input from a technical advisory committee of storm water management consultants and municipal representatives that met 5 times during 2012-13.

We are now soliciting comments from the public on this guidance. Once the 21 day notice period is complete, all comments will be considered by the Department and the Department will be hosting another technical advisory committee meeting to discuss comments raised by the public. After considering all public comments and those provided by the advisory committee, revisions will be made to the guidance document as needed, and final guidance will be made available to internal and external stakeholders. Comments related to this draft guidance document should be sent to: dnrguidancedocuments@wisconsin.gov.



BUREAU OF WATERSHED MANAGEMENT PROGRAM GUIDANCE

Storm Water Management Program

TMDL Guidance for MS4 Permits: Planning, Implementation, and Modeling Guidance

Effective: (DRAFT Insert Date)
Guidance #: 3800-XXXX-XX

Notice: This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

APPROVED:

Pam Biersach, Director
Bureau of Watershed Management

Date

A. Statement of Problem

The U.S. Environmental Protection Agency (EPA) requires the wasteload allocations (WLAs) developed as part of a Total Maximum Daily Load (TMDL) be reflected and implemented through permits. In Wisconsin, storm water discharge permits are issued pursuant to ch. NR 216, Wis. Adm. Code. As part of the TMDL process, permitted municipal Separate Storm Sewer Systems (MS4s) are assigned individual TMDL WLAs. The placement of the WLA in a storm water permit can create numerous challenges including defining the municipal area encompassed by the WLA and modeling conditions to which the storm water WLA is to be applied. Department staff, municipal officials and storm water management plan developers need guidance to clarify how assessment of permit compliance with a WLA is to be demonstrated.

B. Background

A TMDL quantifies the amount of pollution that a waterbody can assimilate and still meet water quality standards. EPA requires that waters listed as impaired on Wisconsin's 303-d list have TMDLs developed. At a minimum, TMDLs must allocate the assimilative capacity between the load allocation, the WLA, and a margin of safety. The WLA is the portion of the assimilative capacity that is allocated to point sources. Nonpoint sources receive load allocations (LAs). WLAs are established for continuous point source discharges and also intermittent pollutant releases such as permitted storm water discharges.

Establishing WLAs for storm water sources requires an understanding of under what flow conditions impairments occur, and how storm water discharges are contributing to the identified impairments. Establishing WLAs for storm water sources also requires an understanding of exactly where the discharges are occurring. In many cases, municipal separate storm sewer systems (MS4s) have multiple discharge points that can be located in more than one reach¹. In a TMDL, WLAs are assigned for each pollutant of concern and by reach. In a TMDL a MS4 can have multiple and different pollutant reduction goals within its municipal jurisdiction.

C. Discussion

Once EPA has approved a TMDL that contains permitted MS4s, the next permit issued must contain an expression of the WLAs consistent with the assumptions and requirements contained in the TMDL. As part of the TMDL process EPA approves the WLAs and generally these WLAs are mirrored directly in the permit. While this seems like a relatively straight forward permit process, the direct application of the WLA can present certain challenges in implementation due to assumptions required during the development of the TMDL. These assumptions revolve around aerial extent of the MS4 and its boundary, incorporation of new areas and expansion of the municipal boundary, and modeling differences between the tools used to create the TMDL versus the compliance tools used by the MS4. In addition, permitted MS4s have already performed municipal wide analysis to comply with requirements stipulated in ch. NR 151.13, Wis. Adm. Code. These requirements expressed reduction goals as a percent reduction from a defined no controls scenario with defined climate records.

¹ Reachsheds are also referred to as subwatersheds or segment sheds in TMDL development. A reach is a stream segment or individual lake or reservoir that is artificially assigned a compliance point or "pour point" where the applicable in-stream water quality standards must be met. Breaks for stream reaches are made at changes in stream listing (each individually named 303(d) water must have their own set of TMDLs), changes in water quality criteria, and at pour points or compliance points just upstream of significant changes in flow/assimilative capacity.

To build on established methodologies contained in s. NR 151.13, DNR's preferred option for implementing TMDLs is using a percent reduction methodology similar to s. NR 151.13. The use of a percent reduction strategy will utilize reduction goals consistent with the TMDL and allow implementation to continue to build on the same percent reduction strategy employed in s. NR 151.13 using the same models and tools that MS4s have already been utilizing. Since EPA only approves the WLA and not the corresponding percent reduction it is important that the TMDL reports and permit fact sheets, as appropriate, highlight that the percent reductions being used for implementation are consistent with the approved WLAs in the TMDL.

The usage of a percent reduction framework for implementation allows both the MS4 and DNR the ability to implement the reductions without having to reallocate and track WLAs across reachsheds, MS4s, and other land uses. This will minimize the need to continually update the TMDL as municipal boundaries evolve and ease reporting requirements. In some rare cases allocations may need to be adjusted. This is discussed in Attachment A.

D. Guidance

This document divides DNR's guidance for implementing TMDL WLAs for permitted MS4s into three parts:

- **Part 1** – Expressing WLAs and Reduction Targets
- **Part 2** – Implementation and Compliance Benchmarks
- **Part 3** – Modeling

PART 1 – Expressing WLAs and Reduction Targets

An MS4 will have a WLA for each pollutant of concern addressed by the TMDL. Generally the pollutant of concern for TMDLs in Wisconsin include total suspended solids (TSS) and total phosphorus (TP); however, allocations for other pollutants such as bacteria or chlorides are possible depending on what pollutants are causing impairments to surface waters.

Unlike the requirements contained in s. NR 151.13, individual MS4s may be divided in multiple reachsheds. As such, MS4s may have multiple WLAs and percent reductions instead of the uniform municipal wide percent reduction employed in s. NR 151.13. Multiple WLAs and percent reductions are the result of needing to meet water quality requirements for all water bodies and account for changes in water body type, changes in water quality criteria or targets, changes in flow, changes in designated use, and other similar factors. Compliance with TMDL requirements will need to be achieved on a reach by reach basis. Ultimately, water quality standards must be met in-stream at the compliance point located at the farthest most downstream point of the reachshed.

Due to the complexity of natural systems, the WLAs identified in the TMDL are the best estimate for meeting water quality standards and are modeled or simulated predictions. Initial implementation of the TMDL will be in most cases by design using SLAMM, P-8, or equivalent methodologies to estimate and track pollutant reductions. The MS4 is typically not required to perform ambient monitoring to assess if water quality standards are being met, but MS4 do need to track implementation activities and reductions achieved, and report on TMDL implementation in MS4 annual reports. Once an adequate level of implementation has been achieved, ambient monitoring can be used to judge progress and monitoring will ultimately be required to de-list impaired waters and show compliance with the TMDL.

During the first term of an MS4 permit, after EPA approval of a TMDL, DNR will request that each permitted MS4 report its actual MS4 area served within each reachshed. Existing MS4 permittees should already have sewershed mapping completed to satisfy previous MS4 permit conditions and this should be used to verify the current MS4 area served within each reachshed. The Department will provide the GIS data sets used for the TMDL reachshed boundaries through its website. The main reasons for reporting this information are to determine if the MS4 area served by each permittee corresponds to each other and does not overlap or omit MS4 service areas and to provide a detailed accounting of MS4 areas and responsible parties.

In most TMDLs, non-traditional MS4s such as permitted universities and state and county highway facilities were not given unique WLAs and these areas will need to be identified. In addition, most TMDLs are not able to account for modifications in drainage due to manmade conveyance systems such as storm sewers. These modifications may require modification of reachshed boundaries. To account for this, the MS4 general permit (see section 1.5.4.3) will require that permittees submit information to the DNR to verify appropriate boundaries and areas. To accomplish this DNR will require the following information:

- Updated storm sewer system map that identifies:
 - The current municipal boundary/permited area. For city and village MS4s, identify the current municipal boundary. For MS4s that are not a city or village, identify its permitted area. The permitted area for towns, counties and non-traditional MS4s pertains to the area within the Urbanized Area of the 2010 Decennial Census.
 - The TMDL reachshed boundaries within the municipal boundary, and the area in acres of each TMDL reachshed within the municipal boundary.
 - The MS4 drainage area boundary associated with each TMDL reachshed, and the area in acres of the MS4 drainage area associated with each TMDL reachshed.
- Identification of areas on a map and the acreage of those areas within the municipal boundary that the permittee believes should be excluded from its analysis to show compliance with its WLA (see “WLA Analysis Area” in Part 3 of this document”). In addition, the permittee shall provide an explanation of why each area identified should not be its responsibility.

Note: This information is to be acquired by the DNR through an MS4 annual report.

DNR will evaluate this information and consider whether modifications to the TMDL are warranted. It is common for TMDL derived MS4 areas and reachsheds to deviate from the actual MS4 drainage areas. Such deviations can have an impact on the TMDL; however in most cases, these deviations will not have a significant effect on the calculated percent reduction needed to meet the TMDL allocations.

To assist in understanding allocations the TMDLs developed in Wisconsin have in many cases expressed reduction goals in both a WLA format (a load expressed as a mass) and a percent reduction format. The percent reduction is calculated from the baseline condition used in the TMDL to quantify what is needed to meet water quality standards. During the development of the TMDLs, the percent reduction is calculated using the following equation:

$$\text{Percent Reduction} = 100 * (1 - (\text{WLA Loading Condition} / \text{Baseline Loading Condition}))$$

The baseline loading condition should be described in the TMDL. While there is some variation across TMDLs in Wisconsin, the baseline loading condition reflects the regulatory conditions stipulated in s. NR 151.13 and utilizes either the 20% control requirement or the 40% control requirement as the starting point for TMDL allocations. This is because TMDLs are required, at a minimum, to meet existing regulatory requirements.

In 2011, the Wisconsin Legislature approved Act 32 which prohibited the Department from enforcing the 40% TSS reduction contained in s. NR 151.13. As such, TMDLs under development and approved by EPA prior to January 1, 2012 used the 40% reduction as the baseline loading condition. For TMDLs approved by EPA after January 1, 2012, the 20% reduction serves as the baseline loading condition.

For consistency with existing s. NR 151.13 guidance and requirements, the MS4 general permit (see section 1.5.4.4.1) will be requiring that for TMDL implementation planning, the no-controls modeling condition be used such that the TMDL percent reduction goals will be measured from the s. NR 151.13 defined no controls modeling condition. Since TMDL development uses the 20% or 40% reduction baseline loading condition, implementation planning will necessitate converting the TMDL stipulated percent reduction back to a no-controls percent reduction. This can be done using a mathematical conversion:

For a TMDL that uses 20% reduction as the baseline loading condition (TMDLs approved after January 1, 2012) the conversion to the s. NR 151.13 no-controls modeling condition is:

$$\text{Total Percent Reduction} = (20 + (80 * \% \text{ control in TMDL}))$$

For a TMDL that uses 40% reduction as the baseline loading condition (TMDLs approved prior to January 1, 2012) the conversion to the no-controls modeling condition is:

$$\text{Total Percent Reduction} = (40 + (60 * \% \text{ control in TMDL}))$$

The above calculated reductions correspond to the no-controls percent reduction required by the MS4 general permit (see section 1.5.4.4.1). This percent reduction can be compared to the reduction already achieved with existing management practices as outlined in the MS4 general permit (see section 1.5.4.4.4). This comparison, needed for each reachshed, will determine if additional reductions are needed to meet the TMDL requirements.

For the MS4 area contained in each reachshed, the no controls load is calculated using SLAMM, P-8, or equivalent. The MS4 area includes the entire acreage that the MS4 is responsible for and subtracts areas not under the jurisdiction of the permittee. As new MS4 area is added or subtracted, the TMDL percent reduction applied to these areas remains the same. The percent reduction calculated to meet the TMDL (the percent reduction from section 1.5.4.4.1 of the MS4 general permit) is applied to the no controls load providing the allocated mass that needs to be controlled by the MS4. This mass will be different from that stipulated by the TMDL WLA; however, MS4 implementation of the TMDL is driven by the percent reduction and corresponding mass calculated using that percent reduction should be used in any accounting required through water quality trading and or adaptive management.

PART 2 – Implementation and Compliance Benchmarks

Storm Water Management Planning (SWMP)

As described in the MS4 general permit (see section 1.5.4.5) DNR will be requiring a TMDL implementation analysis and plan be completed by an MS4 permittee that receives TMDL WLAs. This analysis and plan should be incorporated in the SWMP and should be completed during the term of the next permit issuance/reissuance after the TMDL is approved or as outlined in the MS4 general permit (see section 1.5.4). Each MS4 permittee should evaluate all potentially cost-effective alternatives to reduce its discharge of pollutants of concern so that its

discharge is comparable to the percent reductions stipulated in the TMDL. MS4 permittees also should consider alternatives that involve working together with other MS4s that reside in the same reachshed.

A focus of the SWMP should be on improving storm water treatment for areas of existing development during times of redevelopment. Older, urban development patterns typically did not include the same level of stormwater management controls that new development does. Reductions achieved through redevelopment can be counted towards compliance with WLAs. Each municipality should estimate the pollutant reductions that are expected to be achieved over time through redevelopment of both public and private facilities, including roadway reconstruction. The rate of redevelopment should be estimated in order provide a gauge as to how long it would take to improve storm water management in areas of redevelopment.

When developing components of a TMDL implementation plan, municipalities should consider the minimum following implementation methods:

- **Ordinance Review and Updates** – A municipality may elect to revise its current post-construction storm water management ordinance to require greater levels of pollutant control for redevelopment and highway reconstruction that are above the minimum performance standards of ch. NR 151, Wis. Adm. Code and are consistent with the reduction requirements contained in the TMDL.

Current ch. NR 151 post-construction performance standards for areas of new development include an 80% TSS control level and maintaining 60 - 90% of predevelopment infiltration (with certain exemptions and exclusions). Areas that have stormwater management practices designed and maintained to meet these performance standards should already be controlling TSS and total phosphorus to levels comparable to TMDL water quality targets. Placing additional controls beyond what is already required under the ch. NR 151 post-construction performance standards for new development is not be expected to have as great an effect on reducing the overall MS4 load discharged to a reach.

In addition, core provisions in the municipality’s SWMP could be strengthened. For example, if bacteria are a pollutant of concern the MS4 may want to place greater emphasis on detecting and eliminating cross-connections between wastewater pipes and storm sewers or stronger pet waste programs.

- **Structural Management Practices** – These include structural controls and vegetated swales where reductions can be quantified through water quality modeling such as WinSLAMM and P-8.
- **Operational Management Practices**– This includes “soft-control” storm water measures such as street cleaning, residential leaf and yard debris management programs. Quantifiable pollutant reductions may be difficult to determine for some measures but DNR and the permittee should be able to come to an agreement as to whether the measure is beneficial. In cases where quantifiable reductions are not possible, the use of agreed upon non-traditional practices shall be deemed as making progress toward compliance with the TMDL reductions. As data becomes available to quantify reductions the appropriate credit will be given toward meeting the TMDL reduction requirements.
- **Streambank Stabilization** – Stabilization of streambanks is an important activity that reduces the discharge of sediment and other sediment-bound pollutants. Streambank stabilization projects are eligible for a 50% cost share match through DNR’s Runoff Management Grant Programs. DNR considers streambank stabilization activities as an important step toward reducing the discharge of sediment, which is of equal importance to storm water treatment controls in improving downstream water quality. Unfortunately, TMDL baseline modeling already assumes that streambanks and other storm water

conveyance systems are stable; therefore, it is not appropriate to take credit for streambank stabilization against the WLA or percent reduction in the TMDL. However stabilization projects should be identified in the TMDL implementation plan as important steps to achieve the TMDL implementation goal of the receiving streams meeting water quality standards.

- **Water Quality Trading and Adaptive Management** - If economically beneficial, a MS4 may wish to participate in one of these programs. MS4s are eligible to participate in water quality trading to help meet WLAs. Also a MS4 may be invited by a Waste Water Treatment Facility (WWTF) to participate in an adaptive management program pursuant to s. NR 217.18, Wis. Adm. Code, to reduce phosphorus. Water quality trading and adaptive management guidance are covered under separate DNR guidance documents available on the DNR website.
- **Wetlands** - Wetlands are waters of the state and wetland water quality standards are given under ch. NR 103, Wis. Adm. Code. Additionally, the U.S. Army Corps of Engineers has authority to protect wetlands as well. All applicable state and federal wetland permits would need to be obtained before storm water treatment credit can be given within a wetland. It is quite difficult to obtain state and federal permits to construct a storm water treatment facility in a wetland. Constructed wetlands for the purpose of providing storm water treatment are eligible for treatment credit provided that a long-term maintenance plan is implemented. Wetlands that receive runoff pollutants are expected to, at some point, reach a certain equilibrium point where they would provide minimal pollutant removal or even act as a pollutant source unless they are maintained by harvesting vegetation and/or have accumulated sediment removed from them. Additionally, constructed wetlands installed after October 1, 2002 need to be maintained as stormwater treatment areas in order to maintain their “non-waters-of-the-state” status. Constructed wetlands installed prior to October 1, 2002 can be evaluated for credit on a case by case basis. Wetlands constructed as part of wetland mitigation should not be used for treatment credit.

As discussed, SWMPs for municipalities with approved TMDLs should identify what pollutant reduction measures will be employed and over what time frame reductions will occur (i.e. 20 tons/yr TSS for redevelopment sites over the next 20 years).

Compliance Schedule and Benchmarks

Once a TMDL is approved, affected MS4 permittees will receive a TMDL implementation planning requirement within their next (or potentially initial) permit term. TMDL implementation planning will include determining storm water management treatment and other measures needed and their associated implementation costs and timelines to achieve TMDL reductions consistent with the TMDL WLAs. It is expected that the 2nd reissuance of an MS4 permit after the TMDL is approved, that a compliance schedule to meet applicable TMDL reductions will be included in the MS4 permit.

The compliance schedule will require that the permittee be able to show continual progress by meeting ‘benchmarks’ of performance within each permit term. In this case, a ‘benchmark’ means a progress increment – a level of pollutant reduction or an application of a pollutant reduction measure, which is part of a larger TMDL implementation plan designed to bring the overall MS4 discharge of pollutants of concern down to a level which is comparable to the MS4’s TMDL WLA. It is possible that certain benchmarks will not be easily quantifiable but there needs to be evidence that such benchmarks will provide a legitimate step toward reducing the discharge of pollutants of concern.

DNR may elect to place specific benchmarks in an MS4 permit. However, it is expected that MS4 permittees will have the primary role in establishing their own benchmarks for each 5-year permit term. Benchmarks should be reevaluated at least once every 5 years and are interim steps/goals of compliance. It is expected that in many cases, where substantial reductions are required that multiple benchmarks of compliance will be needed which may need to be implemented over more than one permit cycle. However, the schedule should lead to meeting the TMDL WLA as quickly as is feasible.

Redevelopment ordinances designed to implement stormwater management controls to achieve compliance with the TMDL requirements are an excellent tool to show progress in meeting the WLA with smart growth and development patterns. In most cases DNR will not require removal of existing infrastructure to comply with TMDL requirements. Rather management practices should be installed as infrastructure is replaced. For example, it may be most cost-effective for municipalities to install storm water treatment and infiltration practices as other street or sewer projects are scheduled.

Under a TMDL, EPA does not acknowledge the concept of maximum extent practicable as defined in s. NR 151.006, Wis. Adm. Code, but rather compliance schedules can be structured in SWMPs and permits to allow MS4s the flexibility needed to meet TMDL goals. Any storm water control measures employed by the MS4 permittee to reduce its pollutant discharge to comply with the TMDL reductions will need to be maintained or replaced with comparable stormwater control measures to ensure that load reductions will be maintained into the future.

Runoff Treatment Outside of the MS4's Jurisdiction

In order for an MS4 to take credit for the control of pollutants by another municipality or private property owner (i.e. industry or riparian property owner), the MS4 must have an agreement with the entity with control over such treatment measure. This agreement must specify how the pollutant reduction credit will be shared or otherwise granted to an MS4. Responsibilities for maintenance of the BMPs and preservation of the BMPs over time should also be addressed in any such agreement.

Tracking

The permittee will need to track and show progress in reducing discharges of pollutants of concern. This tracking should assist in showing that MS4 permit compliance benchmarks have been achieved in accordance with an overall storm water management plan to achieve compliance with the TMDL percent reduction targets.

A tabular TMDL compliance summary of pollutant loading per reach will be required to be submitted to DNR with the MS4 report at least once every MS4 permit term. The summary should identify the following: reach name and number (consistent with the name and number in the TMDL report), the MS4 outfall numbers, named/labeled drainage areas, the applicable TMDL percent reduction target(s), pollutant reduction benchmarks, storm water management control measures implemented, and pollutant reduction achieved as compared to no controls. Attachment B is an example of a tabular TMDL compliance summary.

PART 3 – Modeling

Discussion

The following discussion highlights the main compatibility challenges between TMDL development and MS4 implementation and how they will be addressed.

The first issue is the expression of the WLA *itself*. TMDLs are required to have a daily load component; but can contain a seasonal or annual allocation as well. An alternative allocation to a daily load needs to be explained as to how it is consistent with the daily load. Since traditional point sources (municipal and industrial wastewater facilities) monitor and collect data at their outfalls on a frequent basis, the expression of the WLA as a monthly average or even as a daily maximum limitation in some instances may be appropriate; especially given that the waters are evaluated against the phosphorus criteria based on monthly sampling protocols.

Whereas, MS4s have historically relied on modeled estimations of runoff flows and pollutant loadings as generated on an annual average basis as opposed to monitoring and collecting samples. Therefore, in TMDL implementation planning and WPDES permits the annual average values can be used as long as they are shown to be consistent with the TMDL. This will allow MS4s to continue using water quality models such as WinSLAMM and P-8 for determining compliance. As with s. NR 151.13, TMDL compliance for MS4s will be by design.

The second issue is the compatibility of using existing stormwater management planning efforts for use in TMDL implementation. As noted above, MS4s subject to a TMDL should perform analyses and planning to identify cost-effective approaches for reducing discharges of pollutants of concern. To cost-effectively achieve pollutant reductions, MS4s should look for opportunities such as site redevelopment and road reconstruction projects, implementation of streambank stabilization and wetland restoration projects, implementation of traditional BMPs, and possibly water quality trading and adaptive management². Each of these elements can be considered for implementation to meet the requirements of a TMDL. It is likely that existing MS4 water quality modeling and mapping can be used and adjusted as necessary for SWM planning needs for TMDL implementation.

The third issue deals with different land areas/scales at which the TMDL is typically applied versus prior s. NR 151.13 modeling. Because of the scale at which they are developed, allocations from a TMDL have generally been applied across the entire urban area that is served by the permitted MS4. It is important to note that while many components of existing planning efforts and modeling results can be used for TMDL implementation, adjustments will likely be necessary to account for a TMDL focus on compliance by reachshed.

Another issue is inconsistency of TMDL modeled drainage area to the actual MS4 drainage area. Actual MS4 drainage areas may not follow the surface drainage areas and MS4 drainage areas commonly expand due to urban development. The modeled versus actual MS4 drainage areas commonly deviated by 30% and by as much as 60% in the Rock River TMDL. Although these deviations may have a significant effect on a mass wasteload allocation, its affects are greatly moderated on a percent reduction basis across the reachshed. Area deviations commonly affect the MS4 percent reductions by a few percent across a reachshed but have been seen to approach 7%. Given the modeling assumptions that have gone into TMDL modeling, deviations by a few percent or even 7% in limited situations is within the expected error range of TMDL modeling. Modeling is not an exact science and the TMDL MS4 percent reductions are still considered valid implementation goals to work toward meeting in-stream water quality.

Guidance

TMDL-established WLAs and LAs are ‘targets’ of treatment performance and/or pollutant control for point and non-point sources. The WLAs and LAs are TMDL modeled estimates of the level of pollutants that can be discharged and still meet in-stream standards. The ultimate goal of a TMDL is for continual reduction of

² The Department has prepared separate guidance documents on water quality trading and adaptive management. MS4s are considered non-point sources for the purposes of adaptive management. This does not preclude them from participating in an adaptive management program if approached by a traditional point source such as a municipal or industrial wastewater treatment facility. The “Adaptive Management Technical Handbook” is available for download at <http://dnr.wi.gov/topic/surfacewater/adaptivemanagement.html>

pollutants discharged so that both the listed impaired waters and other waters meet in-stream water quality standards, which would then allow for removal of waters from the 303-d impaired waters list. Municipalities should consider the drainage area served by their MS4 as a whole and look for the most cost-effective means to reduce discharges of pollutants of concern until their discharge is comparable with its TMDL requirements.

TMDL Analysis Area

An MS4 is to include all areas within its corporate boundary unless it is listed as optional. Although the MS4 permit focuses on current areas served by an MS4, it may be appropriate to include future land use planning areas.

Incorporation of rural areas: A municipality may have incorporated the entire township or a large portion of the rural township in which it resides. In this situation, the municipality needs to include all areas within the 2010 urbanized area and adjacent urban developed areas within its jurisdiction which drain into its MS4.

Highways: A permitted MS4 owner/operator of a highway needs to account for the pollutants generated within the Right-Of-Way (ROW). An exception would be a roadway crossing over a highway where the owner of the roadway crossing structure is responsible for the pollutants associated with their bridge and approach structure within the lower highway's ROW. WisDOT is responsible for state highways that are not connected highways. A county is responsible for county highways that it maintains. Cities and villages need to include connecting highways as identified and listed in the Official Highway State Truck Highway System Maps at: <http://www.dot.wisconsin.gov/localgov/highways/connecting.htm>

Optional: The pollutant loads associated with the following areas are optional for an MS4 to include:

1. Area that never passes through a permittee's MS4 such as a riparian area.
2. Land zoned for agricultural use and operating as such.
3. Manufacturing, outside storage and vehicle maintenance areas of industrial facilities permitted under subch. II of ch. NR 216, Wis. Adm. Code, are optional to include. This does not include any industrial facilities that have certified a condition of "no exposure" pursuant to s. NR 216.21(3), Wis. Adm. Code.
Note: DNR recommends that municipalities include all industrial facility areas within their WLA analysis area instead of creating 'holes' within its area of analysis.
4. Any area that discharges to an adjacent municipality's MS4 (Municipality B) without passing through the jurisdictional municipality's MS4 (Municipality A). Municipality B that receives the discharge into their MS4 may choose to be responsible for this area from Municipality A. If Municipality B has a stormwater treatment practice that serves a portion of A as well as a portion of B, then the practice must be modeled as receiving loads from both areas, independent of who carries the responsibility for the area. However, if runoff from an area within Municipality A's jurisdiction drains into Municipality B's MS4 but then drains back into Municipality A's MS4 farther downgradient, then Municipality B does not have the option of including the load from Municipality A in their analysis and the load from that area is Municipality A's responsibility.
5. For towns, the area outside of the 2010 urbanized area as defined by the US Census Bureau as this area is classified as non-permitted urban and part of the non-point source load allocation (NPS LA).

MS4 Water Quality Models and Related Information

To model pollutants such as TSS and total phosphorus in the area served by the MS4, the municipality must select a model such as SLAMM, P8 or an equivalent method deemed acceptable by the Department. For the analysis to show compliance, SLAMM version 9.2 or P8 version 3.4 or a subsequent version of these models may be used.

All roadway right-of-ways within the urbanized area that are part of a county or town's MS4 are the responsibility of the county or town. Model the road based on the nearest urban land use, even if agricultural land use is on one

or both sides of the road. Select the urban land use that will most likely typify the traffic that will be on that road (for example commercial or residential) and include that area in the corresponding standard land use file.

A municipality is not required to use the standard land use files if it has surveyed the land uses in its developed urban area and has “real” source area data on which to base the input files. The percent connected imperviousness beyond the standard land use files must be verified in the field. Disconnection may be assumed for residential rooftops where runoff has a flow path of 20 feet or greater over a pervious area in good condition. Disconnection for impervious surfaces other than residential rooftops may be assumed provided all of the following are met:

- The source area flow length does not exceed 75 feet,
- The pervious area is covered with a self-sustaining vegetation in “good” condition and at a slope not exceeding 8%,
- The pervious area flow length is at least as long as the contributing impervious area and there can be no additional runoff flowing into the pervious area other than that from the source area.
- The pervious area must receive runoff in a sheet flow manner across an impervious area with a pervious width at least as wide as the contributing impervious source area.

Water quality modeling is a means to determine a storm water management control practice’s treatment efficiency. If the model cannot predict efficiencies for certain storm water management control measures that a municipality identifies as a water quality management practice, then a literature review should be conducted to estimate the reduction value. Proprietary stormwater management control measures that utilize settling as their means of TSS reduction should be modeled in accordance with DNR Technical Standard 1006 (Method for Predicting the Efficiency of Proprietary Storm Water Sedimentation Devices).

When designing storm water management practices, runoff draining to a management practice from off-site must be taken into account in determining the treatment efficiency of the measure. Any impact on the efficiency must be compensated for by increasing the size of the measure accordingly.

Storm water management practices on private property that drain to an MS4 can be given treatment credit, provided the municipality enters into an agreement or has an equivalent enforceable mechanism with the facility/land owner that will ensure the management practice is properly maintained. The municipality will need a tracking system that includes maintenance of treatment practices. An operation and maintenance plan, including a maintenance schedule, must be developed for the stormwater management practice in accordance with relevant DNR technical standards. The agreement or equivalent mechanism between the municipality and the private owner should include the following:

- A description of the stormwater management practice including dimensions and location.
- Identify the owner of the property on which the stormwater management practice is located.
- Identify who is responsible for implementing the operation and maintenance plan.
- Outline a means of terminating the agreement that includes notifying DNR.

The efficiency of a storm water management practice on private property must be modeled using the best information the municipality can obtain on the design of the practice. For example, permanent pool area is not sufficient information to know the pollutant reduction efficiency of a wet detention basin even if it matches the area requirements identified in Technical Standard 1001 Wet Detention Basin for an 80% reduction. Information on the depth of the wet pool and the outlet design are critical features that determine the level of control a detention pond is providing.

Modeling Clarifications

- A TMDL might remove certain internally drained areas from its analysis. If an internally drained area is removed from the TMDL analysis, the MS4 permittee shall not include such area in its MS4 analysis to show compliance with its TMDL requirements. Under this scenario if stormwater is pumped from inside the internally drained area to an external drainage area, then this additional pollutant discharge needs to be accounted for in the MS4 analysis to show compliance with its TMDL requirements.
- Where an internally drained area is included in the TMDL analysis, an MS4 permittee has the option of including this area in its TMDL analysis to show compliance with its TMDL requirements. However, credit for pollutant removal in internally drained areas may only be taken provided the April 6, 2009 DNR Internally Drained Area guidance memo is met with respect to taking pollutant reduction credit within internally drained areas.
- Credit for pollutant removal in a wetland may not be taken unless a wetland permit or equivalent approval in accordance with ch. NR 103, Wis. Adm. Code, has been given for constructing a storm water treatment facility in the wetland.
- Where water is pumped rather than gravity drained from an internally drained area, the MS4 will be expected to monitor the discharge to determine the mass of pollutants discharged to the surface water to which the TMDL applies.
- If a portion of a municipality's MS4 drains to a stormwater treatment facility in an adjacent municipality, the municipality generating the load will not receive any treatment credit due to the downstream municipality's treatment facility unless there is an inter-municipal agreement where the downstream municipality agrees to allow the upstream municipality to take credit for such treatment. DNR anticipates that such an agreement would have the upstream municipality assist with the construction and/or maintenance of the treatment facility. This contract must be in writing with signatures from both municipalities specifying how the treatment credit will be shared.
- For reporting purposes, the pollutant reductions must be summarized by TMDL reachshed. Additionally, pollutant loads for grouped drainage areas as modeled shall also be reported. Drainage areas may be grouped at the discretion of the modeler for such reasons as to emphasize higher priority areas, balance model development with targeting or for cost-effectiveness.
- Credit should not be taken for cleaning of non-curbed streets.
- The additional runoff volume from areas that are outside of the analysis area needs to be accounted for when it drains into treatment devices. The pollutant load can be "turned off" but the runoff hydrology needs to be accounted for to properly calculate the treatment efficiency of the device.
- Due to concerns of sediment resuspension, basins with an outlet on the bottom are generally not eligible for pollutant removal based solely on settling. However, credit may be taken for treatment due to infiltration or filtration. Filtration might occur through engineered soil or proprietary filters. Features to prevent scour should always be included for any practice where appropriate.
- To model a combination of mechanical broom and vacuum assisted street cleaning, it may require an analysis of several model runs depending on the timing of the mechanical and vacuum cleaning. If mechanical broom and vacuum cleaning occur at generally the same time (e.g. within two weeks of each other) then only the removal efficiency of the vacuum cleaning should be taken. If the municipality performs broom sweeping in the spring or fall and vacuum clean the remained of the year, calculate the combined cleaning efficiency using the following method:
 - (A) Model the entire street cleaning program as if entire period is done by a mechanical broom cleaner.
 - (B) Model just the period of time for vacuum cleaning (do not include the mechanical broom cleaning).
 - (C) Model the same period as B) but with a mechanical broom.
 - (D) The overall combined efficiency would be $A + B - C$.

WinSLAMM clarification

- WinSLAMM 9.4 and earlier versions of WinSLAMM result in double counting of pollutant removal for most treatment practices modeled in series. WinSLAMM 9.2 and subsequent versions contain warnings to help alert modelers of this issue. The modeler will need to make adjustments to ensure that the results do not include double credit for removal of the same particle size. PV & Associates has created a document titled ‘Modeling Practices in Series Using WinSLAMM’ which helps to guide a user as to whether and or how certain practices can be modeled in series and this document is available at: http://winslamm.com/Select_documentation.html
- In WinSLAMM 9.4 and earlier versions, when street cleaning is applied across a larger modeled area with devices that serve only a certain area within the larger modeled area, it is acceptable to first take credit for street cleaning across the entire larger area but then the treatment efficiency for other devices must be reduced by the efficiency of the street cleaning to prevent double counting.

P8 clarifications

- P8 does not account for scour and sediment resuspension. DNR requires that a wet basin with less than a 3-foot permanent pool have its treatment efficiency reduced. A basin with zero permanent pool depth should be considered to get zero credit for pollutant removal due to settling and a basin with 3 or more feet of permanent pool depth can be given the full pollutant removal efficiency credited by settling. The pollutant removal efficiency may be given straight-line depreciation such that a basin with a 1.5 foot-deep permanent pool would be eligible for 1/2 the pollutant removal efficiency that would be credited due to settling.
- A device that DNR gives no credit for pollutant removal may still be modeled if it is in series with other practices because of its benefit on runoff storage capacity that may enhance the treatment efficiency of downgradient treatment devices. To do so, turn the treatment efficiency off in P-8.
- P8 should be started an extra year or at least several months before the “keep dates”, in order to allow the model to build up representative pollutant concentrations in wet basins.

CREATED:

Eric Rortvedt, Water Resource Engineer
On behalf of the Storm Water Liaison Team

Date

Kevin Kirsch, Water Resource Engineer
TMDL Development Coordinator

Date

APPROVED:

Mary Anne Lowndes, Chief
Runoff Management Section

Date

Runoff Management Policy Management Team approved on _____ (date).

Attachment A: Technical Notes

Establishing relationships between multiple point and nonpoint pollutant sources and their influences on stream flow and water quality is complex. This process is often further complicated by the spatial scale under which TMDLs are developed. In order to help make TMDL development manageable, TMDLs are often developed using large scale modeling approaches that can be difficult to translate to the smaller scale often needed for implementation. For instance, loadings from “non-traditional” permitted MS4s (WDOT and county highways and UW campus systems) are often aggregated with the loadings of traditional MS4s (cities, villages and towns). This loss in resolution can result in inconsistencies in the WLA assignment necessitating a more thorough examination and possible reallocation of a portion of the WLA to non-traditional MS4 permittees.

In many cases where there is an existing TMDL that aggregated WLAs, the Wisconsin Department of Natural Resources (DNR) will need to review, and may need to reallocate WLAs to MS4 permittees. MS4 permittees will then need to conduct storm water management planning to evaluate their current pollutant loads relative to the TMDL reduction goals and create and implement a plan to meet the TMDL reductions.

Whether or not a municipality changes in size or land use, the allowable pollutant load that the receiving water can handle does not change. In the TMDL, the total allowable permitted MS4 load was determined by reach and typically was distributed uniformly across permitted MS4s on a unit area load basis. Since the permitted MS4 allowable unit area load is the same across a reachshed, MS4 WLAs can be reallocated between each other based on area. However, this reallocation must occur at the same time step that was used in the TMDL development process.

Example: the Rock River TMDL generated allocations on a monthly basis so any reallocation of the WLA between sources must also proceed on a monthly basis. Simply adding the monthly allocations into an annual load and reallocating using an average annual unit load approach will result in a misrepresentation of the TMDL allocations. Analysis must be conducted on a monthly basis.

It is expected that the extent area that will need to be modeled for the MS4 WLA will be larger than that modeled under the s. NR 151.13 (developed urbanized area modeling analysis). This is because the s. NR 151.13 modeling area has many optional and excluded areas, whereas, the TMDL WLA analysis generally lumps all of these areas into the WLA.

In municipalities that have recently experienced significant growth, there may be a significant increase in urban area. In addition, in some instances the total actual permitted MS4 area within a reachshed is different than that used in the TMDL development process. Initially DNR believed that it would be easy to reallocate a portion of the non-point source LA to the permitted MS4s based on a unit load approach; however, the task can be more difficult than it initially appears. As explained above, the reallocation needs to be conducted using the same time step used in the development of the TMDL and at the same critical flow period used to develop the TMDL. In many cases, this critical flow period used in the development of the TMDL may not correspond with an average annual unit load.

Reallocation Option: In some cases, where TMDL analysis was conducted on an average annual basis it may be appropriate to adjust WLAs based on the acreage associated with each MS4 by reachshed. If reallocating WLAs and LAs within the same reach will still not be adequate to address significant area differences between actual and TMDL modeled reachsheds, DNR will consider on a case-by-case basis as to whether a reallocation between reaches is warranted. For example, an MS4 may collect runoff from a substantial amount of area from one reachshed and discharge it directly into another reachshed.

DNR will be including reallocated WLAs in the next reissued permit of affected MS4s. MS4s will have the opportunity to comment and/or adjudicate reallocated WLAs when the permit is public noticed.

Attachment B
TMDL Benchmark Compliance Summary

TMDL Reach Number & Name: 64 (Yahara River, Lake Mendota & Lake Monona)

MS4 TMDL Percent Reductions needed (no controls): 73% (TSS) & 68% (TP)*

MS4 Existing Controls Percent Reduction (year 2014): 32% (TSS) & 24% (TP)

Modeled MS4 Annual Average Pollutant Load (no controls): 433 tons/yr (TSS) & 124 lb/yr

Modeled MS4 Annual Average Pollutant Load (existing controls): 294 tons/yr (TSS) & 94 lb/yr

Benchmark (BM)	Description of BM Measure	Outfalls Affected by BM control	Affected Drainage Areas (as modeled)	Implementation Date	Measure Treatment Performance	BM % Reduction toward TMDL Reduction	MS4 Cumulative % Control (from no controls)
N/A	Existing control measures	All	All	Ongoing	TSS: 32% TP: 24%	TSS: 32% TP: 24%	TSS: 32% TP: 24%
1	Increased SWM control for Roadway Reconstruction	All	All	1/1/2020	TSS: 60% TP: 40% to MEP	TSS: 0.6% (annually) TP: 0.4% (annually) (30% TSS reduction over 50 years)	TSS: 35% TP: 26% (Accounts for 5 years of reduction)
2	Implement Enhanced Street Cleaning Program	001 003 004 008	1A - 1D 3A – 3K 4C – 4F 8D	1/1/2020	TSS: 12% TP: 8% (no redundant controls)	TSS: 9% TP: 6% (eff. reduced for redundant measures)	TSS: 44% TP: 32%
3	Implement Enhanced Yard Waste Collection Program	All	All	1/1/2021	TSS: 2% TP: 6% (no redundant controls)	TSS: 1.6% TP: 5% (eff. reduced for redundant measures)	TSS: 46% TP: 37%
4	Ordinance Revised – Higher Redevelopment Standard	All	All	1/1/2022	TSS: 60% TP: 40% to MEP	TSS: 0.6% (annually) TP: 0.4% (annually) (30% of TSS reduction over 50 years)	TSS: 49% TP: 39% (Accounts for 5 years of reduction)
5	Retrofit 2 nd St. Basin into wet basin	002	B4	1/1/2023	TSS: 60% TP: 40%	TSS: 2% TP: 1% (only serves part of MS4)	TSS: 51% TP: 40%
6	New Wet Basin B15	005	5B - 5H	1/1/2023	TSS: 60% TP: 40% to MEP	TSS: 3% TP: 2% (only serves part of MS4)	TSS: 55% TP: 42%
7	Stabilize MS4 Drainage Ways between X and Y streets	003	3D and 3E	1/1/2024	20 tons/year sediment reduction	N/A Streambank & MS4 stabilization does not count against TMDL reduction requirement	TSS: 55% TP: 42%

* The TSS and TP percent reductions were taken from the Rock River Report’s Appendix H and I. All other mass and percent reductions listed are fictitious and shown for example purposes only.