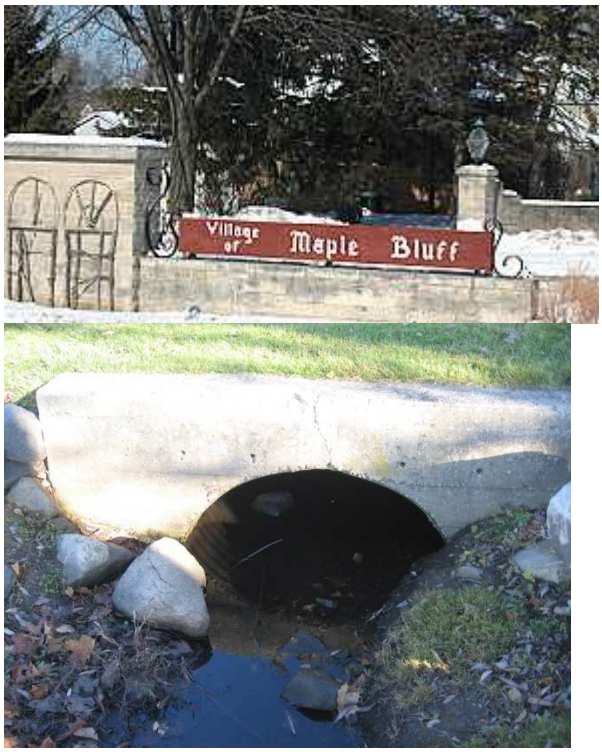


Village of Maple Bluff

STORM WATER QUALITY MANAGEMENT PLAN

Prepared by:

Nahn and Associates L.L.C.

May 6, 2009

Village of Maple Bluff Stormwater

Quality Management Plan

Table of Contents

Tables

Figures

Appendices

1. EXECUTIVE SUMMARY

The Village of Maple Bluff (Village), population 1,375, is a 452-acre primarily residential community on the northeast shores of Lake Mendota in central Dane County, Wisconsin. The Village limits are defined by Lake Mendota (Lake) on the west, Sherman Avenue and the Chicago and Northwestern Railroad on the east, the Yahara River on the south, and Warner Beach on the north. The Village is unique from a stormwater perspective because:

- it is entirely developed and land-locked by the City of Madison and the Lake so that the only construction activity is re-development of existing homes and roads,
- land use is almost entirely residential/park/open space with very little commercial (4%) and no industrial,
- it is located directly on the shores of the Lake.

The purpose of this plan is to describe and quantify existing and proposed Village Best Management Practices (BMPs) to reduce the adverse impacts associated with stormwater runoff pollution from urban areas to adjacent water resources including the Lake and the Yahara River. Since 1999, the Village has a stormwater discharge permit (WPDES Permit No. WI-S058416-2) containing requirements for stormwater pollution control which will also be described as a part of this plan.

The Village has taken a pro-active approach to managing stormwater through the following activities:

- In 2005, all of the village stormwater drain inlets were stenciled with a message warning residents "Don't Dump-Drains Directly to Lake",
- In 2006, an illicit discharge screening of the major outfalls into the Lake was negative,
- In 2007, the Village adopted the Dane County Erosion Control and Stormwater Management Ordinance (Chapter 14) as the local governing ordinance for erosion control and stormwater management (Chapter 115),
- In 2008, the Village adopted Ordinance 192-6.1 prohibiting storing leaves in the gutter,
- Participation in the Madison Area Municipal Stormwater Partnership (MAMSWaP) stormwater education campaign,
- Stormwater pollution prevention articles appear regularly in the municipal newsletter,
- Informational stormwater pollution brochures and a DVD titled "Dane Waters- A Reflection on Us All" are available at Village Hall for village residents use,
- Links have been placed on the Village website to the "Myfairlakes" website which contains additional articles on stormwater pollution prevention,

- A Building Board Permit Packet has been developed that includes requirements for construction erosion control and post-construction stormwater management.

The Village Department of Public Works also performs the following non-structural BMPs on a regular basis to directly control stormwater runoff pollution:

- Weekly leaf and yard debris pickup,
- Annual catch basin sump cleaning,
- Limited salt use for winter roadway de-icing,
- Semi-annual street sweeping of entire village with high-efficiency vacuum-type sweeper.

The stormwater permit contains requirements to remove 20% of the average annual Total Suspended Solids (TSS) load and 40% of the average annual TSS load by 2008 and 2013 respectively. The Village will achieve these goals by continuing the practices listed above. In addition, the Village proposes to exceed these requirements by:

- Placing additional sumps in storm sewers during the 2010 roadway improvement project,
- Constructing a wet detention basin near the Tennis Courts (cost-sharing with the City of Madison).

2. BACKGROUND

The Village of Maple Bluff (Village), population 1,375, is a 452-acre primarily residential community on the northeast shores of Lake Mendota in central Dane County, Wisconsin. The Village limits are defined by Lake Mendota (Lake) on the west, Sherman Avenue and the Chicago and Northwestern Railroad on the east, the Yahara River on the south, and Warner Beach on the north. The Village is unique from a stormwater perspective because:

- it is entirely developed and land-locked by the City of Madison and the Lake so that the only construction activity is re-development of existing homes and roads,
- land use is almost entirely residential/park/open space with very little commercial (4%) and no industrial,
- it is located directly on the shores of the Lake.

The purpose of this plan is to describe and quantify existing and proposed Village Best Management Practices (BMPs) to reduce the adverse impacts associated with stormwater runoff pollution from urban areas to adjacent water resources including the Lake and the Yahara River. Since 1999, the Village has a stormwater discharge permit (WPDES Permit No. WI-S058416-2) containing requirements for stormwater pollution control which will also be described as a part of this plan.

Stormwater pollution is one of the leading causes of water body impairment nationwide. The Lake is part of the Lower Rock River Basin- Yahara River Watershed which is listed as impaired water under the statewide 303d list (2008 updated list). The cause for impairment is sediment and phosphorus. The WDNR Yahara River Watershed Plan (LR09, page 4) lists the following goals to control stormwater runoff pollution into the lake:

> "A major focus of the Lake Mendota Priority Watershed Project is on sediment and phosphorus reductions from agricultural and urban sources, stormwater management, groundwater and wetland protection, and public education…"

The following recommendations are listed in the Dane County Water Quality Plan (2004, Page 47) under "URBAN NONPOINT SOURCE CONTROL RECOMMENDATIONS":

> U-1: All urbanizing units of government should develop comprehensive stormwater management plans that account for water quality and quantity, that encourage infiltration of stormwater, and that are integrated into the long-term land use and open space plans of the area. Stormwater management plans should attempt to mitigate the adverse impacts of development on water resources to the maximum extent practicable.
>
> U–2: Management agencies should promote land use patterns and practices which preserve the integrity of the natural hydrologic system, including the balance between groundwater and surface water. Require future development to implement infiltration measures, wherever practicable, as a means of controlling stormwater impacts and ensuring groundwater recharge.

U–3: Designated municipalities should implement the state NR 216, NR 151, and federal Phase II stormwater regulations along with the existing Erosion Control and Stormwater Management Ordinance (Chap. 14). Other municipalities should consider developing consistent programs, ordinances, and requirements.

U–5: Prepare specific watershed plans incorporating flow and water quality management practices for all existing and developing urban drainage basins. Where possible, such plans should be prepared in the context of comprehensive watershed water quality plans.

U–6 A coordinated stormwater management plan should be developed for all communities in the municipal NR 216 stormwater permit area.

U–7 Eligible units of government should apply for funding through the DNR Targeted Runoff Management or Urban Nonpoint Pollution grant programs to develop stormwater management plans and install practices that control urban stormwater impacts.

U–8: Management agencies should promote open drainage systems incorporating detention and infiltration areas and natural greenways in developing areas.

U–9: Urban management agencies should work cooperatively with state and local agencies to incorporate stormwater infiltration practices into local erosion control/stormwater management ordinances. Infiltration practices should be designed to protect the groundwater.

U–10: Evaluate and promote potential approaches for enhancing or improving sediment and phosphorus removal in the design, operation, and maintenance of urban drainage systems.

U–12: Design urban drainage systems and associated land use practices to minimize the potential for toxic or hazardous materials being washed or discharged into surface waters, with emphasis on source control.

U–14: Urban management agencies should enact and enforce leaf, yard, and garden debris storage and disposal ordinances in urban areas, including leaf pick-up in the fall, with emphasis on keeping leaves and yard waste off of streets and paved surfaces.

U–15: Urban management agencies should include provisions in building codes and ordinances to require that, wherever feasible, drainage from roofs, driveways, and parking lots be directed toward grassed or vegetated areas, rather than paved areas or storm sewers.

U–16: Conduct aggressive public education and information programs regarding source control, on an annual basis.

U–17: Improve the water quality protection and effectiveness of street sweeping by providing frequent (weekly to biweekly) sweeping of streets in commercial and industrial areas, and regular (biweekly to monthly) sweeping of residential streets, with extra efforts at thoroughly cleaning all streets in early spring and late autumn. Vacuum sweepers should be used where feasible because of greater removal effectiveness.

U–18: Continue to expand efforts to reduce ground and surface water impacts associated with road salt storage and use, and snow removal, including alternative materials and approaches.

The purpose of this plan is to discuss these recommendations as they relate to the Village. Specifically items U-1, U-3, U-4, U-5,U-9, U-10, U-12, U-14, U-15 and U-16 described above will be addressed in this report.

The Village is required to obtain and comply with a stormwater discharge permit (called a Wisconsin Pollutant Discharge Elimination System or WPDES permit) to discharge into waters of the state under NR 216. The WPDES stormwater discharge permit (permit) also contains the following terms and conditions concerning storm water runoff pollution:

(6) MUNICIPAL POLLUTION PREVENTION: Each co-permittee shall implement a municipal operation and maintenance program to prevent or minimize pollutants entering the MS4 and waters of the state. At a minimum, the program shall include the following activities:

(a) An annually updated inventory of long-term storm water best management practices owned, operated, managed, or maintained by the co-permittee.

(b) Implementation of maintenance procedures and schedules for practices identified under Part I, Section C. (6) (a), other source area controls, catch basin cleaning, and the physical condition of elements of the MS4 that may adversely affect water quality.

(c) Implementation of roadway maintenance procedures that includes street sweeping and de-icing management that takes into consideration the effects on water quality.

(d) Collection procedures and/or instruction to citizens for on-site management of leaves, yard waste, and grass clippings.

(e) Pollution prevention procedures at municipal garages, public works facilities, and storage areas.

(f) Management of the storage of salt for roadway de-icing in accordance with ch. TRANS 277, Wis. Adm. Code.

(g) Pollution prevention procedures for the use and application of lawn and garden fertilizers on municipally controlled properties. By March 10, 2008, the application of lawn and garden fertilizers on municipally controlled properties, with pervious surface over 5 acres each, shall be done in accordance with s. NR 151.13(1)(b)3., Wis. Adm. Code.

(h) Pollution prevention procedures for the use and application of pesticides and herbicides on municipally controlled properties.

(i) Documentation of the estimated amount of leaves collected, solids captured from street sweeping, solids removed from catch basins, and solids removed from structural controls.

(j) To the maximum extent practicable, the development and implementation of policies and procedures to meet the developed urban area performance standard of s. NR 151.13(2)(b)1.b., Wis. Adm. Code, by the required compliance date of March 10, 2008.

Note: Section NR 151.13(2)(b)1.b., Wis. Adm. Code, states that a municipality regulated by a municipal storm water discharge permit shall, by March 10, 2008, achieve a 20% reduction in total suspended solids in runoff that enters waters of the state as compared to no controls.

(8) VILLAGE OF MAPLE BLUFF: In addition to the requirements specified in Part I, Sections A. through H. of this permit, the Village of Maple Bluff shall meet the following requirements:

(a) By October 1, 2004, develop a proposed illicit discharge detection and elimination program in conformance with the requirements of Part I, Section C. (3) of this permit, with an implementation date of March 31, 2005. The Village of Maple Bluff shall submit the proposed program to the Department of Natural Resources by the compliance date.

(b) Continue the implementation and administration of the construction site pollution control program described in Part 8c. of the permit application submitted to the Department of Natural Resources on January 6, 2003. The Village of Maple Bluff shall ensure that the program is consistent with the requirements of Part I, Section C. (4) of this permit by the compliance date specified in Part I, Section H.

(c) By October 1, 2004, develop a proposed post-construction storm water management program consistent with the requirements of Part I, Section C. (5) of this permit, with an implementation date of March 31, 2005. The Village of Maple Bluff shall submit the proposed program to the Department of Natural Resources by the compliance date.

(d) By October 1, 2004, develop a proposed municipal pollution prevention program consistent with the requirements of Part I, Section C. (6) of this permit, with an implementation date of March 31, 2005. The Village of Maple Bluff shall submit the proposed program to the Department of Natural Resources by the compliance date and shall ensure that the program is consistent with the requirements of Part I, Section C. (6) of this permit …

This plan will also cover the permit requirements listed above. Some of the permit requirements are also contained in the Stormwater Permit Annual Reports that the Village submits to the WDNR by March 31 of every year.

3. PUBLIC EDUCATION AND INPUT

A critical portion of the Village stormwater plan is educating the village residents about every-day activities which can contribute to stormwater pollution. Since obtaining the stormwater permit in 1999, the village has participated in the Madison Area Municipal Stormwater Partnership (MAMSWP) which is a group of permitted communities in Dane County addressing certain permit requirements jointly. The MAMSWP group has a comprehensive public education program including a radio ad campaign, audio-visual presentations, and salt- use salt and deicing program materials.

The following list of on-going activities is taken from the 2009 MAMSWP Information and Education work plan to give an idea of the differing public education activities:

"ONGOING (actions initiated in previous years that require maintenance or updating)

1. Continue Plant Dane! Cost-Share program.
2. Continue promoting rain barrel programs.
3. Continue to work with the Earth Gauge Partnership.
4. Continue to promote NASECA events.
5. Develop and distribute articles to municipalities for their newsletters.
6. Create and distribute articles for friends groups, community groups and neighborhood association newsletters.
7. Develop presentations (PowerPoint, slides, overheads, etc.) focused on audience interests/concerns.
8. Maintain web site (information and resource lists for environmental actions, link to municipal sites) listing resources.
9. Continue to use existing list serves to disseminate info.
10. Develop and set up displays for fairs, expos, etc.
11. Continue providing organizations and community groups assistance with projects.
12. Continue to promote storm drain stenciling and marking programs.
13. Promote curriculum developed.
14. Maintain distribution lists.
15. Develop, publicize and offer in-house training for building inspectors, contractors and staff.
16. Publicize availability of BMP Manual."

Additional information on the MAMSWaP I& E program is available at http://www.danewaters.com/management/mamswap.aspx.

In addition to the extensive MAMSWaP Public Education Campaign, the Village staff also continually educates and informs the village residents about stormwater pollution as described in the Non-Structural BMP section below.

4. STORM SEWER INVENTORY AND SUBWATERSHED

The Village stormwater conveyance system is comprised of underground storm sewer pipes, roadside ditches, depressed sumps and curb inlets. A comprehensive field inventory was performed to document the existing stormwater conveyance system in terms of storm sewer and depressed sump dimensions. This data was input into an ArcMap system and combined with the 2005 ortho-photograph of the Village as shown in Figure 1-7. Table 1 lists the cumulative lengths of the different diameter sewer pipes. Table 2 lists the number of storm sewer structures and Table 3 lists the locations and dimensions of the depressed sumps within the Village.

TABLE 1- SUMMARY OF VILLAGE STORM SEWER CONVEYANCE SYSTEM
Stormwater Pipe Sizes and Lengths

Diameter (Inches)	Cum. Length (feet)
12"	10483
15"	5887
18"	1231
18" x 28"	184
19" x 30"	449
20"	252
21"	624
24"	1746
24" x 38"	153
27"	541
28"	1148
30"	709
30" x 42"	363
30"x24"	237
36" x 48"	300
8"	96
9"	328
Unknown	3114
Total Length	27845

TABLE 2- SUMMARY OF VILLAGE STORM SEWER CONVEYANCE SYSTEM
Stormwater Structures

Type of Storm Sewer Structures	Number of Structures
Area Inlets	18
Carlson Inlets	190
Clean outs	21
Curb Inlets	40
Endwalls	14
Manholes	52
Vane Drain	1

TABLE 3- SUMMARY OF VILLAGE STORM SEWER CONVEYANCE SYSTEM
Depressed Sump Locations and Dimensions

Sump #	Location	Sump Dimensions	Sump outflow
S-1	1900 Sherman Ave.	7'x5'- 2' sump	24" pipe to lake
S-2	25 Fuller Dr.	8'x6'- 2' sump	15" pipe to lake
S-8	Bayside Dr.	8' X6' -2' sump	30"x 24" pipe to lake
S-18	Lakewood / Bayside	7'x4'-2' sump	24" pipe to lake
S-18a	Lakewood / Kensington / Bayside	7'x 4' - 2' sump	15" flow to S-18

Sump #	Location	Sump Dimensions	Sump outflow
S- 17	132 Kensington	7'x 4' -2' sump	15" flow to Lakewood/Kens./Bay
S-19	122 Lakewood	8'x 4'- 2' sump	15" flow to S- 18
S- 20	Lakewood / Cambridge	6' x 5' -2' sump	15" flow to S-19
S-22	135 Lakewood	4' x 5' -2' sump	15" flow to S-20
S-31	58 Cambridge	4'x6' -2' sump	15" flow to S-22
S-23	139 Lakewood	5'x6' -2' sump	12" flow to S-22
S-24	175 Lakewood	7'x 6'-2' sump	12" flow to S-23
S-25	221 Lakewood	4' x 6'-2' sump	12" flow to S-24
S-33-A	In Beach Park (next to Yost's)	4' x 5'-2' sump	15" flow to lake
S-35-A	Kensington / Fisk	4' x 8'-1' sump	15" flow to S-33-A
S-35	Kensington / Fisk	3' x 3' 1' sump	12" flow to S-35-A
S-36	Cambridge / Kensington	5' x 7' -2' sump	12" flow to S-35-A
S-27	Cambridge / Lakewood	5' x 7' -2' sump	12" flow to S-36
S-28	Cambridge / Lakewood (in blvd.)	3' x 3' -1' sump	12" flow to S-27
S-37	In Beach (near old volley ball ct.)	5' x 8'- 2' sump	30"x 42" flow to lake
S-37a	In Blvd @ Beach	5' x 8'-2' sump	flow to S-37
S-38	at beach	5'x 8' -2' sump	flow to S-37
S-39	at beach	5' x 8'-2' sump	flow to S-38

Sump #	Location	Sump Dimensions	Sump outflow
S-51	Farwell / Leroy	4’ Round w/3’sump	flow to Bay Avenue

Figure 1-Maple Bluff Storm Sewer Map-Northwest

Figure 2- Maple Bluff Storm Sewer Map-Central- West

Figure 3- Maple Bluff Storm Sewer Map-South

Figure 4-Maple Bluff Storm Sewer Map- Central-East

Figure 5- Maple Bluff Storm Sewer Map-Central-South

Figure 6- Maple Bluff Storm Sewer Map- Southwest

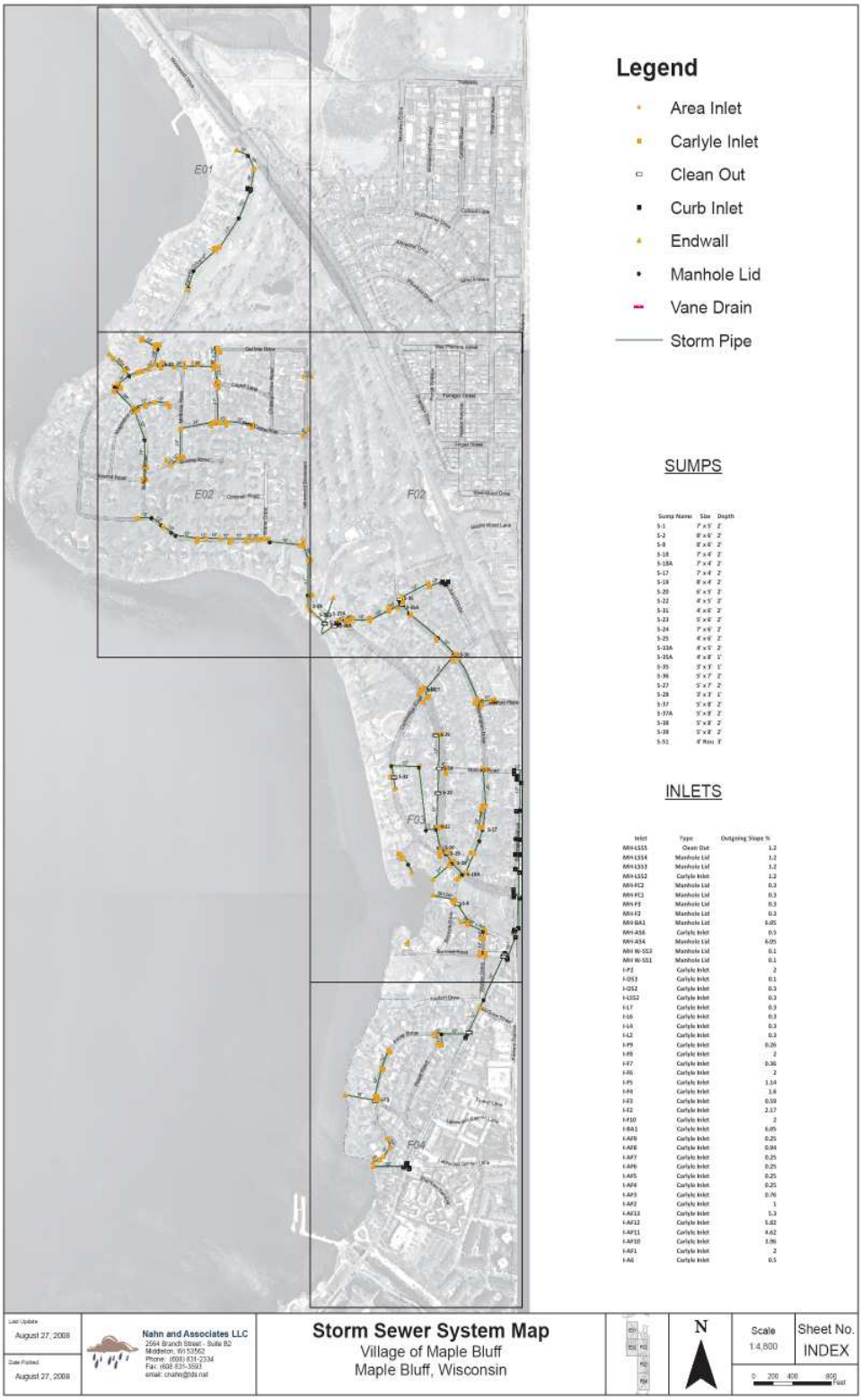


Figure 7- Maple Bluff Stormsewer Map- Index

5. ILLICIT DISCHARGE MONITORING

Illicit Discharge connections into the stormwater conveyance system can be a major source of stormwater pollution identified in earlier stormwater studies. An illicit discharge connection can be defined as any non stormwater related discharge in the stormwater conveyance system including sanitary connections, interior floor drain connections, commercial car wash discharges and swimming pool discharges.

For the purposes of this program, the following non-stormwater discharges or flows are not considered illicit discharges unless identified by the Department of Natural Resources (DNR) as significant sources of pollutants to waters of the State:

- landscape irrigation,
- diverted streamflows,
- uncontaminated groundwater infiltration,
- uncontaminated pumped groundwater,
- discharges from potable water sources,
- foundation drains,
- air conditioning condensation,
- irrigation water,
- lawn and garden watering,
- individual residential car-washing
- non-commercial charity car-washing,
- flows from riparian habitats and wetlands,
- fire fighting, and
- other discharges covered by a WPDES permit issued by the DNR and in compliance with that permit.

Other occasional or incidental non-storm water discharges may be considered non illicit discharges on a case-by-case basis and with the concurrence of the DNR.

As part of this plan, major city outfalls were monitored during the summer of 2008 for illicit discharge connections using the dry weather discharge observation technique. The dry weather discharge observation technique is visually observing stormwater outfalls after a period of 72 hours with no rainfall. If no discharge is observed then an absence of illicit discharge connections is confirmed for the particular stormwater conveyance system. If discharge is observed, then additional monitoring is needed to document the source of the discharge. As described above, some non-stormwater discharges are not considered illicit discharges. Any illicit discharges should be disconnected immediately. No dry weather discharges were observed during the illicit discharge screening period and the Village has no illicit discharge connections in the stormwater conveyance system.

6. VILLAGE STORM WATER ORDINANCE REVIEW AND UPDATE

The Village ordinance was reviewed for this plan to determine local compliance with current county and state standards for stormwater pollution control. The existing Village ordinance was not in compliance with either the County or state requirements so an ordinance update was recommended. In 2007, the applicable portions of the Dane County Erosion Control and Stormwater Management ordinance (Chapter 14) were adopted as local code (Chapter 115). The Dane County stormwater ordinance has been determined to be similar to the WDNR model ordinance.

The Village has a number of additional ordinances related to stormwater pollution control including:

- Pet Waste Pickup (Chapter 82-2 C.)
- Prohibiting leaf storage in streets (Chapter 192-6.1)
- Prohibiting Spills and Cleanup (Chapter 149-18 to 149-20)
- Littering (Chapter 166.1)
- Mandatory Recycling (Chapter 186.2)

7. VILLAGE BMPS

EXISTING

The village has a numerous BMPS which are integrated into the regular operation schedule including non-structural (practices which don't require a structure) and structural (practices that do require a structure) as follows:

Non -structural

1.) Catch basin cleaning- The village storm sewer conveyance system has 24 depressed sumps in catch basins which capture the heavier stormwater particulates. The dimensions and location of these sumps are listed above in Table 3. These basins are cleaned at a minimum of once per year and more frequently if needed. Table 4 lists the amount of sediment removed per year from these depressed sumps. These depressed sumps are effective within the Village due to the lack of surface space to treat stormwater.

Table 4- Annual Sediment Removed from Village Depressed Sumps

Year	**Sediment Removed (Tons)**
2004	3-5
2005	3-5
2006	4
2007	37.6
2008	11.3

2.) Leaf and Yard debris Pickup- The Village has an extremely aggressive pickup schedule to pick up leaves and other yard waste in which the entire village is covered on a weekly basis. This pickup starts in April and ends in December. After each material pickup, the area is cleaned with a hand operated street sweeper. Table 5 lists the amount of leaves picked up within the last several years. The aggressive yard pick schedule significantly reduces the phosphorus load into the Lake. (See Water Quality Modeling Section below)

Table 5- Annual Leaf/Yard Waste pickup

Year	Leaf and Brush Collection Amounts (Cubic Yards/Tons)
2004	2080 Cubic Yards
2005	2300 Cubic Yards
2006	378 Tons
2007	375 Tons
2008	300 Tons

3.) Street Sweeping- The Village street sweeping schedule is usually two to three times per year for the entire village using a high-efficiency vacuum type sweeper (equipped with both a sweeper and a vacuum). The street sweeping is contracted out to Kleen Sweep. Both the driving lane and the parking lane of each roadway are swept. Street sweeping debris is disposed at the Dane County Compost site on Highway 113. Table 6 lists the annual amount picked up by street sweeping.

Table 6- Street Sweeping Pickup

Year	Street Sweeping Collection Amounts (Tons)
2004	6-10
2005	6-8
2006	30
2007	23
2008	23

4.) Roadway De-icing- The village has a low-salt use policy in which only major intersections, tight corners and hillsides are de-iced. The Village mixes sand/salt in a 50%/50% mix ratio which also decreases salt use. The same sand/salt mix is stored in barrels at steep intersections for residents use. Table 7 lists the annual salt/sand usage for the Village.

Table 7-Village Salt/Sand mix Usage

Year	Salt/sand Amounts (Cubic Yards)
2004	59
2005	60
2006	73
2007	60
2008	107

5.) Public Education- The village has an extensive public education campaign to alert the citizens of storm water pollution, describe above, including-

a. Storm-drain stenciling of all stormwater inlets with the warning- "Dump no waster, Drains to Lake" by a local Boy Scout troop

b. Articles in Municipal newsletter- The Village produces a bi-annual newsletter and sends to all the residents. The current and past newsletters are also posted on the municipal website. Under the "Public Works News" section of the newsletter, tips on how to properly recycle material, where to place yard waste and how to minimize stormwater contact are inserted.

c. Dane Waters DVD and other informational brochures at Village Hall for residents use.- The DVD titled "Dane Waters: A Reflection on us all" and other informational stormwater brochures are available at Village Hall for resident's use.

d. Links on municipal website for "MyFairLakes" website.- A link has been established on the municipal website to the "MyFairLakes" website which contains a plethora of stormwater information and articles.

6.) Oil Recycling Center and curbside pickup of Used Oil/Toxic material- The Village operates a used oil recycling facility at the Maple Bluff Country Club and offers curbside pickup of toxic material and used oil three times per year (Spring, summer and Fall) for village residents.

Structural

1.) Maple Bluff Country Club Wet Detention Basins- The Maple Bluff Country Club is operated by the Village and has three wet detention basins providing stormwater treatment runoff from the Golf Course.

2.) Farley Swale- The extreme northern portion of the Village discharges to a grassed swale next to the Village Boatyard and adjacent to Warner Beach.

Proposed-

Structural

1.) Increase Depressed Sumps in 2010 roadway improvement project- In 2010, the Village proposes to improve a number of roadways as shown in Figure 2. The roadways that will be improved without existing depressed sumps will have three foot deep sumps installed. Table 8 lists the lengths of roadway to be improved in 2010. Fifteen new depressed sumps will be installed in 2010 when these roadway surfaces are improved. Figure 8 shows a drawing of a typical depressed sump cross-section.

Table 8- Proposed Lengths of Roadway Improvements

Road Name	C/L Length (feet)
Cambridge Road	515
Charing Cross Road	304
Farwell Drive	3793
Kensington Drive	2231
Magdeline Drive	1239

McBride Road	953
New Castle Way	929
Roxbury Road	818
Summit Road	676
Woodland Drive	1426

2.) Tennis Court Wet Detention Basin- The Village has an open space area near the Tennis Courts across from Lakewood Boulevard that has experienced mosquito larval growth associated with standing water. The Dane County Department of Health is very concerned about the mosquito growth issue as it relates to West Nile and other mosquito-borne illnesses. The Village proposes to construct a wet detention basin with a minimum of three to five feet of standing water in this area. Figure 3 shows the potential layout for this basin. Since a potion of the stormwater runoff comes from Madison, the cost should be shared with each municipality based on drainage area. The opinion for probable cost for this basin is $345,000 as detailed in Appendix C.

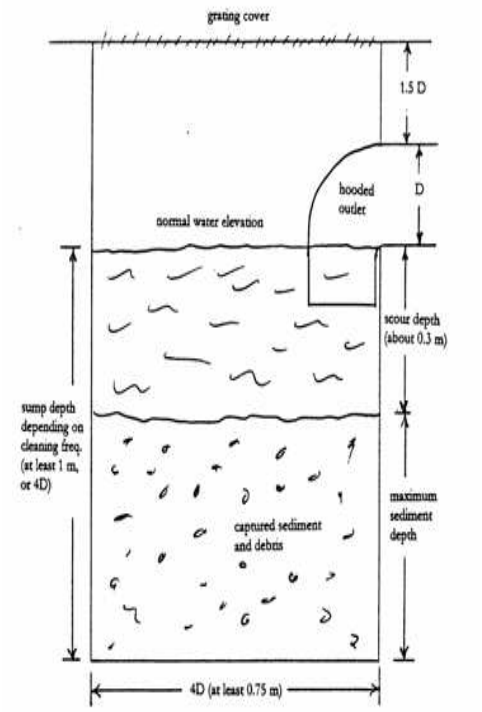


Figure 8- Typical Depressed Sump

Figure 9- Roadway Improvement Locations for 2010

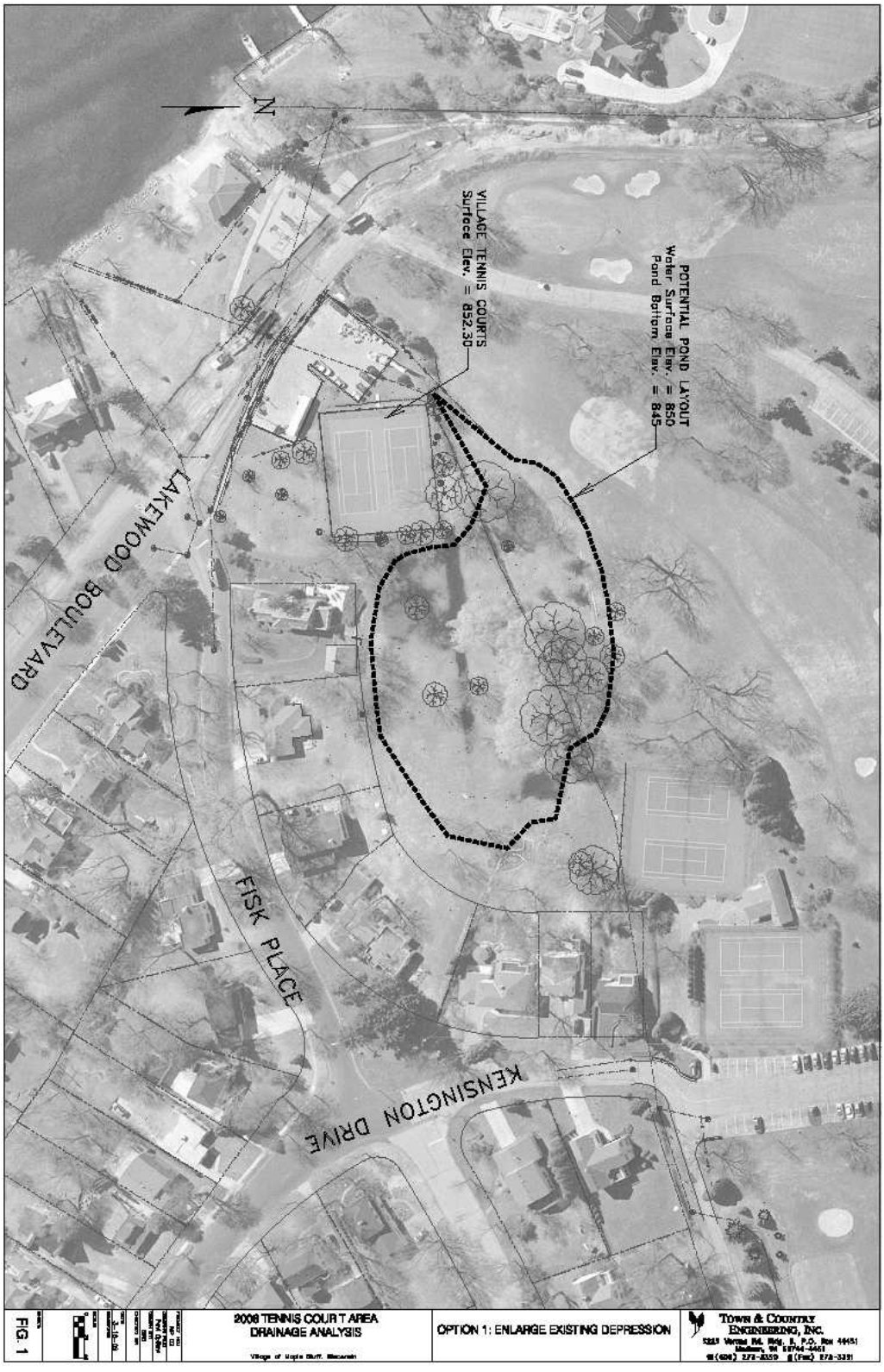


Figure 10- Proposed Tennis Court Wet Detention Basin Location

8. STORMWATER MODELING

The effectiveness of the existing and proposed BMPs listed above in terms of reducing the annual loading of Total Suspended Solids (TSS) was modeled using WinSLAMM (version 8.5). This modeling was conducted to meet the permit requirements to reduce TSS by 20% in 2008 and 40% in 2013. Figure 10 shows the major drainage areas of the village.

The WDNR guidance for stormwater modeling from Russ Rasmussen dated June 6, 2005 was used to determine the applicable area to include in the model. All areas west of Farwell were excluded because they drain directly to the Lake.

20% TSS reduction

The baseline model used the residential, park, institutional and open space standard land use file for various portions of the village. The village extensive storm sewer depressed sump system and street sweeping were input into the model to determine their effectiveness. Since the solids removed by both street sweeping and catch basin cleaning are the same size particles, the catch basin cleaning method was selected. The existing golf course ponds and Farwell grassed swale were then placed in the model to represent the existing BMPS already installed by the Village. The WinSLAMM modeling results are shown in Table 9 for a catch basin cleaning schedule of once every three years. This modeling was submitted to and approved by the WDNR in 2008 to satisfy that 20% TSS removal permit requirement. Documentation for that submittal is shown in Appendix A.

Table 9- WinSLAMM Modeling Results-20% TSS Removal

Drainage Area	Area (Acres)	Primary Land Use *	Discharge no Controls (lbs)	Discharge with controls (lbs)	TSS Control
ME06-U-0001-A-MAP-V	43	O	35374	5863	0.834256799
ME06-A-0002-A-MAP-V	60.5	R	71743	68975	0.038582161
ME06-B-0003-A-MAP-V	142	R	29212	24530	0.160276599
ME06-C-0004-A-MAP-V	60.3	R	16661	14114	0.152871976
ME06-U-0005-MAP-V	20.2	R	5261	3529	0.329214978
TOTALS	326		158251	117011	0.260598669

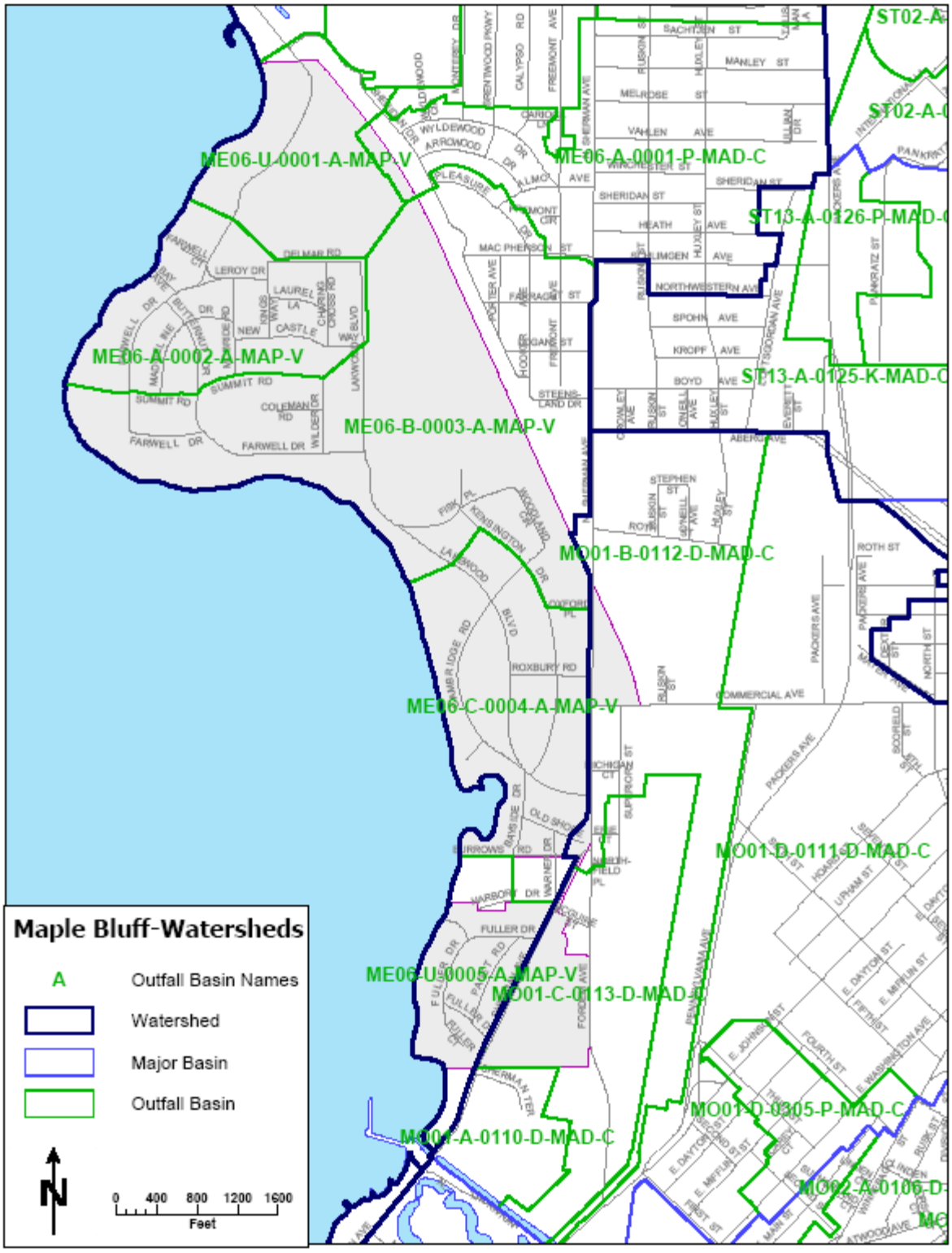


Figure 11- Maple Bluff Watersheds for Stormwater Modeling

40% TSS Reduction

The WinSLAMM model was run with proposed BMPs to get to the 40% TSS removal threshold. The WDNR modeling guidelines state that if a practice cannot be modeled in SLAMM as a BMP built into the model, removal rates from textbooks and or past studies can be used. The Village aggressive leaf pickup schedule is a BMP that falls into this category. Several recent studies have been conducted concerning the phosphorus reduction of leaf removal as listed in Appendix A. This research suggests from 25-30% of total phosphorus load is removed with weekly leaf pickup. Since the TSS removal rate is usually 1.5 to 2 times the phosphorus removal rate, the weekly leaf pickup equates to a 37.5%-60% TSS removal rate. Therefore in combining the 26% removal rate of catch basin cleaning with the 37.5%-60% removal rate to weekly leaf pickup gives us an overall TSS removal rate of approximately 60%-80%.

The Village is committed to exceeding the TSS pollutant rates specified in the permit. Figure 3 above lists the roadways to be improved in 2010.

A depressed sump of at least three feet depth will be placed in storm sewers every 300-500 feet during this project in roadway sections that do not have depressed sumps. The typical dimensions for the depressed sump are shown in Figure 4. Installation of these sumps will increase the removal to 29% of the TSS average annual load (without accounting for the aggressive leaf pickup schedule or Tennis Court wet detention basin).

The second proposed wet detention basin is proposed at the tennis courts. Installation of this wet detention basin will increase the removal rates to 40.4% for wet detention/catch basin cleaning only (weekly leaf pickup not considered). With all of the BMPS, both proposed and existing, in place the overall TSS Sediment Removal rate is from 77.5% to 90%.

9. Recommendations and Implementation

The recommendations of this plan are to design and construct the wet detention basin near the tennis courts and to install additional depressed sumps in 2010. The Village has already secured a Dane County Urban Water Quality grant to help finance the wet detention basin construction.

APPENDIX A- WDNR WINSLAMM REVIEW AND APPROVAL DOCUMENTATION

Original Village Submittal Letter to WDNR for WinSLAMM Modeling

November 7, 2007

Eric Rortvedt
Water Resources Engineer
Wisconsin Dept. of Natural Resources
3911 Fish Hatchery Road
Fitchburg WI 53711

Re: SLAMM Modeling results for Village of Maple Bluff

Dear Mr. Rortvedt,

Enclosed are the SLAMM input and output files for the "no controls" and "controls" condition within the Village of Maple Bluff to demonstrate 20% Total Suspended Solids (TSS) control as required in our stormwater permit. The SLAMM model used was version 8.5 which is the model that was used for original modeling work in 2004.

The entire portion of the Village of Maple Bluff along the lakefront was not included because stormwater doesn't contribute to the village MS4. This area includes the majority of the lots west of Fuller Drive, Cambridge Road, Bayside Drive, Lakewood Boulevard, Cambridge Court and Farwell Drive.

The enclosed spreadsheet and map summarize the "no control" and "control" SLAMM modeling results for the five watersheds in the Village. To achieve 20% TSS control , the Village intends to clean the depressed catch basins in the south three watersheds once every three years (one cleaning for one drainage area annually on a three year rotation schedule) (ME06-U-0005-A-MAP-V, ME06-C-0004-A-MAP-V and ME06-B-0003-A-MAP-V).

Enclosed are the Input files (*.data) and Output files (*.out) for the SLAMM Model runs.

Sincerely,

Tom Schroeder
Director of Public Works
Village of Maple Bluff

CC: Chuck Nahn, Nahn and Associates,

E-mail message stream dated Mon 12/8/2008 12:11 PM from WDNR to Village

Tom and Chuck,

Thank you for the February 15, 2008 letter responding to my comments on the Village of Maple Bluff's analysis to demonstrate that 20% TSS control has been met for the Village's MS4 discharge. I concur that the submitted MS4 analysis is adequate to demonstrate that the Maple Bluff MS4 stormwater practices are reducing the TSS discharge by at least 20%.

40% TSS Control Standard

I have the following comments that will need to be incorporated into the MS4 analysis to demonstrate compliance with the 40% TSS control standard, which is to be achieved by year 2013 as follows:

A. SLAMM version 9.2 or a newer version will need to be used (version 8.5 had been used for the 20% analysis).

B. The 5-year Madison rainfall file need to be used with the winter season removed from the analysis. In order for WinSLAMM to appropriately calculate TSS removal removing for the winter season, the "winter season range" box must be checked and the "start of winter" and "end of winter" fields need to be filed as 12/02 and 03/12 (for Madison rainfall files). The rainfall file "start date" and "end date" fields are automatically updated based on the rainfall file that is selected. The required SLAMM parameter files and winter seasons are listed/available on the USGS web site at: http://wi.water.usgs.gov/slamm/C

C. Wet detention basins need to be modeled with the "Initial Stage Elevation" set equal to the lowest outlet invert. The wet basin modeled in drainage area 001 has a starting elevation 2 feet lower than the outlet elevation.

D. Attached is a reporting format that I suggest be used for summarizing the modeling results. Please consider using this format.

E. Due to inconsistencies in modeling of grass swales and the need to help define which open drainage systems are eligible as water quality swales, the DNR recently created a guidance memo on the Process to Assess and Model Grass Swales for TSS reduction, dated April 24, 2008. This MS4 guidance memo is given toward the bottom of the municipal storm water management page at: http://www.dnr.state.wi.us/runoff/stormwater/muni.htm

Please review this guidance and adjust the modeling to be consistent with this guidance, in particular, the infiltration rate and swale geometry should be adjusted.

Thank you for your cooperation. If you have any questions, feel free to contact me.

P Eric S. Rortvedt, P.E.
Water Resources Engineer
South Central Region
Wisconsin Department of Natural Resources
(() **phone:** (608) 273-5612
(() **fax:** (608) 275-3338
(+) **e-mail:** Eric.Rortvedt@wisconsin.gov

From: Rortvedt, Eric - DNR

Sent: Friday, January 11, 2008 11:26 AM

To: Schroeder, Tom; 'cnahn@tds.net'

Subject: MS4 SLAMM analysis - 20% TSS control - Village of Maple Bluff

Hi Tom and Chuck,

I have reviewed the SLAMM analysis and summary submitted by the City of Maple Bluff to demonstrate compliance with the 20% TSS control standard for the area served by Maple Bluff's MS4. I have the following comments on the analysis:

1. **MS4 Drainage Area Map** – My understanding is that only portions of the 5 mapped drainage areas flow into the Maple Bluff MS4 and therefore only these partial areas are included in the modeling. However, the submitted map does not depict which areas flow into the permitted MS4. Please revise the map to depict which portions of the drainage areas flow into the MS4 versus those areas which do not drain into the MS4. Please send me a copy of this revised map.
2. **Catch Basin Sump Volumes –** Catch basin cleaning is the treatment device applied to 4 of the 5 drainage areas. A potential concern is that the volume of the sumps for drainage areas 003, 004 and 005 are much larger than typical catch basin sumps. Please confirm that the modeled sizes are correct and adjust the modeling if appropriate.
3. **Swale width and infiltration rate** – Swale treatment is utilized for drainage area 001. The inputted wetted perimeter is 15 feet which is wider than expected. The wetted perimeter is that length that is wet under a 2 inch depth of flow condition (not a channel full condition). Generally, swales have a wetted perimeter no

greater than about 6 feet. Swales with a bottom wider than 6 feet are susceptible to scour/channeling. The infiltration rate for a dynamic infiltration system such as a grassed swale should be calculated as 1/2 the static infiltration rate. The 0.5 inch per hour rate input for the grassed swales seems like it may be the static rate. What type of soil information was used to select the infiltration rate and was ½ the dynamic rate used? Please correct the modeling and summary as appropriate.

Comments for the future analysis to demonstrate 40% TSS control (year 2013):

A. **SLAMM model version** – SLAMM version 8.5 was used to evaluate compliance with the 20% TSS control standard. Using this version is acceptable for determining compliance with the 20% TSS standard.

   Note: The SLAMM model has had a few updates over the past few years, and in particular the model's calculation of street sweeping efficiency has substantially changed. Therefore, a new model run will be required to show compliance with the year 2013 developed urban area standard of 40% TSS. The Department is in the process of revising ch. NR 151, Wis. Adm. Code, and intends to require SLAMM version 9.2 or the use of any subsequent version of SLAMM after 9.2 to demonstrate compliance with meeting the year 2013 TSS control standard of 40%.

B. **SLAMM parameter files** – The 1981 Madison rainfall file was used in the SLAMM analysis. Department policy is to require that the 5 year Madison rainfall file be used MS4 modeling. This policy was established due modeling issues associated with street sweeping/cleaning. However, I don't believe it is necessary to rerun this rainfall file at this time. But, the 5 year Madison rainfall file will be needed in the future model run to show compliance with the 40% TSS standard. The required SLAMM parameter files are listed and available on the USGS web site at: http://wi.water.usgs.gov/slamm/

Please send me the information to address comments 1 through 3 within 30 days or contact me to discuss an alternative timeline.

Thank you for your cooperation. Feel free to contact me if you have any questions.

P Eric S. Rortvedt, P.E.
Water Resources Engineer
South Central Region
Wisconsin Department of Natural Resources
(() **phone:** (608) 273-5612
(() **fax:** (608) 275-3338
(+) **e-mail:** Eric.Rortvedt@wisconsin.gov

Village Response to 1/11/08 e-mail message from WDNR

February 15, 2008

Eric S. Rortvedt, P.E.
Water Resource Engineer
Wisconsin Dept. of Natural Resources
3911 Fish Hatchery Road
Fitchburg WI 53711

Re: SLAMM modeling for Village of Maple Bluff- Additional information as requested in 1/13/08 e-mail message

Dear Mr. Rortvedt,

In your 1/11/08 e-mail, you requested additional information for the Village of Maple Bluff (Village) SLAMM modeling submitted on November 7, 2007 as a requirement of our municipal stormwater permit. The three items in your e-mail are noted below in quotation marks with the village response in bold.

1. **"MS4 Drainage Area Map** – My understanding is that only portions of the 5 mapped drainage areas flow into the Maple Bluff MS4 and therefore only these partial areas are included in the modeling. However, the submitted map does not depict which areas flow into the permitted MS4. Please revise the map to depict which portions of the drainage areas flow into the MS4 versus those areas which do not drain into the MS4. Please send me a copy of this revised map."

A map is enclosed as Attachment #1. All of the lakefront homes, yards and driveways on the lakeside of Farwell, Lakewood, Cambridge, Bayside and Fuller drain directly to the lake and do not drain to the Village MS4. 4-foot contour maps for selected areas of the Village of Maple Bluff are also enclosed as Attachment #1 showing the elevation decrease from the road to the lake.

2. **"Catch Basin Sump Volumes –** Catch basin cleaning is the treatment device applied to 4 of the 5 drainage areas. A potential concern is that the volume of the sumps for drainage areas 003, 004 and 005 are much larger than typical catch basin sumps. Please confirm that the modeled sizes are correct and adjust the modeling if appropriate**."**

The Village staff recently manually measured the sump volumes at drainage areas 003, 004 and 005 and the measured sump depths and areas were used in the SLAMM Model. The table that summarizes the field measurements is enclosed as Attachment #2.

3. **"Swale width and infiltration rate** – Swale treatment is utilized for drainage area 001. The inputted wetted perimeter is 15 feet which is wider than expected. The wetted perimeter is that length that is wet under a 2 inch depth of flow condition (not a channel

full condition). Generally, swales have a wetted perimeter no greater than about 6 feet. Swales with a bottom wider than 6 feet are susceptible to scour/channeling. The infiltration rate for a dynamic infiltration system such as a grassed swale should be calculated as 1/2 the static infiltration rate. The 0.5 inch per hour rate input for the grassed swales seems like it may be the static rate. What type of soil information was used to select the infiltration rate and was ½ the dynamic rate used? Please correct the modeling and summary as appropriate."

Pictures of the swale are enclosed as Attachment #3. The bottom width was measured in the field at 15 feet. No signs of scour/channeling were noted in the field.

The two soils shown in the swale are Pecatonica Silt Loam (PeB) and Batavia Silt Loam (BbB) as shown in the enclosed map also included as Attachment #3. The Dane County Soil Survey lists the permeability of these two soils as follows:

- **Pecatonica Silt Loam- .63-2.0 inches/hour**
- **Batavia Silt Loam- .63-2.0 inches/hour**

Using .5inches/hour as the infiltration rate is below the minimum value listed in these tables. The average tabular value is 1.32 inches/hour which if it is the static rate would still give a dynamic rate of .65 inches/hour. Therefore the use of .5 inches/hour is based on the best available information.

Please contact me if you need any additional information.

Very Truly Yours,

Thomas Schroeder
Village of Maple Bluff
Director of Public Works

CC: Chuck Nahn, Nahn and Associates

Attachments (3)

APPENDIX B -TEXTBOOK RESEARCH FOR PHOSPHORUS REMOVAL RATES FOR LEAF/YARDWASTE PICKUP

The Village of Maple Bluff has an extremely aggressive leaf/yard debris pickup with weekly pickup of the entire Village during the growing season between March 12 and December 2. This pickup schedule has a direct relationship to the phosphorus reduction into the lakes as referenced in two articles in Attachment A. An excerpt from the first article follows:

"For streets with extensive canopy from boulevard trees, P input from tree leaves can be greater than inputs from lawns. The most appropriate source reduction step would be street sweeping, perhaps on several occasions during the fall leaf-fall period, to remove tree leaves before they decompose and release soluble P."

Maple Bluff is almost entirely (over 95%) residential) and has 10 inch-14 inch (25 to 35 cm)DBH maple and oak trees lining all of the streets within the Village . Using Figure 1, each tree contributes .3 kg of phosphorus per year. For the 8.2 miles of city streets, assuming the trees are spaced at 25 feet gives 1731 trees or 519 kg/yr of phosphorus(1145 lbs) which is equivalent to a 20% reduction in TSS).

The second article documents that 25-30% of Total Phosphorus mass comes from leaves . Typically a 2:1 TSS reduction to Total phosphorus reduction is applicable for the Village of Maple Bluff based on our earlier modeling results. Therefore, a 25% reduction in phosphorus would be comparable to a 50% reduction in TSS which exceeds the 40% TSS reduction requirement. Based on research conducted by the UW Limnology Department, Phosphorus is the critical limiting agent related to the health of the Yahara Chain of Lakes.

ATTACHMENT A_ REFERENCES for Phosphorus Reduction Caused by Tree Leaf Removal

Source1

: Stormwater Pollution: Getting at the Source- Stormwater Magazine November-December 2007

The problem with the end-of-pipe approach for stormwater pollution

By Lawrence A Baker

Tree Leaves. Tree leaves are a second source of nutrients to streets. Trees can play an important role in stormwater management, intercepting rainfall and reducing runoff. However, leaf fall from boulevard trees can contribute nutrients to fall-season runoff. In our research, we've estimated the amount of P in leaf fall from several types of trees as a function of diameter at breast height (DBH; Figure 3). The regression line in Figure 3 shows that leaves from a maple with a DBH of 40 centimeters would contribute about 0.3 kilograms of P per year. Table 4 shows P inputs from tree leaves falling onto 1 kilometer of a city street lined on both sides by maple trees, as a function of tree size and spacing.

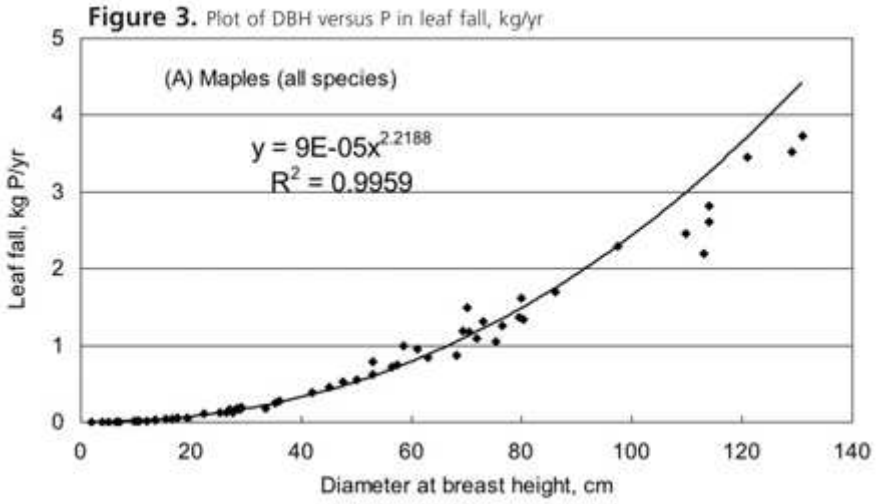


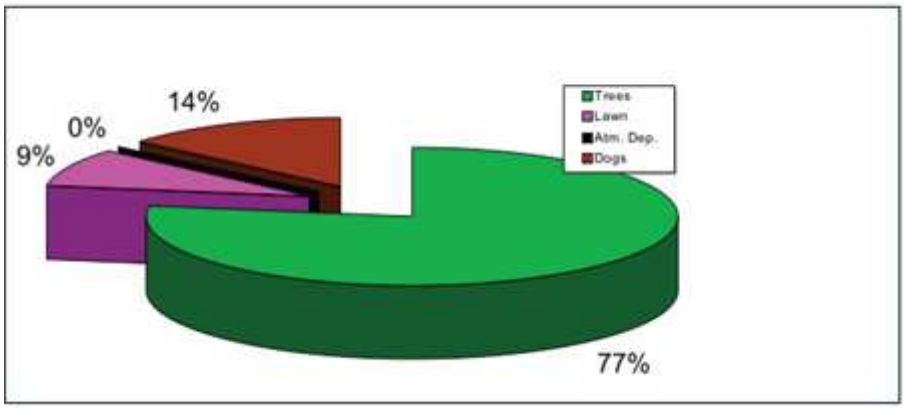
Figure 3. Plot of DBH versus P in leaf fall, kg/yr

For streets with extensive canopy from boulevard trees, P input from tree leaves can be greater than inputs from lawns. The most appropriate source reduction step would be street sweeping, perhaps on several occasions during the fall leaf-fall period, to remove tree leaves before they decompose and release soluble P.

Figure 4 shows a hypothetical scenario for P inputs to 1 kilometer of a tree-lined residential street bordered by 30- by 30-meter lots, with 50% of the lot area contributing to runoff. The example uses a runoff coefficient of 0.1 and a P concentration in lawn runoff of 1.0 milligram per liter. The street is bordered by 30-centimeter DBH maple trees spaced at 10-meter intervals. Sixty percent of the households owned dogs. Dog wastes were not "scooped," and the P delivery ratio was assumed to be 0.1. The P input rate from atmospheric deposition to the street was 0.25 kilogram per hectare-year (Barr 2004). Figure 4 shows that tree leaves would be the largest source of P to the street,

indicating that street sweeping would be an effective P reduction technique for this street. For streets with no boulevard trees, lawn and dog wastes would be the largest contributors.

Figure 4. P inputs to a 1-kilometer tree-lined street



SOURCE 2.(Sources of Phosphorus in Stormwater and Street Dirt from Two Urban Residential Basins in Madison, Wisconsin, 1994–95)
By R.J. Waschbusch1, W.R. Selbig1, and R.T. Bannerman

Abstract ….Street-dirt samples were collected using industrial vacuum equipment. Leaves in these samples were separated out and the remaining sediment was sieved into >250 µm, 250-63 µm, 63-25 µm, <25 µm size fractions and were analyzed for total phosphorus. Approximately 75 percent of the sediment mass resides in the >250 µm size fractions. Less than 5 percent of the mass can be found in the particle sizes less than 63 µm. The >250 µm size fraction also contributed nearly 50 percent of the total-phosphorus mass and the leaf fraction contributed an additional 30 percent. In each particle size, approximately 25 percent of the total-phosphorus mass is derived from leaves or other vegetation.

Summary….

Streets and lawns are the largest contributors of suspended-solids, total-phosphorus, and dissolved phosphorus loads in a residential urban basin. Lawns are the largest contributors of total and dissolved phosphorus; however, streets contributed nearly 40 percent of the basin load, as seen in the Monroe Basin. Streets were found to be the largest source of suspended solids. There was a large difference between geometric mean concentrations of phosphorus in lawn runoff from 1994 to 1995. Phosphorus data collected from lawns in the Harper and Lakeland Basins during 1995 are remarkably similar, which suggests that the phosphorus concentration in lawn runoff is affected by some variable or variables that are not yet understood.
Street-dirt samples indicate that approximately 75 percent of the sediment mass resides in the >250 µm particle-size fraction. Less than 5 percent of the mass can be found in the particle sizes less than 63 µm. The >250 µm particle-size fraction also contributed nearly 50 percent of the total-phosphorus mass, and the leaf fraction contributed an additional 30 percent. In each particle-size fraction, approximately 25 percent of the total-phosphorus mass is derived from leaves or other vegetation

APPENDIX C- OPINION OF PROBABLE COST FOR WET DETENTION BASIN NEAR TENNIS COURTS

Enlarge Tennis Court Depression

CLIENT NAME:	Village of Maple Bluff
PROJECT NAME:	Tennis Court Drainage Analysis
	Option 1: Enlarge Tennis Court Depression
DATE OF ESTIMATE:	March 7, 2009

COST ESTIMATE:

Description:	Units		Unit Price		Estimated Cost
Mobilization, Bonds, Insurance	1	lump sum	$13,260.00		$13,260
Tree Removal	1	lump sum	$2,600.00	lump sum	$2,600
Bulk Excavation	11565	cu. yd.	$5.00	/cu. yd.	$57,825
Trucking and Disposal of Exc. Material	11565	cu. yd.	$15.00	/cu. yd.	$173,475
Topsoil Restoration, Seeding, Fertilizing & Mulching Allowance	5225	sq. yd.	$4.50	/sq. yd.	$23,513
Erosion Matting	1161	sq. yd.	$4.50	/sq. yd.	$5,225
Other Erosion Control	1	lump sum	$2,500.00	lump sum	$2,500
CONSTRUCTION SUBTOTAL					$278,398
Engineering	@ 14	%			$38,976
Contingency	@ 10	%			$27,840
TOTAL					**$345,214**

Important items to note:

1. Tree removal cost is based on visual inspection of aerial photos.
2. Excavation and trucking quantities are based on a preliminary layout of pond boundary. Changes to the final pond layout will effect this quantity.
3. It is assumed that the pond sideslopes will be grass surface, and NOT rip-rap. Rip-rap would add significant cost.
4. Grass restoration is shown as included, but may be provided by MBCC crews.