

# Stormwater Management Plan City of La Crosse, Wisconsin

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## LIST OF ABBREVIATIONS

$t_c$	concentration
EPA	United States Environmental Protection Agency
GIS	Geographic Information System
H&H	hydrologic and hydraulic
HSD	Hydrodynamic Separation Device
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
TSS	Total Suspended Solids
WDNR	Wisconsin Department of Natural Resources
WinSLAMM	Source Loading and Management Model for Windows
WNV	West Nile Virus
WPDES	Wisconsin Pollutant Discharge Elimination System
XP-SWMM	XP Software's Stormwater & Wastewater Management Model

## 1.0 INTRODUCTION

The City of La Crosse contracted with Earth Tech AECOM in June of 2005 to assist in the development of a Stormwater Management Plan for the City. The City received a grant from the Wisconsin Department of Natural Resources (WDNR) to fund portions of this study. Because of the grant program's provisions, portions of the plan dealing with stormwater infrastructure capacity issues are funded solely through City revenue. The remainder of the project is funded at a ratio of 65 percent WDNR and 35 percent local funding with a maximum state assistance of \$80,000.

The project has two goals. The first is to provide a mechanism for La Crosse to comply with the City's General Wisconsin Pollutant Discharge Elimination System (WPDES) Municipal Separate Storm Sewer System (MS4) permit. The second is to perform a limited hydraulic analysis of the City's storm sewer conveyance system. The project scope included 10 tasks:

1. Project Management and Project Meetings
2. Inventory and Collection of Existing Data, Records, Maps and Reports
3. Modeling Base Work
4. Pollution Loading Analysis
5. Evaluate and Document Municipal Operations
6. Stormwater Management Plan
7. Provide Geographic Information System (GIS) Technical Assistance
8. Evaluating a Proposed Stormwater Utility Rate Structure
9. Review City Ordinance Recommendations
10. Limited Hydrologic and Hydraulic Analysis

The purpose of this report is to document the process and results of the project.

The plan includes a citywide stormwater pollution analysis for three conditions:

1. A "no controls" condition which reflects the stormwater pollution generated from the City of La Crosse under the land use as of October 1, 2004, and **not** accounting for the pollution management measures that the City currently employs.
2. The existing condition which reflects the stormwater pollution produced under the "no controls" condition, while accounting for the stormwater pollution management activities currently employed by the City.
3. A future stormwater pollution condition accounting for the current stormwater management practices, and the recommended additional practices as described in Chapter 5 of this document.

The stormwater capacity analysis portion of the plan consists of two parts, both of which included a hydrologic and hydraulic analysis of the storm sewer pipes 36-inch diameter and larger. The grant-eligible portion analyzes the system capacity for the 2-year, 24-hour storm. The non grant-eligible section addresses the 10-year and 100-year, 24- hour storms.

Additionally, the plan includes an information and education plan that addresses three local stormwater related ordinances also identified in the NR 216 requirements. Finally, there is a Plan Implementation chapter which provides an overview of the responsible parties, financing, and schedule for the proposed stormwater management practices.

## 2.0 PROJECT SETTING

### 2.1 OVERVIEW

The City of La Crosse is located on the east shore of the Mississippi River in southwestern Wisconsin. The confluences of the Black, Mississippi Rivers, and La Crosse Rivers are located within the city limits. La Crosse's 2000 population is reported at 51,818. The La Crosse metropolitan area has been identified as an "Urbanized Area" by the US Census Bureau. As a result, the City and neighboring communities are subject to stormwater management regulations as defined in Chapter NR 216 of the Wisconsin Administrative Code.

### 2.2 WISCONSIN STORMWATER REGULATORY PROGRAM

The WDNR administers the state municipal stormwater management program under Chapter NR 216 of the State Administrative Code. WDNR issued the General WDPES Permit (included in Appendix A) for Municipal Separate Storm Sewer Systems on January 19, 2006. This General Permit applies to over 200 communities in Wisconsin; WDNR issued letters to each municipality authorizing them under the General Permit. Two groups of communities are covered by the permit program. One includes all municipal governments that are part of an Urbanized Area; these are identified by the US Census Bureau, and consist of contiguous areas with a population over 50,000 and a population density of at least 1,000 people per square mile. The second group of communities includes those with a population of at least 10,000 people. The La Crosse metropolitan area has been identified by the Census Bureau as an Urbanized Area.

Seven minimum standards will be required of the City relative to stormwater management. To comply with the minimum standards, the City must develop and implement the following programs:

1. Public education and outreach program.

La Crosse will be required to implement a public education and outreach program. The purpose of this program is to increase awareness of stormwater pollution impacts on waters of the state and to encourage changes in public behavior which will reduce these impacts.

2. Public involvement and participation program.

The public involvement in participation component of the permit requirements includes a program to notify the public of activities required by the WDPES permit and compliance with applicable state and local public notice requirements.

3. Illicit discharge detection and elimination (program and ordinance).

La Crosse will develop, implement, and enforce a program to prevent and eliminate illicit discharges and connections to the MS4. Requirements of this program include adoption of an ordinance, establishing an inspection and enforcement authority, and establishing a dry weather field screening program.

4. Construction site pollutant control (ordinance).

This component of the WPDES permit will require La Crosse to adopt and enforce a construction site pollution control ordinance. Appendix A of Chapter NR 152 of the Wisconsin administrative code contains an example construction site pollution control ordinance.

5. Post-construction site stormwater management (ordinance).

An additional requirement of the WPDES permit is to develop, implement, and enforce a program to require control of the quality of stormwater discharges from areas of new development and redevelopment. Appendix B. of chapter NR 152 of the Wisconsin administrative code contains an example Post-Construction Stormwater Management Ordinance.

6. Pollution prevention (reduce stormwater pollution from municipal operations, and the city-wide storm sewer system).

Permitted communities are required to develop and implement a pollution prevention program for stormwater related municipal activities. This includes inspection and maintenance of municipally-owned or operated stormwater management facilities, street sweeping and catch basin cleaning, proper management of leaf and grass clippings and other programs.

7. Stormwater quality management.

La Crosse is also required to achieve a 20 percent reduction in Total Suspended Solids (TSS) loadings by November of 2008 and a 40 percent reduction by March 10, 2013. The actual language in the permit is as follows:

- To the maximum extent practicable, implementation of storm water management practices necessary to achieve a 20 percent reduction in the annual average mass of total suspended solids discharging from the MS4 to surface waters of the state as compared to implementing no stormwater management controls

The definitions portion of the permit defines maximum extent practicable as follows:

- A level of implementing management practices in order to achieve a performance standard or other goal which takes into account the best available technology, cost effectiveness and other competing issues such as human safety and welfare, endangered and threatened resources, historic properties and geographic features.



### 3.0 MODELING BASE WORK

#### 3.1 DEFINING THE PROJECT AREA

The project area for purposes of the stormwater pollution computer modeling analysis is based on the regulatory requirements of NR 216, and the policy memo developed by the WDNR (see Appendix B for the WDNR policy memo). The project area for the nonpoint source pollution analysis includes:

1. Any developed area that was not subject to the post-construction performance standards of NR 151 that went into effect October 1, 2004, and that drains to the stormwater conveyance system. The conveyance system includes the city-owned or managed stormwater pipes, ditches, streets, gutters, stormwater ponds, detention areas, or other constructed systems for conveying stormwater runoff to a lake, river, or wetland.
2. Any area covered by a Notice of Intent (NOI) submitted prior to October 1, 2004, where development is still underway.
3. Undeveloped (in-fill) areas under 5 acres. These areas are required to be modeled as fully developed, with a land use similar to surrounding areas.
4. Non-manufacturing areas of industrial facilities covered under an NR 216 industrial permit.
5. Any industry that has certified a condition of “no exposure” in accordance with Section NR 216.21(3).
6. Any developed area where it is already established that the area will be annexed by La Crosse prior to March 10, 2008.

Within the City, certain lands were excluded from the stormwater pollution analysis, because these areas are not regulated by NR 216, or these areas are regulated under their own individual NR 216 permit. The areas excluded from the pollution analysis include:

1. Riparian lands that discharge stormwater runoff to a river, lake or wetland without entering into the City’s stormwater conveyance system.
2. Lands owned by La Crosse County (La Crosse County will receive a separate NR 216 permit).
3. Industrial areas already regulated under NR 216.
4. Undeveloped land parcels over 5 acres within the City.
5. Lands within the City zoned agriculture and under agricultural condition as of October 1, 2004.

Figure 3-1 depicts the project area for the stormwater pollution analysis purposes.

The project area was divided into 212 subbasins by Earth Tech AECOM with assistance from City staff. Stormwater from the City discharges to the Mississippi, La Crosse, and Black Rivers.

## **3.2 LAND USE**

### **3.2.1 General Background**

The type and distribution of land use has a major impact on the hydrology and nonpoint source pollution within a watershed. The volume and rate of stormwater runoff increases with the percentage of impervious surfaces (streets, parking lots, roofs, etc.) in an area. As development occurs, the impervious area generally increases significantly. Land use also plays an important role in determining the types and amounts of pollutants that are contained within runoff.

Highly urbanized commercial and industrial areas usually contain a large percentage of impervious area, and also generate high amounts of a variety of nonpoint source pollutants, including sediment, nutrients, bacteria, metals, and toxic substances. Less intensive development, such as low to medium density residential development, contains a moderate amount of impervious area and generates lower levels of most pollutants. Agricultural areas may generate high amounts of sediment and nutrients, but usually generate very low levels of metals.

### **3.2.2 Data Sources and Methods**

A map of existing land use, as of October 01, 2004, was developed from several sources. Land use data developed by the University of Wisconsin - La Crosse for La Crosse was used as a starting point. This dataset was developed by the University of Wisconsin - La Crosse researchers driving the county and assigning appropriate land use based on visual observations. Earth Tech AECOM viewed this data, overlaid on an aerial photograph of the City, and adjusted the land use data to match the aerial photo where appropriate. City staff reviewed the land use prior to the Earth Tech AECOM performing the Source Load and Management Model (SLAMM) modeling. SLAMM land use codes have been developed specifically for modeling stormwater pollutant loadings. Therefore they do not necessarily coincide with the zoning or other land use naming conventions developed by municipalities. Following is a description of land use codes utilized in modeling for this project:

#### **1. Residential Land Uses**

- High Density Residential without Alleys (HDRNA): Urban single family housing at a density of greater than 6 units/acre. Includes house, driveway, yards, sidewalks, and streets.
- High Density Residential with Alleys (HDRWA): Same as HDRNA, except alleys exist behind the houses.
- Medium Density Residential without Alleys (MDRNA): Same as HDRNA except the density is from 2 to 6 units/acre.

- Medium Density Residential with Alleys (MDRWA): Same as HDRWA, except alleys exist behind the houses.
- Low Density Residential (LDR): Same as HDRNA except the density is 0.7 to 2 units/acre.
- Duplexes (DUP): Housing having two separate units in a single building.
- Multiple Family Residential (MFRNA): Housing for three or more families, from 1 to 3 stories in height. Units may be adjoined up-and-down, side-by-side; or front-and-rear. Includes building, yard, parking lot, and driveways. Does not include alleys.
- High Rise Residential (HRR): Same MFRNA except buildings are High Rise Apartments; multiple family units 4 or more stories in height.
- Mobile Home Park (MOBH): A mobile home or trailer park, includes all vehicle homes, the yard, driveway, and office area.
- Suburban (SUB): Same as HDRNA except the density is between 0.2 and 0.6 units/acre.

## 2. Commercial Land Uses

- Strip Commercial (SCOM): Those buildings for which the primary function involves the sale of goods or services. This category includes some institutional lands found in commercial strips, such as post offices, courthouses, and fire and police stations. This category does not include buildings used for the manufacture of goods or warehouses. This land use includes the buildings, parking lots, and streets. This land use does not include nursery, tree farms, vehicle service areas, or lumber yards.
- Shopping Centers (SHOP): Commercial areas where the related parking lot is at least 2.5 times the area of the building roof area. Parking areas usually surround the buildings in this land use. This land use includes the buildings, parking lot, and streets.
- Office Parks (OFPK): Land use where non-retail business takes place. The buildings are usually multi-storied buildings surrounded by larger areas of lawn and other landscaping. This land use includes the buildings, lawn, and road areas. Types of establishments that may be in this category include: insurance offices, government buildings, and company headquarters.
- Commercial Downtown (CDT): Multi-story high-density area with minimal pervious area, and with retail, residential and office uses.

3. Industrial Land Uses

- Medium Industrial (MI): This category includes businesses such as lumber yards, auto salvage yards, junk yards, grain elevators, agricultural coops, oil tank farms, coal and salt storage areas, slaughter houses, and areas for bulk storage of fertilizers.
- Light Industrial (LI): Those buildings that are used for the storage and/or distribution of goods waiting further processing or sale to retailers. This category mostly includes warehouses and wholesalers where all operations are conducted indoors, but with truck loading and transfer operations conducted outside.

4. Institutional Land Uses

- Education (SCH): Includes any public or private primary, secondary, or college educational institutional grounds. Includes buildings, playgrounds, athletic fields, roads, parking lots, and lawn areas.
- Miscellaneous Institutional (INST): Churches and large areas of institutional property not part of CST and CDT.
- Hospital (HOSP): Multi-story building surrounded by parking lots and some vegetated areas.

5. Other Urban Land Uses

- Parks (PARK): Outdoor recreational areas including municipal playgrounds, botanical gardens, arboretums, golf courses, and natural areas.
- Undeveloped (OSUD): Lands that are private or publicly owned with no structures and have a complete vegetative cover. This includes vacant lots, urban fringe areas slated for development, greenways, and forest areas.
- Cemetery (CEM): This land use file covers cemeteries, and includes road frontage along the cemetery, and paved areas and buildings within the cemetery.

6. Freeway Land Uses

- Freeways (FREE): Limited access highways and the interchange areas, including any vegetated rights-of-ways.

Table 3-1 summarizes the existing land use.

Figure 3-2 depicts land use conditions used for the pollution loading analysis.

TABLE 3-1 EXISTING LAND USE SUMMARY (Conditions as of October 1, 2004)		
Land Use	Area (acres)	Percent of Total
<b>Commercial</b>	<b>724</b>	<b>11.3%</b>
Downtown	199	3.1%
Office Park	43	0.7%
Shopping Center	112	1.7%
Strip Mall	370	5.8%
<b>Industrial</b>	<b>873</b>	<b>13.6%</b>
Light Industrial	486	7.6%
Medium Industrial	388	6.1%
<b>Institutional</b>	<b>542</b>	<b>8.5%</b>
Hospital	165	2.6%
Miscellaneous Institutional	164	2.6%
School	213	3.3%
<b>Open</b>	<b>595</b>	<b>9.3%</b>
Airport	224	3.5%
Cemetery	72	1.1%
Park	270	4.2%
Undeveloped	29	0.4%
<b>Residential</b>	<b>3,668</b>	<b>57.3%</b>
Duplex	59	0.9%
High Density	1,599	25.0%
High Rise Residential	4	0.1%
Low Density	176	2.7%
Medium Density	1,550	24.2%
Mobile Home	11	0.2%
Multi-Family	255	4.0%
Suburban	14	0.2%
<b>Total</b>	<b>6,403</b>	<b>100.0%</b>

### 3.3 PRECIPITATION

Precipitation data is used in both the nonpoint source pollution model, SLAMM, and the hydrology and hydraulic model, XP software's Storm Water Management Model (SWMM). When modeling nonpoint source pollutant loadings, cumulative amounts over a long period of time are more important than the pollutant amounts from individual or design rainfall storm

events. Therefore, modeling simulations are performed with rainfall records of a longer duration. For this management plan, pollutant loads were estimated for a five-year period to determine an average annual load. The WDNR requires input rainfall files to be chosen from a collection of specific data sets; the set geographically closest to La Crosse and therefore the set used for this project, is from the City of Madison, Wisconsin. The rainfall data used is for the years 1980 through 1984.

The project scope called for the hydrologic and hydraulic (H&H) analysis to use precipitation events from the United States Department of Agriculture-Soil Conservation Service Technical Release – 55, “Urban Hydrology for Small Watersheds”, (TR-55). Modeled events included the 2-, 10-, and 100-hour storms. The events are summarized in the following table:

Recurrence Interval	24-Hour Precipitation Depth
2	3.0
10	4.3
100	6.1

### 3.4 SOILS

Soil properties influence the volume and rate of runoff generated from rainfall events, as well as the level of suspended solids pollution contained in the runoff. Soils that allow rainfall to freely drain into the ground will result in lower runoff rates and volumes. Soils that restrict the drainage of rainfall into the ground will cause higher runoff rates and volumes. The U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS) classifies soils based on their runoff potential into hydrologic Groups A, B, C, or D.

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 inches/hour).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15 to 0.30 inches/hour).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05 to 0.15 inches/hour).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0 to 0.05 inches/hour).

According to the NRCS Soil Survey, the project area primarily consists of Group A and B soils. The NRCS Soil Surveys were developed to summarize soil characteristics, actual soils can vary depending upon location. Figure 3-3 displays the distribution of Hydrologic Soil Groups across the project area.

## 4.0 NONPOINT SOURCE POLLUTION ANALYSIS

Nonpoint source pollution is defined as the contamination of surface water and groundwater by sediment, nutrients, organic compounds, pathogens, and heavy metals found in the runoff from urban or rural areas. Nonpoint source pollution can have a significant negative impact on receiving waters, often exceeding the impact of point-source discharges (factories, wastewater treatment plants, etc.) typically associated with water pollution. Therefore, an assessment of nonpoint source pollution is an important part of watershed planning. In addition, the City of La Crosse WPDES permit requires nonpoint pollution analysis; this study provides information required to comply with that permit.

### 4.1 METHODOLOGY

To estimate surface water nonpoint source pollution loads for La Crosse, the SLAMM, version 9.2.5 was used. SLAMM is the most widely used model to assess urban nonpoint source pollution loads in Wisconsin.

The project area was determined based on WDNR guidelines. The project area began with all lands within the municipal boundary. Riparian properties and properties owned by other permitted entities were removed. Riparian areas were delineated by Earth Tech AECOM staff and then reviewed by City staff. Examples of other permitted properties include the WisDOT State Trunk Highway (see Appendix C), County of La Crosse properties, Tier 1 Industries, and Tier 2 Industries. A list of Tier 1 and Tier 2 properties was obtained from the WDNR and referenced through the GIS database created for the project. The County of La Crosse properties were obtained from the assessor's database.

The GIS database created contains information for each subbasin delineated within the project area. This database includes data on land use, soil conditions, surface drainage conditions, and existing and proposed stormwater management practices.

WinSLAMM requires input files that describe characteristics of the project area. The model uses rainfall records to calculate runoff and pollution loads for selected parameters. Multiple rainfall files are available for the State of Wisconsin, and the WDNR requirement is to use the rainfall file from the location nearest the project area. The rainfall data for the City of Madison for the years 1980 through 1984 was used for this application. The years of rainfall have been determined by the WDNR and others to represent a "typical" series of rainfalls in the area and are generally used for WinSLAMM analysis in south and southwestern Wisconsin.

WinSLAMM also requires support files containing data describing typical runoff volumes, solids concentrations from source areas, solids retainage in the drainage system, pollutant concentrations based on solids loads or runoff volumes, and typical particle size distributions. The United States Geological Survey (USGS) and WDNR have developed versions of these files for use in Wisconsin based on extensive data collection and calibration. The latest versions of these WinSLAMM files were obtained from the USGS and used for this project. The files used were:

- ☛ WISREG – MADISON FIVE YEAR RAINFALL.RAN
- ☛ WI\_GEO01.PPD

- ☛ WI\_SL01.RSV
- ☛ WI\_AVG01.PSC
- ☛ WI\_DLV01.PRR
- ☛ WI\_STR04.STD

WinSLAMM calculated loadings for each land use and subbasin. The pollutants analyzed for this project were suspended sediment, total phosphorus, and total lead.

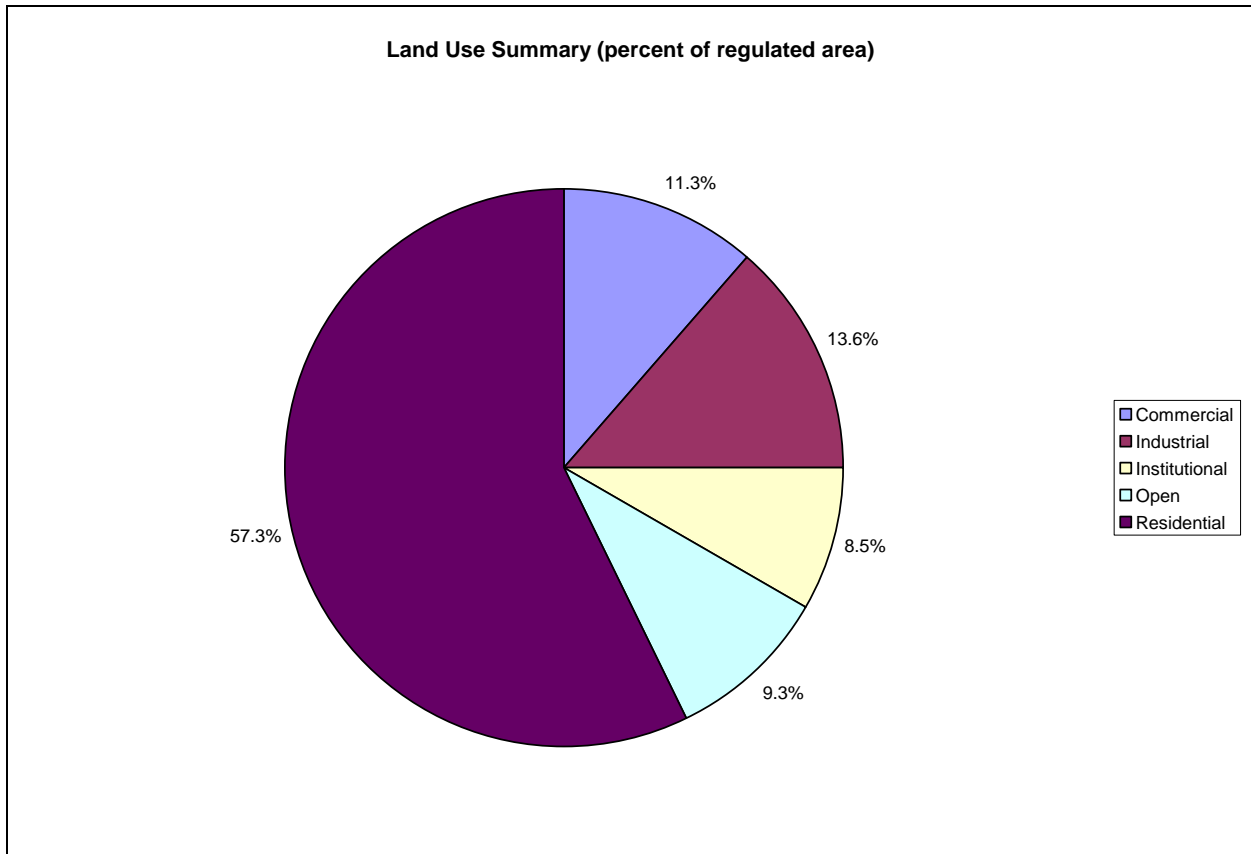
## 4.2 BASE CONDITIONS

The WPDES permit requires La Crosse to reduce urban TSS loads by 20 percent by November 2008 and by 40 percent by the year 2013. These reductions are calculated against a baseline condition, defined as the October 1, 2004, land use with no stormwater best management practices (BMPs). The City's base load is 1,125.3 tons per year. Table 4-1 summarizes the City's no-controls (or base) nonpoint-point source pollution load by land use. Figure 4-1 summarizes the areas of land use categories in the regulated area of the City. Figure 4-2 graphically presents the existing condition TSS loadings summarized by the same land use categories. Appendix D contains a list of the base pollution load for each subbasin.

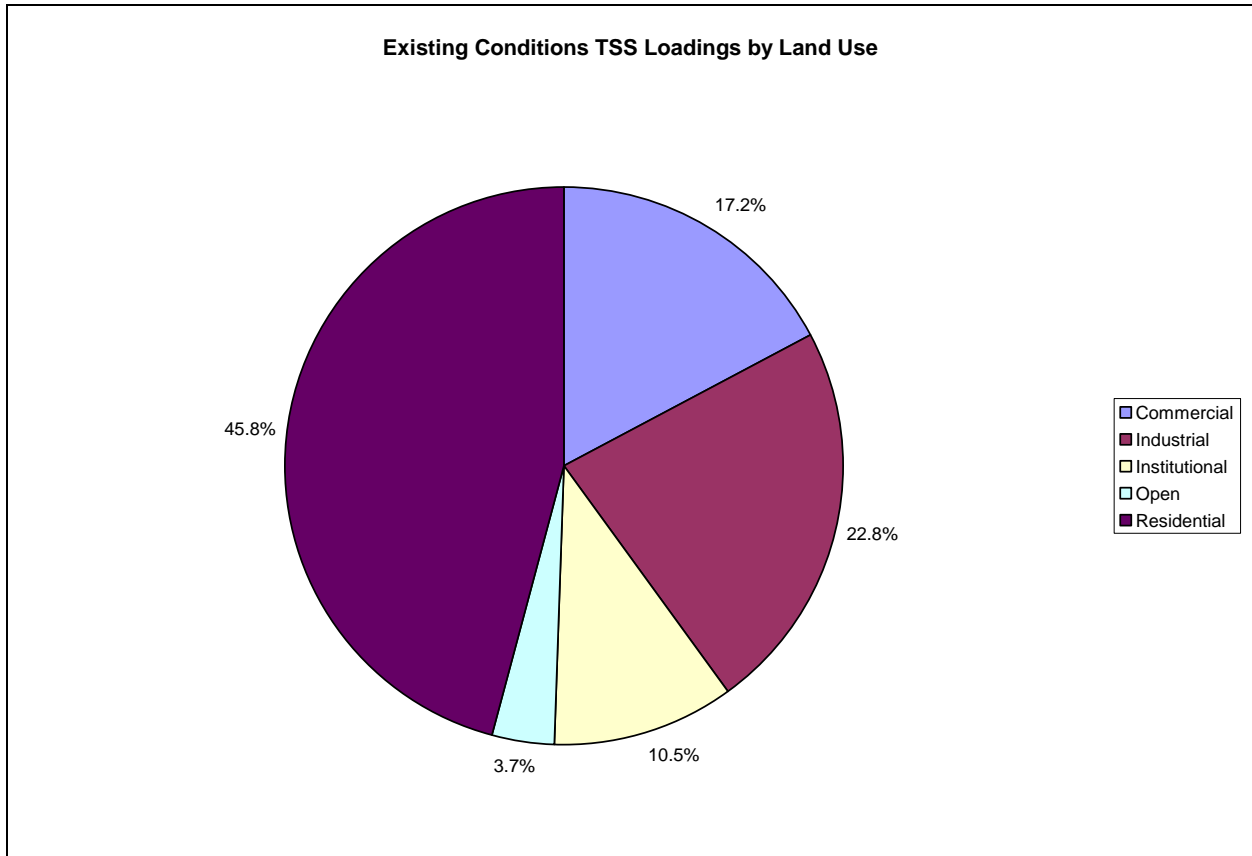
TABLE 4-1 NO-CONTROLS AND EXISTING CONDITIONS TSS LOADINGS BY LAND USE				
Land Use	No Controls		Existing Conditions	
	tons/TSS/yr	(%)	tons/TSS/yr	(%)
<b>Commercial</b>	<b>192.2</b>	<b>17.1%</b>	<b>165.0</b>	<b>17.2%</b>
Downtown	45.5	4.0%	39.3	4.1%
Office Park	10.0	0.9%	8.7	0.9%
Shopping Center	27.0	2.4%	23.5	2.4%
Strip Mall	109.7	9.7%	93.5	9.7%
<b>Industrial</b>	<b>262.8</b>	<b>23.4%</b>	<b>218.5</b>	<b>22.8%</b>
Light Industrial	152.1	13.5%	125.4	13.1%
Medium Industrial	110.8	9.8%	93.0	9.7%
<b>Institutional</b>	<b>118.1</b>	<b>10.5%</b>	<b>100.6</b>	<b>10.5%</b>
Hospital	36.7	3.3%	31.4	3.3%
Miscellaneous Institutional	38.0	3.4%	32.4	3.4%
School	43.4	3.9%	36.9	3.8%
<b>Open</b>	<b>37.4</b>	<b>3.3%</b>	<b>35.4</b>	<b>3.7%</b>
Airport	11.4	1.0%	11.4	1.2%
Cemetery	5.4	0.5%	5.0	0.5%
Park	19.8	1.8%	18.4	1.9%
Undeveloped	0.7	0.1%	0.7	0.1%



TABLE 4-1 (cont.)				
Residential	514.7	45.7%	439.2	45.8%
Duplex	7.3	0.6%	6.0	0.6%
High Density	260.2	23.1%	220.9	23.0%
High Rise Residential	0.8	0.1%	0.7	0.1%
Low Density	15.9	1.4%	13.8	1.4%
Medium Density	188.6	16.8%	160.6	16.8%
Mobile Home	1.4	0.1%	1.3	0.1%
Multi-Family	39.5	3.5%	35.0	3.7%
Suburban	0.9	0.1%	0.8	0.1%
<b>Totals</b>	<b>1,125.3</b>	<b>100.0%</b>	<b>958.7</b>	<b>100.0%</b>



**FIGURE 4-1 - LAND USE BY PERCENTAGE**



**FIGURE 4-2 - POLLUTION LOAD BY LAND USE**

### 4.3 EXISTING CONDITIONS

The next step following the calculation of the no-controls conditions loadings is to insert existing management practices into the model and calculate the existing conditions loadings. This establishes how close a community is to meeting WPDES permit requirements and provides a starting point for adding BMPs to meet these requirements.

Table 4-2 summarizes the effectiveness of the existing BMPs. Under existing conditions, the City does not receive credit for TSS removal from any wet detention ponds. The only two wet detention ponds constructed according to the WDNR's Wet Detention Pond Code 1001 are privately owned; for the City to count their TSS removal towards the City's permit requirements, the City needs to obtain a written agreement from the pond owners guaranteeing future maintenance of the structure.

Treatment Obtained from Existing BMPs	TSS Removed (tons/yr)	Percent
Catch Basin Cleaning	144	13%
Swales	12	1%
WWTP	7	0.6%
<b>Total</b>	<b>163</b>	<b>15%</b>

Currently, due to limitations of the approved TSS loading models, WDNR policy is that either catch basin cleaning or street cleaning is allowed as a practice, but both cannot be applied to the same area. Earth Tech AECOM calculated the efficiency of each available BMP for each polygon within the City and selected the most efficient. Under existing conditions, the treatment efficiency of the City's catch basin cleaning program exceeded the benefit of the street cleaning program for all areas. As a result, street cleaning does not appear in Table 4-2. Appendix E contains a list of the existing pollution load for each subbasin.

#### **4.4 PROPOSED BMPS**

Once the base load and existing conditions were established, Earth Tech AECOM began identifying BMPs required to reach the reduction goals. Complying with the 20 percent reduction goal requires removing 225.6 tons of sediment from the baseline 1,125.3 tons. To reach the goal of 40 percent reduction, the City has to reduce its load by 451.2 tons to a total load of 674.1 tons per year. Based on the City's existing practices, they are already reducing the total load by 166.6 tons, or 15 percent.

The first BMP Earth Tech AECOM added was to replace one of the mechanical broom sweepers with a vacuum sweeper and use it for the downtown area, which is swept twice weekly. After discussion with City staff, the vacuum sweepers were not extended to the rest of the City due to cost and noise concerns. The vacuum sweepers are much louder than the mechanical broom sweepers. This is not a concern in the downtown area, as the vacuum street cleaners can be used at night downtown. Using the louder equipment in residential areas would likely not be as acceptable.

Cost is another concern with expanding the vacuum cleaning program. One vacuum cleaner is sufficient to cover the downtown area, but more machines would need to be acquired to cover the rest of the City. The City intends to continue using the mechanical broom sweepers to remove debris and trash from streets; covering the entire City with vacuum sweepers would require expanding the size of the fleet and maintaining multiple vacuum sweepers and multiple mechanical broom sweepers.

To facilitate selection of potential structural BMP locations, Earth Tech AECOM plotted the existing conditions pollutant loading rate density (lbs TSS/acre/year) as a color coded layer over the City aerial photo (Figure 4-3). The City staff worked with Earth Tech AECOM to utilize this mapping to locate possible BMPs. Potential BMPs included new wet detention ponds, conversion of existing dry detention ponds to wet detention ponds, and improvement of existing wet detention ponds that were not designed to WDNR's Wet Detention Pond Code 1001 standards.

Additional potential structural BMPs include swales, biofiltration structures, and Hydrodynamic Separation Devices. Additional information on these types of BMPs is included in Chapter 7.

Filtration units designed to treat small areas are also currently entering the collection of available BMP options. The filters are potentially capable of TSS treatment rates in excess of 90 percent when properly sized, installed and maintained.

WinSLAMM currently does not contain a module for filtration units or Hydrodynamic Separation Devices (HSDs), and the WDNR has not issued a technical memorandum regarding use of

filtration units. Increases in WinSLAMM capabilities, and acceptance by WDNR of TSS treatment efficiencies for both HSDs and filters, will potentially increase the cost effectiveness of selecting either of these BMPs.

As this is a planning level study, it did not evaluate site-specific evaluation of BMPs used to treat small areas, such as HSDs and filters. La Crosse should continue to seek opportunities to implement these BMPs in conjunction with street reconstruction, storm sewer improvement and other CIB projects. The installation cost of these units drops significantly if they are incorporated into other construction projects, enough that the cost-benefit equation could potentially tip from not doing the project as a stand-alone installation to doing the project in tandem with other construction.

Proposed structural BMP options were evaluated for feasibility, cost effectiveness, and other criteria. Examples of selection criteria include land availability, public acceptability, and potential for preexisting environmental contamination. Land acquisition costs are a significant component of the cost of installing large structural BMPs; predicting these costs is difficult due to factors including land use, current market conditions, owner cooperation and others. Rather than ignore the land acquisition cost, or attempt to forecast current market values for required land purchases, Earth Tech AECOM, with the approval of city staff, set the land acquisition cost equal to construction cost for proposed structural BMPs. Previous experience in other communities has been that the cost of acquiring the land for a structural BMP can approach the construction cost of the BMP.

These evaluations are at a planning-level of detail; decisions concerning environmental contamination and public acceptability included input from City staff. Aerial photographs were used for locating potential BMPs, but record drawings or other design-level data sources were excluded.

Earth Tech AECOM and City staff initially met several times to identify potential BMPs. Following each meeting, Earth Tech AECOM updated the City-wide pollutant loading model to reflect the additional BMPs. Assumed treatment efficiencies for each type of BMP are summarized below:

BMP Type	Assumed TSS Removal Rate (percent)
Wet Detention Pond	80
Swale	50
Biofiltration	80
HSD	15

Earth Tech AECOM chose the 15 percent treatment level for HSDs based on an analysis of placing one 8-foot diameter device for every five acres of Shopping Center land use. Similar analysis was performed for 6-, 8-, and 10-foot diameter devices for a sampling of other land uses, with resulting TSS treatment rates ranging from 12 to 31 percent. Because treatment efficiencies vary with device size and installation density, Earth Tech AECOM used the 15 percent figure throughout the City. This treatment rate was selected because it is considered conservative enough to be a responsible figure, yet achievable with what is currently known about manufactured underground treatment devices.

Ultimately, City staff and Earth Tech AECOM identified a collection of apparent placement opportunities for structural BMPs. Construction of all these BMPs, in conjunction with using a vacuum street cleaner twice weekly in the downtown area, would raise La Crosse's TSS treatment rate to 36.7 percent. Earth Tech AECOM then analyzed the remaining areas in the City to determine what additional acreage would need to be treated with BMP locations to be determined at a future time. The results of this analysis point to La Crosse probably not being able to attain the 40 percent TSS reduction required under the WPDES permit. After existing and proposed BMPs are accounted for, there are 3,066 acres in the City's regulated area that are treated at less than 15 percent efficiency (installing HSDs in areas currently treated at 15 percent or higher would not provide any benefit). If all 3,066 acres were raised to a treatment level of 15 percent, an additional 9.3 tons per year of TSS would be removed, for a total reduction rate of 37.6 percent. In other words, installing HSDs to treat 4.8 square miles of the City would raise La Crosse's TSS treatment rate by 0.9 percent, and still not reach the 40 percent level required by the WPDES permit.

The analyzed BMPs can be found in Appendix F.

The final alternatives were ordered not only based on pollution loading effectiveness and cost, but also using criteria such as open space availability, land ownership, and expected public acceptability. Appendix F also contains the evaluation matrix used to order the alternatives.

The City has reviewed each alternative and provided comments. City comments were included in the final ordering.

Figure 4-4 depicts the City's future Capital Improvement Projects overlaid over existing pollutant loading rates; this document will be used to prioritize inclusion of small-scale BMPs with other construction projects. Figure 4-5 depicts the BMPs identified by Earth Tech AECOM. Figure 4-6 is the City's Storm Sewer System Map required for WPDES permitting purposes.

#### **4.5 CONCLUSIONS**

To meet the goal of 20 percent reduction by the year 2008, the City needs to convert three existing dry ponds to wet ponds and use a vacuum sweeper in the downtown sweeping zone.

Section 5.11 of the WPDES permit defines Maximum Extent Practicable as a level of implementing management practices in order to achieve a performance standard or other goal which takes into account the best available technology, cost effectiveness, and other competing issues such as human safety and welfare, endangered and threatened resources, historic properties and geographic features. Given that treating 3,066 acres at a density of one HSD per 5 acres would require 614 devices, and installation of an 8-foot diameter HSD costs up to \$30,000 when not part of street reconstruction, the total cost to raise City-wide treatment by 0.8 percent would be on the order of \$20 million in capital construction costs. Because the MEP definition addresses cost-effectiveness, Earth Tech AECOM and the City of La Crosse conclude that attaining 40 percent TSS treatment is not achievable under the MEP.

## 5.0 LIMITED HYDROLOGIC AND HYDRAULIC ANALYSIS

### 5.1 BACKGROUND

La Crosse has suffered from significant street flooding from intense precipitation events. The City is also faced with locating multiple BMPs to comply with the State WPDES permit for MS4s. Both of these factors motivate the limited hydrologic and hydraulic analysis performed as part of this project. Potential sites for future BMPs require stormwater conveyance systems capable of delivering water quality events to the site location. The WDNR recognizes the 2-year storm as the water quality event. The portion of this project funded by the WDNR grant, as defined in Section 1.0, includes hydrologic and hydraulic analysis of the 2-year, 24-hour design storm event.

### 5.2 OBJECTIVES

The scope of modeling is limited to pipes with a diameter of 36 inches or larger. The results of the modeling provided output including the peak flow, volume of runoff, energy grade lines, and locations where surface flooding may occur under design storm conditions. The objective of the second portion of the hydrologic and hydraulic analysis, which is not eligible for a WDNR funding, is to determine the peak flow and runoff volumes for each analyzed area for the 10- and 100-year, 24-hour, design storm events.

### 5.3 METHODS

Earth Tech AECOM used the XP-SWMM software modeling program to perform the hydrologic hydraulic analysis. The methodology described by Urban Hydrology for Small Watersheds, Soil Conservation Service, United States Department of Agriculture Technical Release 55, (TR-55) was used throughout the hydrologic and hydraulic analysis. Delineation of drainage basins, soil conditions, and assignment of land uses were described in detail in Section 3, Modeling Base Work.

XP-SWMM has two modules that were utilized during the study. The runoff module performs hydrology calculations, analyzing rainfall and determining runoff for drainage basins. The hydraulic module routes results from the runoff module through drainage network and models system performance. Inputs for the runoff module include drainage basins, times of concentration, and curve numbers. The time of concentration represents the time it takes for water to flow from the hydraulically most remote point of a watershed to the point it enters the modeled system. It is dependent upon the length of flow, gradient, and surface over which the water is flowing. The time of concentration determines the temporal relationship between rainfall and runoff.

This project only included pipes of 36 inches and greater in the hydraulic model; there are potentially sites within the City that experience street flooding due to insufficient capacity in smaller pipes. In these cases, increasing the capacity of the 36 inch and larger pipes may not relieve the localized street flooding. Before La Crosse spends resources on upsizing pipes 36 inch or larger to alleviate localized street flooding, the City should model the smaller pipes in the area of concern to determine if their capacity is the cause of the flooding, and whether or not the smaller pipes need to be upsized in conjunction with larger system pipes.

Curve numbers, as defined by TR-55, are determined from land use cover and soil conditions. Earth Tech AECOM used the land use and soil data to be paired as described in Section 3, in conjunction with Tables 2-2A through 2-2D in TR-55 to assign curve numbers to the drainage basins for the City of La Crosse.

Earth Tech AECOM calculated the times of concentration ( $t_c$ ) by determining the flow path from the hydrologically most remote point to the storm sewer system in each subbasin. These flowpaths were determined using topographic contours and storm sewer mapping overlaid in GIS on the City aerial photographs. The  $t_c$  for each subbasin was calculated in accordance with TR-55 methodology to the storm sewer system entrance. Earth Tech AECOM calculated the sheet flow and shallow concentrated flow lengths and velocities to determine  $t_c$ . The flow time within the storm sewer system itself was considered negligible.

The MS4 is represented by two types of components within the hydraulic module of XP-SWMM, links and nodes. Links represent individual components of the conveyance system and nodes are the points which connect the links. Links are characterized by length, roughness, diameter, and upstream and downstream inverts. Earth Tech AECOM imported the City's electronic storm sewer mapping into a GIS.

In the GIS, Earth Tech AECOM selected the pipe network containing pipes with a diameter of 36 inches or greater. The GIS was used to convert the City's electronic storm sewer system mapping into links and nodes and prepare it for import into XP-SWMM. The naming convention for nodes includes two parts separated by a hyphen. The first is the letter and number combination designating the drainage basin containing the node. The second component represents the nodes position within the drainage basin pipe network. The second component is a three or four digit number. The first number represents the number of the main branches within the storm sewer system network. The second number represents branches off of the main storm sewer lines, and the third and fourth numbers sequentially identify individual nodes within the system. For example, node L24-100 would be the most downstream node in the storm sewer system pipe flowing in Basin 24 in the La Crosse River watershed. Node B3-34 would be the fourth node in the third branch off of the main storm sewer line in Basin 3 in the Black River watershed.

To identify areas of possible localized flooding, Earth Tech AECOM included a representation of the street surface above the pipes within the storm sewer network. The street is represented as a 30-foot wide channel 1-foot deep with a 6-inch high crown in the middle. Street elevations for the model were determined from a combination of pipe invert elevation, pipe depth where both were present, and ground surface elevation from contour mapping where they were not. The street surface was not included in an effort to accurately model flow of water within the street, but as a method of identifying areas where street flooding could be occurring. Sites where the hydraulic grade line reaches the ground surface are susceptible to potential flooding.

## 5.4 RESULTS

The following table includes those pipes within the network that were determined to have surface flooding occur under the conditions represented by the 2-year, 24-hour design storm event. The location of these pipes is depicted in Figures 5-1, 5-2, and 5-3.

PIPES WITHIN NETWORK DETERMINED TO HAVE SURFACE FLOODING OCCUR					
L1-129-1	L17-115-1	M06-101-1	M26-1422-1	M35-1020-1	M39-120-1
L1-131-1	L17-116-1	M18-1010-1	M26-148-1	M35-1021-1	M43-1024-1
L1-132-1	L17-117-1	M18-101-1	M35-1014-1	M35-130-1	M43-123-1
L13-104-1	L17-118-1	M26-1214-2	M35-1015-1	M35-202-1	M43-142-1
L13-105-1	L17-119-1	M26-1215-1	M35-1016-1	M36-107-1	M43-143-1
L15-104-1	L17-120-1	M26-1216-1	M35-1017-1	M36-108-1	M43-144-1
L17-112-1	L4-121-1	M26-1217-1	M35-1018-1	M39-118-1	M43-145-1
L17-114-1	L9-107-1	M26-1219-1	M35-1019-1	M39-119-1	M43-146-1
M26-1221-1	M26-1221-1	M26-1221-1	M26-1221-1	M57-102-1	M57-102-1
M58-1014-1	M58-1014-1	M58-1014-1			

Complete tables of the hydrologic and hydraulic modeling results are contained in Appendix G.



## **6.0 STORMWATER MANAGEMENT PROGRAM REVIEW**

As part of the preparation for the City of La Crosse's WPDES permit, Earth Tech AECOM reviewed several components of the City's municipal operations related to stormwater management. This involved a review of Stormwater Pollution Prevention Plans (SWPPP) for several municipal facilities, site visits to review conditions at selected locations where the City performs operations related to stormwater management, and interviews with City staff of programs covered under the WPDES permit.

### **6.1 STORMWATER POLLUTION PREVENTION PLAN REVIEW**

Earth Tech AECOM reviewed the stormwater pollution prevention plans for the Isle La Plume Wastewater Treatment Plant (WWTP) and the City of La Crosse municipal airport. The SWPPPs were reviewed for completeness in regards to current the SWPPP requirements detailed in NR 216.27. Appendix H contains this portion of NR 216 and documents prepared during the SWPPP review process. The following are the SWPPP review findings.

#### **6.1.1 Isle La Plume WWTP**

The Isle La Plume WWTP SWPPP was prepared in January 2003. It has not been updated since then. Any new updates to the SWPPP should include results from the annual inspections, quarterly inspections, and dry weather monitoring. The following deficiencies were found:

- The SWPPP states that there is a drainage map and BMP location map. These maps were not present in the SWPPP provided for review. The existence and completeness of such maps should be determined.
- The SWPPP does not indicate whether or not previous stormwater sampling data has been collected.
- There is no indication that a dry weather monitoring program is being implemented. However, a dry weather monitoring form is provided.
- The maintenance plan for BMPs could be more complete. It should at least specify the frequency of street sweeping.
- There is no listing of potential pollutants after source control measures are implemented.
- A signature page is not provided.

#### **6.1.2 La Crosse Municipal Airport**

The La Crosse Municipal Airport SWPPP was originally prepared in 1996 with the assistance of Mead and Hunt and was updated in 2001. This update did not include any results from the annual inspections, quarterly inspections, and dry weather monitoring. These results should be included in the SWPPP. The following deficiencies were found:

- As noted above, results from the monitoring effort have not been added to the SWPPP.

- There is no listing of potential pollutants after source control measures are implemented.
- If additions or changes to the airport have occurred since 1996, then the original drainage and BMP maps should be updated.

## **6.2 MUNICIPAL SITE EVALUATIONS**

Accompanied by City staff, Earth Tech AECOM visited three municipal facilities and reviewed them for compliance with NR 216 requirements. These included the La Crosse Municipal Services Center, the Isle La Plume WWTP, and the La Crosse Municipal Airport. Field notes from these visits are contained in Appendix I.

### **6.2.1 La Crosse Municipal Services Center**

The Municipal Services Center functions as the City of La Crosse's public work yard and as a storage and maintenance facility. The City stores and maintains vehicles on-site, and also stores bulk construction materials here. The following are site concerns with respect to stormwater management:

- Approximately 10 to 15 impounded vehicles are stored outside. Eventually corrosion, and leaking fluids from the vehicles, could become entrained in stormwater runoff.
- Various machinery drums, street signs, street posts, and cast iron are stored on the southwest side of the facility. This outdoor storage area is a potential source of pollutant loadings.
- The outdoor truck cleaning facility drains to a catch basin with a sump. The ultimate destination of this sump is the sanitary sewer system. The sump is cleaned twice per year.

### **6.2.2 Isle La Plume WWTP**

The Isle La Plume WWTP contains indoor storage for vehicles used by the wastewater utility. The following are cited concerns related to stormwater management:

- Surface runoff from the entire facility is routed into the WWTP and treated with wastewater from the rest of the City.
- The southeast corner of the yard contains other storage of scrap cast iron and concrete materials. Even though this area is a closed watershed, metals from the cast iron and other contaminants could become entrained in stormwater runoff and infiltrate into groundwater.

### **6.2.3 La Crosse Municipal Airport**

The La Crosse Municipal Airport is owned and operated by the City of La Crosse. All municipally-owned vehicles stored on site are stored indoors. The above ground oil storage facility contains sufficient containment to hold all of the oil if it spills. The site does contain a

former fire department training burned spot, which has been abandoned and has had remediation completed.

## **6.3 MUNICIPAL POLLUTION PREVENTION PROGRAMS**

### **6.3.1 Roadway Maintenance**

La Crosse currently conducts street sweeping with three mechanical broom sweepers. The frequency of sweeping is depicted in Figure 6-1. As part of efforts to comply with the WPDES permit, the City plans to acquire a vacuum sweeper in the next fiscal year. La Crosse has reduced salt use by approximately one-half since the early 1990s. They currently do not sand or salt residential streets, except for intersections. Main streets are salted based on temperature conditions. The City is producing a snow and ice control policy that has not yet been finalized and enacted.

### **6.3.2 Collection of Grass Clippings and Leaves**

The City encourages people to compost or mulch their own clippings, but also accept grass clippings through two delivery methods. Grass clippings can be taken to two waste disposal sites through Thanksgiving. Grass clippings can also be left at the curb in open containers or recyclable paper containers, such as paper grocery bags. Plastic bags are not accepted. The City composts the grass clippings and gives the compost away for free. The City Streets Department also runs a six-week leaf pickup program each fall. Leaves can be left at the curb in either open containers or recyclable bags, or delivered by residents to one of the yard waste sites.

### **6.3.3 Nutrient Management**

The City maintains records of fertilizer added to municipally maintained facilities and has reduced the acreage of turf area fertilized from 86.15 acres to 35.9 acres since 2003. The nutrient management policy has been established in an internal City Memorandum included in Appendix J. The City fertilizes at a rate of 3 pounds per 1,000 square feet of 10-10-10 fertilizer. The specific sites that have continued to be fertilized since 2003 are Carroll Outfield, Copeland I and II Outfields, Goose Green Outfield, Powell Park, Riverside/Spence Parks, Weigent Outfields, and Houska Outfield. The City does not currently have a soil testing program as part of its nutrient management program.

## **7.0 RECOMMENDATIONS FOR CITY-WIDE STORMWATER POLLUTION REDUCTION**

### **7.1 BACKGROUND**

The overall focus of this stormwater plan is to analyze alternative approaches to reduce stormwater pollution on a City-wide basis. The results from Chapter 4 show that the City can not practicably reduce the nonpoint source pollution (sediment) to the ultimate 40 percent goal.

Stormwater quality management measures can be categorized as non-structural and structural measures. Non-structural measures include activities such as street sweeping, ordinance enforcement, leaf pickup, and education programs. These measures are generally less costly than structural measures, but have limited pollution control capabilities. Most of the non-structural measures will be required when the City receives an NR 216 permit. Examples of stormwater management structural measures include wet detention basins, commercially available products, and infiltration basins.

The analysis conducted for this study showed that both types of measures would be necessary for the City to approach the 40 percent suspended solids reduction goal. This chapter describes the recommended non-structural and structural measures that have not been previously described in this document.

### **7.2 NON-STRUCTURAL STORMWATER QUALITY MANAGEMENT MEASURES**

#### **7.2.1 Information and Education Program**

La Crosse is working cooperatively with La Crosse County, and other permitted municipalities within the urbanized area, to develop an information and education program. The County is leading this effort. Participation in this group provides several benefits; the message relayed to the public is consistent across municipal boundaries, and the participating communities realize a cost savings compared to making the effort individually.

#### **7.2.2 Adopt a Stormwater Management Ordinance for New Development**

Adopting and implementing an ordinance to improve stormwater management for new development will bring La Crosse into compliance with another requirement of the NR 216 permit. Incorporating stormwater management measures to reduce off-site impacts from new land development is most economically accomplished during the site development process. Measures to reduce flow, pollution, and runoff volumes can be incorporated into the site's design.

The scope of this project called for Earth Tech AECOM to review a draft ordinance prepared by the City; rather than develop a draft ordinance from scratch, the City requested Earth Tech AECOM to instead provide commentary on the draft Post-Construction Stormwater Management Ordinance produced by WDNR and available as Appendix B of NR 152. The WDNR draft ordinance and Earth Tech AECOM's letter reviewing the draft ordinance are in Appendix K.

### **7.2.3 Adopt a Construction Site Erosion Control Ordinance**

Another requirement of the City's NR 216 permit will be to implement a construction erosion control ordinance. Construction site erosion can be a major input of sediment to local rivers, wetlands, and lakes. On a per acre basis, sediment from construction sites can exceed urban or agricultural runoff sources.

The scope of this project called for Earth Tech AECOM to review a draft ordinance prepared by the City; rather than develop a draft ordinance from scratch, the City requested Earth Tech AECOM to instead provide commentary on the draft Construction Site Erosion Control Ordinance produced by WDNR and available as Appendix A of NR 152. The draft ordinance and Earth Tech AECOM's letter reviewing the draft ordinance are in Appendix K.

### **7.2.4 Illicit Discharge Detection and Elimination Ordinance**

A third important ordinance for the municipal stormwater management program is the prohibition of illegal discharges in the storm sewer system such as sanitary waste, dumping of solid waste, or dumping of other material that may be harmful to receiving waters. Earth Tech AECOM recommends that the City adopt an ordinance explicitly prohibiting these activities. A draft ordinance prepared by the Center for Watershed Protection, which is based on EPA guidelines, is included in Appendix K.

### **7.2.5 Maintain Street Sweeping Schedule**

The City currently sweeps its downtown streets with a fleet of three mechanical broom sweepers and has parking controls in place. Earth Tech AECOM recommended, based on the SLAMM modeling results, replacing one of the mechanical brooms sweepers with a vacuum assisted sweeper and using the vacuum street cleaner in the downtown area.

## **7.3 STRUCTURAL STORMWATER QUALITY MANAGEMENT MEASURES**

### **7.3.1 Introduction**

This section describes BMPs that are currently being used by municipalities in Wisconsin for stormwater pollution reduction. The first part of this section presents information on wet detention basins. This type of practice is one of the most commonly used BMPs for pollution control. It has been shown to be very effective when site conditions are favorable. However, there are locations where wet detention basins are not feasible, especially in fully developed urban areas (such as downtown La Crosse). The second part of the section discusses alternative BMPs that could be used in the City of La Crosse.

### **7.3.2 Wet Detention Basins**

#### **7.3.2.1 Overview**

A wet detention basin is an area that is naturally depressed or has been graded to hold runoff. The outlet is constructed so that there is a permanent pool of water. This settling basin causes particles of sediment to be removed from the water column through quiescent settling. When

correctly designed and built, wet detention basins remove 80 percent of TSS from incoming pollutant loads.

Wet detention basins have many concerns associated with them. These include safety, mosquito habitat, and aesthetics. Various design options are available that can be incorporated into a wet detention basin to reduce or eliminate most concerns. For example, a safety shelf (grading the perimeter of the basin at a shallow slope) reduces the risk of drowning. The design and grading of the basin perimeter, and selection of appropriate vegetation, can enhance aesthetics of wet detention basins.

Since the 1999 emergence of West Nile Virus (WNV) in the United States, the public is more attentive to perceived potential mosquito breeding sites. According to the Center for Disease Control (CDC), the most prevalent carriers of WNV in the Midwest are selected *Culex* species. These species utilize shallow, stagnant water for breeding sites and are sometimes referred to as “container mosquitoes” due to their preference for flower pots, tires, and other small water pockets. As a result of this habitat preference, wet detention ponds are not preferred breeding grounds for the primary WNV vector mosquitoes in Wisconsin.

### **7.3.2.2 Pollution Reduction Results**

This study identified potential sites for wet detention basins based on available data and field visits. Each proposed detention basin location was evaluated for pollution reduction capability and estimated construction cost. Results are in Appendix B.

## **7.4 ALTERNATIVE BMP**

### **7.4.1 Overview**

Alternative BMPs can focus on smaller structures to treat smaller drainage areas of intensive urban land use. Alternative BMPs include infiltration practices (infiltration basins, rain gardens), commercial in-line devices, constructed wetlands, and biofilters. The following discussion describes some of the alternative BMPs available.

### **7.4.2 Hydrodynamic Separation Devices**

HSDs, also known as Inline BMPs, manufactured BMPs or proprietary devices, are generally commercially made underground devices designed to treat pollutant loads. Inline refers to the device being installed along the storm sewer pipe network below ground. These devices usually do not protrude above the ground elevation, allowing them to be installed in densely developed areas without occupying valuable land.

These devices employ various techniques to separate oil from stormwater and trap sediment within a sub-surface chamber. They are designed to treat small, frequent storm events and the initial runoff from larger events. The structures have mechanism to bypass excess flows from larger rain events.

Vendors claim pollutant (sediment) reduction obtained from different devices ranges between 30 percent to 80 percent. These devices treat stormwater utilizing various techniques such as settling, filtering, screening, adsorption, and separation. When reviewing these claims, it is

important to take note of the size of the storm being treated, the particle size distribution evaluated, and the area treated by each device. WDNR policy is to model these devices as catch basin sumps until verified data support the vendor efficiency claims.

The WDNR issued Conservation Practice Standard 1006, Method of Predicting the Efficiency of Proprietary Stormwater Sedimentation Devices, in May 2008. This document establishes a uniform process for predicting the site specific efficiency of proprietary sedimentation devices. The technical standard includes modeling and reporting requirements for predicting device efficiency using either Stokes Law settling or device-specific efficiency data. It also establishes criteria for acceptable models and laboratory testing criteria for defining device-specific efficiency curves. Ultimately, manufacturers desiring to assign treatment efficiencies for their products in SLAMM will need to submit data to WDNR in accordance with this standard. As the WDNR approves data submitted by the manufacturers of proprietary devices, SLAMM will be updated to reflect data specific to the approved proprietary devices.

Until this data becomes available and the WDNR policy towards modeling of HSDs changes, it is more cost effective to simply install oversized catch basins than to purchase more expensive proprietary devices. If these devices are ultimately proven to have TSS treatment efficiencies in excess of those obtained by modeling the devices as oversized catch basins, the city should consider analyzing the potential benefits of installing HSDs in conjunction with other infrastructure improvements.

The BMP selection process for La Crosse assumed a treatment efficiency of 15 percent for these devices. This is representative of the treatment efficiency achieved by treating the Commercial Downtown District land use with 8-foot diameter HSDs installed at an installation density of one unit treating an area of five acres. Increasing the density or size of the HSDs will increase the achieved treatment rate, but the cost-effectiveness decreases with increased density. The following table summarizes the changes in treatment efficiencies (as a percent) achieved by treating this land use with different sizes and densities of HSDs.

		Acres treated per HSD				
		5	4	3	2	1
HSD Diameter (ft)	6	12	14	15	17	22
	8	15	17	19	21	27
	10	18	20	22	25	31

HSDs can be installed in heavily developed areas where open space for other BMPs is not available, such as downtown La Crosse. This makes them an option for TSS treatment, despite their high cost and low treatment efficiency as compared to some other BMPs.

Because current policy and model limitations prevent the use of street cleaning in conjunction with HSDs, the only benefit achieved by installing a HSD is the incremental improvement as compared to the existing street cleaning program. As a result, HSD units are generally only cost effective where street cleaning is not a viable option. These devices cost approximately \$5,000 to \$10,000 if installed in conjunction with a construction project, or as part of a street reconstruction. If done as a retrofit or independent project, the cost approximately triples. When considering use of a HSD, the variables of potential street cleaning efficiency, sizes and densities of HSDs, and whether or not the HSD would be installed in conjunction with a

construction project all need to be considered for each site. Sites with existing street cleaning where a HSD would be installed independent of other construction work are not cost-effective candidates for HSD application. Conversely, high loading areas that are not swept and undergoing street reconstruction or storm sewer improvements should be evaluated for HSD installation during the project design phase.

### 7.4.3 Biofilters

A biofilter is a device that can be constructed to filter the sediment, oil, grease, and heavy metals in runoff. Biofilters have been shown to achieve 90 percent pollution reduction. A biofilter consists of a top layer of mulch, an engineered soil filter bed beneath, and a soil drainage layer with an underdrain at the bottom of the device. The underdrain is connected to the municipal storm sewer system.

In each area chosen to be treated by biofiltration, Earth Tech AECOM assumed the biofiltration surface area required will be 2 percent of the treated area, and estimated the construction cost based on a biofiltration unit depth of 5 feet and the soil mix specified by WDNR Conservation Practice Standard 2004.

Maintenance includes yearly replacement of the top layer of mulch, which traps most of the oil and grease. The engineered soil filter bed should be replaced every 10 to 15 years. Plants, trees, and shrubs can be planted in the biofilters to increase aesthetics. Vegetation selection should take into account the 10- to 15-year replacement cycle of the filter bed.



**BIOFILTER IN PARKING LOT**

Biofilters can be a relatively inexpensive way to control stormwater pollution from parking lots. Commercial and industrial areas can especially achieve significant pollution reduction if biofilters are constructed in all or most parking lots. Because the maximum area treated by a biofiltration unit is 2 acres, as established by the WDNR's Conservation Practice Standard 1004, Bioretention for Infiltration, a large number of biofilters may be necessary to treat a subbasin.



#### 7.4.4 Constructed Wetlands

Constructed wetlands are areas engineered to mimic natural wetlands. Constructed wetlands can be aesthetically pleasing, provide stormwater storage, and provide stormwater pollution reduction. The cost of constructed wetlands is dependent on the site and the vegetation selected. They can be constructed either "off-line" or parallel to a main drainage way. When a constructed wetland is located off-line, it can be designed to treat the smaller rain events, and thus increase stormwater pollution reduction. The actual pollution reduction that constructed wetlands achieve has not been researched as extensively as other BMPs; therefore, dialogue with the WDNR will be required to determine the amount of pollution reduction credited.

#### 7.4.5 Rain Gardens

Rain gardens are landscaped areas planted with wild flowers or other native vegetation and designed to infiltrate stormwater runoff. Buildings, driveways, and sidewalks can be graded to drain to a rain garden. Rain gardens fill with a few inches of stormwater, which slowly filters into the ground rather than entering storm drains. Rain gardens infiltrate approximately 30 percent more stormwater than conventional lawns.

Rain gardens can be integrated into residential land uses with little difficulty. The cost of a residential rain garden can range from \$3 to \$12 per square foot depending upon the size of the rain garden, and if the work is done by the homeowner or a professional landscaper. Rain gardens can also be used in other types of land uses. It is generally not recommended to use a rain garden to treat a parking lot as the oil and grease from the parking lot may damage the plants in the rain garden. Rain gardens work well if they are placed to treat rooftop runoff and lawn runoff. Information on how to construct and maintain a rain garden can be found at <http://clean-water.uwex.edu/pubs/raingarden>.



**EXAMPLE OF A RESIDENTIAL RAIN GARDEN**

#### 7.4.6 Infiltration Basins

Infiltration basins are larger areas designed to infiltrate stormwater and provide pollutant removal. They are similar to rain gardens in that vegetation is chosen to encourage infiltration. Infiltration basins can be designed to treat an entire subbasin and can control a large stormwater volume. Pollutants contained in the infiltrated runoff are removed within the soil.

Infiltration basins also provide for some groundwater recharge if the soil conditions permit. Infiltration basins should include provisions for pretreating stormwater to prevent premature clogging of the basin. A pretreatment device must be used to filter the grease, oil, and heavy metals from parking lot and street runoff. The combination of pretreatment and infiltration removes the greatest amount of pollutants from stormwater. A unique feature of infiltration basins is the ability to reduce runoff *volume* as well as decrease peak flow and pollution.

Accumulated sediment must be removed periodically to avoid resuspension and the resulting release of pollutants back into the stormwater. Infiltration basins can be cost effective in highly urban areas as a single basin can treat a large area where using source controls are difficult or impossible. The primary costs of infiltration basins are construction and land acquisition. Maintenance costs vary depending on the extent of landscaping and frequency of sediment removal. A guideline for sediment removal is for five-year intervals, but this will vary depending on the contributing land use and prevalent soil types in the watershed.

Special precautions are required when planning and designing infiltration basins to prevent groundwater contamination. Information on infiltration basin design requirements can be found in NR 151.12 (5) (c) 4.

#### **7.4.7 Traditional Swales**

Conventional grassed swales are gently sloped (generally less than 2 percent), vegetated conveyance ditches in which pollutants are removed from stormwater by filtration through grass and infiltration into the soil.

Compared to storm sewer systems, grass swales have both water quality and quantity benefits in lower density residential areas. The infiltration occurring in the swale reduces the volume delivered to the system outfall; the TSS loadings are also reduced due to the solids contained in the infiltrated water volume. Biofilters can also be constructed in the swales to increase runoff and pollutant removal.

Grass swales also provide a place for snow storage in winter months. An added benefit is that as the snow melts, the pollutants and salt carried from the street are contained in the ditches rather than going directly into the storm sewer. An adverse effect is that the chloride in road salt moves through the soil fairly rapidly and plants in the swale can be damaged by salt. Salt use should be judicious in areas of swale drainage.

Grass swales may not be feasible in densely developed areas. These areas tend to have closely spaced driveways, which would require closely spaced culverts. In addition, there may not be enough space to construct swales in these areas without encroaching on buildings or parking lots.

One concern about the use of grass swales is that roads are more difficult to plow, and the streets can look less clean if the grass swales are damaged by traffic driving on the shoulder. Some municipalities have installed swales in conjunction with curb and gutter. The streets have inlets that carry the runoff to the swale. This combination allows for an easily maintained street and pollution reduction.



### **EXAMPLE OF GRASS SWALE WITH CURB AND GUTTER STREET DRAINAGE**

#### **7.4.8 Engineered Grass Swales**

Grass swales can also be engineered to achieve a higher pollution reduction. In an area where soils have poor infiltration characteristics, it may be advantageous to construct an engineered swale. An engineered swale is a grass swale where the top 2 to 5 feet have been excavated and replaced with an engineered soil. The soil is made up of different components that will enhance the infiltration capacity of the swale. Additionally, some engineered swales have under-drain systems to convey treated water to the storm sewer system. Engineered swales can also be referred to as infiltration swales.

Maintenance for an engineered swale is similar to biofilter maintenance. Although there is no mulch to replace, the grass will need to be mowed to maintain conveyance, and the upper portion of the engineered soil will need to be replaced when it gets clogged. This is usually required at intervals of approximately 10 to 15 years.

Chapter 4 described the process used to select which BMPs would be most feasible for the City of La Crosse. Table 7-1 summarizes the results of this selection process.

These costs are considered planning-level estimates. They do not include the costs of land acquisition. Due to the difficulty of predicting future land values, the City and Earth Tech AECOM agreed to only evaluate construction costs. In Earth Tech AECOM's experience in other communities, land acquisition costs have been as much as equal to the construction costs. The total cost of BMP implementation could be twice the estimated construction cost when land acquisition costs are realized.

TABLE 7-1

## City of La Crosse BMP Evaluation Matrix

								Evaluation Factors & Scores																			Comments
Outfall Basin	Common Name	Practice	BMP ID	Drainage Area to BMP	Existing TSS Loading	Existing Control		Proposed Control	(1) Proposed Pollution Control			Cost					(4) Flood Control		(5) Ownership		(6) Open Space		(7) Public Acceptability	Total			
				(acres)	(tons/yr)	(%)	(tons/yr)	(%)	lbs/year	(tons/yr)	Score	Land Acquisition Cost	Construction Cost	(2) Capital Cost	Score	Annual Maintenance Cost	(3) Cost per Unit of Control (\$/ton)	Score	Yes/No	Score	Owner	Score	Yes/No	Score	Score	Score	
<b>EXISTING SITES</b>																											
L40.0	LaCrosse International Business Park - South	Dry Pond Convert	1	23.8	5.7	0	80	8,800	4.4		\$ -	\$ 25,000	\$ 25,000		\$ 1,400	\$ 5,700	10	NO	0	CITY	10	YES	10	10	40	Existing pond from construction located north of the interstate	
L40.1	LaCrosse International Business Park - Center	Dry Pond Convert	2	42.1	4.3	0	80	6,651	3.3		\$ -	\$ 209,000	\$ 209,000		\$ 4,100	\$ 62,800	0	NO	0	CITY	10	YES	10	10	30	Pond does not provide flood benefits because it is located at the outfall.	
L28.1	Northwoods - Redwing Road	Dry Pond Convert	3	15.9	0.3	0	80	400	0.2		\$ -	\$ 36,000	\$ 36,000		\$ 1,600	\$ 180,000	0	YES	10	PRIVATE	0	YES	10	3	23	Located in back yard of private home	
M10.0, M10.1, M07, M08	Waterford Addition	Wet Pond Convert	4	114.8	2.7	0	80	4,229	2.1		\$ -	\$ 25,000	\$ 25,000		\$ 1,500	\$ 11,800	10	YES	10	PRIVATE	0	YES	10	7	37	Could expand	
M71	Gerard Addition Bookside/Brickyard M68	Dry Pond Convert	5	18.1	1.2	0	80	1,731	0.9		\$ -	\$ 42,000	\$ 42,000		\$ 1,700	\$ 48,500	5	NO	0	PRIVATE	0	YES	10	10	25	Maintenance access to the pond would be difficult due to topography	
L19.4, L19.3	Kwik Trip	Existing Wet	6	47.7	8.1	80		6	0.0		\$ -	\$ 161,000	\$ 161,000		\$ 4,500		10	YES	10	PRIVATE	0	No	0		20	Obtain Maintenance Agreement	
L29.1	Clearwater Development NE Oncota Ridge	Dry Pond Convert	8	28.9	0.3	0	80	385	0.2		\$ -	\$ 49,000	\$ 49,000		\$ 1,900	\$ 254,600	0	YES	10		5	YES	10	3	28	Relatively recent pond that serves a residential area	
M69	Vista Del Rio	Dry Pond Convert	9	11.4	1.0	0	80	1,364	0.7		\$ -	\$ 34,000	\$ 34,000		\$ 1,600	\$ 49,900	5		5		5		5		20		
M66.1	Shrine	Dry Pond Convert	11	73.9	14.6	0	80	22,339	11.2		\$ -	\$ 77,000	\$ 77,000		\$ 2,600	\$ 6,900	10	NO	0	PRIVATE	0	YES	10	6	26		
M09	Creekside Roesks SE	Dry Pond Convert	12	14.8	0.9	0	80	1,383	0.7		\$ -	\$ 43,000	\$ 43,000		\$ 1,800	\$ 62,200	0	NO	0	CITY	10	YES	10	7	27		
M58	Airport Pond	Wet Pond Convert	14	122.5	39.7	0	80	63,021	31.5		\$ -	\$ 282,000	\$ 282,000		\$ 4,600	\$ 8,900	10	NO	0	CITY	10	YES	10	10	40		
L39.1	Grandad View Dairy Estates	Dry Pond Convert	15	13.1	0.0	0	80	33	0.0		\$ -	\$ 62,000	\$ 62,000		\$ 1,800	\$ 3,770,500	0	YES	10		5	YES	10	5	30		
M27.1, M27.0	Pammel Creek Addition	Existing Wet	16	3.9	1.5	80	1.2		0.0		\$ -	\$ 28,000	\$ 28,000		\$ 1,400		10	YES	10	CITY	10	NO	0	0	30	Obtain Maintenance Agreement	
M39.1, M38.1, M38.2	Gorman/ Gund Brewery	Wet Pond Convert	17	7.4	1.4	0	80	1,612	0.8		\$ -	\$ 34,000	\$ 34,000		\$ 1,600	\$ 42,200	5		5		5		5		20		
L19.0, L19.1, L19.2	Interstate Industrial Park East Pond	Wet Pond Convert	19	121.2	18.0	0	80	27,494	13.7		\$ -	\$ 21,000	\$ 21,000		\$ 1,300	\$ 1,500	10	YES	10	PUBLIC	5	YES	10	10	45		
M05	Harry Viner Pond - S. End Treats	Wet Pond Convert	20	71	3.1	0	80	4,712	2.4		\$ -	\$ 21,000	\$ 21,000		\$ 1,300	\$ 8,900	10	NO	0	PRIVATE	0	YES	10	10	30	Permitting could be an issue	
<b>PROPOSED SITES</b>				<b>Existing BMP Totals</b>	<b>102.8</b>	<b>----</b>	<b>1.2</b>	<b>----</b>	<b>72.1</b>	<b>----</b>	<b>\$ -</b>	<b>\$ 1,149,000</b>	<b>\$ 1,149,000</b>	<b>----</b>	<b>\$ 34,700</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	
M36.1	Trane South Central, Future Pond	New Pond	21	37.2	7.0	0	80	10,413	5.2		\$ 152,000	\$ 152,000	\$ 304,000		\$ 3,000	\$ 58,400	0	YES	10	CITY	10	YES	10	3	33	Acceptability issue of putting a pond in a park	
M57, L14	Mobil Oil Site E Central	New Pond	23	68	16.6	0	80	25,620	12.8		\$ 320,000	\$ 320,000	\$ 640,000		\$ 5,000	\$ 50,000	5	NO	0	CITY	10	YES	10	8	33	Owner is City/RDA. Design in with trails so it could be asset. A challenge is getting water to the BMP	
L17, L22	Gillette Street Pond L/S Discharge Point	New Pond	24	233.9	42.2	0	80	64,572	32.3		\$ 919,000	\$ 919,000	\$ 1,838,000		\$ 12,200	\$ 56,900	0	NO	0	CITY	10	YES	10	10	30	Lift station discharge area	
B1, B2	Wet pond at St. Cloud St. Landing N. of City Dock	New Pond	25	40.9	3.5	0	80	5,379	2.7		\$ 212,000	\$ 212,000	\$ 424,000		\$ 3,700	\$ 157,700	0	NO	0	CITY	10	YES	10	0	20	Require destruction of commercial docking facility	
M49	Acquire land and build wet pond	New Pond	26	41.6	9.3	0	80	14,267	7.1		\$ 236,000	\$ 236,000	\$ 472,000		\$ 4,000	\$ 66,200	0	NO	0	PRIVATE	0	NO	0	6	6	L/S Require (probably), potential environmental contamination	
M45	Treats Area M45, check on landfill	New Pond	27	3.4	0.8	0	80	1,265	0.6		\$ 38,000	\$ 38,000	\$ 76,000		\$ 1,500	\$ 120,100	0	NO	0	CITY	10	YES	10	2	22	L/S requires 26 is redundant with 27, but 27 is more engineering feasible	
M40, M39	Treats M41 & M40 across river	New Pond	28	26.9	7.6	0	80	11,645	5.8		\$ 147,000	\$ 147,000	\$ 294,000		\$ 2,900	\$ 50,500	0	NO	0	CITY	10	YES	10	8	28		
M26.7	Wet pond at Ball Fields or Trane	New Pond	29	54.7	13.5	0	80	20,731	10.4		\$ 311,000	\$ 311,000	\$ 622,000		\$ 4,900	\$ 60,000	0	YES	10	CITY	10	YES	10	1	31	Replace ballfield with a wet pond (may be possible to keep/move field)	
B7	New pond at trailer court	New Pond	30	34.1	7.3	0	80	11,232	5.6		\$ 156,000	\$ 156,000	\$ 312,000		\$ 3,000	\$ 55,600	0	NO	0	PRIVATE	0	NO	0	0	0	0	Could remove mobile home park, build pond
M19.0	Wet Pond on State Land Serving part of M19	New Pond	31	97.6	19.8	0	80	30,553	15.3		\$ 435,000	\$ 435,000	\$ 870,000		\$ 6,400	\$ 57,000	0	YES	10	STATE	5	YES	10	8	33	Obtain DOT/DNR Pond Easement	
M3, M68, M69, M70 and M71	South End of Old Town Hall RO Landfill	Swale	32	37.5	3.1	0	50	1,263	0.6		\$ 4,000	\$ 4,000	\$ 8,000		\$ 6,400	\$ 12,700	10		5	PRIVATE	0		5		20	Make improved swale, improve drainage to Farmer	
L31	Valley View Mall	New Pond	33	31.9	6.7	0	80	10,300	5.1		\$ 193,000	\$ 193,000	\$ 386,000		\$ 3,500	\$ 75,000	0	No	0	PRIVATE	0	Yes	10	4	14	Owned by MVC - Mississippi Valley Conservancy. Multi-Jurisdictional	
L1.0, L1.1, L1.2, and L04	Excel Energy Grounds	New Pond	34	518.1	61.0	0	80	93,046	46.5		\$ 1,600,000	\$ 1,600,000	\$ 3,200,000		\$ 20,300	\$ 68,800	0	No	0	PRIVATE	0	Yes	10	6	16	Slated for high-end redevelopment could potentially treat a large area. Safety issue (space issue with pond, so a swale is better)	
B11, B13, B14, B15, B16, B17, B18, B43, L21 and L22	DOT Right of Way	Swale	35	60.4	9.9	0	50	7,563	3.8		\$ 4,000	\$ 4,000	\$ 8,000		\$ 20,300	\$ 2,100	10	No	0	DOT	5	Yes	10	6	31	In floodway, engineering challenge.	
B3.0	Near train tracks	Biofiltration	B1	3.7	0.9	0	80	1,432	0.7		\$ -	\$ 44,000	\$ 44,000		\$ 7,467	\$ 61,400	0	No	0	PRIVATE	0	No	0	4	4		
M18.1	Biofiltration in SE corner of Shopko parking lot	Biofiltration	B2	19.4	4.9	0	80	7,588	3.8		\$ -	\$ 214,000	\$ 214,000		\$ 37,953	\$ 56,400	0	No	0	PRIVATE	0	No	0	4	4		
L1.1	Biofiltration south of main and west of Hwy 35	Biofiltration	B3	0.75	0.2	0	80	293	0.1		\$ -	\$ 11,000	\$ 11,000		\$ 1,690	\$ 75,200	0	No	0	PRIVATE	0	Yes	10	3	13		
L41	N. of St. Andrew and S. of St. James	Biofiltration	B4	29.7	8.1	0	80	12,481	6.2		\$ -	\$ 254,000	\$ 254,000		\$ 45,135	\$ 40,700	5	No	0	PRIVATE	0	No	0	3	8		
M43.2	Bio north of Hwy 33	Biofiltration	B5	8.6	1.5	0	80	2,321	1.2		\$ -	\$ 63,000	\$ 63,000		\$ 10,932	\$ 54,300	0	No	0	PRIVATE	0	No	0	5	5		
M19.1	Man/Bio area not including Shopko bio	Manufactured	M1	52.9	13.2		40	358	0.2		\$ -	\$ 211,600	\$ 211,600		\$ 1,500	\$ 1,182,100	0	No	0	PRIVATE	0	No	0	4	4		
L41	Man/Bio east of tracks north of St. Cloud	Manufactured	M2	35.8	9.7	0	40	555	0.3		\$ -	\$ 143,200	\$ 143,200		\$ 1,500	\$ 516,000	0	No	0	PRIVATE	0	no	0	4	4		
M43.4	Man/bio south of king and West of Hwy 35	Manufactured	M3	1	0.3	0	40	7	0.0		\$ -	\$ 4,000	\$ 4,000		\$ 1,500	\$ 1,142,900	0	No	0	PRIVATE	0	Yes	10	3	13		
M39.0	Man/Bio area along US 61, Hwy 14, and Hwy35	Manufactured	M4	39.4	10.1	0	40	490	0.2		\$ -	\$ 157,600	\$ 157,600		\$ 1,500	\$ 643,300	0	No	0	PRIVATE	0	No	0	4	4		
M43.2	Man/bio East of hwy 53 N. of Cameron	Manufactured	M5	10.1	2.5	0	40	70	0.0		\$ -	\$ 40,400	\$ 40,400		\$ 1,500	\$ 1,154,300	0	No	0	PRIVATE	0	No	0	5	5		
				<b>Proposed BMP Totals</b>	<b>265.8</b>	<b>----</b>	<b>0.0</b>	<b>----</b>	<b>169.3</b>	<b>----</b>	<b>\$ 4,885,000</b>	<b>\$ 6,027,800</b>	<b>\$ 10,912,800</b>	<b>----</b>	<b>\$ 210,877</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	
				<b>Totals</b>	<b>368.6</b>	<b>----</b>	<b>1.2</b>	<b>----</b>	<b>241.3</b>	<b>----</b>	<b>\$ 4,885,000</b>	<b>\$ 7,176,800</b>	<b>\$ 12,061,800</b>	<b>----</b>	<b>\$ 245,577</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	<b>----</b>	

## 8.0 IMPLEMENTATION

This chapter discusses implementation of La Crosse's Stormwater Management Plan.

### 8.1 RESPONSIBLE PARTIES

The City of La Crosse has the primary responsibility for implementing this plan. The City will ultimately be responsible for ensuring that it is carried out within the City's municipal boundaries. Some of the recommended improvements are regional stormwater management facilities that treat and manage stormwater from larger drainage areas with multiple landowners. The City will retain responsibility for the actual design, construction, and maintenance of these facilities. The City and local property owners may share the responsibility for implementation of local facilities constructed in areas of existing development. This will depend upon the agreements reached between the City and landowners at the time of planning and design of the structural BMPs. The City's Engineering department will be responsible for the design (either in-house, or outsourced) of structural BMPs. Oversight and inspection of BMP construction is shared by the Engineering and Parks and Recreation departments. Developers are required to enter into maintenance agreements with the City which include a deed restriction requiring owners to maintain BMPs following construction and provide the City with an easement to ensure maintenance is completed. If maintenance of BMPs is not performed by owners, the City is allowed to perform the maintenance and assess the expense back to the owner. As an additional protection for the City, developers are required to bond stormwater BMPs and the City only releases the bond when the project has been inspected and is at least 80 percent vegetated.

Oversight of BMP maintenance will be performed by Public Works and/or Parks and Recreation staff.

### 8.2 PLAN FINANCING

Although the WDNR Urban Nonpoint Source and Stormwater Grant program does fund the design and construction of BMPs, the vast majority of the expenses associated with permit compliance will need to be funded by the City. La Crosse's stormwater program is currently funded via property taxes by the City's general revenue fund.

A stormwater utility is one alternative to funding the stormwater program through property taxes. Stormwater utilities, as with other utilities, generate revenue by charging customers for the stormwater services provided by the City. In the case of a stormwater utility, the services provided may include the collection, treatment, and conveyance of stormwater.

There are several methods to determine the rate paid by each customer. These include:

#### **Equivalent Runoff Unit (ERU)**

The ERU customer fee system is the most widely used in Wisconsin. It is based strictly on impervious area, which is usually measured from aerial photographs. A sampling of residential customers is taken to determine the average square footage of impervious area for residential customers across the City. This average square footage of impervious area is set to 1.0 ERUs,

and non-residential customers have their rates calculated by dividing their amount of impervious area by the 1.0 ERU square footage. Pervious areas are not charged under the ERU system.

**Equivalent Hydrologic Area (EHA)**

This system is similar to the ERU system, with the addition of a charge for pervious area. It is administratively more demanding because it requires classifying the pervious and impervious areas of each lot within the City, and keeping this data up to date when decks, garages, or other structures are added. The City of Madison currently uses the EHA system.

**Intensity of Development (EHA)**

The EHA system is also based on the ERU system, but with an adjustment based on land use type. The adjustment lowers the rate charged to rural customers. This fee structure is most applicable to communities with a mix of urban and rural customers, and is probably not appropriate for the City of La Crosse.

In July, 2004, Patrick Caffrey, the former Director of Public Works for La Crosse, performed a stormwater utility feasibility study. The study identified stormwater related costs currently incurred by the City.

City staff has also recently evaluated possible solutions to localized flooding problems. The construction costs associated with these improvements are estimated at \$20,000,000 to \$30,000,000.

The construction costs identified in this document for WPDES permit compliance are approximately \$7,000,000, excluding land acquisition costs. When land costs are factored in, this cost could exceed \$12,000,000. Assuming the WPDES costs are spread uniformly across 5 years, and the flood control costs uniformly across 10 years, the estimated annual stormwater expense for the next 5 years works is calculated in the following table:

Costs Related to Stormwater	Annual Cost
Operations and Maintenance	\$500,000
Street Sweeping and Leaf Collection/Composting	\$665,000
WPDES permit costs (\$12,000,000 over 5 years)	\$2,400,000
Flood control (\$25,000,000 over 10 years)	\$2,500,000
Total	\$6,065,000

Working with data prepared by the UW-La Crosse, Earth Tech AECOM calculated the City's total ERUs as summarized below:

Category	ERUs	Percent
Residential	13,761	32%
Non-Residential	28,997	68%
Total	42,758	100%

Dividing the budget of \$6,065,000 by 42,758 ERUs yields an annual charge of \$142 per ERU.

The City could also adopt a utility that funded only a portion of the stormwater program. Potential portions of the program to be funded could include:

- Capital Projects.
- O&M.
- Permit Compliance.
- Flood Control.

Choosing to fund only a portion of the stormwater program with a utility while continuing to fund the rest of the program with property tax revenues would result in a lower SWU rate.

### 8.3 SCHEDULE

The schedule for implementing this plan is designed to meet the WPDES permit requirements. Table 8-1 depicts the recommended implementation schedule.

TABLE 8-1 IMPLEMENTATION SCHEDULE						
Plan Element	2008	2009	2010	2011	2012	2013
<b>Non-Structural</b>						
Public Education and Outreach	X	X	X	X	X	X
Public Involvement and Participation	X	X	X	X	X	X
Implement Stormwater Management Ordinance	X					
Implement Construction Erosion Control Ordinance	X					
Implement Illicit Discharge Detection and Elimination Ordinance	X					
Implement Dry Weather Screening						
Maintain Street Sweeping Schedule	X	X	X	X	X	X
<b>Structural BMPs</b>						
Convert 9 dry ponds to wet ponds		4	5			
Upgrade or modify 5 wet ponds		1	1	3		
Construct 13 new wet ponds		1	1	1	5	5
Install 5 biofiltration devices		1	1	1	1	1
Install 5 HSDs		1	1	1	1	1

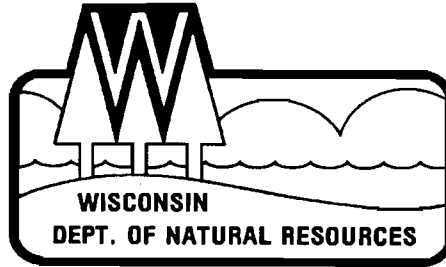
### 8.4 OTHER ISSUES

The City will not be the only party responsible for the implementation of this plan. WDNR oversees the State's stormwater management regulations, and will administer the City's stormwater discharge permit.

For implementation of some of the recommendations, the City (or other parties) may be required to obtain other types of permits from the WDNR and/or the United States Army Corps of Engineers (USACE). These could include Chapter 30 permits for working in or near navigable water bodies, NR 216 permits for construction sites, and permits related to NR 103 for working in wetlands.

**APPENDIX A**  
**WPDES PERMIT**





***STATE OF WISCONSIN  
DEPARTMENT OF NATURAL RESOURCES***

**GENERAL PERMIT TO DISCHARGE UNDER THE  
WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WPDES PERMIT NO. WI-S050075-1**


In compliance with the provisions of ch. 283, Wis. Stats., and chs. NR 151 and 216, Wis. Adm. Code, owners and operators of municipal separate storm sewer systems are permitted to discharge storm water from all portions of the

**MUNICIPAL SEPARATE STORM SEWER SYSTEM**

owned or operated by the municipality to waters of the state in accordance with the conditions set forth in this permit.

The **Start Date** of coverage under this permit shall be included in the Department letter sent to the municipality authorizing coverage under this general permit. The Department is required to charge an annual permit fee to owners and operators authorized to discharge under this permit in accordance with s. NR 216.08, Wis. Adm. Code.

State of Wisconsin Department of Natural Resources  
For the Secretary

By   
Russell A. Rasmussen, Director  
Bureau of Watershed Management  
Division of Water

  
Date Permit Signed/Issued

**PERMIT EFFECTIVE DATE: Jan. 19, 2006**

**EXPIRATION DATE: Dec. 31, 2010**

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## **1. APPLICABILITY CRITERIA**

### **1.1 Permitted Area**

This permit covers all areas under the ownership, control or jurisdiction of the permittee that contribute to discharges from a “municipal separate storm sewer system” or “MS4” that receives runoff from any of the following:

**1.1.1** An "urbanized area", adjacent developing areas and areas whose runoff will connect to a municipal separate storm sewer regulated under subch. I of NR 216; or

**1.1.2** An area associated with a municipal population of 10,000 or more and a population density of 1,000 or more per square mile, adjacent developing areas and areas whose runoff will connect to a MS4 regulated under subch. I of NR 216; or

**1.1.3** An area that drains to a MS4 that is designated for permit coverage pursuant to s. NR 216.02(2) or 216.025, Wis. Adm. Code.

Note: “MS4” and "urbanized area" are defined in section 5 of this permit.

### **1.2 Authorized Discharges**

This permit authorizes storm water point source discharges from the MS4 to waters of the state in the permitted area. This permit also authorizes the discharge of storm water co-mingled with flows contributed by process wastewater, non-process wastewater, and storm water associated with industrial activity, provided the discharges are regulated by other WPDES permits or are discharges which are not considered illicit discharges.

### **1.3 Water Quality Standards**

**1.3.1** This permit specifies the conditions under which storm water may be discharged to waters of the state for the purpose of achieving water quality standards contained in chs. NR 102 through 105 and NR 140, Wis. Adm. Code. For the term of this permit, compliance with water quality standards will be addressed by adherence to general narrative-type storm water discharge limitations and implementation of storm water management programs and practices.

**1.3.2** This permit does not authorize water discharges that the Department, prior to authorization of coverage under this permit, determines will cause or have reasonable potential to cause or contribute to an excursion above any applicable water quality standards. Where such determinations have been made prior to authorization, the Department may notify the municipality that an individual permit application is necessary. However, the Department may authorize coverage under this permit where the storm water management programs required under this permit will include appropriate controls and implementation procedures designed to bring the storm water discharge into compliance with water quality standards.

### **1.4 Outstanding and Exceptional Resource Waters**

**1.4.1** The permittee shall determine whether any part of its MS4 discharges to an outstanding resource water (ORW) or exceptional resource water (ERW). ORWs and ERWs are listed in ss. NR 102.10 and 102.11, Wis. Adm. Code. An unofficial list of ORWs and ERWs may be found on the Department's Internet site at: <http://dnr.wi.gov/org/water/wm/wqs/>.

**1.4.2** The permittee may not establish a new MS4 discharge of pollutants to an outstanding resource water (ORW) or an exceptional resource water (ERW) unless the storm water management programs required under this permit are designed to ensure that any new MS4 discharge of pollutants to an ORW or ERW will not exceed background levels within the ORW or ERW.

**1.4.2.1** “New MS4 discharge of pollutants” means an MS4 discharge that would first occur after the permittee’s start date of coverage under this permit to a surface water to which the MS4 did not previously discharge storm water, and does not include an increase in an MS4’s discharge to a surface water to which the MS4 discharged on or before coverage under this permit.

**1.4.3** If the permittee has an existing MS4 discharge to an ERW, it may increase the discharge of pollutants if the increased discharge would not result in a violation of water quality standards.

**1.4.4** If the permittee has an existing MS4 discharge to an ORW, it may increase the discharge of pollutants provided all of the following are met:

**1.4.4.1** The pollutant concentration within the receiving water and under the influence of the existing discharge would not increase as compared to the level that existed prior to coverage under this permit.

**1.4.4.2** The increased discharge would not result in a violation of water quality standards.

## **1.5 Impaired Water Bodies and Total Maximum Daily Load Requirements**

**1.5.1** The permittee shall determine whether any part of its MS4 discharges to an impaired water body listed in accordance with section 303(d)(1) of the federal Clean Water Act, 33 USC §1313(d)(1)(C), and the implementing regulation of the US Environmental Protection Agency, 40 CFR §130.7(c)(1). Impaired waters are those that are not meeting applicable water quality standards. A list of Wisconsin impaired water bodies may be found on the Department’s Internet site at: <http://dnr.wi.gov/org/water/wm/wqs/303d/303d.html>.

**1.5.2** If the permittee’s MS4 discharges to an impaired water body, the permittee shall include a written section in its storm water management program that discusses the management practices and control measures it will implement as part of its program to reduce, with the goal of eliminating, the discharge of pollutant(s) of concern that contribute to the impairment of the water body. This section of the permittee’s program shall specifically identify control measures and practices that will collectively be used to try to eliminate the MS4’s discharge of pollutant(s) of concern that contribute to the impairment of the water body and explain why these control measures and practices were chosen as opposed to other alternatives. Pollutant(s) of concern means a pollutant that is causing impairment of a water body.

**1.5.3** After the permittee’s start date of coverage under this permit, the permittee may not establish a new MS4 discharge of a pollutant of concern to an impaired water body or increase the discharge of a pollutant of concern to an impaired water body unless the new or increased discharge causes the receiving water to meet applicable water quality standards, or the Department has approved a total maximum daily load (TMDL) for the impaired water body.

**1.5.4** The permittee shall determine whether its MS4 discharges to an impaired water body for which the Department has approved a TMDL. If so, the permittee shall assess whether the TMDL wasteload allocation for the MS4 is being met through the existing storm water management controls or whether additional control measures are necessary. The permittee's assessment of whether the TMDL wasteload allocation is being met shall focus on the adequacy of the permittee's storm water controls (implementation and maintenance). Approved TMDLs are listed on the Department Internet site at:

<http://dnr.wi.gov/org/water/wm/wqs/303d/index.html>.

**1.5.5** The storm water management program developed under section 2 of this permit shall be revised as necessary to achieve and maintain compliance with any Department approved-TMDL wasteload allocation for an impaired water to which the MS4 discharges. The redesigned storm water management programs shall be implemented as soon as possible.

## **1.6 Wetlands**

The permittee's MS4 discharge shall comply with the wetland water quality standards provisions in ch. NR 103, Wis. Adm. Code.

## **1.7 Endangered and Threatened Resources**

The permittee's MS4 discharge shall comply with the endangered and threatened resource protection requirements of s. 29.604, Wis. Stats., and ch. NR 27, Wis. Adm. Code.

## **1.8 Historic Property**

The permittee's MS4 discharge may not affect any historic property that is listed property, or on the inventory or on the list of locally designated historic places under s. 44.45, Wis. Stats., unless the Department determines that the MS4 discharge will not have an adverse effect on any historic property pursuant to s. 44.40 (3), Wis. Stats.

## **1.9 General Storm Water Discharge Limitations**

The permittee may not discharge the following substances from the MS4 in amounts that have an unreasonable effect on receiving water quality or aquatic life:

1. Solids that may settle to form putrescence or otherwise objectionable sludge deposits.
2. Oil, grease, and other floating material that form noticeable accumulations of debris, scum, foam, or sheen.
3. Color or odor that is unnatural and to such a degree as to create a nuisance.
4. Toxic substances in amounts harmful to aquatic life, wildlife, or humans.
5. Nutrients conducive to the excessive growth of aquatic plants and algae to the extent that such growth is detrimental to desirable forms of aquatic life, creates conditions that are unsightly, or is a nuisance.
6. Any other substances that may impair, or threaten to impair, beneficial uses of the receiving water.

## **1.10 Obtaining Permit Coverage**

**1.10.1** In order to obtain coverage under this permit, the owner or operator of an MS4 shall submit a complete Notice of Intent (NOI) to the Department. The Department will make an NOI form available on its Internet site or a copy may be obtained by contacting the storm water

program at (608) 267-7694. The NOI shall be mailed to Wisconsin DNR, Storm Water Program – WT/2, PO Box 7921, Madison, WI 53707-7921 or as otherwise directed by the Department.

**1.10.2** Coverage under this permit does not become effective until the Department sends the owner or operator a letter expressly authorizing coverage under this permit.

**1.11 Public Access to Information including Notices of Intent**

The Department will list on its storm water Internet site, for a period of at least 30 days, the NOIs that are received by the Department requesting coverage under this permit. This list will be accessible via: <http://dnr.wi.gov/runoff/stormwater/muni.htm>. Official Department records for individual municipalities are typically maintained in the office of the Department's regional storm water contact. To gain access to facility records, you should contact the appropriate regional contact, who is listed at: <http://dnr.wi.gov/runoff/stormwater/contact>. Or you may contact the Department's storm water program coordinator for assistance at (608) 267-7694.

**1.12 Public Comment and Request for Public Hearing on Notices of Intent**

All written comments received by the Department within 30 days of the NOI being initially listed on the Internet site will be considered along with the NOI and any other information on file to determine if coverage under this permit is appropriate. A public informational hearing may also be held if significant public interest is expressed. Requests for a public informational hearing must be filed within 30 days of the NOI being initially listed on the Department's Internet site, and must indicate the interest of the party filing the request and the reasons why a hearing is warranted. Comments and requests for public hearing must be mailed to: Wisconsin DNR, Storm Water Program – WT/2, P.O. Box 7921, Madison, WI 53707. The Department will evaluate comments and requests for public hearing to determine if there is sufficient interest to hold a public hearing prior to authorizing coverage under this permit.

**1.13 Transfers**

Coverage under this permit is not transferable to another municipality without the express written approval of the Department. If the permittee's MS4 is annexed into another municipality, the permittee shall immediately notify the Department by letter of such change. If the permittee ceases to own or operate any MS4 regulated under this permit, the Department may terminate its coverage under this permit.

**1.14 Exclusions**

The following are excluded from coverage (i.e. are not authorized) under this permit:

**1.14.1 Combined Sewer and Sanitary Sewer Systems**

Discharges of water from a sanitary sewer or a combined sewer system conveying both sanitary and storm water. These discharges are regulated under s. 283.31, Wis. Stats, and require an individual permit.

**1.14.2 Agricultural Facilities and Practices**

Discharges from "agricultural facilities" and "agricultural practices". "Agricultural facility" means a structure associated with an agricultural practice. "Agricultural practice" means beekeeping; commercial feedlots; dairying; egg production; floriculture; fish or fur farming; grazing; livestock raising; orchards; poultry raising; raising of grain, grass, mint and seed crops; raising of fruits, nuts and berries; sod farming; placing land in federal programs in return for payments in kind; owning land, at least 35 acres of which is enrolled in the conservation reserve

program under 16 USC 3831 to 3836; and vegetable raising.

#### **1.14.3 Other Excluded Discharges**

Storm water discharges from industrial operations or land disturbing construction activities that require separate coverage under a WPDES permit pursuant to subchs. II or III of ch. NR 216, Wis. Adm. Code. For example, while storm water from industrial or construction activity may discharge from an MS4, this permit does not satisfy the need to obtain any other permits for those discharges. This exclusion does not apply to the permittee's responsibility to regulate construction sites within its jurisdiction in accordance with sections 2.4 and 2.5 of this permit.

#### **1.14.4 Indian Country**

Storm water discharges within Indian Country. The federal Clean Water Act requires that owners and operators of storm water discharges within Indian Country in Wisconsin to obtain permit coverage directly from the United States Environmental Protection Agency.

#### **1.14.5 Non-MS4 Discharge**

Storm water discharges that do not enter an MS4.

## **2. PERMIT CONDITIONS**

The permittee shall establish written, measurable goals for achieving compliance with the programs developed under sections 2.1 through 2.6 in accordance with the compliance schedule contained in section 3 of this permit. The following permit conditions apply to the permittee, unless the Department issues a written determination that a condition is not appropriate under the circumstances. For example, where the permittee owns all of the land that drains to its MS4, it may be unnecessary to develop erosion control and storm water management ordinances since they are used to enforce against other landowners of construction and post-construction sites.

### **2.1 Public Education and Outreach**

The permittee shall implement a public education and outreach program to increase the awareness of storm water pollution impacts on waters of the state to encourage changes in public behavior to reduce such impacts. The program shall establish measurable goals and, at a minimum, include the following elements:

- 2.1.1** Promote detection and elimination of illicit discharges and water quality impacts associated with such discharges from municipal separate storm sewer systems.
- 2.1.2** Inform and educate the public about the proper management of materials that may cause storm water pollution from sources including automobiles, pet waste, household hazardous waste and household practices.
- 2.1.3** Promote beneficial onsite reuse of leaves and grass clippings and proper use of lawn and garden fertilizers and pesticides.
- 2.1.4** Promote the management of streambanks and shorelines by riparian landowners to minimize erosion and restore and enhance the ecological value of waterways.
- 2.1.5** Promote infiltration of residential storm water runoff from rooftop downspouts, driveways and sidewalks.

**2.1.6** Inform and where appropriate educate those responsible for the design, installation, and maintenance of construction site erosion control practices and storm water management facilities on how to design, install and maintain the practices.

**2.1.7** Identify businesses and activities that may pose a storm water contamination concern, and where appropriate, educate specific audiences on methods of storm water pollution prevention.

**2.1.8** Promote environmentally sensitive land development designs by developers and designers.

## **2.2 Public Involvement and Participation**

The permittee shall implement a program to notify the public of activities required by this permit and to encourage input and participation from the public regarding these activities. This program shall include measurable goals for public involvement and participation and comply with applicable state and local public notice requirements.

## **2.3 Illicit Discharge Detection and Elimination**

The permittee shall develop, implement and enforce a program to detect and remove illicit connections and discharges to the MS4. The program shall include measurable goals and include all of the following:

**2.3.1** An ordinance or other regulatory mechanism to prevent and eliminate illicit discharges and connections to the MS4. At a minimum, the ordinance or other regulatory mechanism shall:

**2.3.1.1** Prohibit the discharge, spilling or dumping of non-storm water substances or materials into waters of the state or the MS4.

**2.3.1.2** Identify non-storm water discharges or flows that are not considered illicit discharges. Non-storm water discharges that are not considered illicit discharges include water line flushing, landscape irrigation, diverted stream flows, uncontaminated groundwater infiltration, uncontaminated pumped groundwater, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, fire fighting and discharges authorized under a WPDES permit unless identified by the permittee as significant source of pollutants to waters of the state.

**2.3.1.3** Establish inspection and enforcement authority.

**Note:** Chapter NR 815, Wis. Adm. Code, regulates injection wells including storm water injection wells. [Construction or use of a well to dispose of storm water directly into groundwater is prohibited under s. NR 815.11\(5\), Wis. Adm. Code.](#)

**2.3.2** Initial field screening at all major outfalls during dry weather periods. At a minimum, field screening shall be documented and include:

**2.3.2.1** Visual Observation - A narrative description of visual observations including color, odor, turbidity, oil sheen or surface scum, flow rate and any other relevant observations



regarding the potential presence of non-storm water discharges or illicit dumping.

**2.3.2.2** Field Analysis - If flow is observed, a field analysis shall be conducted to determine the presence of illicit non-storm water discharges or illicit dumping. The field analysis shall include sampling for pH, total chlorine, total copper, total phenol and detergents, unless the permittee elects instead to use detergent, ammonia, potassium and fluoride as the indicator parameters. Other alternative indicator parameters may be authorized by the Department in writing.

Note: Detergent, ammonia, potassium and fluoride indicator parameters provide a better screening tool to identify whether the flow is contaminated with sanitary or wastewater, and also whether the source is a tap water or a natural source of water. The Center for Watershed Protection (CWP) has illicit discharge identification and elimination guidance available at [http://www.cwp.org/idde\\_verify.htm](http://www.cwp.org/idde_verify.htm). The CWP guidance includes illicit discharge field sampling guidance developed by Robert Pitt from the University of Alabama on how best to detect illicit discharges including recommended indicator parameters and associated levels of detection.

**2.3.2.2.1** Field screening points shall, where possible, be located downstream of any source of suspected illicit activity.

**2.3.2.2.2** Field screening points shall be located where practicable at the farthest manhole or other accessible location downstream in the system. Safety of personnel and accessibility of the location shall be considered in making this determination.

**2.3.3** On-going dry weather field screening of outfalls during the term of the permit. Outfalls that will be evaluated on an on-going basis and the field screening frequency shall be identified. Consideration shall be given to hydrological conditions, total drainage area of the site, population density of the site, traffic density, age of the structures or buildings in the area, history of the area and land use types. A description of this on-going field screening program shall be submitted to the Department in accordance with section 3.3.4.

**2.3.4** Procedures for responding to known or suspected illicit discharges. At a minimum, procedures shall be established for:

**2.3.4.1** As soon as possible, investigating portions of the MS4 that, based on the results of field screening or other information, indicate a reasonable potential for containing illicit discharges or other sources of non-storm water discharges.

**2.3.4.2** Responding to spills that discharge into and/or from the MS4 including tracking and locating the source of the spill if unknown.

**2.3.4.3** Preventing and containing spills that may discharge into or are already within the MS4.

**2.3.4.4** Notifying the Department immediately in accordance with ch. NR 706, Wis. Adm. Code, in the event that the permittee identifies a spill or release of a hazardous substance, which has resulted or may result in the discharge of pollutants into waters of the state. The Department shall be notified via the 24-hour toll free spill hotline at 1-800-943-0003. The

permittee shall cooperate with the Department in efforts to investigate and prevent such discharges from polluting waters of the state.

**2.3.4.5** To the maximum extent practicable, eliminating leakage from sanitary conveyance systems into the MS4.

**2.3.4.6** Providing the Department with advance notice of the time and location of dye testing within a MS4. (Because the dye may get reported to the Department as an illicit discharge or spill, the Department requires prior notification of dye testing.)

**2.3.5** The permittee shall take appropriate action to remove illicit discharges from its MS4 system as soon as possible. If it will take more than 30 days to remove an illicit connection, the Department shall be contacted to discuss an appropriate action and/or timeframe for removal.

**2.3.6** In the case of an illicit discharge that originates from the permittee's permitted area and that discharges directly to a municipal separate storm sewer or property under the jurisdiction of another municipality, the permittee shall notify the affected municipality within one working day.

**2.3.7** The name, title and phone number of the individual(s) responsible for responding to reports of illicit discharges and spills shall be included in the illicit discharge response procedure and submitted to the Department in accordance with section 3.3.2.

## **2.4 Construction Site Pollutant Control**

Each permittee shall develop, implement and enforce a program to reduce the discharge of sediment and construction materials from construction sites. The program shall establish measurable goals and include:

**2.4.1** An ordinance or other regulatory mechanism to require erosion and sediment control at construction sites and establish sanctions to ensure compliance. Note that Appendix A of ch. NR 152, Wis. Adm. Code, contains a construction site model ordinance. At a minimum, the ordinance or other regulatory mechanism shall establish or include:

### **2.4.1.1** Applicability and jurisdiction.

**2.4.1.1.1** It shall apply to all construction sites with one acre or more of land disturbance, and to sites of less than one acre if they are part of a larger common plan of development or sale under the jurisdiction of the permittee.

**2.4.1.1.2** It does not have to apply to construction sites that are listed under s. NR 216.42(2) to (11), Wis. Adm. Code, except that it shall apply to construction sites listed under s. NR 216.42 (4) and (9) where erosion control authority has been delegated to the permittee by the Wisconsin Department of Commerce.

**2.4.1.1.3** If the permittee is a city, village, county or town and does not have authority from the Wisconsin Department of Commerce (Commerce) to regulate erosion control at public buildings and places of employment, the permittee shall request such authority from Commerce pursuant to s. 101.1205(4), Wis. Stats., **within 18 months after the start date**. If Commerce delegates to the permittee the authority to regulate erosion control at public buildings and places of employment, the permittee shall exercise such

authority as soon as possible.

**2.4.1.2** Erosion and sediment control criteria, standards and specifications equivalent to those approved by the Department. Department erosion and sediment control standards are available through the Department's storm water Internet site at:  
<http://dnr.wi.gov/runoff/stormwater.htm>.

**2.4.1.3** Construction site performance standards equivalent to or more restrictive than those in ss. NR 151.11 and 151.23, Wis. Adm. Code.

**2.4.1.4** Erosion and sediment control plan requirements for landowners of construction sites equivalent to those contained in s. NR 216.46, Wis. Adm. Code.

**2.4.1.5** Inspection and enforcement authority.

**2.4.1.6** Requirements for construction site operators to manage waste such as discarded building materials, concrete truck washout, chemicals, litter and sanitary waste at the construction site so as to reduce adverse impacts to waters of the state.

**2.4.2** Procedures for construction site inspection and enforcement of erosion and sediment control measures. At a minimum, the procedures shall establish:

**2.4.2.1** Municipal departments or staff responsible for construction site inspections and enforcement.

**2.4.2.2** Construction site inspection frequency.

**2.4.2.3** Construction site inspection documentation.

**2.4.2.4** Enforcement mechanisms that will be used to obtain compliance.

**2.4.3** Procedures for receipt and consideration of information submitted by the public.

Note: A town may demonstrate to the Department that an adequate county ordinance that meets the requirements of this permit is administered and enforced within its town and then the town could be excused from having to adopt its own ordinance.

## **2.5 Post-Construction Storm Water Management**

The permittee shall develop, implement and enforce a program to require control of the quality of discharges from areas of new development and redevelopment, after construction is completed. The program shall establish measurable goals and include:

**2.5.1** An ordinance or other regulatory mechanism to regulate post-construction storm water discharges from new development and redevelopment. Note that Appendix B of ch. NR 152, Wis. Adm. Code, contains a post-construction site model ordinance. At a minimum, the ordinance or other regulatory mechanism shall establish or include:

**2.5.1.1** Applicability and jurisdiction that shall apply to construction sites with one acre or more of land disturbance, and sites of less than one acre if they are part of a larger common

plan of development or sale under the jurisdiction of the permittee.

**2.5.1.2** Design criteria, standards and specifications equivalent to technical standards or the Wisconsin Storm Water Manual approved by the Department. The Department-approved technical standards shall take precedence over the Wisconsin Storm Water Manual. The Department-approved technical standards and the Wisconsin Storm Water Manual are available at <http://dnr.wi.gov/runoff/stormwater/techstds.htm>.

**2.5.1.3** Post-construction performance standards equivalent to or more restrictive than those in ss. NR 151.12 and 151.24, Wis. Adm. Code.

**2.5.1.4** Storm water plan requirements for landowners of construction sites equivalent to those contained in s. NR 216.47, Wis. Adm. Code.

**2.5.1.5** Long-term maintenance requirements for landowners and other persons responsible for long-term maintenance of post-construction storm water control measures.

**2.5.1.6** Inspection and enforcement authority.

**2.5.2** Procedures that will be used by the permittee to ensure the long-term maintenance of storm water management facilities.

Note: A town may demonstrate to the Department that an adequate county ordinance that meets the requirements of this permit is administered and enforced within its town and then the town could be excused from having to adopt its own ordinance.

## **2.6 Pollution Prevention**

Each permittee shall develop and implement a pollution prevention program that establishes measurable goals for pollution prevention. The program shall include:

**2.6.1** Routine inspection and maintenance of municipally owned or operated structural storm water management facilities to maintain their pollutant removal operating efficiency.

**2.6.2** Routine street sweeping and cleaning of catch basins with sumps where appropriate.

**2.6.3** Proper disposal of street sweeping and catch basin cleaning waste.

**2.6.4** If road salt or other deicers are applied by the permittee, no more shall be applied than necessary to maintain public safety.

Note: The DOT "Highway Maintenance Manual", chapter 35, contains guidance on application of road salt and other deicers that can be used to determine whether not application is necessary and what application rate is appropriate for deicing and ice prevention. This information is held on a secured server and users must first register with the state of Wisconsin to obtain an ID and password. You can learn more about getting connected to this secured server at:

<http://www.dot.wisconsin.gov/business/extranet/>. The Wisconsin Department of Transportation (DOT) highway salt storage requirements are contained in ch. Trans 277, Wis. Adm. Code.

**2.6.5** Proper management of leaves and grass clippings, which may include on-site beneficial

reuse as opposed to collection.

**2.6.6** Storm water pollution prevention planning for municipal garages, storage areas and other sources of storm water pollution from municipal facilities.

**2.6.7** Application of lawn and garden fertilizers on municipally controlled properties, with pervious surfaces over 5 acres each, in accordance with a site-specific nutrient application schedule based on appropriate soil tests.

**2.6.8** Education of appropriate municipal and other personnel involved in implementing this program.

**2.6.9** Measures to reduce municipal sources of storm water contamination within source water protection areas. Wisconsin's source water assessment program information is available at: <http://www.dnr.state.wi.us/org/water/dwg/swap/index.htm>.

## **2.7 Storm Water Quality Management**

The permittee shall develop and implement a municipal storm water management program. This program shall achieve compliance with the developed urban area performance standards of s. NR 151.13(2), Wis. Adm. Code, for those areas of the municipality that were not subject to the post-construction performance standards of s. NR 151.12 or 151.24. The program shall include:

**2.7.1** To the maximum extent practicable, implementation of storm water management practices necessary to achieve a 20% reduction in the annual average mass of total suspended solids discharging from the MS4 to surface waters of the state as compared to implementing no storm water management controls, by March 10, 2008. The permittee may elect to meet the 20% total suspended solids standard on a watershed or regional basis by working with other permittee(s) to provide regional treatment that collectively meets the standard.

Note: Pursuant to s. NR 151.13(2), Wis. Adm. Code, the total suspended solids reduction requirement increases to 40% by March 10, 2013. The 20% and 40% total suspended solids reduction requirements are applied to runoff from areas of urban land use and are not applicable to agricultural or rural land uses and associated roads. Additional MS4 modeling guidance for modeling the total suspended solids control is given on the Department's Internet site at: <http://dnr.wi.gov/runoff/stormwater/techstds.htm>

**2.7.2** Evaluation of all municipal owned or operated structural flood control facilities to determine the feasibility of retrofitting to increase total suspended solids removal from runoff.

**2.7.3** Assessment of compliance with s. NR 151.13(2), Wis. Adm. Code, by conducting a pollutant-loading analysis using a model such as SLAMM, P8 or equivalent methodology approved by the Department. At a minimum, the average annual total suspended solids and phosphorus loads to the MS4 shall be determined for the cumulative discharge from all outfalls for the controls and no controls conditions. For purposes of evaluating the modeling, pollutant loads from grouped drainage areas as modeled shall be reported. The modeling shall calculate the theoretical annual average mass of total suspended solids generated for the entire area served by a MS4 within the permittee's jurisdiction with no controls or BMPs applied. Modeling to reflect the current state of controls and BMPs shall be judged against the no controls condition to determine the percent of reduction. A storm water infiltration system is considered to be a

control or BMP. Controls and BMPs that exist at the time of permit issuance may be used to achieve this reduction. This pollutant level reduction applies to total suspended solids only.

Note: It is recommended that the pollutant-loading analysis be conducted as soon as possible. This analysis is needed to provide the permittee with information on which BMPs are needed to meet the implementation date of March 10, 2008.

## **2.8 Storm Sewer System Map**

The permittee shall develop and maintain a MS4 map. The municipal storm sewer system map shall include:

**2.8.1** Identification of waters of the state, name and classification of receiving water(s), identification of whether the receiving water is an ORW, ERW or listed as an impaired water under s. 303(d) of the Clean Water Act, storm water drainage basin boundaries for each MS4 outfall and municipal separate storm sewer conveyance systems.

**2.8.2** Identification of any known threatened or endangered resources, historical property and wetlands, as defined in sections 1.6 through 1.8 of this permit, which might be affected.

**2.8.3** Identification of all known MS4 outfalls discharging to waters of the state and other MS4s. Major outfalls shall be uniquely identified.

**2.8.4** Location of any known discharge to the MS4 that has been issued WPDES permit coverage by the Department. A list of WPDES permit holders in the permittee's area may be obtained from the Department.

**2.8.5** Location of municipally owned or operated structural storm water management facilities including detention basins, infiltration basins, and manufactured treatment devices. If the permittee will be taking credit for pollutant removal from privately-owned facilities, they must be identified.

**2.8.6** Identification of publicly owned parks, recreational areas and other open lands.

**2.8.7** Location of municipal garages, storage areas and other public works facilities.

**2.8.8** Identification of streets.

## **2.9 Annual Report**

The permittee shall submit an annual report to the Department in accordance with section 3.10 of this permit. The permittee shall invite the municipal governing body, interest groups and the general public to review and comment on the annual report. The annual report shall include:

**2.9.1** The status of implementing the permit requirements, status of meeting measurable program goals and compliance with permit schedules.

**2.9.2** A fiscal analysis which includes the annual expenditures and budget for the reporting year, and the budget for the next year.

**2.9.3** A summary of the number and nature of inspections and enforcement actions conducted

to ensure compliance with the required ordinances.

**2.9.4** Identification of any known water quality improvements or degradation in the receiving water to which the permittee's MS4 discharges. Where degradation is identified, identify why and what actions are being taken to improve the water quality of the receiving water.

**2.9.5** A duly authorized representative of the permittee shall sign and certify the annual report and include a statement or resolution that the permittee's governing body or delegated representatives have reviewed or been apprised of the content of the annual report. A signed copy of the annual report and other required reports shall be submitted to the appropriate Department regional storm water contact or to the Wisconsin DNR, Storm Water Program – WT/2, PO Box 7921, Madison, WI 53707-7921. Section 3.10 of this permit contains the date by which annual reports shall be submitted to the Department.

### **2.10 Cooperation**

The permittee may, by written agreement, implement this permit with another municipality or contract with another entity to perform one or more of the conditions of this permit. For example, if a county is implementing and enforcing an adequate storm water ordinance(s) within a town, the town would then not have to adopt its own ordinance. However, the permittee is ultimately responsible for compliance with the conditions of this permit.

## **3. COMPLIANCE SCHEDULE**

The permittee's programs under section 2 shall be submitted to the Department for review. The Department intends to review the program within the 6-month period prior to implementation to verify compliance with the requirements of this permit. The permittee shall comply with the specific permit conditions contained in section 2 according to following schedule:

### **3.1 Public Outreach and Education**

The permittee shall submit the proposed public education and outreach program to the Department within **18 months of the start date** of permit coverage. The permittee shall implement the public education and outreach program **within 24 months of the start date**.

### **3.2 Public Involvement and Participation**

The permittee shall submit the proposed public involvement and participation program to the Department within **18 months of the start date** of permit coverage. The permittee shall implement the public involvement and participation program **within 24 months of the start date**.

### **3.3 Illicit Discharge Detection and Elimination**

**3.3.1** The permittee shall submit the proposed illicit discharge and elimination ordinance to the Department **within 24 months of the start date** of permit coverage. The permittee shall adopt the illicit discharge and elimination ordinance **within 30 months of the start date**.

**3.3.2** The permittee shall submit the proposed illicit discharge response procedures to the Department **within 24 months of the start date** of permit coverage. The permittee shall implement the illicit discharge response procedures **within 30 months of the start date**.

**3.3.3** The permittee shall complete initial field screening **within 36 months of the start date**

of permit coverage.

**3.3.4** The permittee shall submit the proposed on-going field screening program to the Department **within 36 months of the start date** of permit coverage. The permittee shall implement the on-going field screening program **within 48 months of the start date**.

### **3.4 Construction Site Pollutant Control**

**3.4.1** The permittee shall submit the proposed construction site pollutant control ordinance to the Department **within 18 months of the start date** of permit coverage. The permittee shall adopt the construction site pollutant control ordinance **within 24 months of the start date**. If revision to any existing construction site pollutant control ordinance is necessary, the existing ordinances shall continue to be enforced until the revised ordinance becomes effective.

**3.4.2** The permittee shall submit the proposed construction site inspection and enforcement procedures to the Department **within 18 months of the start date** of permit coverage. The permittee shall implement the construction site inspection and enforcement procedures **within 24 months of the start date**.

### **3.5 Post-Construction Storm Water Management**

**3.5.1** The permittee shall submit the proposed post-construction storm water management ordinance to the Department **within 18 months of the start date** of permit coverage. The permittee shall adopt the post-construction storm water management ordinance **within 24 months of the start date**. If revision to any existing post-construction storm water management ordinance is necessary, the existing ordinances shall continue to be enforced until the revised ordinance becomes effective.

**3.5.2** The permittee shall submit the proposed long-term maintenance procedures to the Department **within 18 months of the start date** of permit coverage. The permittee shall implement the long-term maintenance procedures **within 24 months of the start date**.

### **3.6 Pollution Prevention**

The permittee shall submit the proposed pollution prevention program to the Department **within 24 months of the start date** of permit coverage. The pollution prevention program shall be implemented **within 30 months of the start date**.

### **3.7 Storm Water Quality Management**

The permittee shall complete the evaluation of flood control structures and assessment of compliance and submit the results to the Department **by March 10, 2008 or within 24 months of the start date** of permit coverage.

### **3.8 Storm Sewer System Map**

The permittee shall submit the MS4 map to the Department **within 24 months of the start date** of permit coverage.

### **3.9 Amendments**

The permittee shall amend a program required under this permit as soon as possible if the permittee becomes aware that it does not meet a requirement of this permit. The permittee shall amend its



program if notified by the Department that a program or procedure is insufficient or ineffective in meeting a requirement of this permit. The Department notice to the permittee may include a deadline for amending and implementing the amendment.

**3.10 Annual Report**

The permittee shall submit an annual report for each calendar year by **March 31<sup>st</sup> of the following year**. However, an annual report does not have to be submitted after the initial calendar year of permit coverage. The first annual report sent to the Department shall report on the previous 2 calendar years of permit coverage.

**3.11 Reapplication for Permit Coverage**

To retain authorization to discharge after the expiration date of this permit, the permittee shall apply for reissuance of this permit in accordance with the requirements of s. NR 216.09, Wis. Adm. Code, at least 180 days prior to this permit's expiration date.

**COMPLIANCE SCHEDULE SUMMARY**

PERMIT CONDITION	ACTIVITY	DUE TO DNR	IMPLEMENT
Public Education and Outreach – Section 3.1	Submit public education and outreach program	Within 18 months of the start date	Within 24 months of the start date
Public Involvement and Participation – Section 3.2	Submit public involvement and participation program	Within 18 months of the start date	Within 24 months of the start date
Illicit Discharge Detection and Elimination – Section 3.3	1. Submit illicit discharge ordinance	Within 24 months of the start date	Within 30 months of the start date
	2. Submit illicit discharge response procedures	Within 24 months of the state date	Within 30 months of the state date
	3. Complete initial field screening		Within 36 months of the start date
	4. Submit on-going field screening	Within 36 months of the start date	Within 48 months of the start date
Construction Site Pollutant Control – Section 3.4	1. Submit construction site pollutant control ordinance	Within 18 months of the start date	Within 24 months of the start date
	2. Submit construction site inspection and enforcement procedures	Within 18 months of the start date	Within 24 months of the start date
Post-Construction Storm Water Management – Section 3.5	1. Submit post-construction storm water management ordinance	Within 18 months of the start date	Within 24 months of the start date
	2. Submit long-term maintenance procedures	Within 18 months of the start date	Within 24 months of the start date
Pollution Prevention – Section 3.6	Submit pollution prevention program	Within 24 months of the start date	Within 30 months of the start date
Storm Water Quality Management – Section 3.7	1. Submit evaluation of flood control structures	By March 10, 2008 or within 24 months after start date	
	2. Submit assessment of compliance	By March 10, 2008 or within 24 months after start date	
MS4 Map – Section 3.8	Submit MS4 map	Within 24 months of the state date	
Annual Report – Section 3.10	Submit annual report	By March 31 of each year*	
Reapplication for Permit Coverage – Section 3.11	Submit reapplication	By March 31, 2009	

**\*Note:** An annual report does not have to be submitted after the initial calendar year of permit coverage. The first annual report sent to the Department shall report on the previous 2 calendar years of permit coverage.

#### **4. STANDARD CONDITIONS**

The conditions in s. NR 205.07(1) and (3), Wis. Adm. Code, are incorporated by reference in this permit. The permittee shall be responsible for meeting these requirements, except for s. NR 205.07(1)(n), which does not apply to facilities covered under general permits. Some of these requirements are outlined below in sections 4.1 through 4.18. Requirements not specifically outlined below can be found in s. NR 205.07(1) and (3), Wis. Adm. Code.

**4.1 Duty to Comply:** The permittee shall comply with all conditions of the permit. Any act of noncompliance with this permit is a violation of this permit and is grounds for enforcement action or withdrawal of permit coverage under this permit and issuance of an individual permit. If the permittee files a request for an individual WPDES permit or a notification of planned changes or anticipated noncompliance, this action by itself does not relieve the permittee of any permit condition.

**4.2 Enforcement Action:** The Department is authorized under s. 283.89 and 283.91, Wis. Stats., to utilize citations or referrals to the Department of Justice to enforce the conditions of this permit. Violation of a condition of this permit is subject to a fine of up to \$10,000 per day of the violation.

**4.3 Compliance Schedules:** Reports of compliance or noncompliance with interim and final requirements contained in any compliance schedule of the permit shall be submitted in writing within 14 days after the scheduled due date, except that progress reports shall be submitted in writing on or before each schedule date for each report. Any report of noncompliance shall include the cause of noncompliance, a description of remedial actions taken, and an estimate of the effect of the noncompliance on the permittee's ability to meet the remaining scheduled due dates.

#### **4.4 Noncompliance**

**4.4.1** Upon becoming aware of any permit noncompliance that may endanger public health or the environment, the permittee shall report this information by a telephone call to the Department regional storm water specialist within 24 hours. A written report describing the noncompliance shall be submitted to the Department regional storm water specialist within 5 days after the permittee became aware of the noncompliance. The Department may waive the written report on a case-by-case basis based on the oral report received within 24 hours. The written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

**4.4.2** Reports of any other noncompliance not covered under STANDARD CONDITIONS sections 4.3, 4.4.1, or 4.6. shall be submitted with the annual report. The reports shall contain all the information listed in STANDARD CONDITIONS section 4.4.1.

**4.5 Duty to Mitigate:** The permittee shall take all reasonable steps to minimize or prevent any adverse impact on the waters of the state resulting from noncompliance with the permit.

**4.6 Spill Reporting:** The permittee shall immediately notify the Department, in accordance with ch. NR 706, Wis. Adm. Code, in the event of a spill or accidental release of hazardous substances which has resulted or may result in a discharge of pollutants into waters of the state. The Department shall be notified via the 24-hour spill hotline (1-800-943-0003).

**4.7 Proper Operation and Maintenance:** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the municipality to achieve compliance with the conditions of the permit and the storm water management plan. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with conditions of this permit.

**4.8 Bypass:** The permittee may temporarily bypass storm water treatment facilities if necessary for maintenance, or due to runoff from a storm event which exceeds the design capacity of the treatment facility, or during an emergency.

**4.9 Duty to Halt or Reduce Activity:** Upon failure or impairment of storm water management practices identified in the storm water management program, the permittee shall, to the extent practicable and necessary to maintain permit compliance, modify or curtail operations until the storm water management practices are restored or an alternative method of storm water pollution control is provided.

**4.10 Removed Substances:** Solids, sludges, filter backwash or other pollutants removed from or resulting from treatment or control of storm water shall be stored and disposed of in a manner to prevent any pollutant from the materials from entering the waters of the state, and to comply with all applicable federal, state, and local regulations.

**4.11 Additional Monitoring:** If a permittee monitors any pollutant more frequently than required by the permit, the results of that monitoring shall be reported to the Department in the annual report.

**4.12 Inspection and Entry:** The permittee shall allow authorized representatives of the Department, upon the presentation of credentials, to:

**4.12.1** Enter upon the municipal premises where a regulated facility or activity is located or conducted, or where records are required to be maintained under the conditions of the permit;

**4.12.2** Have access to and copy, at reasonable times, any records that are required under the conditions of the permit;

**4.12.3** Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under the permit; and

**4.12.4** Sample or monitor at reasonable times, for the purposes of assuring permit compliance, any substances or parameters at any location.

**4.13 Duty to Provide Information:** The permittee shall furnish the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking or reissuing the permit or to determine compliance with the permit. The permittee shall also furnish the Department, upon request, copies of records required to be kept by the permittee.

**4.14 Property Rights:** The permit does not convey any property rights of any sort, or any

exclusive privilege. The permit does not authorize any injury or damage to private property or an invasion of personal rights, or any infringement of federal, state or local laws or regulations.

**4.15 Other Information:** Where the permittee becomes aware that it failed to submit any relevant facts in applying for permit coverage or submitted incorrect information in any plan or report sent to the Department, it shall promptly submit such facts or correct information to the Department.

**4.16 Records Retention:** The permittee shall retain records of all monitoring information, copies of all reports required by the permit, and records of all data used to complete the notice of intent for a period of at least 5 years from the date of the sample, measurement, report or application.

**4.17 Permit Actions:** Under s. 283.35, Wis. Stats., the Department may withdraw a permittee from coverage under this general permit and issue an individual permit for the municipality if: (a) The municipality is a significant contributor of pollution; (b) The municipality is not in compliance with the terms and conditions of the general permit; (c) A change occurs in the availability of demonstrated technology or practices for the control or abatement of pollutants from the municipality; (d) Effluent limitations or standards are promulgated for a point source covered by the general permit after the issuance of that permit; or (e) A water quality management plan containing requirements applicable to the municipality is approved. In addition, as provided in s. 283.53, Wis. Stats., after notice and opportunity for a hearing this permit may be suspended, modified or revoked, in whole or in part, for cause.

**4.18 Signatory Requirements:** All applications, reports or information submitted to the Department shall be signed by a ranking elected official, or other person authorized by those responsible for the overall operation of the MS4 and storm water management program activities regulated by the permit. The representative shall certify that the information was gathered and prepared under his or her supervision and, based on report from the people directly under supervision that, to the best of his or her knowledge, the information is true, accurate, and complete.

**4.19 Attainment of Water Quality Standards after Authorization:** At any time after authorization, the Department may determine that the discharge of storm water from a permittee's MS4 may cause, have the reasonable potential to cause, or contribute to an excursion of any applicable water quality standard. If such determination is made, the Department may require the permittee to do one of the following:

**4.19.1** Develop and implement an action plan to address the identified water quality concern to the satisfaction of the Department.

**4.19.2** Submit valid and verifiable data and information that are representative of ambient conditions to demonstrate to the Department that the receiving water or groundwater is attaining the water quality standard.

**4.19.3** Submit an application to the Department for an individual storm water discharge permit.

## 5. DEFINITIONS

Definitions for some of the terms found in this permit are as follows:

**5.1 Controls Condition** means a surface-water pollutant-loading analysis that includes pollutant reductions from storm water management practices.

**5.2 Department** means the Wisconsin Department of Natural Resources.

**5.3 Erosion** means the process by which the land's surface is worn away by the action of wind, water, ice or gravity.

**5.4 Hazardous substance** means any substance which may pose a substantial present or potential hazard to human health or the environment because of its quantity, concentration or physical, chemical or infectious characteristics.

**5.5 Illicit Connection** means any man-made conveyance connecting an illicit discharge to a MS4.

**5.6 Illicit Discharge** means any discharge to a MS4 that is not composed entirely of storm water except discharges authorized by a WPDES permit or other discharge not requiring a WPDES permit such as landscape irrigation, individual residential car washing, fire fighting and similar discharges.

**5.7 Infiltration** means the entry and movement of precipitation or runoff into or through soil.

**5.8 Infiltration system** means a device or practice such as a basin, trench, rain garden or swale designed specifically to encourage infiltration, but does not include natural infiltration in pervious surfaces such as lawns, redirecting of rooftop downspouts onto lawns or minimal infiltration from practices, such as swales or road side channels designed for conveyance and pollutant removal only.

**5.9 Jurisdiction** means the area where the permittee has authority to enforce its ordinance(s) or otherwise has authority to exercise control over a particular activity of concern.

**5.10 Land Disturbing Construction Activity** means any man-made alteration of the land surface resulting in a change in the topography or existing vegetative or non-vegetative soil cover that may result in storm water runoff and lead to increased soil erosion and movement of sediment into waters of the state. Land disturbing construction activity includes, but is not limited to, clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities.

**5.11 Maximum Extent Practicable or MEP** means a level of implementing management practices in order to achieve a performance standard or other goal which takes into account the best available technology, cost effectiveness and other competing issues such as human safety and welfare, endangered and threatened resources, historic properties and geographic features.

**5.12 Major Outfall** means a municipal separate storm sewer outfall that meets one of the following criteria:

**5.12.1** A single pipe with an inside diameter of 36 inches or more or equivalent conveyance (cross sectional area of 1,018 square inches) which is associated with a drainage area of more than 50 acres.

**5.12.2** A single pipe with an inside diameter of 12 inches or more or equivalent conveyance (cross sectional area of 113 square inches) which receives storm water runoff from land zoned for industrial activity with 2 or more acres of industrial activity, but not land zoned for industrial activity that does not have any industrial activity present.

**5.13 Municipality** means any city, town, village, county, county utility district, town sanitary district, town utility district, school district or metropolitan sewage district or any other public entity created pursuant to law and having authority to collect, treat or dispose of sewage, industrial wastes, storm water or other wastes.

**5.14 Municipal Separate Storm Sewer System or MS4** means a conveyance or system of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all of the following criteria:

**5.14.1** Owned or operated by a municipality.

**5.14.2** Designed or used for collecting or conveying storm water.

**5.14.3** Which is not a combined sewer conveying both sanitary and storm water.

**5.15 No Controls Condition** means a surface water pollutant-loading analysis that does not include pollutant reductions from existing storm water management practices including, but not limited to, infiltration systems.

**5.16 Outfall** means the point at which storm water is discharged to waters of the state or leaves one municipality and enters another.

**5.17 Permittee** means the owner or operator of a MS4 authorized to discharge storm water into waters of the state.

**5.18 Permitted Area** refers to the areas of land under the jurisdiction of the permittee that drains into a MS4, which is regulated under a permit issued pursuant to subch. I of NR 216, Wis. Adm. Code.

**5.19 Redevelopment** means areas where development is replacing older development.

**5.20 Riparian Landowners** are the owners of lands bordering lakes and rivers.

**5.21 Sediment** means settleable solid material that is transported by runoff, suspended within runoff or deposited by runoff away from its original location.

**5.22 Start Date** is the initial date of permit coverage, which is specified in the Department letter authorizing coverage under this permit.

**5.23 Storm Water Management Practice** means structural or non-structural measures, practices, techniques or devices employed to avoid or minimize soil, sediment or pollutants carried in runoff to waters of the state.

**5.24 Storm Water Pollution Prevention Planning** refers to the development of a site-specific

plan that describes the measures and controls that will be used to prevent and/or minimize pollution of storm water.

**5.25 Structural Storm Water Management Facilities** are engineered and constructed systems that are designed to provide storm water quality control such as wet detention ponds, constructed wetlands, infiltration basins and grassed swales.

**5.26 Urbanized Area** means a place and the adjacent densely settled surrounding territory that together have a minimum population of 50,000 people, as determined by the U.S. bureau of the census based on the latest decennial federal census.

**5.27 Waters of the State** include surface waters, groundwater and wetlands.

**5.28 WPDES Permit** means a Wisconsin Pollutant Discharge Elimination System permit issued pursuant to ch. 283, Wis. Stats.




**APPENDIX B**

**WDNR GUIDANCE MEMORANDUM FOR TSS REDUCTION CALCULATIONS**

DATE: June 6, 2005

TO: Regional Water Leaders, Basin Leader & Experts  
Storm Water Permit Staff (via Email)

FROM: Russ Rasmussen, Director   
Bureau of Watershed Management

SUBJECT: Developed Urban Areas and the 20% and 40% TSS Reductions  
Sections NR 151.13(2) and NR 216.07(6), Wis. Adm. Code

*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.*

### **Issue**

Under s. NR 151.13 (2), Wis. Adm. Code, a municipality subject to the municipal storm water permit requirements of subch. I of ch. NR 216, Wis. Adm. Code, must, to the maximum extent practicable, implement a 20% and a 40% reduction in total suspended solids in runoff that enters waters of the state as compared to no controls, by March 10, 2008 and March 10, 2013, respectively. Staff who work with affected municipalities need guidance on what areas under the municipalities' jurisdictions will be included in this requirement. They also need to know what is meant by "no controls" and "with controls", and what methods are acceptable for making these calculations.

### **Discussion**

Chapter NR 216, Wis. Adm. Code, is the implementation code for the developed urban area performance standard. Applicability for permit coverage purposes is dictated by s. NR 216.02, Wis. Adm. Code. Under this provision, owners or operators of the following municipal separate storm sewer systems (MS4s) are required to obtain coverage under a WPDES municipal storm water permit:

- MS4s serving populations of 100,000 or more.
- Previously notified owners or operators of municipal separate storm sewer systems.
- MS4s within urbanized areas as identified by EPA.
- MS4s serving populations over 10,000 unless exempted by DNR.

"MS4" means a conveyance or system of conveyances, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all the following criteria:

- Owned or operated by a municipality.
- Designed or used for collecting or conveying storm water.
- Not a combined sewer conveying both sanitary and storm water.
- Not part of a publicly owned wastewater treatment works that provides secondary or more stringent treatment.

Under s. NR 216.07(6)(a), Wis. Adm. Code, a municipality must develop a stormwater management program to achieve compliance with the developed urban area performance standard (s. NR 151.12(2), Wis. Adm. Code). Developed areas are generally those that were not subject to the post-construction performance standards (s. NR 151.12 or NR 151.24, Wis. Adm. Code). The total suspended solids control requirements of s. NR 151.13(2)(b)1.b. and 2., Wis. Adm. Code, may be achieved on an individual municipal basis. Control does not have to apply uniformly across the municipality. The control may also be applied on a regional basis by involving several municipalities.

A municipality is required under s. NR 216.07(6)(b), Wis. Adm. Code, to provide an assessment of the actions taken to comply with the performance standards. This assessment may take the form of an annual progress report. The initial assessment must include a pollutant-loading analysis using a model such as SLAMM, P8 or equivalent methodology that is approved by the department. At a minimum, a pollutant-loading analysis must be conducted for total suspended solids and phosphorus. A model would not be run again after the initial assessment unless significant management changes occurred that should be accounted for, or the progress report indicates a re-run is necessary.

### **DNR Guidance**

To comply with the code, the developed urban area must be modeled under a “no control” condition and a “with controls” condition. The 20% and 40% TSS reductions are assessed against the “no control” condition for the entire area served by the MS4 as defined below. They are not applied uniformly across the municipality, nor are they applied drainage area by drainage area within the municipal boundary. In most cases however, a calculation drainage basin by drainage basin will be used to determine the total loading and the achieved reductions.

### **Areas Required to be Included in the Calculations**

A municipality must include the following areas when calculating compliance with the developed urban area standard (s. NR 151.13, Wis. Adm. Code):

1. Any developed area that was not subject to the post-construction performance standards of s. NR 151.12 or 151.24, Wis. Adm. Code, that went into effect October 1, 2004 and that drains to the MS4 owned or operated by the municipality.
2. Any area covered by an NOI submitted prior to October 1, 2004 where development is still underway. The pollutant load shall be based on full build out. If it is known that the future development of some parcels may require compliance with s. NR 151.12 or NR 151.24, Wis. Adm. Code, then these areas may be excluded from the calculation.
3. Any undeveloped (in-fill) areas under 5 acres. These areas must be modeled as fully developed, with a land use similar to the properties around them.
4. For municipalities with large areas of agricultural lands separating areas of development, only the areas within the urbanized area as defined by the U.S. Census Bureau.

5. Non-manufacturing areas of industrial facilities such as customer or employee parking lots. (The manufacturing, outside storage and vehicle maintenance areas of these industrial facilities are covered under a subch. II of ch. NR 216, Wis. Adm. Code, industrial permit.)
6. Any industry that has certified a condition of “no exposure” in accordance with s. NR 216.21(3), Wis. Adm. Code.
7. Any developed urban area where it is already established that the area will be annexed by the municipality prior to March 10, 2008. There must be an agreement with the municipality that will be losing the area, to prevent double counting.

### **Areas Prohibited from Inclusion in the Calculations**

Areas and loadings that shall not be included:

1. Lands zoned for agricultural use and operating as such.
2. Pollutant loadings from an upstream MS4 (independent of whether it is regulated under a ch. NR 216, Wis. Adm. Code, permit)
3. Any internally drained area with natural infiltration. (This does not include engineered or constructed infiltration areas.) However, an internally drained area that discharges to a karst feature is not likely to be receiving adequate treatment prior to any contact with the groundwater. The municipality is encouraged to look at this area for possible treatment options.
4. Undeveloped land parcels over 5 acres within the municipality. These areas will be subject to s. NR 151.12 or 151.24, Wis. Adm. Code, when developed.

### **Optional Areas to Include in the Calculations**

Areas a municipality may, but is not required to, include in the developed urban area load calculation:

1. Property that drains to *waters of the state* without passing through the permittee’s MS4. Waters of the state include surface water, wetlands and groundwater and has the meaning given in s. 283.01(20), Stats. Waters of the state may overlap with the definition of MS4. For this purpose, if a waterway meets the definition of an MS4 it will be regulated as an MS4. The definition for MS4 is given in s. NR 216.002(17), Wis. Adm. Code. The significant language in that definition is whether or not the municipality owns or operates the drainage way (i.e., maintains, has easement access for work, etc.). For example, when a “stream” is designed or used for collecting or conveying storm water such as flowing through a municipally owned or operated culvert or bridge restriction, that “stream” is part of the MS4.
2. 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 treatment device 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.
3. Industrial facilities subject to a permit under subch. II of ch. NR 216, Wis. Adm. Code. This exclusion covers the facilities that are required to have permit coverage. Contact the regional stormwater specialist or central office to get a list of permitted facilities within a municipality.
  - The industrial NR 216 permit covers areas with industrial materials and activities, specifically areas with manufacturing, vehicle maintenance, storage of materials, etc.

A municipality may include any of the areas identified above in their developed urban area as part of their load calculation provided the areas are not prohibited from inclusion in the calculation. If they choose to include an area, it must be included in both the “no controls” and “with controls” condition. Inclusion of areas they choose to be responsible for will allow them to take credit for any of those areas that may have

controls in place. For example, if an industrial park would have been excluded because all the industries in the industrial park have an NR 216 industrial permit, but the municipality chooses to keep this area in their “no controls” area, then any best management practices existing or built to serve the industrial park can be included in the “with controls” scenario.

## **Model Inputs**

### Model Version:

To model the TSS load in the area served by the MS4 the municipality must select a model that can track particle distribution. Such models include SLAMM and P8. In general, a municipality must use the most current version of a model that is available at the time of the analysis. However, a municipality may use an earlier version of a model if it was previously used to calculate loads in the municipality and these loads were documented in a stormwater management plan, database, or other report. The most current versions of SLAMM and P8 will be accessible through the DNR website with links to the authors. A summary of past versions and the changes made with each SLAMM update will also be posted. The DNR has recently received a grant to help upgrade P8 to a Windows format.

As part of the reporting process, the municipality must identify which version it is using. It must use the same version for both the “no controls” scenario and the “with controls” scenario. If an older version of the model is used, this may mean that as the model is updated a municipality cannot take credit for some practices that are only available in the most recent models. In order to take credit for practices that are in recent versions of the models, both the “no controls” and “with controls” scenario must be run with the latest model. A municipality must run all drainage basins in the developed urban area with the same model and model version.

### “No control”

The “no controls” condition can be based on the standard land use files for different land uses in SLAMM. This assumes certain default parameter files, an assumed level of disconnection and an assumed distribution of road smoothness. For the drainage system, the default will be curb and gutter (even if the drainage system is currently swale drainage), in fair condition. For “no controls” there will be no recognition of street sweeping, catch basin cleaning, swale drainage, or the existence of any engineered best management practices. These practices and facilities will be accounted for under the “with controls” condition. 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.

### “With controls”

The “with controls” condition is applied to the developed urban area with the inclusion of the practices and facilities (existing and proposed). Modeling is a means to confirm a device’s efficiency for the conditions found in Wisconsin. If the model cannot predict efficiencies for certain practices that the municipality identifies as water quality practices, then a literature review must be conducted to estimate the reduction value. However, proprietary devices that utilize settling as their means of solids reduction should be modeled as catch basins with sumps. The efficiency of proprietary devices that utilize filtration as a means of solids reduction cannot currently be modeled using SLAMM.

Practices on private property that drain to an MS4 can be included in the “with controls” scenario for a municipality, if the municipality is able to ensure that the practice will continue to be maintained. The efficiency of the 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 sediment storage layer and the outlet design are critical features that determine whether a detention pond is providing 80% TSS reduction.

As information on proprietary practices or new stormwater designs becomes available through monitoring, the model will be adjusted to reflect changes in efficiency.

Again, future versions of the model can be used to evaluate the “with controls” condition, but only if the “no controls” scenario is also run with the new version.

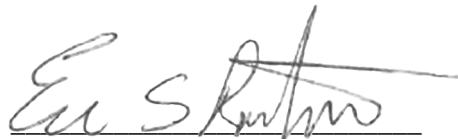
**Further clarifications**

- 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 unless there is an inter-municipal agreement for maintenance of the BMP. This contract must be in writing with signatures from both municipalities at the time of the evaluation.
- The model results will be the basis for determining compliance with the permit for “no controls” and “with controls” TSS load. No credit will be given for implementation of ordinances or information and education programs.
- For reporting purposes, the pollutant load must be summarized as the cumulative total for the developed urban area served by the MS4. 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.

Approved By:



Gordon Stevenson, Chief  
Runoff Management Section



Eric S. Rortved  
Storm Water Program Coordinator

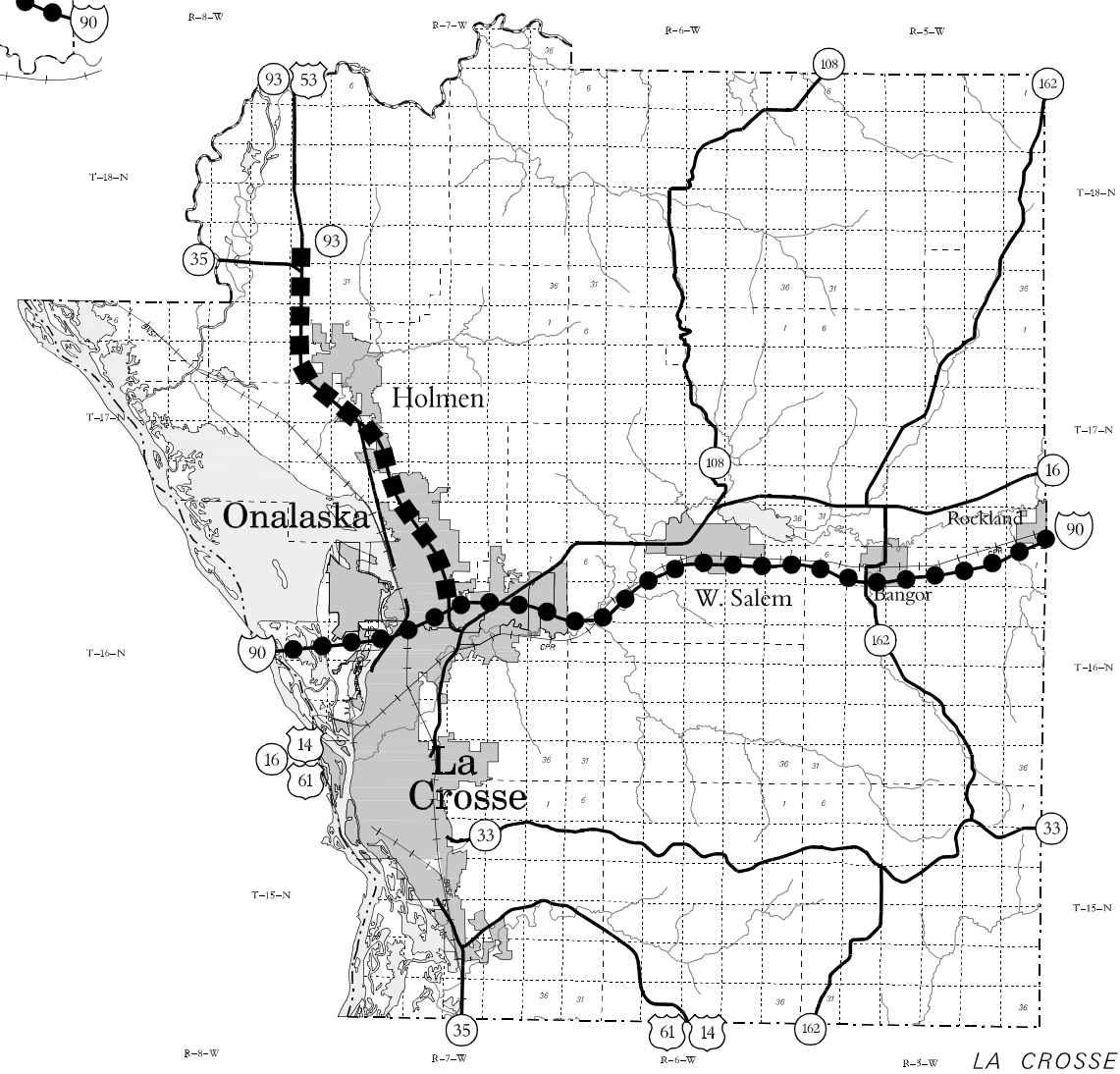
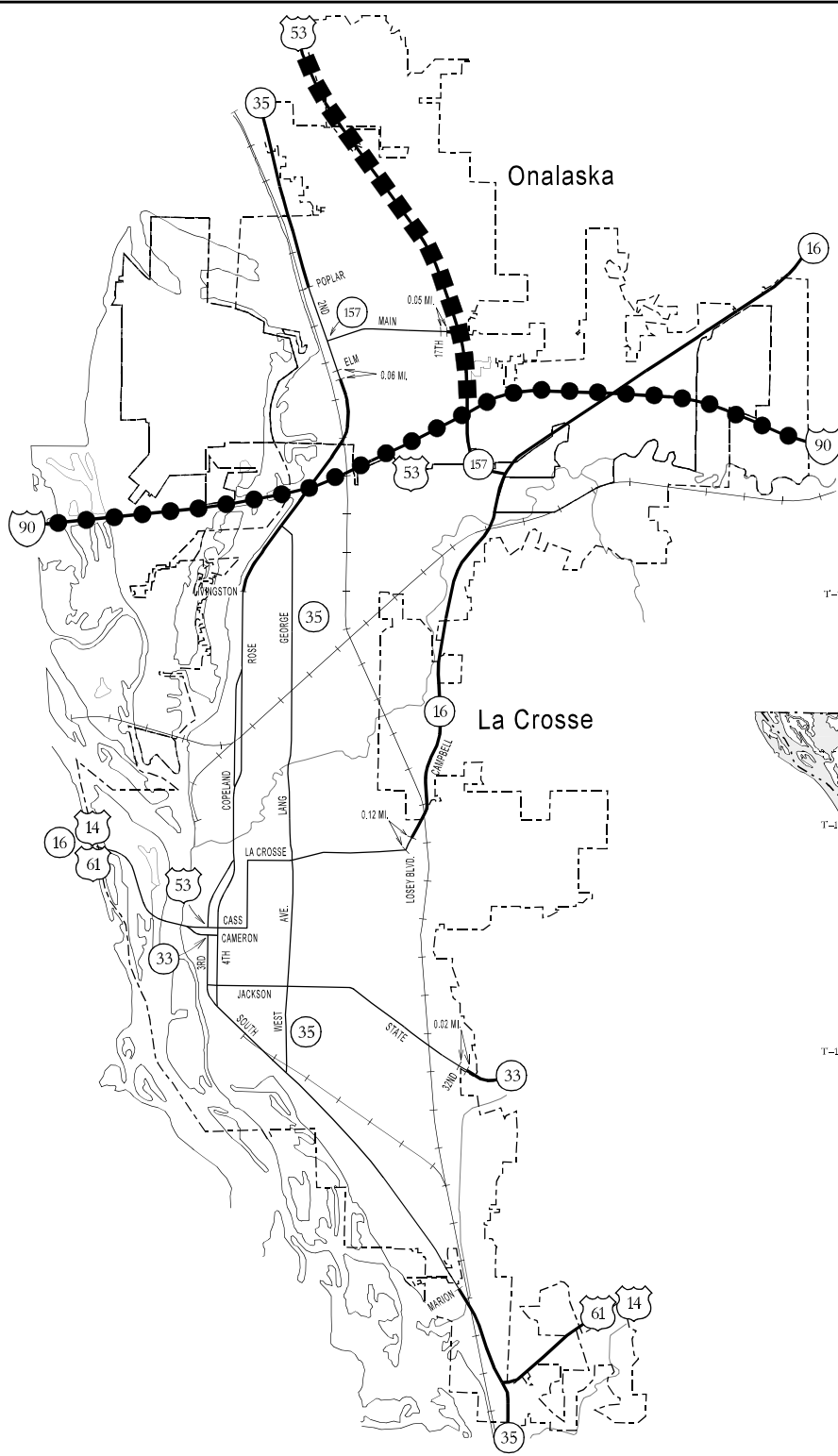
**APPENDIX C**

**WDOT LA CROSSE COUNTY STATE TRUNK HIGHWAY SYSTEM MAP**

# LA CROSSE COUNTY

Prepared by the State of Wisconsin, Department of Transportation  
 Div. of Transportation Infrastructure Development in accordance  
 with Section 84.02(12) showing the official layout of the STATE TRUNK  
 HIGHWAY SYSTEM as of December 31, 2006

SYMBOL	HIGHWAY DESIGNATION	WI. STATE STATUTES
	STATE TRUNK HIGHWAY (Maintained & Traveled)	84.02
	STATE TRUNK HIGHWAY (Not Maintained & Traveled)	84.02
	STATE TRUNK HIGHWAY (To be removed from the Official STH System upon opening to traffic the highway segment shown as symbol  )	84.02
	CONNECTING HIGHWAYS	84.02(11)
	DESIGNATED FREEWAY- INTERSTATE HIGHWAY	84.29 & 84.295
	DESIGNATED FREEWAY	84.295
	DESIGNATED EXPRESSWAY	84.295



LA CROSSE

LA CROSSE



**APPENDIX D**

**BASE POLLUTANT LOADS BY SUBBASIN**

## Annual Loadings, lbs

Subbasin	No Controls Conditions			Existing Conditions		
	TSS	Pb	P	TSS	Pb	P
B1	35,797.85	0.38	51.59	31,136.11	0.38	44.89
B10	34,455.56	0.54	89.97	29,307.32	0.54	76.88
B11	7,803.33	0.13	13.59	6,349.55	0.13	11.07
B12.0	116,957.31	1.83	302.70	99,558.49	1.83	258.64
B12.1	235,585.99	3.58	613.82	200,969.89	3.58	525.31
B13	4,392.70	0.07	9.57	3,478.11	0.07	7.67
B14	17,744.38	0.28	31.78	15,047.99	0.28	26.98
B15	25,335.50	0.46	47.72	20,727.61	0.46	39.37
B16	2,981.82	0.06	5.52	2,162.60	0.06	4.06
B17	6,516.12	0.12	12.38	5,456.95	0.12	10.42
B18	35,027.74	0.65	65.26	27,640.53	0.65	51.94
B19	94,045.39	1.40	234.56	80,156.50	1.40	201.38
B2	4,343.69	0.06	7.95	3,786.52	0.06	6.99
B20	1,206.12	0.02	3.07	1,075.50	0.02	2.75
B21	941.56	0.01	2.60	806.47	0.01	2.23
B22	1,754.09	0.02	4.98	1,516.05	0.02	4.33
B23	898.09	0.01	2.55	776.21	0.01	2.22
B24	1,260.77	0.02	3.58	1,089.85	0.02	3.12
B25	3,874.02	0.06	6.63	3,347.29	0.06	5.74
B26	377.43	0.00	1.07	326.21	0.00	0.93
B27	42,441.90	0.49	145.59	41,890.36	0.60	147.19
B28	4,134.87	0.05	14.65	4,134.87	0.05	13.41
B29	782.41	0.01	2.28	541.42	0.01	1.62
B3.0	236,358.40	3.56	565.33	202,752.47	3.56	486.34
B3.1	171,957.76	2.56	384.70	147,271.88	2.56	329.96
B31	92.73	0.00	0.27	64.17	0.00	0.19
B32	1,475.51	0.02	4.30	1,021.05	0.02	3.06
B33	774.63	0.01	2.26	536.04	0.01	1.61
B34	360.43	0.00	1.05	249.42	0.00	0.75
B35	896.36	0.01	2.61	620.28	0.01	1.86
B36	1,322.27	0.02	3.76	889.02	0.02	2.60
B37	1,565.90	0.02	4.45	1,052.81	0.02	3.08
B38	886.33	0.01	2.57	627.38	0.01	1.88
B39	3,364.48	0.04	9.65	2,235.14	0.04	6.76
B4	761.39	0.01	1.64	668.85	0.01	1.46
B40	14.03	0.00	0.04	9.71	0.00	0.03
B41	98.89	0.00	0.29	68.43	0.00	0.21
B42	12,241.10	0.21	26.25	10,619.08	0.21	22.96
B43	1,558.49	0.03	2.89	1,082.27	0.03	2.04
B44	20,995.99	0.38	40.23	17,049.52	0.38	33.05
B5	184.86	0.00	0.59	174.13	0.00	0.56
B6.0	95,643.89	1.51	215.24	82,094.75	1.51	185.05
B6.1	48,983.95	0.75	124.52	41,859.20	0.75	106.79
B6.2	151,767.91	2.30	351.23	129,662.65	2.30	300.67
B7	127,223.39	1.93	249.51	110,590.58	1.93	217.05
CLOSED	155,167.52	1.76	545.65	155,141.66	2.04	525.91
L02	9,545.75	0.28	20.88	8,245.78	0.28	18.14
L03	793.88	0.01	1.90	687.49	0.01	1.65
L04	192,073.38	2.94	512.92	164,942.37	2.94	442.73

Subbasin	No Controls Conditions			Existing Conditions		
	TSS	Pb	P	TSS	Pb	P
L05	6,474.50	0.08	16.07	5,829.86	0.08	14.53
L06	8,693.83	0.13	22.34	7,421.07	0.13	19.12
L07	3,253.88	0.05	8.56	2,762.04	0.05	7.28
L08	15,307.18	0.24	40.75	13,005.22	0.24	34.74
L09	116,050.43	1.62	324.36	100,355.19	1.62	282.26
L1.0	208,724.72	4.77	425.59	180,710.45	4.77	370.13
L1.1	234,536.91	3.84	586.09	202,070.66	3.84	507.10
L1.2	91,865.83	1.50	236.07	78,889.13	1.50	203.81
L10	5,382.29	0.07	15.48	4,734.31	0.07	13.73
L12	22,480.82	0.26	68.00	20,350.58	0.26	62.02
L13.0	92,760.01	1.07	294.09	85,465.66	1.07	272.81
L13.1	93,456.85	1.34	257.86	79,473.61	1.34	220.65
L13.2	48,316.49	0.73	134.14	41,642.83	0.73	116.31
L14	38,274.06	0.53	60.00	33,246.28	0.53	52.20
L15	228,164.96	3.56	532.06	196,498.97	3.56	459.02
L16	44,396.96	0.52	93.10	38,535.13	0.52	80.90
L17	523,810.19	4.62	641.54	421,635.60	4.62	517.43
L18	17,841.82	0.19	24.56	15,625.06	0.19	21.55
L19.0	35,070.34	0.32	47.44	21,174.32	0.32	30.15
L19.1	146,518.11	1.23	173.85	125,372.31	1.23	148.89
L19.2	40,015.61	0.33	46.91	34,811.57	0.33	40.84
L19.3	70,321.33	0.62	87.40	61,636.01	0.62	76.76
L19.4	19,592.04	0.17	23.71	16,026.04	0.17	19.43
L20	12,657.92	0.22	25.68	10,927.61	0.22	22.29
L21	27,501.83	0.58	49.32	23,924.72	0.58	42.96
L22	10,160.40	0.21	18.22	8,838.86	0.21	15.87
L23	9,362.83	0.12	27.13	8,019.52	0.12	23.48
L24	2,969.42	0.05	7.82	2,625.49	0.05	6.93
L25	1,156.03	0.01	4.03	998.30	0.01	3.51
L26	22,005.20	0.36	46.74	18,868.25	0.36	40.41
L27	7,555.14	0.12	16.60	6,266.44	0.12	13.77
L28	37,781.34	0.47	110.59	28,951.93	0.47	86.61
L28.1	10,339.73	0.12	31.98	8,333.94	0.12	26.37
L29	31,216.95	0.48	83.55	25,188.74	0.48	68.53
L30	403.05	0.01	0.72	350.63	0.01	0.63
L31	76,871.96	1.61	137.90	66,873.95	1.61	120.10
L32	74.39	0.00	0.11	64.89	0.00	0.10
L33	2,688.27	0.05	5.01	2,317.21	0.05	4.34
L34	951.56	0.02	1.77	820.21	0.02	1.54
L35	2,778.53	0.05	5.18	2,395.01	0.05	4.48
L36	959.61	0.02	1.79	827.15	0.02	1.55
L37	682.39	0.01	1.27	588.20	0.01	1.10
L38	1,267.86	0.02	2.36	1,092.77	0.02	2.04
L39	278.66	0.00	0.76	220.17	0.00	0.61
L40.0	65,899.83	0.83	98.05	57,180.30	0.83	85.21
L40.1	49,503.90	0.42	60.96	43,156.72	0.42	53.26
L41	395,259.90	4.43	643.74	343,674.13	4.43	558.98
L42	33,776.40	0.30	43.36	29,619.20	0.30	38.11
M01	35,968.58	0.57	93.40	30,846.29	0.57	80.67
M02	227.94	0.00	0.65	197.01	0.00	0.56

Subbasin	No Controls Conditions			Existing Conditions		
	TSS	Pb	P	TSS	Pb	P
M03	716.03	0.01	2.26	630.86	0.01	2.01
M05	34,810.78	0.46	98.74	30,549.20	0.46	87.28
M06	51,140.24	0.73	140.03	43,425.90	0.73	119.50
M07	1,640.30	0.02	4.89	1,430.25	0.02	4.29
M08	782.62	0.01	2.26	678.23	0.01	1.97
M09	10,915.78	0.14	32.47	9,097.82	0.14	27.37
M10.0	20,420.64	0.25	61.03	17,879.59	0.25	53.83
M10.1	6,255.52	0.08	18.79	5,410.86	0.08	16.37
M11	41,210.17	0.55	116.96	31,754.11	0.55	91.48
M12	4,464.56	0.06	13.23	3,815.20	0.06	11.40
M13	3,010.24	0.05	8.08	2,301.48	0.05	6.27
M14	13,079.67	0.17	36.95	11,213.75	0.17	31.87
M15	42,056.42	0.62	110.42	36,562.62	0.62	96.42
M16	3,733.06	0.06	9.61	3,296.58	0.06	8.51
M18.0	52,146.35	0.97	96.87	44,926.56	0.97	83.76
M18.1	131,263.89	2.38	255.61	113,357.35	2.38	221.76
M18.2	7,956.40	0.14	16.82	6,884.88	0.14	14.65
M18.3	31.01	0.00	0.06	26.71	0.00	0.05
M18.4	6,229.88	0.10	14.95	5,388.28	0.10	13.00
M19.0	100,474.39	1.37	184.46	88,103.27	1.37	163.16
M19.1	174,049.70	3.12	358.85	150,619.08	3.12	312.44
M19.2	62,280.90	1.31	118.74	54,220.02	1.31	103.64
M19.3	90,635.85	1.76	182.17	78,520.64	1.76	158.52
M26.0	90,851.58	1.44	202.13	78,781.40	1.44	176.16
M26.1	61,541.10	0.94	153.85	52,930.11	0.94	133.13
M26.11	254,552.06	4.23	606.96	218,012.14	4.23	521.37
M26.12	47,814.43	0.69	130.14	39,845.84	0.69	109.12
M26.13	169,214.48	2.65	452.81	144,020.24	2.65	386.96
M26.14	97,889.93	1.43	268.20	83,691.37	1.43	230.35
M26.16	91,436.12	1.21	259.26	79,124.23	1.21	225.59
M26.2	185,561.53	2.62	511.37	159,607.96	2.62	442.00
M26.3	153,060.45	2.23	412.35	131,364.67	2.23	355.71
M26.4	8,318.06	0.07	10.74	7,267.93	0.07	9.40
M26.5	94,029.83	1.13	139.13	81,629.89	1.13	120.94
M26.6	46,496.23	0.66	127.63	40,014.56	0.66	110.51
M26.7	261,421.20	3.15	477.76	225,864.38	3.15	412.88
M26.8	6,449.10	0.07	16.53	5,859.66	0.07	15.23
M26.9	73,996.91	1.18	188.59	63,726.91	1.18	163.26
M27	6,814.24	0.08	21.39	5,999.13	0.08	18.98
M27.1	10,157.57	0.12	31.83	8,940.22	0.12	28.23
M29.0	16,511.44	0.22	47.46	14,334.44	0.22	41.43
M29.1	51,918.82	0.69	147.68	45,291.37	0.69	129.58
M29.2	124,595.42	2.38	317.41	109,007.06	2.38	279.79
M29.3	50,628.25	0.68	144.85	43,422.17	0.68	125.08
M30	50,160.88	0.87	95.83	43,453.25	0.87	83.34
M31	3,133.41	0.05	5.93	2,713.88	0.05	5.16
M32	3,093.38	0.05	5.91	2,680.30	0.05	5.14
M33	15,726.39	0.41	35.76	13,549.95	0.41	30.95
M34	22,062.04	0.38	55.51	18,677.01	0.38	47.10
M35.0	70,409.54	0.93	197.79	60,737.52	0.93	171.58

Subbasin	No Controls Conditions			Existing Conditions		
	TSS	Pb	P	TSS	Pb	P
M35.1	105,544.59	1.45	289.95	91,252.14	1.45	252.15
M35.2	50,390.45	0.65	144.47	43,626.32	0.65	125.84
M35.3	137,721.19	1.80	401.17	115,417.58	1.80	340.33
M36.0	137,778.71	2.31	328.84	118,449.86	2.31	283.60
M36.1	78,446.63	0.88	138.14	67,751.87	0.88	119.09
M37	29,130.00	0.42	50.01	24,412.14	0.42	41.41
M38.0	38,458.53	1.00	88.40	32,872.79	1.00	76.08
M38.1	4,762.40	0.12	10.96	4,071.10	0.12	9.44
M38.2	2,035.68	0.05	4.68	1,740.24	0.05	4.03
M39.0	403,983.39	6.79	881.98	347,742.94	6.79	760.58
M39.1	5,509.71	0.14	12.68	4,709.84	0.14	10.91
M40	31,250.41	0.45	47.36	27,276.35	0.45	41.40
M41	31,820.10	0.44	49.50	27,603.11	0.44	42.98
M42	12,364.45	0.10	14.41	10,749.51	0.10	12.54
M43.0	108,466.21	1.64	246.52	93,250.38	1.64	212.41
M43.1	81,654.91	1.48	190.06	70,213.82	1.48	163.91
M43.2	152,987.24	2.53	379.98	131,012.03	2.53	326.79
M43.3	84,722.90	1.42	222.38	72,272.77	1.42	190.46
M43.4	374,231.59	7.00	927.33	320,595.12	7.00	798.62
M43.5	241,625.59	3.55	649.04	207,670.36	3.55	560.98
M43.6	295,861.30	4.48	767.21	252,643.20	4.48	657.29
M44	1,459.03	0.02	4.79	1,379.11	0.02	4.56
M45	9,452.16	0.08	11.00	8,216.42	0.08	9.56
M46	1,241.41	0.01	4.08	1,173.41	0.01	3.88
M47	882.47	0.01	2.90	832.61	0.01	2.75
M48	2,337.59	0.02	2.78	2,032.93	0.02	2.42
M49	106,734.72	1.98	182.35	92,684.16	1.98	158.74
M50	13,807.14	0.20	20.97	12,028.90	0.20	18.30
M52.0	2,176.77	0.04	3.65	1,893.37	0.04	3.18
M52.1	147,131.63	3.77	303.45	127,398.62	3.77	264.08
M53	67,699.84	1.82	144.64	58,488.44	1.82	125.68
M55	199.35	0.00	0.47	178.41	0.00	0.42
M56	165.07	0.00	0.39	147.73	0.00	0.35
M57	152,531.98	1.75	230.61	133,037.34	1.75	201.29
M58	384,416.03	3.86	659.53	345,291.96	4.10	632.00
M60	9,503.77	0.08	12.17	8,516.72	0.08	10.93
M62	11,564.77	0.20	21.98	10,018.17	0.20	19.12
M64	15,845.76	0.23	43.50	13,771.03	0.23	37.95
M65	76,743.79	0.68	98.30	0.00	0.68	91.59
M66.1	171,065.78	2.84	344.45	145,907.79	2.84	295.64
M68	8,229.56	0.11	24.28	5,880.38	0.11	17.87
M69	13,758.46	0.18	40.19	9,570.66	0.18	28.75
M71	8,553.53	0.11	24.60	6,131.55	0.11	18.06

**APPENDIX E**

**EXISTING POLLUTANT LOADS BY SUBBASIN**

## Existing Conditions TSS Loadings

Subbasin	Annual TSS load, lbs
B1	31,136
B10	29,307
B11	6,350
B12.0	99,558
B12.1	200,970
B13	3,478
B14	15,048
B15	20,728
B16	2,163
B17	5,457
B18	27,641
B19	80,156
B2	3,787
B20	1,076
B21	806
B22	1,516
B23	776
B24	1,090
B25	3,347
B26	326
B27	54,741
B28	4,135
B29	541
B3.0	202,752
B3.1	147,272
B31	64
B32	1,021
B33	536
B34	249
B35	620
B36	889
B37	1,053
B38	627
B39	2,235
B4	669
B40	10
B41	68
B42	10,619
B43	1,082
B44	17,050
B5	174
B6.0	82,095
B6.1	41,859
B6.2	129,663
B7	110,591
L02	8,246
L03	687
L04	164,942
L05	5,830
L06	7,421

L07	2,762
L08	13,005
L09	100,355
L1.0	180,710
L1.1	202,071
L1.2	78,889
L10	4,734
L12	20,351
L13.0	85,466
L13.1	79,474
L13.2	41,643
L14	33,246
L15	196,499
L16	38,535
L17	421,636
L18	15,625
L19.0	21,174
L19.1	125,372
L19.2	34,812
L19.3	61,636
L19.4	16,026
L20	10,928
L21	23,925
L22	8,839
L23	8,020
L24	2,625
L25	998
L26	18,868
L27	6,266
L28	28,952
L28.1	8,334
L29	25,189
L30	351
L31	66,874
L32	65
L33	2,317
L34	820
L35	2,395
L36	827
L37	588
L38	1,093
L39	220
L40.0	57,180
L40.1	43,157
L41	343,674
L42	29,619
M01	30,846
M02	197
M03	631
M05	30,549
M06	43,426
M07	1,430



M08	678
M09	9,098
M10.0	17,880
M10.1	5,411
M11	31,754
M12	3,815
M13	2,301
M14	11,214
M15	36,563
M16	3,297
M18.0	44,927
M18.1	113,357
M18.2	6,885
M18.3	27
M18.4	5,388
M19.0	88,103
M19.1	150,619
M19.2	54,220
M19.3	78,521
M26.0	78,781
M26.1	52,930
M26.11	218,012
M26.12	39,846
M26.13	144,020
M26.14	83,691
M26.16	79,124
M26.2	159,608
M26.3	131,365
M26.4	7,268
M26.5	81,630
M26.6	40,015
M26.7	225,864
M26.8	5,860
M26.9	63,727
M27	5,999
M27.1	8,940
M29.0	14,334
M29.1	45,291
M29.2	109,007
M29.3	43,422
M30	43,453
M31	2,714
M32	2,680
M33	13,550
M34	18,677
M35.0	60,738
M35.1	91,252
M35.2	43,626
M35.3	115,418
M36.0	118,450
M36.1	67,752
M37	24,412

M38.0	32,873
M38.1	4,071
M38.2	1,740
M39.0	347,743
M39.1	4,710
M40	27,276
M41	27,603
M42	10,750
M43.0	93,250
M43.1	70,214
M43.2	131,012
M43.3	72,273
M43.4	320,595
M43.5	207,670
M43.6	252,643
M44	1,379
M45	8,216
M46	1,173
M47	833
M48	2,033
M49	92,684
M50	12,029
M52.0	1,893
M52.1	127,399
M53	58,488
M55	178
M56	148
M57	133,037
M58	487,583
M60	8,517
M62	10,018
M64	13,771
M65	0
M66.1	145,908
M68	5,880
M69	9,571
M71	6,132

**APPENDIX F**  
**BMP SELECTION DOCUMENTS**

**City of Appleton**

**Potential City-Wide Biofilter Annual TSS Treatment Levels**

Land Use	Acres of Land Use NOT Treated by Existing or Future Ponds	TSS Control (tons / acre)	TSS Control with Variable Treatment Levels (tons /					Construction Cost
			10%	25%	50%	75%	100%	
Commercial *	470	0.15	7.2	18.1	36.2	54.4	72.5	\$ 15,000
Industrial *	789	0.21	16.3	40.9	81.7	122.6	163.4	\$ 13,000
Institutional *	496	0.14	6.8	17.1	34.2	51.3	68.4	\$ 11,000

**Potential City-Wide HSD Annual TSS Treatment Levels**

Land Use	Acres of Land Use NOT Treated by Existing or Future Ponds	TSS Control (tons / 5 acres)	TSS Control with Variable Treatment Levels (tons /					Construction Cost
			10%	25%	50%	75%	100%	
Commercial *								
6' dia.	470	0.12	1.1	2.8	5.6	8.5	11.3	\$ 13,000
8' dia.	470	0.15	1.4	3.5	7.0	10.5	14.0	\$ 20,000
10' dia.	470	0.18	1.6	4.1	8.2	12.4	16.5	\$ 24,000
Industrial *								
6' dia.	789	0.18	2.8	7.1	14.2	21.2	28.3	\$ 13,000
8' dia.	789	0.22	3.5	8.7	17.5	26.2	35.0	\$ 20,000
10' dia.	789	0.26	4.1	10.2	20.4	30.6	40.9	\$ 24,000
Institutional *								
6' dia.	496	0.13	1.3	3.2	6.5	9.7	12.9	\$ 13,000
8' dia.	496	0.16	1.6	4.0	7.9	11.9	15.9	\$ 20,000
10' dia.	496	0.19	1.8	4.6	9.2	13.8	18.5	\$ 24,000

\* Total Cost/ton equals construction cost plus annual cost per ton of removal

\* Commercial Lands include SLAMM categories of Strip Commercial and Shopping Center

\* Industrial Lands include SLAMM categories of Light Industrial and Medium Industrial

\* Institutional Lands include SLAMM categories of Institutional, Schools, and Hospitals

**Biofilter Maintenance Costs**

Commercial (YR 1      2300

<b>Construction Cost / ton</b>	<b>Total Cost / ton</b>
\$ 97,000	\$ 97,000
\$ 63,000	\$ 63,000
\$ 80,000	\$ 80,000

<b>or Independent Project</b>		<b>Cost when Combined with</b>		
<b>Construction Cost / ton</b>	<b>Total Cost / ton</b>	<b>Construct ion Cost</b>	<b>Construct ion Cost / ton</b>	<b>Total Cost / ton</b>
\$ 111,000	\$ 123,000	\$ 4,000	\$ 33,000	\$ 45,000
\$ 136,000	\$ 145,000	\$ 5,000	\$ 36,000	\$ 45,000
\$ 137,000	\$ 145,000	\$ 8,000	\$ 43,000	\$ 51,000
\$ 75,000	\$ 82,000	\$ 4,000	\$ 22,000	\$ 30,000
\$ 92,000	\$ 98,000	\$ 5,000	\$ 24,000	\$ 31,000
\$ 93,000	\$ 98,000	\$ 8,000	\$ 29,000	\$ 35,000
\$ 103,000	\$ 114,000	\$ 4,000	\$ 31,000	\$ 41,000
\$ 127,000	\$ 136,000	\$ 5,000	\$ 34,000	\$ 42,000
\$ 129,000	\$ 136,000	\$ 8,000	\$ 41,000	\$ 48,000

**APPENDIX G**

**HYDROLOGIC AND HYDRAULIC MODELING RESULTS**

Subbasin	2-year, 24-hour storm		10-year, 24-hour storm		100-year, 24-hour storm	
	Peak Flow (cfs)	Runoff volume (ac-ft)	Peak Flow (cfs)	Runoff volume (ac-ft)	Peak Flow (cfs)	Runoff volume (ac-ft)
B10	32	2	72	4	127	7
B12.0	19	6	46	12	85	21
B12.1	111	18	195	32	316	52
B19	111	7	203	12	336	20
B3.0	63	11	154	22	289	40
B3.1	32	7	79	14	152	26
B6.0	75	4	167	9	291	15
B6.1	37	2	84	5	150	9
B6.2	31	6	75	13	143	24
L04	63	10	162	23	318	42
L09	89	6	213	13	408	24
L1.0	27	8	63	16	115	29
L1.1	190	11	444	24	815	43
L1.2	144	9	325	18	600	34
L13.0	113	26	321	62	705	126
L13.1	56	5	140	10	272	20
L13.2	18	3	35	6	60	11
L14	29	2	56	3	90	5
L15	186	11	415	22	743	40
L17	178	25	336	46	571	77
L18	8	1	16	1	26	2
L19.0	57	11	104	20	174	33
L19.1	68	4	161	8	318	17
L19.2	18	2	35	4	61	6
L20	73	7	185	15	359	29
L21	63	3	126	7	207	11
L23	13	1	36	3	74	6
L25	3	0	10	1	21	2
L26	12	1	31	2	60	5
L27	33	6	92	13	199	26
L28	21	3	59	6	127	13
L29	53	4	132	8	262	16
L31	72	5	115	8	175	13
M05	66	5	135	11	242	19
M06	36	3	94	8	190	15
M11	51	4	108	8	196	14
M18.0	24	3	55	6	95	11
M18.1	171	10	274	16	417	25
M19.0	16	3	40	7	78	14
M19.1	45	7	106	14	194	24
M19.2	52	3	103	6	169	9
M19.3	92	6	150	10	229	15
M26.0	82	5	185	10	335	18
M26.1	15	3	38	6	74	11
M26.11	198	12	443	24	794	43
M26.12	41	2	96	5	178	9
M26.13	56	9	138	18	257	32
M26.14	118	7	214	13	354	22

Subbasin	2-year, 24-hour storm		10-year, 24-hour storm		100-year, 24-hour storm	
	Peak Flow (cfs)	Runoff volume (ac-ft)	Peak Flow (cfs)	Runoff volume (ac-ft)	Peak Flow (cfs)	Runoff volume (ac-ft)
M26.16	39	6	102	13	202	24
M26.2	32	13	76	28	145	50
M26.3	106	9	257	18	483	34
M26.4	5	0	11	1	19	1
M26.5	56	4	116	7	193	12
M26.6	8	2	21	5	41	9
M26.7	171	10	373	21	660	37
M26.8	4	0	11	1	22	1
M26.9	54	3	128	7	244	13
M29.0	3	1	9	2	17	4
M29.1	73	9	190	20	379	38
M29.2	58	9	106	17	177	28
M29.3	83	7	208	16	401	30
M35.0	52	4	127	8	242	15
M35.1	74	7	189	14	367	27
M35.2	63	6	133	12	244	22
M35.3	148	31	406	71	860	140
M36	134	10	303	20	538	36
M39	227	18	520	37	920	66
M41	23	1	48	2	80	4
M43.0	79	5	176	10	313	18
M43.1	15	4	34	8	63	14
M43.2	104	7	234	15	420	26
M43.3	18	4	43	9	79	16
M43.4	299	17	668	36	1,197	64
M43.5	100	16	197	30	344	52
M43.6	44	14	103	30	194	53
M52.0	1	0	2	0	4	0
M52.1	130	7	261	13	429	22
M53	47	3	96	6	158	10
M57	120	8	204	13	324	22
M58	108	25	291	56	609	110
M64	15	1	33	2	60	3

L:\work\Projects\86365\wp\r2\[appendix g.xls]10 and 100 yr



**APPENDIX H**  
**SWPPP REVIEW DOCUMENTS**

Date: August 11, 2006  
To: Kurt Schoen  
From: Bernie Michaud  
Subject: City of La Crosse SWPP Review

The Storm Water Pollution Prevention Plans (SWPP) for both the Isle La Plume Wastewater Treatment Plant and the La Crosse Municipal Airport were reviewed for completeness in regards to current WDNR Chapter NR 216 storm water discharge permit requirements. The attached table lists the items that Chapter NR 216 specifically requests to have in a SWPP. Both SWPPS were then reviewed to see if they contain each requested item. Any further deficiencies are noted below.

### **Isle La Plume Wastewater Treatment Plant**

The Isle La Plume Wastewater Treatment Plant SWPP was prepared in January of 2003. It has not been updated since then. Any new updates to the SWPP should include results from the annual inspections, quarterly inspections, and dry weather monitoring. The following deficiencies were found.

- The SWPP states that there is a drainage map and BMP location map. These maps were not present in the SWPP provided for review. The existence and completeness of such maps should be determined.
- The SWPP does not indicate whether or not previous stormwater sampling data has been collected.
- There is no indication that a dry weather monitoring program is being implemented. However, a dry weather monitoring form is provided.
- The maintenance plan for BMPs could be more complete. It should at least specify the frequency of street sweeping.
- There is no listing of potential pollutants after source control measures are implemented.
- A signature page is not provided.

### **La Crosse Municipal Airport**

The La Crosse Municipal Airport SWPP was originally prepared in 1996 with the assistance of Mead and Hunt and was updated in 2001. This update did not include any results from the annual inspections, quarterly inspections, and dry weather monitoring. These results should be included in the SWPP. The following deficiencies were found.

- As noted above, results from the monitoring effort have not been added to the SWPP.

- There is no listing of potential pollutants after source control measures are implemented.
- If additions or changes to the airport have occurred since 1996, then the original drainage and BMP maps should be updated.

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an individual WPDES permit, the department shall explain its decision in writing to the permittee prior to revoking general permit coverage and issuing an individual WPDES permit.

**History:** CR 03-028; cr. Register July 2004 No. 583, eff. 8-1-04.

**NR 216.27 Storm water pollution prevention plan.**

**(1) APPLICABILITY.** Any person who owns or operates a storm water discharge covered by a general or individual storm water discharge permit shall prepare and implement an SWPPP.

**(2) INCORPORATION BY REFERENCE.** When plans are developed or activities conducted in accordance with other federal, state or local regulatory programs that meet the requirements of this section, the plans may be incorporated into the SWPPP by reference.

**(3) PLAN REQUIREMENTS.** The SWPPP shall contain, at a minimum, the following items and provisions:

(a) The SWPPP shall identify by job title the specific individual who has primary responsibility for all aspects of SWPPP development and implementation and identify any other individuals concerned with SWPPP development or implementation, and their respective roles. The specific individual who has primary responsibility shall develop, evaluate, maintain and revise the SWPPP; and carry out the specific management actions identified in the SWPPP, including: maintenance practices, monitoring activities, preparing and submitting reports and serving as facility contact for the department.

(b) The SWPPP shall contain a short summary of the major activities conducted at various locations throughout the facility.

(c) The SWPPP shall include a drainage base map depicting all of the following:

1. How storm water drains on, through and from the facility to groundwater, surface water or wetlands.
2. The facility property.
3. A depiction of the storm drainage collection and disposal system including all surface and subsurface conveyances.
4. Any secondary containment structures.
5. The location of all outfalls that discharge channelized flow to surface water, ground water or wetlands, including outfalls recognized as permitted outfalls under another WPDES permit, numbered for reference.
6. The drainage area boundary for each outfall.
7. The surface area in acres draining to each outfall, including the percentage that is impervious such as paved, roofed or highly compacted soil, and the percentage that is pervious such as grassy areas and woods.
8. Existing structural storm water controls.
9. The name and location of receiving waters.
10. The location of activities and materials that have the potential to contaminate storm water.

(d) The SWPPP shall summarize any results of available storm water sampling data or other observations that characterize the quality of storm water discharges or identifying sources of storm water contamination. Available data that characterizes the quality of storm drainage discharges under dry weather flow conditions shall also be included, except when the data has been or will be reported to the department under another WPDES permit.

(e) The SWPPP shall identify all potential source areas of storm water contamination including:

1. Outdoor manufacturing areas.
2. Rooftops contaminated by industrial activity.
3. Industrial plant yards.
4. Storage and maintenance areas for material handling equipment.
5. Immediate access roads and rail lines.
6. Material handling sites including storage, loading, unloading, transportation, or conveyance of any raw material, finished product, intermediate product and by-product or waste areas.

7. Storage areas for raw materials, finished and intermediate products including tank farms.

8. Disposal or application of wastewater.

9. Areas containing residual pollutants from past industrial activity.

10. Areas of significant soil erosion.

11. Refuse sites.

12. Vehicle maintenance and cleaning areas.

13. Washing areas for equipment, vehicles, containers or other material.

14. Shipping and receiving areas.

15. Manufacturing buildings.

16. Residual treatment, storage and disposal sites.

17. Any other areas capable of contaminating storm water runoff.

(f) Specific pollutants likely to be present in storm water as a result of contact with source areas identified in par. (e) shall also be listed.

(g) The SWPPP shall identify all contaminated and uncontaminated sources of non-storm water discharges to the storm sewer system and indicate which are covered by WPDES permits. The SWPPP shall contain the results of the non-storm water discharge monitoring required by s. NR 216.28. If monitoring is not feasible due to the lack of suitable access to an appropriate monitoring location, the SWPPP shall include a statement that the monitoring could not be conducted and an explanation of the reasons why.

(h) The SWPPP shall rely to the maximum extent practicable, and to the extent it is cost effective, on the use of source area control best management practices that are designed to prevent storm water from becoming contaminated at the site. Source area control best management practices that are either proposed or in place at the facility shall be indicated on the facility drainage base map. The SWPPP shall provide for the use of the following applicable source area control best management practices:

1. Practices to control significant soil erosion.
2. Good housekeeping measures, preventive maintenance measures, visual inspections, spill prevention and response measures and employee training and awareness.
3. Covering or enclosing salt storage piles so that neither precipitation nor storm water runoff can come into contact with the stored salt; or, for facilities that use brine and have salt storage piles on impervious curbed surfaces, a means of diverting contaminated storm water to a brine treatment system for process use.
4. Use of a combination of precipitation control, containment, drainage controls or diversions to control section 313 water priority chemicals potentially discharged through the action of storm water runoff, leaching or wind.

(i) The SWPPP shall maintain best management practices necessary to maintain compliance with the performance standards in s. NR 151.12 for those areas that are described in s. NR 151.12 (2).

(j) The SWPPP shall identify pollutants that are likely to contaminate storm water discharges to waters of the state following implementation of source area control best management practices. Past sampling data collected at the facility or at sufficiently similar outfalls at other facilities may be used in making this determination. At a minimum, all of the following pollutants shall be considered for their potential to contaminate storm water:

1. Any pollutant for which an effluent limitation is contained in any WPDES permit issued to the facility by the department.
2. Any pollutant contained in a categorical effluent limitation or pre-treatment standard to which the facility is subject.
3. Any section 313 water priority chemical for which the facility has reporting requirements and which has the potential for contaminating storm water.
4. Any other toxic or hazardous pollutants from present or past activity at the site that remain in contact with precipitation or

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storm water and which could be discharged to the waters of the state and which are not regulated by another environmental program.

5. Any of the following parameters that might be present in significant concentrations: oil and grease; acids or bases; total suspended solids; 5-day biological oxygen demand; chemical oxygen demand.

(k) When source area control best management practices are not feasible, not cost effective or are inadequate to control storm water pollution, or when the department determines source area control best management practices are inadequate to achieve a water quality standard, the SWPPP shall prescribe appropriate storm water treatment practices as needed to reduce the pollutants in contaminated storm water prior to discharge to waters of the state. Proposed or existing storm water treatment practices shall be shown on the facility drainage basin map. The SWPPP shall provide for the following types of storm water treatment practices:

1. Storm water significantly contaminated with petroleum products shall be treated for oil and grease removal by an adequately sized, designed and functioning wastewater treatment device. Coverage under an individual or general WPDES permit is required for discharges of storm water from oil/water treatment devices.

2. Point source discharges of storm water contaminated by significant amounts of sediment from eroding areas, including bare earth industrial lots and ongoing industrial processes, shall be treated by filtration or settling type practices.

(L) The SWPPP shall include provisions for complying with the monitoring requirements specified in s. NR 216.28. The SWPPP shall include a checklist of inspections to be made during the annual facility site inspection described in s. NR 216.28 (2). The SWPPP shall also identify for each outfall the type of monitoring that will be conducted, such as non-storm water discharge monitoring; storm water discharge quality inspections; or chemical pollutant monitoring for facilities covered under a tier 1 permit. The following are requirements for facilities covered under a tier 1 permit:

1. A list of chemical parameters proposed for testing at each outfall shall be included along with the analytic sample testing procedures from ch. NR 219 that will be used to determine pollutant concentrations.

2. The list of chemical parameters shall include each of the residual pollutants identified in par. (j), or an explanation of why the pollutant should not be included in the chemical testing.

(m) The SWPPP shall include an implementation schedule that is consistent with the compliance schedule in the general storm water discharge permit.

(n) The SWPPP shall be signed in accordance with s. NR 216.22 (7) prior to submittal to the department.

**(4) PLAN AMENDMENT.** A permittee shall amend an SWPPP if any of the following circumstances occur:

(a) When expansion, production increases, process modifications, changes in material handling or storage or other activities are planned which will result in significant increases in the exposure of pollutants to storm water discharged either to waters of the state or to storm water treatment devices. The amendment shall contain a description of the new activities that contribute to the increased pollutant loading, planned source control activities that will be used to control pollutant loads, an estimate of the new or increased discharge of pollutants following treatment and, when appropriate, a description of the effect of the new or increased discharge on existing storm water treatment facilities.

(b) The facility finds through its comprehensive annual facility site compliance inspection, quarterly visual inspection of storm water quality, annual chemical storm water sampling or other means that the provisions of the SWPPP are ineffective in controlling storm water pollutants discharged to waters of the state.

(c) Upon written notice that the department finds the SWPPP to be ineffective in achieving the conditions of the storm water discharge permit applicable to the facility.

**History:** CR 03-028: cr. Register July 2004 No. 583, eff. 8-1-04.

**NR 216.28 Monitoring requirements. (1) NON-STORM WATER DISCHARGES.** The permittee shall evaluate all outfalls for non-storm water discharges into the storm drainage system beginning in the first year of permit coverage. Evaluations shall take place during dry periods. The following are additional requirements for evaluating non-storm water discharges:

(a) Any monitoring shall be representative of non-storm water discharges from the facility.

(b) One of the following monitoring procedures shall be followed:

1. End of pipe screening shall consist of visual observations made at least twice per year at each outfall of the storm sewer collection system. Observations shall be made at times when non-storm water discharges from the facility are considered most likely to occur. Instances of dry weather flow, stains, sludges, color, odor or other indications of a non-storm water discharge shall be recorded; or

2. A detailed testing of the storm sewer collection system may be performed. Testing methods include dye testing, smoke testing or video camera observation. Should the permittee use detailed testing as an alternative, the department shall require a re-test after 5 years or a lesser period as deemed necessary by the department.

(c) All permitted facilities shall maintain the results of their non-storm water evaluations on site. Facilities shall report the results of the initial non-storm water evaluations to the department within the SWPPP summary form required pursuant to s. NR 216.29 (1) (e). Information reported shall include date of testing, test method, outfall location, testing results and potential significant sources of non-storm water discovered through testing.

**Note:** The department storm water pollution prevention summary Form 3400-167 contains a table for recording the results of the non-storm water discharge evaluations.

(d) Any permittee unable to evaluate outfalls for non-storm water discharges shall sign a statement certifying that this requirement could not be complied with, and include a copy of the statement in the SWPPP. The statement shall be submitted to the department.

(e) If a permittee identifies an unauthorized discharge of pollutants, the permittee shall immediately cease the discharge and contact the department to determine if a permit is required under s. 283.31 or 283.35, Stats.

**(2) ANNUAL SITE INSPECTIONS.** Permittees under this subchapter shall perform and document the results of an annual facility site compliance inspection. The inspection shall be adequate to verify that the site drainage conditions and potential pollution sources identified in the SWPPP remain accurate, and that the best management practices prescribed in the SWPPP are being implemented, properly operated and adequately maintained. Information reported shall include the inspection date, inspection personnel, scope of the inspection, major observations and revisions needed in the SWPPP.

**(3) QUARTERLY VISUAL INSPECTION.** Permittees under this subchapter shall perform and document quarterly visual inspections of storm water discharge quality at each outfall. Inspections shall be conducted within the first 30 minutes or as soon thereafter as practical, but not to exceed 60 minutes, after runoff begins discharging at the outfall. The inspections shall include any observations of color, odor, turbidity, floating solids, foam, oil sheen or other obvious indicators of storm water pollution. Information documented shall include: the inspection date, inspection personnel, visual quality of the storm water discharge and probable sources of any observed storm water contamination.

<b>La Crosse Municipal SWPP Review. August, 2006</b>		Waste Water Treatment Plant	Airport
	NR 216 SWPP Requirements	Present	Present
a	Identify primary responsible individual	Y	Y
b	Summary of facility activities	Y	Y
c	Drainage map showing:		
1	stormwater drainage paths	?	Y
2	facility property	?	Y
3	stormwater conveyance system	?	Y
4	secondary containment structures	?	Y
5	outfall locations	?	Y
6	outfall drainage boundaries and areas	?	Y
7	existing structural stormwater controls	?	Y
8	name and location of receiving waters	?	Y
9	location of stormwater contaminants	?	Y
d	Summary of past stormwater sampling data	N	Y
e	Identify potential source areas of contamination (see NR-216.27(3)(e))	Y	Y
f	List pollutants likely to be present in above source areas	Y	Y
g1	Identify all sources of non-stormwater discharges to the storm sewer	Y	Y
g2	Results of non-stormwater discharge monitoring	N	N
h	Show proposed and existing source control BMPs on drainage map.		
1	soil erosion BMPs	?	Y
2	good housekeeping measures	?	Y
3	covering salt storage piles	?	Y
4	control section 313 water priority chemicals	?	Y
i	Maintain BMPs	Y	Y
j	Identify pollutants likely to be present after source control BMP implementation (see NR-216(3)(j))	N	N
k	Show proposed and existing stormwater treatment practices on drainage map.	?	
1	oil and grease removal	?	Y
2	sediment removal	?	Y
l	Monitoring		
1	annual inspection	Y	Y
2	quarterly inspection	Y	Y
3	dry weather monitoring	N	Y
m	Implementation schedule	Y	Y
n	Signature	N	Y

**APPENDIX I**

**MUNICIPAL SITE EVALUATION FIELD NOTES**





**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

**GENERAL INFORMATION**

<b>Earth Tech Staff:</b> Kurt Schoen	<b>City Contacts (Name, Title, Phone #):</b>
<b>Date:</b> 9/21/2006	
<b>Site Location:</b> MUNICIPAL SERVICES CENTER	<b>Responsible City Department:</b> La Crosse,

**SITE ACTIVITIES**

<b>General Description:</b> PUBLIC WORKS YARD / STORAGE FACILITY

**Vehicle Parking/Storage:**

Vehicle Type	#	In/Out-Door?
1. BUSES FOR LACROSSE MUNICIPAL TRANSIT AUTHORITY	~25	IN
2. PICKUPS, TANDEN AXLE TRUCKS	~45	IN
3. SWEEPERS	4	IN
4. IMPOUNDED CARS	~10-15	OUT
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

**Vehicle Maintenance On Site? (type, disposal of materials)**

YES, ALL MAINTENANCE FOR CITY PUBLIC WORKS VEHICLES  
- BURN WASTE OIL TO HEAT BUILDINGS

**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

Outdoor Storage (Bulk)	Quantity	Location	Comments
Sand	50K yd <sup>3</sup> USACE, US ARMY CORPS	VARIOUS LOCATIONS	USACE DRENCH PILES, CITY PILE
Soil TOPSOIL & COMPOST	"	ADJACENT COOL STORAGE	
Salt	3000 TON	INDOORS	<u>INDOORS</u>
Cold Asphalt	50K yd <sup>3</sup>	SE AREA	
Oil			
Fuel		UST - GASOLINE & DIESEL W/ COOL STORAGE	DISPENSOR UNDER CANOPY
Other? CRUSHED CONCRETE STREET SIGNPOSTS	TONS		
<b>Outdoor Storage (Scrap)</b>			
Machinery	VARIOUS	SW SIDE	
Drums	"	"	
Street Signs/posts	"	"	
Cast Iron	"	"	
Other?	"	"	
<b>Indoor Storage</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<b>1. Parks/Landscaping</b>			
- Fertilizer		COOL STORAGE	
- Pesticides		INDOOR COOL STORAGE	
- Topsoil			
- Manure	N/A		
- Mulch		OUTDOORS	
- Fuel containers on-site		SEE ABOVE	(non-spill containers?)
- Other			
<b>2. Cleaning Supplies</b>	<b>Quantity</b>	<b>Locations</b>	<b>Comments</b>
- Solvents (types)		INDOORS	
- Detergents			
- Degreasers			

**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

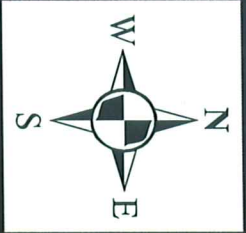
- Other			
<b>3. General Maintenance</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
- Paints		<i>Dodge</i>	
- Lubricants			
- Antifreeze			
- Other			

**OTHER POTENTIAL CONCERNS Municipal Garage(s)/Yards**

<b>1. Historical Spills/Leaks</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<i>N/A</i>			
<b>2. Construction Erosion</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<i>N/A</i>			
<b>3. Bare Soil/Gullies</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<b>4. Other</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>

**Other Notes: (runoff destination; type of conveyance system, receiving waters; existing BMPs):**

CONCRETE TRUCK CLEANING DRAINS TO CURB WITH SUMP, TOP  
GOES TO EITHER STORM OR SANITARY - URBAN



DICKS  
LOSTBARK  
SCMP

LINDA

**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

**GENERAL INFORMATION**

**Earth Tech Staff:**

Kurt Schoen

**City Contacts (Name, Title, Phone #):**

**Date:** 9/21/2006

**Site Location:**

WWT P

**Responsible City Department:**

La Crosse,

**SITE ACTIVITIES**

**General Description:**

**Vehicle Parking/Storage:**

	Vehicle Type	#	In/Out-Door?
1.	BACKHOES, GARBAGE TRUCKS INDOORS		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			

**Vehicle Maintenance On Site? (type, disposal of materials)**

NO - MSC

**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

Outdoor Storage (Bulk)	Quantity	Location	Comments
Sand	N/A		
Soil	N/A		
Salt	N/A		
Cold Asphalt	N/A		
Oil	N/A		
Fuel	N/A		
Other?			
<b>Outdoor Storage (Scrap)</b>			
Machinery	N/A		
Drums	N/A		
Street Signs/posts			
Cast Iron	YES	SE CORNER YARD	CLOSED WATERPANEL
Other? <i>CONCRETE</i>			
<b>Indoor Storage</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<b>1. Parks/Landscaping</b>			
- Fertilizer			
- Pesticides	1 BULK	DEWATERING BUILDING	
- Topsoil			
- Manure		DUH	
- Mulch			
- Fuel containers on-site			(non-spill containers?)
- Other <i>BULK OIL</i>	~ 200 GAL	TANKER BUILDING	
<b>2. Cleaning Supplies</b>	<b>Quantity</b>	<b>Locations</b>	<b>Comments</b>
- Solvents (types)			
- Detergents			
- Degreasers			

**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

- Other			
PERRIC CHLORIDE	10K gall	CONTAINMENT HOLDS 10K	
		VALVED BACK TO PLANT	
<b>3. General Maintenance</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
- Paints	SMALL	IN ROOMS	
- Lubricants			
- Antifreeze		/	
- Other			

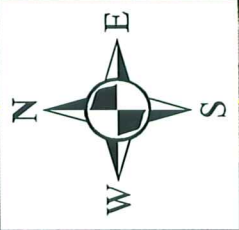
**OTHER POTENTIAL CONCERNS Municipal Garage(s)/Yards**

<b>1. Historical Spills/Leaks</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
N/A			
<b>2. Construction Erosion</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<b>3. Bare Soil/Gullies</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
BARE SOIL BEING SEEDING/VEGETATED			
<b>4. Other</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>



**Other Notes: (runoff destination; type of conveyance system, receiving waters; existing BMPs):**

MOST OF FACILITY DRAINS BACK TO PLANT AND  
IS FULLY TREATED



800 400 0 800 1,600 Feet

**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

**GENERAL INFORMATION**

<b>Earth Tech Staff:</b> Kurt Schoen	<b>City Contacts (Name, Title, Phone #):</b>
<b>Date:</b> 9/21/2006	
<b>Site Location:</b> AIRPORT	<b>Responsible City Department:</b> La Crosse,

**SITE ACTIVITIES**

**General Description:**


**Vehicle Parking/Storage:**

Vehicle Type	#	In/Out-Door?
1. BI-DIRECTIONAL TRUCK	1	IN
2. PALLETS	2	IN
3. RUNWAY MAINTENANCE VEHICLES	8	IN
4. FUEL + FUEL STORAGE ON SITE - 2 TANKS 1 FIRE	3	IN
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

**Vehicle Maintenance On Site? (type, disposal of materials)**

INDOOR, PUT WASTE OIL (T-HANGER ALSO) IN TANK, BURN @ CITY MSC WHEN FULL

**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

<b>Outdoor Storage (Bulk)</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
Sand			
Soil			
Salt			
Cold Asphalt			
Oil	5005	OUTDOOR, ADJACENT MAINTENANCE SHOP	CONTAINMENT
Fuel	~ 10163	UST	UST FOR GAS & DIESEL
Other?			
<b>Outdoor Storage (Scrap)</b>			
Machinery			
Drums			
Street Signs/posts			
Cast Iron			
Other?			
<b>Indoor Storage</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<b>1. Parks/Landscaping</b>			
- Fertilizer		UNGA	FERTILIZER
- Pesticides			
- Topsoil			
- Manure			
- Mulch			
- Fuel containers on-site			(non-spill containers?)
- Other		SAND	
<b>2. Cleaning Supplies</b>	<b>Quantity</b>	<b>Locations</b>	<b>Comments</b>
- Solvents (types)			
CALCUM CHLORIDE - DESCR	2-250g	MAINTENANCE SHOP	
- Detergents			
- Degreasers			

**City of La Crosse Stormwater Management Project  
Municipal Services Operations & Maintenance Checklist**

- Other			
<b>3. General Maintenance</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
- Paints	LOW	MANNING ST	
- Lubricants			
- Antifreeze	2005		
- Other			

**OTHER POTENTIAL CONCERNS Municipal Garage(s)/Yards**

<b>1. Historical Spills/Leaks</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
FOURTH FLOOR DPT BURN SPOT	N/A	EAST SIDE - UNDER WELLS	REPAIRS HAVE BEEN DONE
<b>2. Construction Erosion</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<b>3. Bare Soil/Gullies</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>
<b>4. Other</b>	<b>Quantity</b>	<b>Location</b>	<b>Comments</b>

**Other Notes: (runoff destination; type of conveyance system, receiving waters; existing BMPs):**

STORM SEWER - BLOCK REVER

LIFT STATION IS FROM INDUSTRIAL (NEW NUMB) SITE

**APPENDIX J**

**LA CROSSE NUTRIENT MANAGEMENT INFORMATION**



**City of La Crosse**  
**PARK & RECREATION DEPARTMENT**  
**CITY HALL (608) 789-7533**



**GARLAND AMUNSON**  
Park Superintendent

**ROBERT A. BERG**  
Director

**MICHAEL ULRICH**  
Recreation Superintendent

**BOARD OF PARK  
COMMISSIONERS**

**JOHN SATORY JR.**  
President

**TODD OLSON**  
Vice President

**SANDRA CLARK**  
Secretary

**CHRIS KAHLOW**

**DUANE JOHNSON**

**DAVE LANGE**

**VICKI MONK**

**GREG SHEEHAN**

**ROGER LEGRAND**

**DEPARTMENT  
OFFICE HOURS**

**M-F**

**8:30 A.M.**

**TO 5:00 P.M.**

**PARK DIVISION  
789-7308**

**GREEN ISLAND  
ICE ARENA  
789-7199**

**MYRICK PARK  
ZOO  
789-7190**

April 12, 2004

**TO: Sean Hutchison  
Public Works Specialists**

**FROM: Gar Amunson <sup>RAM</sup>  
Superintendent of Parks**

**REF: Nutrient Management**

The City of La Crosse Parks and Recreation Department recognizes the need for increased protection of its water resources. These efforts include storm water treatment facilities as well as pollution prevention/good housekeeping practices for municipal operations. Therefore, the Parks and Recreation department will reduce the amount of fertilizers used on City maintained properties. The Parks and Recreation department has reduced the amount of acreage fertilized from 86.15 to 35.9 by the year 2004, and will continue to reduce when possible, the amount of nutrients added to City owned property.

Prior to the year 2003, the City of La Crosse Parks and Recreation Department fertilized 86.15 acres of turf area with 3 pounds per 1,000 square feet of 10-10-10. Since the year 2003 the department has reduced the total acreage fertilized to 35.9 acres.

Specific sites that were fertilized prior to 2003 were Burns Park, Cameron Park, Copeland Park, and Erickson Field including Erickson Pool, Green Island Park, Myrick Park, Roellig Park, Riverside/Spence Park, Weigent Park and Diagonal Park for a total of 86.15 acres.

Specific sites that are fertilized since 2003 are Carroll outfield, Copeland I and II outfields, Goose Green outfield, Powell Park, Riverside/Spence Parks, Weigent outfields and Houska outfield for a total of 35.9 acres.



**APPENDIX K**  
**STORMWATER ORDINANCE DOCUMENTS**

December 18, 2007

Tony Hutchens  
City of La Crosse  
400 La Crosse Street  
La Crosse, WI 54601

Subject: **Ordinance Reviews**  
**Stormwater Management Plan**  
**Earth Tech Project No. 86365**

Dear Tony,

As you know, one of the tasks to be performed as part of our Comprehensive Stormwater Management Plan project is to review draft stormwater-related ordinances prepared by the City. Because the City attorney has not completed these documents, and we are approaching the end of the project timeline, I will provide comments and suggestions on the Wisconsin Department of Natural Resources (WDNR) draft stormwater ordinances and the example illicit discharge control ordinance produced by the Center for Watershed Protection in Ellicott City, Maryland, and Robert Pitt at the University of Alabama in Tuscaloosa, Alabama. Appendices A and B of NR 152 contain draft versions of a construction site erosion control zoning ordinance and a post-construction stormwater management zoning ordinance. All three of these documents are enclosed.

Adoption of these ordinances will fulfill the requirements of Sections 2.3.1, 2.4.1, and 2.5.1 of the Wisconsin Pollutant Discharge Elimination System (WPDES) permit governing La Crosse's Municipal Separate Storm Sewer System (MS4). My comments on the individual ordinances are as follows:

**NR 152 APPENDIX A: MODEL CONSTRUCTION SITE EROSION CONTROL ZONING ORDINANCE**

- The administering authority is the position identified in the ordinance who will be responsible for the management and enforcement of the ordinance. One option is to choose a City position and append language such as "or his written designee" throughout the ordinance. This gives staff the option to delegate the program without requiring a rewriting of the ordinance.
- Consider removing S.08 (3)(e), or sending permit denial notices by registered mail.
- S.04(1)(6)1 of the Draft Erosion Control Ordinance references COMM 51.115. This COMM code no longer exists; please replace the reference with COMM 21.125.

**NR 152 APPENDIX B: MODEL POST-CONSTRUCTION STORM WATER MANAGEMENT ZONING ORDINANCE**

- This ordinance is designed for water quality benefit. The only quantity-related requirement pertains to the two-year storm. Given the localized flooding issues facing La Crosse, I recommend requiring reduction from post-development peak to pre-development peak of at least the 10-year event, and if possible, also the 25- or 100-year. Even if the 100-year peak is not required to be reduced, require the safe conveyance of the 100-year event. Section S.07(3)(b) is the appropriate location for this language.
- As above, consider authorizing a designee in writing for ordinance enforcement.
- In S.06(3), select the Madison 1981 rainfall.

**CENTER FOR WATERSHED PROTECTION MODEL ILLICIT DISCHARGE AND CONNECTION ORDINANCE**

- Where the ordinance references the National Pollutant Discharge Elimination System (NPDES), replace with the appropriate WPDES reference.
- Section 10 requires holders of NPDES discharge permits to submit documentation of their federal permit compliance to the municipality. This section can be eliminated; Wisconsin does not require municipalities to receive copies of documentation submitted by industrial permit holders.

In addition, I recommend that you update your Wellhead Protection program to prevent infiltration of runoff selected land uses in areas near wells. NR 151.12(5)(c)5.g excludes infiltrating runoff from commercial, industrial, and institutional land uses or regional devices for residential development within 400 feet of a community water system well or 100 feet of a private well.

Sincerely,

Earth Tech, Inc.

Kurt Schoen, P.E., P.H.  
Project Manager

Enclosures: As Noted.

c: Mark Johnson, La Crosse Water Utility

## APPENDIX A: MODEL CONSTRUCTION SITE EROSION CONTROL ZONING ORDINANCE

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	<b>Foreword</b>
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<b>S.02</b>	<b>Findings of Fact</b>
<b>S.03</b>	<b>Purpose</b>
<b>S.04</b>	<b>Applicability and Jurisdiction</b>
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	(2) Jurisdiction
	(3) Exclusions
<b>S.05</b>	<b>Definitions</b>
<b>S.06</b>	<b>Technical Standards</b>
	(1) Design Criteria, Standards and Specifications
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<b>S.07</b>	<b>Performance Standards</b>
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	(3) Erosion and Other Pollutant Control Requirements
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	(4) Surety Bond
	(5) Permit Requirements
	(6) Permit Conditions
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<b>S.09</b>	<b>Erosion and Sediment Control Plan, Statement and Amendments</b>

- (1) Erosion and Sediment Control Plan
- (2) Erosion and Sediment Control Plan Statement
- (3) Amendments

**S.10 Fee Schedule**

**S.11 Inspection**

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**S.13 Appeals**

- (1) Board of Appeals or Adjustment
- (2) Who May Appeal

**S.14 Severability**

**S.15 Effective Date**

## MODEL CONSTRUCTION SITE EROSION CONTROL ZONING ORDINANCE

**Note to Users:** *This model ordinance includes the use of brackets [ ] around phrases that are to be filled in by the municipality. For example, the phrase [administering authority] is frequently used. Where the municipality chooses to have the ordinance administered by the City Engineer, the phrase [administering authority] should be replaced by "City Engineer". In a few places, the model ordinance includes phrases in brackets that are underlined [\_\_\_\_\_]. In these cases, one of the underlined phrases should be selected verbatim. For example, if the phrase includes statutory citations, several underlined choices may be given such as 59.693, 60.627, 61.354, or 62.234. A county would replace the phrase in brackets with "59.693", since that is the appropriate citation for the county to use.*

### AN ORDINANCE TO CREATE CHAPTER [NUMBER] OF THE [CODE OR ORDINANCE] OF THE [NAME OF MUNICIPALITY] RELATING TO THE CONTROL OF CONSTRUCTION SITE EROSION RESULTING FROM LAND DISTURBING CONSTRUCTION ACTIVITIES

#### FOREWORD.

The intent of this ordinance is to require use of best management practices to reduce the amount of sediment and other pollutants resulting from land disturbing construction activities on sites that do not include the construction of a building and is otherwise regulated by the Wisconsin Department of Commerce in s. COMM 21.125 or COMM 50.115, Wis. Adm. Code. Use of this ordinance will foster consistent, statewide application of the construction site performance standards for new development and redevelopment contained in subchapters III and IV of ch. NR 151, Wis. Adm. Code.

The [governing body] of the [name of municipality] does hereby ordain that Chapter [number] of the [code or ordinance] of the [name of municipality] is created to read as follows:

**[CHAPTER]**  
**CONSTRUCTION SITE EROSION**

**S.01 AUTHORITY.**

- (1) This ordinance is adopted under the authority granted by [s. 59.693, Wis. Stats., for counties; s. 60.627, Wis. Stats., for towns; s. 61.354, Wis. Stats., for villages; s. 62.234, Wis. Stats., for cities]. This ordinance supersedes all provisions of an ordinance previously enacted under s. [59.69, 60.62, 61.35, or 62.23], Wis. Stats., that relate to construction site erosion control. Except as otherwise specified in s. [59.693, 60.627, 61.354, or 62.234] Wis. Stats., s. [59.69, 60.62, 61.35, or 62.23], Wis. Stats., applies to this ordinance and to any amendments to this ordinance.
- (2) The provisions of this ordinance are deemed not to limit any other lawful regulatory powers of the same governing body.
- (3) The [governing body] hereby designates the [administering authority] to administer and enforce the provisions of this ordinance.
- (4) The requirements of this ordinance do not pre-empt more stringent erosion and sediment control requirements that may be imposed by any of the following:
- (a) Wisconsin Department of Natural Resources administrative rules, permits or approvals including those authorized under ss. 281.16 and 283.33, Wis. Stats.
  - (b) Targeted non-agricultural performance standards promulgated in rules by the Wisconsin Department of Natural Resources under s. NR 151.004, Wis. Adm. Code.

**S.02 FINDINGS OF FACT.**

The [governing body] finds that runoff from land disturbing construction activity carries a significant amount of sediment and other pollutants to the waters of the state in [name of municipality].

**S.03 PURPOSE.**

It is the purpose of this ordinance to further the maintenance of safe and healthful conditions; prevent and control water pollution; prevent and control soil erosion; protect spawning grounds, fish and aquatic life; control building sites, placement of structures and land uses; preserve ground cover and scenic beauty; and promote sound economic growth, by minimizing the amount of sediment and other pollutants carried

by runoff or discharged from land disturbing construction activity to waters of the state in the [name of municipality].

#### **S.04 APPLICABILITY AND JURISDICTION.**

(1) APPLICABILITY.

(a) This ordinance applies to the following land disturbing construction activities except as provided under sub. (b):

1. A construction site, which has 5 or more acres of land disturbing construction activity.
2. A construction site, which has one or more acres of land disturbing construction activity after March 10, 2003.

**Note to Users:** The 5- and 1-acre land disturbance thresholds are consistent with state and federal laws regarding applicability of construction site erosion control permits.

(b) This ordinance does not apply to the following:

1. Land disturbing construction activity that includes the construction of a building and is otherwise regulated by the Wisconsin Department of Commerce under s. COMM 21.125 or COMM 50.115, Wis. Adm. Code.
2. A construction project that is exempted by federal statutes or regulations from the requirement to have a national pollutant discharge elimination system permit issued under chapter 40, Code of Federal Regulations, part 122, for land disturbing construction activity.
3. Nonpoint discharges from agricultural facilities and practices.
4. Nonpoint discharges from silviculture activities.
5. Routine maintenance for project sites under 5 acres of land disturbance if performed to maintain the original line and grade, hydraulic capacity or original purpose of the facility.

(c) Notwithstanding the applicability requirements in paragraph (a), this ordinance applies to construction sites of any size that, in the opinion of the [administering authority], are likely to result in runoff that exceeds the safe capacity of the existing drainage facilities or receiving body of water, that causes undue channel erosion, that increases water pollution by scouring or the transportation of particulate matter or that endangers property or public safety.



**Note to Users:** The municipality may want to consider separate legal authority to address situations where persons other than the responsible party destroy or render ineffective BMPs constructed to meet the performance standards of this ordinance.

(2) JURISDICTION.

This ordinance applies to [land disturbing construction activity on construction sites located within the boundaries and jurisdiction of the [name of municipality]].

or

[land disturbing construction activities on lands within the boundaries and jurisdiction of the [name of municipality], as well as the extraterritorial division of land subject to an ordinance enacted pursuant to s. 236.45(2) and (3), Wis. Stats].

or

[land disturbing construction activities on lands within the boundaries and jurisdiction of the [name of municipality], as well as all lands located within the extraterritorial plat approval jurisdiction of [name of municipality], even if plat approval is not involved.]

**Note to Users:** These options differ in the amount of land area covered by this ordinance and may have ramifications for enforcement authority. For counties, the first option will be the only option since counties do not have extraterritorial authority. Under s. 59.693(10), Wis. Stats., if a county ordinance exists at the time of annexation, then the municipal ordinance must be at least as restrictive as the county ordinance.

(3) EXCLUSIONS.

This ordinance is not applicable to activities conducted by a state agency, as defined under s. 227.01 (1), Wis. Stats., but also including the office of district attorney, which is subject to the state plan promulgated or a memorandum of understanding entered into under s. 281.33 (2), Wis. Stats.

**Note to Users:** The Wisconsin Department of Transportation (WisDOT) has entered into a memorandum of understanding with the Wisconsin Department of Natural Resources that satisfies s. 281.33 (2), Wis. Stats., such that activities directed and supervised by WisDOT are exempt from this model ordinance.

**S.05 DEFINITIONS.**

- (1) “Administering authority” means a governmental employee, or a regional planning commission empowered under s. [59.693; 60.627; 61.354; 62.234], Wis. Stats., that is designated by the

[governing body] to administer this ordinance.

- (2) "Agricultural facilities and practices " has the meaning in s. 281.16(1), Wis. Stats.
- (3) "Average annual rainfall" means a calendar year of precipitation, excluding snow, which is considered typical.
- (4) "Best management practice" or "BMP" means structural or non-structural measures, practices, techniques or devices employed to avoid or minimize soil, sediment or pollutants carried in runoff to waters of the state.
- (5) "Business day" means a day the office of the [administering authority] is routinely and customarily open for business.
- (6) "Cease and desist order" means a court-issued order to halt land disturbing construction activity that is being conducted without the required permit.
- (7) "Construction site" means an area upon which one or more land disturbing construction activities occur, including areas that are part of a larger common plan of development or sale where multiple separate and distinct land disturbing construction activities may be taking place at different times on different schedules but under one plan.
- (8) "Division of land" means the creation from one parcel of [number] or more parcels or building sites of [number] or fewer acres each in area where such creation occurs at one time or through the successive partition within a 5 year period.
- (9) "Erosion" means the process by which the land's surface is worn away by the action of wind, water, ice or gravity.
- (10) "Erosion and sediment control plan" means a comprehensive plan developed to address pollution caused by erosion and sedimentation of soil particles or rock fragments during construction.
- (11) "Extraterritorial" means the unincorporated area within 3 miles of the corporate limits of a first, second, or third class city, or within 1.5 miles of a fourth class city or village.
- (12) "Final stabilization" means that all land disturbing construction activities at the construction site have been completed and that a uniform perennial vegetative cover has been established, with a density of at least 70 percent of the cover, for the unpaved areas and areas not covered by permanent structures, or that employ equivalent permanent stabilization measures.
- (13) "Governing body" means town board of supervisors, county board of supervisors, city council, village board of trustees or village council.
- (14) "Land disturbing construction activity" means any man-made alteration of the land surface resulting in a change in the topography or existing vegetative or non-vegetative soil cover, that may result in runoff and lead to an increase in soil erosion and movement of sediment into waters of the state. Land disturbing construction activity includes clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities.
- (15) "MEP" or "maximum extent practicable" means a level of implementing best management

practices in order to achieve a performance standard specified in this chapter which takes into account the best available technology, cost effectiveness and other competing issues such as human safety and welfare, endangered and threatened resources, historic properties and geographic features. MEP allows flexibility in the way to meet the performance standards and may vary based on the performance standard and site conditions.

- (16) "Performance standard" means a narrative or measurable number specifying the minimum acceptable outcome for a facility or practice.
- (17) "Permit" means a written authorization made by the [administering authority] to the applicant to conduct land disturbing construction activity or to discharge post-construction runoff to waters of the state.
- (18) "Pollutant" has the meaning given in s. 283.01 (13), Wis. Stats.
- (19) "Pollution" has the meaning given in s. 281.01 (10), Wis. Stats.
- (20) "Responsible party" means any entity holding fee title to the property or performing services to meet the performance standards of this ordinance through a contract or other agreement.
- (21) "Runoff" means storm water or precipitation including rain, snow or ice melt or similar water that moves on the land surface via sheet or channelized flow.
- (22) "Sediment" means settleable solid material that is transported by runoff, suspended within runoff or deposited by runoff away from its original location.
- (23) "Separate storm sewer" means a conveyance or system of conveyances including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all of the following criteria:
  - (a) Is designed or used for collecting water or conveying runoff.
  - (b) Is not part of a combined sewer system.
  - (c) Is not draining to a storm water treatment device or system.
  - (d) Discharges directly or indirectly to waters of the state.
- (24) "Site" means the entire area included in the legal description of the land on which the land disturbing construction activity is proposed in the permit application.
- (25) "Stop work order" means an order issued by the [administering authority] which requires that all construction activity on the site be stopped.
- (26) "Technical standard" means a document that specifies design, predicted performance and operation and maintenance specifications for a material, device or method.
- (27) "Waters of the state" has the meaning given in s. 281.01 (18), Wis. Stats.

## **S.06 TECHNICAL STANDARDS.**

- (1) DESIGN CRITERIA, STANDARDS AND SPECIFICATIONS. All BMPs required to comply with this ordinance shall meet the design criteria, standards and specifications based on any of the following:
  - (a) Applicable design criteria, standards and specifications identified in the *Wisconsin Construction Site Best Management Practice Handbook*, WDNR Pub. WR-222 November 1993 Revision.
  - (b) Other design guidance and technical standards identified or developed by the Wisconsin Department of Natural Resources under subchapter V of chapter NR 151, Wis. Adm. Code.
  - (c) For this ordinance, average annual basis is calculated using the appropriate annual rainfall or runoff factor, also referred to as the R factor, or an equivalent design storm using a type II distribution, with consideration given to the geographic location of the site and the period of disturbance.

**Note to Users :** The USLE and its successors RUSLE and RUSLE2, utilize an R factor which has been developed to estimate annual soil erosion, averaged over extended time periods. The R factor can be modified to estimate monthly and single-storm erosion. A design storm can be statistically calculated to provide an equivalent R factor as an average annual calculation.

- (2) OTHER STANDARDS. Other technical standards not identified or developed in sub. (1), may be used provided that the methods have been approved by the [administering authority].

## **S.07 PERFORMANCE STANDARDS.**

- (1) RESPONSIBLE PARTY. The responsible party shall implement an erosion and sediment control plan, developed in accordance with S. 09, that incorporates the requirements of this section.
- (2) PLAN. A written plan shall be developed in accordance with S. 09 and implemented for each construction site.

**Note to Users:** The written plan may be that specified within s. NR 216.46, the erosion control portion of a construction plan or other plan.

- (3) EROSION AND OTHER POLLUTANT CONTROL REQUIREMENTS. The plan required under sub. (2) shall include the following:
  - (a) BMPs that, by design, achieve to the maximum extent practicable, a reduction of 80% of the sediment load carried in runoff, on an average annual basis, as compared with no

sediment or erosion controls until the construction site has undergone final stabilization. No person shall be required to exceed an 80% sediment reduction to meet the requirements of this paragraph. Erosion and sediment control BMPs may be used alone or in combination to meet the requirements of this paragraph. Credit toward meeting the sediment reduction shall be given for limiting the duration or area, or both, of land disturbing construction activity, or other appropriate mechanism.

**Note to Users:** Soil loss prediction tools that estimate the sediment load leaving the construction site under varying land and management conditions, or methodology identified in subch. V. of ch. NR 151, Wis. Adm. Code, may be used to calculate sediment reduction.

- (b) Notwithstanding par. (a), if BMPs cannot be designed and implemented to reduce the sediment load by 80%, on an average annual basis, the plan shall include a written and site-specific explanation as to why the 80% reduction goal is not attainable and the sediment load shall be reduced to the maximum extent practicable.
  - (c) Where appropriate, the plan shall include sediment controls to do all of the following to the maximum extent practicable:
    - 1. Prevent tracking of sediment from the construction site onto roads and other paved surfaces.
    - 2. Prevent the discharge of sediment as part of site de-watering.
    - 3. Protect the separate storm drain inlet structure from receiving sediment.
  - (d) The use, storage and disposal of chemicals, cement and other compounds and materials used on the construction site shall be managed during the construction period, to prevent their entrance into waters of the state. However, projects that require the placement of these materials in waters of the state, such as constructing bridge footings or BMP installations, are not prohibited by this paragraph.
- (4) LOCATION. The BMPs used to comply with this section shall be located prior to runoff entering waters of the state.

**Note to Users:** While regional treatment facilities are appropriate for control of post-construction pollutants, they should not be used for construction site sediment removal.

- (5) ALTERNATE REQUIREMENTS. The [administering authority] may establish storm water management requirements more stringent than those set forth in this section if the [administering authority] determines that an added level of protection is needed for sensitive resources.

**S.08 PERMITTING REQUIREMENTS, PROCEDURES AND FEES.**

- (1) PERMIT REQUIRED. No responsible party may commence a land disturbing construction activity subject to this ordinance without receiving prior approval of an erosion and sediment control plan for the site and a permit from the [administering authority].
- (2) PERMIT APPLICATION AND FEES. At least one responsible party desiring to undertake a land disturbing construction activity subject to this ordinance shall submit an application for a permit and an erosion and sediment control plan that meets the requirements of S.09 and shall pay an application fee of [amount] to the [administering authority]. By submitting an application, the applicant is authorizing the [administering authority] to enter the site to obtain information required for the review of the erosion and sediment control plan.
- (3) REVIEW AND APPROVAL OF PERMIT APPLICATION. The [administering authority] shall review any permit application that is submitted with an erosion and sediment control plan, and the required fee. The following approval procedure shall be used:
  - (a) Within [number] business days of the receipt of a complete permit application, as required by sub. (2), the [administering authority] shall inform the applicant whether the application and plan are approved or disapproved based on the requirements of this ordinance.
  - (b) If the permit application and plan are approved, the [administering authority] shall issue the permit.
  - (c) If the permit application or plan is disapproved, the [administering authority] shall state in writing the reasons for disapproval.
  - (d) The [administering authority] may request additional information from the applicant. If additional information is submitted, the [administering authority] shall have [number] business days from the date the additional information is received to inform the applicant that the plan is either approved or disapproved.
  - (e) Failure by the [administering authority] to inform the permit applicant of a decision within [number] business days of a required submittal shall be deemed to mean approval of the submittal and the applicant may proceed as if a permit had been issued.
- (4) SURETY BOND. As a condition of approval and issuance of the permit, the [administering authority] may require the applicant to deposit a surety bond or irrevocable letter of credit to guarantee a good faith execution of the approved erosion control plan and any permit conditions.

- (5) PERMIT REQUIREMENTS. All permits shall require the responsible party to:
- (a) Notify the [administering authority] within 48 hours of commencing any land disturbing construction activity.
  - (b) Notify the [administering authority] of completion of any BMPs within 14 days after their installation.
  - (c) Obtain permission in writing from the [administering authority] prior to any modification pursuant to S.09(3) of the erosion and sediment control plan.
  - (d) Install all BMPs as identified in the approved erosion and sediment control plan.
  - (e) Maintain all road drainage systems, stormwater drainage systems, BMPs and other facilities identified in the erosion and sediment control plan.
  - (f) Repair any siltation or erosion damage to adjoining surfaces and drainage ways resulting from land disturbing construction activities and document repairs in a site erosion control log.
  - (g) Inspect the BMPs within 24 hours after each rain of 0.5 inches or more which results in runoff during active construction periods, and at least once each week, make needed repairs and document the findings of the inspections in a site erosion control log with the date of inspection, the name of the person conducting the inspection, and a description of the present phase of the construction at the site.
  - (h) Allow the [administering authority] to enter the site for the purpose of inspecting compliance with the erosion and sediment control plan or for performing any work necessary to bring the site into compliance with the control plan. Keep a copy of the erosion and sediment control plan at the construction site.
- (6) PERMIT CONDITIONS. Permits issued under this section may include conditions established by [administering authority] in addition to the requirements set forth in sub. (5), where needed to assure compliance with the performance standards in S.07.
- (7) PERMIT DURATION. Permits issued under this section shall be valid for a period of 180 days, or the length of the building permit or other construction authorizations, whichever is longer, from the date of issuance. The [administering authority] may extend the period one or more times for up to an additional 180 days. The [administering authority] may require additional BMPs as a condition of the extension if they are necessary to meet the requirements of this ordinance.
- (8) MAINTENANCE. The responsible party throughout the duration of the construction activities shall maintain all BMPs necessary to meet the requirements of this ordinance until the site has undergone final stabilization.

## **S.09 EROSION AND SEDIMENT CONTROL PLAN, STATEMENT, AND AMENDMENTS.**

### **(1) EROSION AND SEDIMENT CONTROL PLAN.**

- (a) An erosion and sediment control plan shall be prepared and submitted to the [administering authority].
- (b) The erosion and sediment control plan shall be designed to meet the performance standards in S.07 and other requirements of this ordinance.
- (c) The erosion and sediment control plan shall address pollution caused by soil erosion and sedimentation during construction and up to final stabilization of the site. The erosion and sediment control plan shall include, at a minimum, the following items:
  - 1. The name(s) and address(es) of the owner or developer of the site, and of any consulting firm retained by the applicant, together with the name of the applicant's principal contact at such firm. The application shall also include start and end dates for construction.
  - 2. Description of the site and the nature of the construction activity, including representation of the limits of land disturbance on a United States Geological Service 7.5 minute series topographic map.
  - 3. A sequence of construction of the development site, including stripping and clearing; rough grading; construction of utilities, infrastructure, and buildings; and final grading and landscaping. Sequencing shall identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas, areas of clearing, installation of temporary erosion and sediment control measures, and establishment of permanent vegetation.
  - 4. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by construction activities.
  - 5. Estimates, including calculations, if any, of the runoff coefficient of the site before and after construction activities are completed.
  - 6. Calculations to show the expected percent reduction in the average annual sediment load carried in runoff as compared to no sediment or erosion controls.
  - 7. Existing data describing the surface soil as well as subsoils.
  - 8. Depth to groundwater, as indicated by Natural Resources Conservation Service soil information where available.
  - 9. Name of the immediate named receiving water from the United States Geological Service 7.5 minute series topographic maps.
- (d) The erosion and sediment control plan shall include a site map. The site map shall include the following items and shall be at a scale not greater than 100 feet per inch and at a contour interval not to exceed five feet.



1. Existing topography, vegetative cover, natural and engineered drainage systems, roads and surface waters. Lakes, streams, wetlands, channels, ditches and other watercourses on and immediately adjacent to the site shall be shown. Any identified 100-year flood plains, flood fringes and floodways shall also be shown.
  2. Boundaries of the construction site.
  3. Drainage patterns and approximate slopes anticipated after major grading activities.
  4. Areas of soil disturbance.
  5. Location of major structural and non-structural controls identified in the plan.
  6. Location of areas where stabilization practices will be employed.
  7. Areas which will be vegetated following construction.
  8. Areal extent of wetland acreage on the site and locations where storm water is discharged to a surface water or wetland.
  9. Locations of all surface waters and wetlands within one mile of the construction site.
  10. An alphanumeric or equivalent grid overlying the entire construction site map.
- (e) Each erosion and sediment control plan shall include a description of appropriate controls and measures that will be performed at the site to prevent pollutants from reaching waters of the state. The plan shall clearly describe the appropriate control measures for each major activity and the timing during the construction process that the measures will be implemented. The description of erosion controls shall include, when appropriate, the following minimum requirements:
1. Description of interim and permanent stabilization practices, including a practice implementation schedule. Site plans shall ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized.
  2. Description of structural practices to divert flow away from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from the site. Unless otherwise specifically approved in writing by the [administering authority], structural measures shall be installed on upland soils.
  3. Management of overland flow at all sites, unless otherwise controlled by outfall controls.
  4. Trapping of sediment in channelized flow.
  5. Staging construction to limit bare areas subject to erosion.
  6. Protection of downslope drainage inlets where they occur.
  7. Minimization of tracking at all sites.
  8. Clean up of off-site sediment deposits.
  9. Proper disposal of building and waste materials at all sites.

10. Stabilization of drainage ways.
  11. Control of soil erosion from dirt stockpiles.
  12. Installation of permanent stabilization practices as soon as possible after final grading.
  13. Minimization of dust to the maximum extent practicable.
- (f) The erosion and sediment control plan shall require that velocity dissipation devices be placed at discharge locations and along the length of any outfall channel, as necessary, to provide a non-erosive flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.

**Note to Users:** The plan requirements of this subsection will meet the erosion control plan requirements of s. NR 216.46, Wis. Adm. Code, when prepared in accordance with good engineering practices and the design criteria, standards and specifications outlined in the *Wisconsin Construction Site Best Management Practice Handbook* (WDNR Pub. WR-222 November 1993 Revision).

- (2) **EROSION AND SEDIMENT CONTROL PLAN STATEMENT.** For each construction site identified under S.04 (1)(c), an erosion and sediment control plan statement shall be prepared. This statement shall be submitted to the [administering authority]. The control plan statement shall briefly describe the site, including a site map. Further, it shall also include the best management practices that will be used to meet the requirements of the ordinance, including the site development schedule.
- (3) **AMENDMENTS.** The applicant shall amend the plan if any of the following occur:
- (a) There is a change in design, construction, operation or maintenance at the site which has the reasonable potential for the discharge of pollutants to waters of the state and which has not otherwise been addressed in the plan.
  - (b) The actions required by the plan fail to reduce the impacts of pollutants carried by construction site runoff.
  - (c) The [administering authority] notifies the applicant of changes needed in the plan.

## **S.10 FEE SCHEDULE.**

The fees referred to in other sections of this ordinance shall be established by the [administering authority] and may from time to time be modified by resolution. A schedule of the fees established by the [administering authority] shall be available for review in [location].

## S.11 INSPECTION.

If land disturbing construction activities are being carried out without a permit required by this ordinance, the [administering authority] may enter the land pursuant to the provisions of ss. 66.0119(1), (2), and (3), Wis. Stats.

## S.12 ENFORCEMENT.

- (1) The [administering authority] may post a stop-work order if any of the following occurs:
  - (a) Any land disturbing construction activity regulated under this ordinance is being undertaken without a permit.
  - (b) The erosion and sediment control plan is not being implemented in a good faith manner.
  - (c) The conditions of the permit are not being met.

**Note to Users:** The [administering authority] should inspect any construction site that holds a permit under this chapter at least once a month during the period starting March 1 and ending October 31 and at least 2 times during the period starting November 1 and ending February 28 to ensure compliance with the approved sediment and erosion control plan.

- (2) If the responsible party does not cease activity as required in a stop-work order posted under this section or fails to comply with the erosion and sediment control plan or permit conditions, the [administering authority] may revoke the permit.
- (3) If the responsible party, where no permit has been issued, does not cease the activity after being notified by the [administering authority], or if a responsible party violates a stop-work order posted under sub. (1), the [administering authority] may request the [district attorney, city attorney, town attorney, village attorney or county corporation counsel] to obtain a cease and desist order in any court with jurisdiction.
- (4) The [administering authority, or the board of appeals or adjustment] may retract the stop-work order issued under sub. (1) or the permit revocation under sub. (2).
- (5) After posting a stop-work order under sub. (1), the [administering authority] may issue a notice of intent to the responsible party of its intent to perform work necessary to comply with this ordinance. The [administering authority] may go on the land and commence the work after issuing the notice of intent. The costs of the work performed under this subsection by the [administering authority], plus interest at the rate authorized by [administrative authority] shall be billed to the

responsible party. In the event a responsible party fails to pay the amount due, the clerk shall enter the amount due on the tax rolls and collect as a special assessment against the property pursuant to subch. VII of ch. 66, Wis. Stats.

- (6) Any person violating any of the provisions of this ordinance shall be subject to a forfeiture of not less than [amount] nor more than [amount] and the costs of prosecution for each violation. Each day a violation exists shall constitute a separate offense.
- (7) Compliance with the provisions of this ordinance may also be enforced by injunction in any court with jurisdiction. It shall not be necessary to prosecute for forfeiture or a cease and desist order before resorting to injunctive proceedings.

**Note to Users:** Injunctive orders are authorized pursuant to s. 59.69(11), 61.35, or 62.23(8), Wis. Stats., for counties, villages and towns with village powers, and cities respectively.

#### **S.13 APPEALS.**

- (1) BOARD OF [APPEALS or ADJUSTMENT]. The board of [appeals or adjustment] created pursuant to section [number] of the [county's, town's, city's or village's] ordinance pursuant to [s. 59.694, 60.65, 61.354(4)(b) or 62.23(7)(e)], Wis. Stats.:
  - (a) Shall hear and decide appeals where it is alleged that there is error in any order, decision or determination made by the [administering authority] in administering this ordinance except for cease and desist orders obtained under S.12 (3).
  - (b) Upon appeal, may authorize variances from the provisions of this ordinance which are not contrary to the public interest and where owing to special conditions a literal enforcement of the provisions of the ordinance will result in unnecessary hardship; and
  - (c) Shall use the rules, procedures, duties and powers authorized by statute in hearing and deciding appeals and authorizing variances.
- (2) WHO MAY APPEAL. Appeals to the board of [appeals or adjustment] may be taken by any aggrieved person or by any office, department, board, or bureau of the [name of municipality] affected by any decision of the [administering authority].

#### **S.14 SEVERABILITY.**

If a court of competent jurisdiction judges any section, clause, provision or portion of this ordinance unconstitutional or invalid, the remainder of the ordinance shall remain in force and not be affected by such judgment.

**S.15 EFFECTIVE DATE.**

This ordinance shall be in force and effect from and after its adoption and publication. The above and foregoing ordinance was duly adopted by the [governing body] of the [name of municipality] on the [number] day of [month], [year].

Approved: \_\_\_\_\_

Attested \_\_\_\_\_

Published on [day, month, and year].

**APPENDIX B: MODEL POST-CONSTRUCTION STORM WATER MANAGEMENT ZONING  
ORDINANCE**

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## **MODEL POST-CONSTRUCTION STORM WATER MANAGEMENT ZONING ORDINANCE**

**Note to Users:** *This model ordinance includes the use of brackets [ ] around phrases that are to be filled in by the municipality. For example, the phrase [administering authority] is frequently used. Where the municipality chooses to have the ordinance administered by the City Engineer, the phrase [administering authority] should be replaced by "City Engineer". In a few places, the model ordinance includes phrases in brackets that are underlined [\_\_\_\_\_]. In these cases, one of the underlined phrases should be selected verbatim. For example, if the phrase includes statutory citations, several underlined choices may be given such as [59.693, 60.627, 61.354, or 62.234]. A county would replace the phrase in brackets with "59.693", since that is the appropriate citation for the county to use.*

### **AN ORDINANCE TO CREATE CHAPTER [NUMBER] OF THE [CODE OR ORDINANCE] OF THE [NAME OF MUNICIPALITY] RELATING TO THE CONTROL OF POST-CONSTRUCTION RUNOFF**

#### **FOREWORD.**

The intent of this ordinance is to reduce the amount of post-construction storm water and associated pollutants reaching waters of the state. Use of this ordinance by municipalities will foster the consistent statewide application of post-construction performance standards for new development and redevelopment contained in subchapters III and IV of chapter NR 151, Wis. Adm. Code.



The [governing body] of the [name of municipality] does hereby ordain that Chapter [number] of the [code or ordinance] of the [name of municipality] is created to read as follows:

**[CHAPTER]**  
**POST-CONSTRUCTION STORM WATER MANAGEMENT**

**S.01 AUTHORITY.**

- (1) This ordinance is adopted by the [governing body] under the authority granted by s. [59.693, for counties; 60.627, for towns; 61.354, for villages; or 62.234, for cities], Wis. Stats. This ordinance supersedes all provisions of an ordinance previously enacted under s. [59.69, 60.62, 61.35, or 62.23], Wis. Stats., that relate to storm water management regulations. Except as otherwise specified in s. [59.693, 60.627, 61.354, or 62.234], Wis. Stats., s. [59.69, 60.62, 61.35, or 62.23], Wis. Stats., applies to this ordinance and to any amendments to this ordinance.
- (2) The provisions of this ordinance are deemed not to limit any other lawful regulatory powers of the same governing body.
- (3) The [governing body] hereby designates the [administering authority] to administer and enforce the provisions of this ordinance.
- (4) The requirements of this ordinance do not pre-empt more stringent storm water management requirements that may be imposed by any of the following:
  - (a) Wisconsin Department of Natural Resources administrative rules, permits or approvals including those authorized under ss. 281.16 and 283.33, Wis. Stats.
  - (b) Targeted non-agricultural performance standards promulgated in rules by the Wisconsin Department of Natural Resources under s. NR 151.004, Wis. Adm. Code.

**S.02 FINDINGS OF FACT.**

The [governing body] finds that uncontrolled, post-construction runoff has a significant impact upon water resources and the health, safety and general welfare of the community and diminishes the public enjoyment and use of natural resources. Specifically, uncontrolled post-construction runoff can:

- (1) Degrade physical stream habitat by increasing stream bank erosion, increasing streambed scour, diminishing groundwater recharge, diminishing stream base flows and increasing stream temperature.

- (2) Diminish the capacity of lakes and streams to support fish, aquatic life, recreational and water supply uses by increasing pollutant loading of sediment, suspended solids, nutrients, heavy metals, bacteria, pathogens and other urban pollutants.
- (3) Alter wetland communities by changing wetland hydrology and by increasing pollutant loads.
- (4) Reduce the quality of groundwater by increasing pollutant loading.
- (5) Threaten public health, safety, property and general welfare by overtaxing storm sewers, drainage ways, and other minor drainage facilities.
- (6) Threaten public health, safety, property and general welfare by increasing major flood peaks and volumes.
- (7) Undermine floodplain management efforts by increasing the incidence and levels of flooding.

### **S.03 PURPOSE AND INTENT.**

- (1) **PURPOSE.** The general purpose of this ordinance is to establish long-term, post-construction runoff management requirements that will diminish the threats to public health, safety, welfare and the aquatic environment. Specific purposes are to:
  - (a) Further the maintenance of safe and healthful conditions.
  - (b) Prevent and control the adverse effects of storm water; prevent and control soil erosion; prevent and control water pollution; protect spawning grounds, fish and aquatic life; control building sites, placement of structures and land uses; preserve ground cover and scenic beauty; and promote sound economic growth.
  - (c) Control exceedance of the safe capacity of existing drainage facilities and receiving water bodies; prevent undue channel erosion; control increases in the scouring and transportation of particulate matter; and prevent conditions that endanger downstream property.
- (2) **INTENT.** It is the intent of the [governing body] that this ordinance regulates post-construction storm water discharges to waters of the state. This ordinance may be applied on a site-by-site basis. The [governing body] recognizes, however, that the preferred method of achieving the storm water performance standards set forth in this ordinance is through the preparation and implementation of comprehensive, systems-level storm water management plans that cover hydrologic units, such as watersheds, on a municipal and regional scale. Such plans may prescribe regional storm water devices, practices or systems, any of which may be designed to treat runoff from more than one site prior to discharge to waters of the state. Where such plans are in conformance with the performance standards developed under s. 281.16, Wis. Stats., for regional storm water management measures and have been approved by the [governing body], it

is the intent of this ordinance that the approved plan be used to identify post-construction management measures acceptable for the community.

#### **S.04                    APPLICABILITY AND JURISDICTION.**

(1)    **APPLICABILITY.**

(a)    Where not otherwise limited by law, this ordinance applies after final stabilization to a site of land disturbing construction activity meeting any of the criteria in this paragraph, unless the site is otherwise exempt under paragraph (b).

1.      A post construction site that had 5 or more acres of land disturbing construction activity.
2.      A post-development construction site that had one or more acres of land disturbing construction activity after March 10, 2003.

**Note to Users:** The 5- and 1-acre land disturbance thresholds are consistent with state and federal laws regarding applicability of construction site erosion control permits.

(b)    A site that meets any of the criteria in this paragraph is exempt from the requirements of this ordinance.

1.      A redevelopment post-construction site with no increase in exposed parking lots or roads.
2.      A post-construction site with less than 10% connected imperviousness based on complete development of the post-construction site, provided the cumulative area of all parking lots and rooftops is less than one acre.
3.      Nonpoint discharges from agricultural facilities and practices.
4.      Nonpoint discharges from silviculture activities.
5.      Routine maintenance for project sites under 5 acres of land disturbance if performed to maintain the original line and grade, hydraulic capacity or original purpose of the facility.
6.      Underground utility construction such as water, sewer and fiberoptic lines. This exemption does not apply to the construction of any above ground structures associated with utility construction.

(c)    Notwithstanding the applicability requirements in paragraph (a), this ordinance applies to post-construction sites of any size that, in the opinion of the [administering authority], is likely to result in runoff that exceeds the safe capacity of the existing drainage facilities or receiving body of water, that causes undue channel erosion, that increases water

pollution by scouring or the transportation of particulate matter or that endangers property or public safety.

(2) JURISDICTION.

This ordinance applies to [post construction sites within the boundaries and jurisdiction of the [name of the municipality]].

or

[post construction sites within the boundaries and jurisdiction of the [name of municipality]], as well as the extraterritorial division of land subject to an ordinance enacted pursuant to s. 236.45(2) and (3) Wis. Stats.]

or

[post construction sites within the boundaries and jurisdiction of the [name of the municipality]], as well as all lands located within the extraterritorial plat approval jurisdiction of the [name of municipality], even if plat approval is not involved.]

**Note to Users:** These options differ in the amount of land area covered by this ordinance and may have ramifications for enforcement authority. For counties, the first option will be the only option since counties do not have extraterritorial authority. Under s. 59.693(10), Wis. Stats., if a county storm water management ordinance exists at the time of annexation, then the municipal ordinance must be at least as restrictive as the county ordinance.

(3) EXCLUSIONS.

This ordinance is not applicable to activities conducted by a state agency, as defined under s. 227.01 (1), Wis. Stats., but also including the office of district attorney, which is subject to the state plan promulgated or a memorandum of understanding entered into under s. 281.33 (2), Wis. Stats.

**Note to Users:** The Wisconsin Department of Transportation (WisDOT) has entered into a memorandum of understanding with the Wisconsin Department of Natural Resources that satisfies s. 281.33 (2), Wis. Stats., such that activities directed and supervised by WisDOT are exempt from this model ordinance.

**S.05 DEFINITIONS.**

- (1) “Administering authority” means a governmental employee, or a regional planning commission empowered under s. [59.693; 60.627; 61.354; 62.234], Wis. Stats., that is designated by the [governing body] to administer this ordinance.

- (2) "Agricultural facilities and practices" has the meaning given in s. 281.16, Wis. Stats.
- (3) "Average annual rainfall" means a calendar year of precipitation, excluding snow, which is considered typical.
- (4) "Best management practice" or "BMP" means structural or non-structural measures, practices, techniques or devices employed to avoid or minimize sediment or pollutants carried in runoff to waters of the state.
- (5) "Business day" means a day the office of the [administering authority] is routinely and customarily open for business.
- (6) "Cease and desist order" means a court-issued order to halt land disturbing construction activity that is being conducted without the required permit.
- (7) "Combined sewer system" means a system for conveying both sanitary sewage and storm water runoff.
- (8) "Connected imperviousness" means an impervious surface that is directly connected to a separate storm sewer or water of the state via an impervious flow path.
- (9) "Design storm" means a hypothetical discrete rainstorm characterized by a specific duration, temporal distribution, rainfall intensity, return frequency, and total depth of rainfall.
- (10) "Development" means residential, commercial, industrial or institutional land uses and associated roads.
- (11) "Division of land" means the creation from one parcel of [number] or more parcels or building sites of [number] or fewer acres each in area where such creation occurs at one time or through the successive partition within a 5 year period.
- (12) "Effective infiltration area" means the area of the infiltration system that is used to infiltrate runoff and does not include the area used for site access, berms or pretreatment.
- (13) "Erosion" means the process by which the land's surface is worn away by the action of wind, water, ice or gravity.
- (14) "Exceptional resource waters" means waters listed in s. NR 102.11, Wis. Adm. Code.
- (15) "Extraterritorial" means the unincorporated area within 3 miles of the corporate limits of a first, second, or third class city, or within 1.5 miles of a fourth class city or village.
- (16) "Final stabilization" means that all land disturbing construction activities at the construction site have been completed and that a uniform, perennial, vegetative cover has been established, with a density of at least 70% of the cover, for the unpaved areas and areas not covered by permanent structures, or employment of equivalent permanent stabilization measures.
- (17) "Financial guarantee" means a performance bond, maintenance bond, surety bond, irrevocable letter of credit, or similar guarantees submitted to the [administering authority] by the responsible party to assure that requirements of the ordinance are carried out in compliance with the storm water management plan.

- (18) "Governing body" means town board of supervisors, county board of supervisors, city council, village board of trustees or village council.
- (19) "Impervious surface" means an area that releases as runoff all or a large portion of the precipitation that falls on it, except for frozen soil. Rooftops, sidewalks, driveways, parking lots and streets are examples of areas that typically are impervious.
- (20) "In-fill area" means an undeveloped area of land located within existing development.
- (21) "Infiltration" means the entry of precipitation or runoff into or through the soil.
- (22) "Infiltration system" means a device or practice such as a basin, trench, rain garden or swale designed specifically to encourage infiltration, but does not include natural infiltration in pervious surfaces such as lawns, redirecting of rooftop downspouts onto lawns or minimal infiltration from practices, such as swales or road side channels designed for conveyance and pollutant removal only.
- (23) "Karst feature" means an area or surficial geologic feature subject to bedrock dissolution so that it is likely to provide a conduit to groundwater, and may include caves, enlarged fractures, mine features, exposed bedrock surfaces, sinkholes, springs, seeps or swallets.
- (24) "Land disturbing construction activity" means any man-made alteration of the land surface resulting in a change in the topography or existing vegetative or non-vegetative soil cover, that may result in runoff and lead to an increase in soil erosion and movement of sediment into waters of the state. Land disturbing construction activity includes clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities.
- (25) "Maintenance agreement" means a legal document that provides for long-term maintenance of storm water management practices.
- (26) "MEP" or "maximum extent practicable" means a level of implementing best management practices in order to achieve a performance standard specified in this ordinance which takes into account the best available technology, cost effectiveness and other competing issues such as human safety and welfare, endangered and threatened resources, historic properties and geographic features. MEP allows flexibility in the way to meet the performance standards and may vary based on the performance standard and site conditions.
- (27) "New development" means development resulting from the conversion of previously undeveloped land or agricultural land uses.
- (28) "Off-site" means located outside the property boundary described in the permit application.
- (29) "On-site" means located within the property boundary described in the permit application.
- (30) "Ordinary high-water mark" has the meaning given in s. NR 115.03(6), Wis. Adm. Code.
- (31) "Outstanding resource waters" means waters listed in s. NR 102.10, Wis. Adm. Code.
- (32) "Percent fines" means the percentage of a given sample of soil, which passes through a # 200 sieve.

**Note to Users:** Percent fines can be determined using the “American Society for Testing and Materials”, volume 04.02, “Test Method C117-95 Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Material Aggregates by Washing”. Copies can be obtained by contacting the American society for testing and materials, 100 Barr Harbor Drive, Conshohocken, PA 19428-2959, or phone 610-832-9585, or on line at: “<http://www.astm.org/>”.

- (33) “Performance standard” means a narrative or measurable number specifying the minimum acceptable outcome for a facility or practice.
- (34) “Permit” means a written authorization made by the [administering authority] to the applicant to conduct land disturbing construction activity or to discharge post-construction runoff to waters of the state.
- (35) “Permit administration fee” means a sum of money paid to the [administering authority] by the permit applicant for the purpose of recouping the expenses incurred by the authority in administering the permit.
- (36) “Pervious surface” means an area that releases as runoff a small portion of the precipitation that falls on it. Lawns, gardens, parks, forests or other similar vegetated areas are examples of surfaces that typically are pervious.
- (37) “Pollutant” has the meaning given in s. 283.01(13), Wis. Stats.
- (38) “Pollution” has the meaning given in s. 281.01(10), Wis. Stats.
- (39) “Post-construction site” means a construction site following the completion of land disturbing construction activity and final site stabilization.
- (40) “Pre-development condition” means the extent and distribution of land cover types present before the initiation of land disturbing construction activity, assuming that all land uses prior to development activity are managed in an environmentally sound manner.
- (41) “Preventive action limit” has the meaning given in s. NR 140.05(17), Wis. Adm. Code.
- (42) “Redevelopment” means areas where development is replacing older development.
- (43) “Responsible party” means any entity holding fee title to the property or other person contracted or obligated by other agreement to implement and maintain post-construction storm water BMPs.
- (44) “Runoff” means storm water or precipitation including rain, snow or ice melt or similar water that moves on the land surface via sheet or channelized flow.
- (45) “Separate storm sewer” means a conveyance or system of conveyances including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all of the following criteria:
  - (a) Is designed or used for collecting water or conveying runoff.
  - (b) Is not part of a combined sewer system.
  - (c) Is not draining to a storm water treatment device or system.
  - (d) Discharges directly or indirectly to waters of the state.

- (46) "Site" means the entire area included in the legal description of the land on which the land disturbing construction activity occurred.
- (47) "Stop work order" means an order issued by the [administering authority] which requires that all construction activity on the site be stopped.
- (48) "Storm water management plan" means a comprehensive plan designed to reduce the discharge of pollutants from storm water after the site has undergone final stabilization following completion of the construction activity.
- (49) "Storm water management system plan" is a comprehensive plan designed to reduce the discharge of runoff and pollutants from hydrologic units on a regional or municipal scale.
- (50) "Technical standard" means a document that specifies design, predicted performance and operation and maintenance specifications for a material, device or method.
- (51) "Top of the channel" means an edge, or point on the landscape, landward from the ordinary high-water mark of a surface water of the state, where the slope of the land begins to be less than 12% continually for at least 50 feet. If the slope of the land is 12% or less continually for the initial 50 feet, landward from the ordinary high-water mark, the top of the channel is the ordinary high-water mark.
- (52) "TR-55" means the United States Department of Agriculture, Natural Resources Conservation Service (previously Soil Conservation Service), Urban Hydrology for Small Watersheds, Second Edition, Technical Release 55, June 1986.
- (53) "Type II distribution" means a rainfall type curve as established in the "United States Department of Agriculture, Soil Conservation Service, Technical Paper 149, published 1973". The Type II curve is applicable to all of Wisconsin and represents the most intense storm pattern.
- (54) "Waters of the state" has the meaning given in s. 281.01 (18), Wis. Stats.

#### **S.06 TECHNICAL STANDARDS.**

The following methods shall be used in designing the water quality, peak flow shaving and infiltration components of storm water practices needed to meet the water quality standards of this ordinance:

- (1) Technical standards identified, developed or disseminated by the Wisconsin Department of Natural Resources under subchapter V of chapter NR 151, Wis. Adm. Code.
- (2) Where technical standards have not been identified or developed by the Wisconsin Department of Natural Resources, other technical standards may be used provided that the methods have been approved by the [administering authority].
- (3) In this ordinance, the following year(s) and location(s) [has or have] been selected as average annual rainfall(s): [Madison, 1981 (Mar. 12-Dec. 2); Green Bay, 1969 (Mar. 29-Nov. 25)];



Milwaukee, 1969 (Mar. 28-Dec. 6); Minneapolis, 1959 (Mar. 13-Nov. 4 ); Duluth, 1975 (Mar. 24 – Nov. 19)]

**Note to Users:** Of the five locations listed, the location closest to a project site best represents the average annual rainfall for that site.

#### **S.07 PERFORMANCE STANDARDS.**

- (1) RESPONSIBLE PARTY. The responsible party shall implement a post-construction storm water management plan that incorporates the requirements of this section.
- (2) PLAN. A written storm water management plan in accordance with S.09 shall be developed and implemented for each post-construction site.
- (3) REQUIREMENTS. The plan required under sub. (2) shall include the following:
  - (a) TOTAL SUSPENDED SOLIDS. BMPs shall be designed, installed and maintained to control total suspended solids carried in runoff from the post-construction site as follows:
    1. For new development, by design, reduce to the maximum extent practicable, the total suspended solids load by 80%, based on the average annual rainfall, as compared to no runoff management controls. No person shall be required to exceed an 80% total suspended solids reduction to meet the requirements of this subdivision.
    2. For redevelopment, by design, reduce to the maximum extent practicable, the total suspended solids load by 40%, based on the average annual rainfall, as compared to no runoff management controls. No person shall be required to exceed a 40% total suspended solids reduction to meet the requirements of this subdivision.
    3. For in-fill development under 5 acres that occurs within 10 years after the effective date of this rule ...[revisor insert date], by design, reduce to the maximum extent practicable, the total suspended solids load by 40%, based on an average annual rainfall, as compared to no runoff management controls. No person shall be required to exceed a 40% total suspended solids reduction to meet the requirements of this subdivision.
    4. For in-fill development that occurs 10 or more years after the effective date of this rule...[revisor insert date], by design, reduce to the maximum extent practicable, the total suspended solids load by 80%, based on an average annual rainfall, as compared to no runoff management controls. No person shall be required to

exceed an 80% total suspended solids reduction to meet the requirements of this subdivision.

5. Notwithstanding subds. 1. to 4., if the design cannot achieve the applicable total suspended solids reduction specified, the storm water management plan shall include a written and site-specific explanation why that level of reduction is not attained and the total suspended solids load shall be reduced to the maximum extent practicable.

**Note to Users:** Pollutant loading models such as SLAMM, P8 or equivalent methodology may be used to evaluate the efficiency of the design in reducing total suspended solids.

(b) PEAK DISCHARGE.

1. By design, BMPs shall be employed to maintain or reduce the peak runoff discharge rates, to the maximum extent practicable, as compared to pre-development conditions for the 2-year, 24-hour design storm applicable to the post-construction site. Pre-development conditions shall assume “good hydrologic conditions” for appropriate land covers as identified in TR-55 or an equivalent methodology. The meaning of “hydrologic soil group” and “runoff curve number” are as determined in TR-55. However, when pre-development land cover is cropland, rather than using TR-55 values for cropland, the runoff curve numbers in Table 1 shall be used.

Hydrologic Soil Group	A	B	C	D
Runoff Curve Number	56	70	79	83

**Note to Users:** The curve numbers in Table 1 represent mid-range values for soils under a good hydrologic condition where conservation practices are used and are selected to be protective of the resource waters.

2. This subsection of the ordinance does not apply to any of the following:
  - a. A post-construction site where the change in hydrology due to development does not increase the existing surface water elevation at any point within the downstream receiving water by more than 0.01 of a foot for the 2-year, 24-hour storm event.

**Note to Users:** Hydraulic models such as HEC-RAS or another methodology may be used to determine the change in surface water elevations.

- b. A redevelopment post-construction site.
- c. An in-fill development area less than 5 acres.

**Note to Users:** The intent of the peak discharge standard is to minimize streambank erosion, under bank-full conditions. For water quantity concerns, the post-development peak flow rate for the 10, 25, 50 and 100 year – 24 hour storm events should also be controlled either at or below pre-development discharge rates. This has not been addressed in this model ordinance but may need to be included in the local ordinance to address flood control issues.

(c) **INFILTRATION.** BMPs shall be designed, installed, and maintained to infiltrate runoff to the maximum extent practicable in accordance with the following, except as provided in subds. 5. through 8.

1. For residential developments one of the following shall be met:
  - a. Infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 90% of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than 1% of the project site is required as an effective infiltration area.
  - b. Infiltrate 25% of the post-development runoff from the 2 year -24 hour design storm with a type II distribution. Separate curve numbers for pervious and impervious surfaces shall be used to calculate runoff volumes and not composite curve numbers as defined in TR-55. However, when designing appropriate infiltration systems to meet this requirement, no more than 1% of the project site is required as an effective infiltration area.
2. For non-residential development, including commercial, industrial and institutional development, one of the following shall be met:
  - a. Infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 60% of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than 2% of the project site is required as an effective infiltration area.

- b. Infiltrate 10% of the runoff from the 2 year - 24 hour design storm with a type II distribution. Separate curve numbers for pervious and impervious surfaces shall be used to calculate runoff volumes, and not composite curve numbers as defined in TR-55. However, when designing appropriate infiltration systems to meet this requirement, no more than 2% of the project site is required as an effective infiltration area.
3. Pre-development condition shall be the same as in par. (b).

**Note to Users:** A model that calculates runoff volume, such as SLAMM, P8, or an equivalent methodology may be used.

4. Before infiltrating runoff, pretreatment shall be required for parking lot runoff and for runoff from new road construction in commercial, industrial and institutional areas that will enter an infiltration system. The pretreatment shall be designed to protect the infiltration system from clogging prior to scheduled maintenance and to protect groundwater quality in accordance with subd. 8. Pretreatment options may include, but are not limited to, oil/grease separation, sedimentation, biofiltration, filtration, swales or filter strips.

**Note to Users:** To achieve the infiltration requirement for the parking lots or roads, maximum extent practicable should not be interpreted to require significant topography changes that create an excessive financial burden. To minimize potential groundwater impacts, it is desirable to infiltrate the cleanest runoff. To achieve this, a design may propose greater infiltration of runoff from low pollutant sources such as roofs, and less from higher pollutant source areas such as parking lots.

5. Exclusions. The runoff from the following areas are prohibited from meeting the requirements of this paragraph:
  - a. Areas associated with tier 1 industrial facilities identified in s. NR 216.21(2)(a), Wis. Adm. Code, including storage, loading, rooftop and parking.
  - b. Storage and loading areas of tier 2 industrial facilities identified in s. NR 216.21(2)(b), Wis. Adm. Code.

**Note to Users:** Runoff from tier 2 parking and rooftop areas may be infiltrated but may require pretreatment.

- c. Fueling and vehicle maintenance areas.
- d. Areas within 1000 feet upgradient or within 100 feet downgradient of karst features.
- e. Areas with less than 3 feet separation distance from the bottom of the infiltration system to the elevation of seasonal high groundwater or the top of bedrock, except this subd. 5.e. does not prohibit infiltration of roof runoff.
- f. Areas with runoff from industrial, commercial and institutional parking lots and roads and residential arterial roads with less than 5 feet separation distance from the bottom of the infiltration system to the elevation of seasonal high groundwater or the top of bedrock.
- g. Areas within 400 feet of a community water system well as specified in s. NR 811.16(4), Wis. Adm. Code, or within 100 feet of a private well as specified in s. NR 812.08(4), Wis. Adm. Code, for runoff infiltrated from commercial, industrial and institutional land uses or regional devices for residential development.
- h. Areas where contaminants of concern, as defined in s. NR 720.03(2), Wis. Adm. Code are present in the soil through which infiltration will occur.
- i. Any area where the soil does not exhibit one of the following soil characteristics between the bottom of the infiltration system and the seasonal high groundwater and top of bedrock: at least a 3-foot soil layer with 20% fines or greater; or at least a 5-foot soil layer with 10% fines or greater. This does not apply where the soil medium within the infiltration system provides an equivalent level of protection. This subd. 5.i. does not prohibit infiltration of roof runoff.

**Note to Users:** The areas listed in subd. 5 are prohibited from infiltrating runoff due to the potential for groundwater contamination.

- 6. Exemptions. The following are not required to meet the requirements of this paragraph:
  - a. Areas where the infiltration rate of the soil is less than 0.6 inches/hour measured at the site.
  - b. Parking areas and access roads less than 5,000 square feet for commercial and industrial development.
  - c. Redevelopment post-construction sites.

- d. In-fill development areas less than 5 acres.
  - e. Infiltration areas during periods when the soil on the site is frozen.
  - f. Roads in commercial, industrial and institutional land uses, and arterial residential roads.
7. Where alternate uses of runoff are employed, such as for toilet flushing, laundry or irrigation, such alternate use shall be given equal credit toward the infiltration volume required by this paragraph.
8. a. Infiltration systems designed in accordance with this paragraph shall, to the extent technically and economically feasible, minimize the level of pollutants infiltrating to groundwater and shall maintain compliance with the preventive action limit at a point of standards application in accordance with ch. NR 140, Wis. Adm. Code. However, if site specific information indicates that compliance with a preventive action limit is not achievable, the infiltration BMP may not be installed or shall be modified to prevent infiltration to the maximum extent practicable.
- b. Notwithstanding subd. par. a., the discharge from BMPs shall remain below the enforcement standard at the point of standards application.

(d) PROTECTIVE AREAS.

1. "Protective area" means an area of land that commences at the top of the channel of lakes, streams and rivers, or at the delineated boundary of wetlands, and that is the greatest of the following widths, as measured horizontally from the top of the channel or delineated wetland boundary to the closest impervious surface. However, in this paragraph, "protective area" does not include any area of land adjacent to any stream enclosed within a pipe or culvert, such that runoff cannot enter the enclosure at this location.
- a. For outstanding resource waters and exceptional resource waters, and for wetlands in areas of special natural resource interest as specified in s. NR 103.04, 75 feet.
  - b. For perennial and intermittent streams identified on a United States geological survey 7.5-minute series topographic map, or a county soil survey map, whichever is more current, 50 feet.
  - c. For lakes, 50 feet.
  - d. For highly susceptible wetlands, 50 feet. Highly susceptible wetlands include the following types: fens, sedge meadows, bogs, low prairies, conifer swamps, shrub swamps, other forested wetlands, fresh wet meadows, shallow marshes, deep marshes and seasonally flooded

basins. Wetland boundary delineations shall be made in accordance with s. NR 103.08(1m). This paragraph does not apply to wetlands that have been completely filled in accordance with all applicable state and federal regulations. The protective area for wetlands that have been partially filled in accordance with all applicable state and federal regulations shall be measured from the wetland boundary delineation after fill has been placed.

- e. For less susceptible wetlands, 10 percent of the average wetland width, but no less than 10 feet nor more than 30 feet. Less susceptible wetlands include degraded wetlands dominated by invasive species such as reed canary grass.
  - f. In subd. 1.a., d. and e., determinations of the extent of the protective area adjacent to wetlands shall be made on the basis of the sensitivity and runoff susceptibility of the wetland in accordance with the standards and criteria in s. NR 103.03.
  - g. For concentrated flow channels with drainage areas greater than 130 acres, 10 feet.
2. This paragraph applies to post-construction sites located within a protective area, except those areas exempted pursuant to subd. 4.
3. The following requirements shall be met:
- a. Impervious surfaces shall be kept out of the protective area to the maximum extent practicable. The storm water management plan shall contain a written site-specific explanation for any parts of the protective area that are disturbed during construction.
  - b. Where land disturbing construction activity occurs within a protective area, and where no impervious surface is present, adequate sod or self-sustaining vegetative cover of 70% or greater shall be established and maintained. The adequate sod or self-sustaining vegetative cover shall be sufficient to provide for bank stability, maintenance of fish habitat and filtering of pollutants from upslope overland flow areas under sheet flow conditions. Non-vegetative materials, such as rock riprap, may be employed on the bank as necessary to prevent erosion, such as on steep slopes or where high velocity flows occur.

**Note to Users:** It is recommended that seeding of non-aggressive vegetative cover be used in the protective areas. Vegetation that is flood and drought tolerant and can provide long-term bank stability because of an extensive root

system is preferable. Vegetative cover can be measured using the line transect method described in the University of Wisconsin Extension publication number A3533, titled "Estimating Residue Using the Line Transect Method".

- c. Best management practices such as filter strips, swales, or wet detention basins, that are designed to control pollutants from non-point sources may be located in the protective area.

**Note to Users:** Other regulations, such as ch. 30, Wis. Stats., and chs. NR 103, 115, 116 and 117, Wis. Adm. Code, and their associated review and approval process may apply in the protective area.

- 4. This paragraph does not apply to:
  - a. Redevelopment post-construction sites.
  - b. In-fill development areas less than 5 acres.
  - c. Structures that cross or access surface waters such as boat landings, bridges and culverts.
  - d. Structures constructed in accordance with s. 59.692(1v), Wis. Stats.
  - e. Post-construction sites from which runoff does not enter the surface water, except to the extent that vegetative ground cover is necessary to maintain bank stability.

**Note to Users:** A vegetated protective area to filter runoff pollutants from post-construction sites described in subd. 4.e. is not necessary since runoff is not entering the surface water at that location. Other practices, necessary to meet the requirements of this section, such as a swale or basin, will need to be designed and implemented to reduce runoff pollutants before the runoff enters a surface water of the state.

- (e) **FUELING AND VEHICLE MAINTENANCE AREAS.** Fueling and vehicle maintenance areas shall, to the maximum extent practicable, have BMPs designed, installed and maintained to reduce petroleum within runoff, such that the runoff that enters waters of the state contains no visible petroleum sheen.

**Note to Users:** A combination of the following BMPs may be used: oil and grease separators, canopies, petroleum spill cleanup materials, or any other structural or non-structural method of preventing or treating petroleum in runoff.



(f) SWALE TREATMENT FOR TRANSPORTATION FACILITIES. [OPTIONAL]

1. Applicability. Except as provided in subd. 2., transportation facilities that use swales for runoff conveyance and pollutant removal meet all of the requirements of this section, if the swales are designed to the maximum extent practicable to do all of the following:
  - a. Be vegetated. However, where appropriate, non-vegetative measures may be employed to prevent erosion or provide for runoff treatment, such as rock riprap stabilization or check dams.

**Note to Users:** It is preferred that tall and dense vegetation be maintained within the swale due to its greater effectiveness at enhancing runoff pollutant removal.

- b. Carry runoff through a swale for 200 feet or more in length that is designed with a flow velocity no greater than 1.5 feet per second for the peak flow generated using either a 2-year, 24-hour design storm or a 2-year storm with a duration equal to the time of concentration as appropriate. If a swale of 200 feet in length cannot be designed with a flow velocity of 1.5 feet per second or less, then the flow velocity shall be reduced to the maximum extent practicable.

**Note to Users:** Check dams may be included in the swale design to slow runoff flows and improve pollutant removal. Transportation facilities with continuous features such as curb and gutter, sidewalks or parking lanes do not comply with the design requirements of this paragraph. However, a limited amount of structural measures such as curb and gutter may be allowed as necessary to account for other concerns such as human safety or resource protection.

2. Exemptions. The [administering authority] may, consistent with water quality standards, require other provisions of this section be met on a transportation facility with an average daily travel of vehicles greater than 2500 and where the initial surface water of the state that the runoff directly enters is any of the following:
  - a. An outstanding resource water.
  - b. An exceptional resource water.
  - c. Waters listed in s. 303(d) of the federal clean water act that are identified as impaired in whole or in part, due to nonpoint source impacts.

- d. Waters where targeted performance standards are developed under s. NR 151.004, Wis. Adm. Code, to meet water quality standards.

**Note to Users:** The Department of Natural Resource's regional storm water staff can determine if additional BMPs, beyond a water quality swale, are needed under this paragraph.

(4) GENERAL CONSIDERATIONS FOR ON-SITE AND OFF-SITE STORM WATER

MANAGEMENT MEASURES. The following considerations shall be observed in managing runoff:

(a) Natural topography and land cover features such as natural swales, natural depressions, native soil infiltrating capacity, and natural groundwater recharge areas shall be preserved and used, to the extent possible, to meet the requirements of this section.

(b) Emergency overland flow for all storm water facilities shall be provided to prevent exceeding the safe capacity of downstream drainage facilities and prevent endangerment of downstream property or public safety.

(5) LOCATION AND REGIONAL TREATMENT OPTION.

(a) The BMPs may be located on-site or off-site as part of a regional storm water device, practice or system.

(b) Post-construction runoff within a non-navigable surface water that flows into a BMP, such as a wet detention pond, is not required to meet the performance standards of this ordinance. Post-construction BMPs may be located in non-navigable surface waters.

(c) Except as allowed under par. (d), post-construction runoff from new development shall meet the post-construction performance standards prior to entering a navigable surface water.

(d) Post-construction runoff from any development within a navigable surface water that flows into a BMP is not required to meet the performance standards of this ordinance if:

1. The BMP was constructed prior to the effective date of this ordinance and the BMP either received a permit issued under ch. 30, Stats., or the BMP did not require a ch. 30, Wis. Stats., permit; and

2. The BMP is designed to provide runoff treatment from future upland development.

(e) Runoff from existing development, redevelopment and in-fill areas shall meet the post-construction performance standards in accordance with this paragraph.

1. To the maximum extent practicable, BMPs shall be located to treat runoff prior to discharge to navigable surface waters.
2. Post-construction BMPs for such runoff may be located in a navigable surface water if allowable under all other applicable federal, state and local regulations such as ch. NR 103, Wis. Adm. Code and ch. 30, Wis. Stats.

**Note to Users:** This allows the location of BMPs in navigable surface waters where necessary to augment management practices upstream of the navigable surface water to meet the performance standards.

- (f) The discharge of runoff from a BMP, such as a wet detention pond, or after a series of such BMPs is subject to this chapter.

**Note to Users:** This section does not supersede any other applicable federal, state or local regulation such as ch. NR 103, Wis. Adm. Code and ch. 30, Wis. Stats.

- (g) The [administering authority] may approve off-site management measures provided that all of the following conditions are met:
1. The [administrating authority] determines that the post-construction runoff is covered by a storm water management system plan that is approved by the [name of municipality] and that contains management requirements consistent with the purpose and intent of this ordinance.
  2. The off-site facility meets all of the following conditions:
    - a. The facility is in place.
    - b. The facility is designed and adequately sized to provide a level of storm water control equal to or greater than that which would be afforded by on-site practices meeting the performance standards of this ordinance.
    - c. The facility has a legally obligated entity responsible for its long-term operation and maintenance.
- (h) Where a regional treatment option exists such that the [administering authority] exempts the applicant from all or part of the minimum on-site storm water management requirements, the applicant shall be required to pay a fee in an amount determined in negotiation with the [administering authority]. In determining the fee for post-construction runoff, the [administering authority] shall consider an equitable distribution of the cost for land, engineering design, construction, and maintenance of the regional treatment option.

- (6) ALTERNATE REQUIREMENTS. The [administering authority] may establish storm water management requirements more stringent than those set forth in this section if the [administering authority] determines that an added level of protection is needed to protect sensitive resources.

**S.08 PERMITTING REQUIREMENTS, PROCEDURES AND FEES.**

- (1) PERMIT REQUIRED. No responsible party may undertake a land disturbing construction activity without receiving a post-construction runoff permit from the [administering authority] prior to commencing the proposed activity.
- (2) PERMIT APPLICATION AND FEES. Unless specifically excluded by this ordinance, any responsible party desiring a permit shall submit to the [administering authority] a permit application made on a form provided by the [administering authority] for that purpose.
- (a) Unless otherwise excepted by this ordinance, a permit application must be accompanied by a storm water management plan, a maintenance agreement and a non-refundable permit administration fee.
  - (b) The storm water management plan shall be prepared to meet the requirements of SS.07 and 09, the maintenance agreement shall be prepared to meet the requirements of S.10, the financial guarantee shall meet the requirements of S.11, and fees shall be those established by the [governing body] as set forth in S.12.
- (3) REVIEW AND APPROVAL OF PERMIT APPLICATION. The [administering authority] shall review any permit application that is submitted with a storm water management plan, maintenance agreement, and the required fee. The following approval procedure shall be used:
- (a) Within [number] business days of the receipt of a complete permit application, including all items as required by sub. (2), the [administering authority] shall inform the applicant whether the application, plan and maintenance agreement are approved or disapproved based on the requirements of this ordinance.
  - (b) If the storm water permit application, plan and maintenance agreement are approved, or if an agreed upon payment of fees in lieu of storm water management practices is made, the [administering authority] shall issue the permit.
  - (c) If the storm water permit application, plan or maintenance agreement is disapproved, the [administering authority] shall detail in writing the reasons for disapproval.
  - (d) The [administering authority] may request additional information from the applicant. If additional information is submitted, the [administering authority] shall have

[number] business days from the date the additional information is received to inform the applicant that the plan and maintenance agreement are either approved or disapproved.

(e) Failure by the [administering authority] to inform the permit applicant of a decision within [number] business days of a required submittal shall be deemed to mean approval of the submittal and the applicant may proceed as if a permit had been issued.

(4) **PERMIT REQUIREMENTS.** All permits issued under this ordinance shall be subject to the following conditions, and holders of permits issued under this ordinance shall be deemed to have accepted these conditions. The [administering authority] may suspend or revoke a permit for violation of a permit condition, following written notification of the responsible party. An action by the [administering authority] to suspend or revoke this permit may be appealed in accordance with S.14.

(a) Compliance with this permit does not relieve the responsible party of the responsibility to comply with other applicable federal, state, and local laws and regulations.

(b) The responsible party shall design and install all structural and non-structural storm water management measures in accordance with the approved storm water management plan and this permit.

(c) The responsible party shall notify the [administering authority] at least [number] business days before commencing any work in conjunction with the storm water management plan, and within [number] business days upon completion of the storm water management practices. If required as a special condition under sub. (5), the responsible party shall make additional notification according to a schedule set forth by the [administering authority] so that practice installations can be inspected during construction.

(d) Practice installations required as part of this ordinance shall be certified "as built" by a licensed professional engineer. Completed storm water management practices must pass a final inspection by the [administering authority] or its designee to determine if they are in accordance with the approved storm water management plan and ordinance. The [administering authority] or its designee shall notify the responsible party in writing of any changes required in such practices to bring them into compliance with the conditions of this permit.

(e) The responsible party shall notify the [administering authority] of any significant modifications it intends to make to an approved storm water management plan. The [administering authority] may require that the proposed modifications be submitted to it for approval prior to incorporation into the storm water management plan and execution by the responsible party.

- (f) The responsible party shall maintain all storm water management practices in accordance with the storm water management plan until the practices either become the responsibility of the [governing body], or are transferred to subsequent private owners as specified in the approved maintenance agreement.
- (g) The responsible party authorizes the [administering authority] to perform any work or operations necessary to bring storm water management measures into conformance with the approved storm water management plan, and consents to a special assessment or charge against the property as authorized under subch. VII of ch. 66, Wis. Stats., or to charging such costs against the financial guarantee posted under S.11.
- (h) If so directed by the [administering authority], the responsible party shall repair at the responsible party's own expense all damage to adjoining municipal facilities and drainage ways caused by runoff, where such damage is caused by activities that are not in compliance with the approved storm water management plan.
- (i) The responsible party shall permit property access to the [administering authority] or its designee for the purpose of inspecting the property for compliance with the approved storm water management plan and this permit.
- (j) Where site development or redevelopment involves changes in direction, increases in peak rate and/or total volume of runoff from a site, the [administering authority] may require the responsible party to make appropriate legal arrangements with affected property owners concerning the prevention of endangerment to property or public safety.
- (k) The responsible party is subject to the enforcement actions and penalties detailed in S.13, if the responsible party fails to comply with the terms of this permit.

(5) PERMIT CONDITIONS. Permits issued under this subsection may include conditions established by [administering authority] in addition to the requirements needed to meet the performance standards in S.07 or a financial guarantee as provided for in S.11.

(6) PERMIT DURATION. Permits issued under this section shall be valid from the date of issuance through the date the [administering authority] notifies the responsible party that all storm water management practices have passed the final inspection required under sub. (4)(d).

**S.09                   STORM WATER MANAGEMENT PLAN.**

(1) PLAN REQUIREMENTS. The storm water management plan required under S.08 (2) shall contain at a minimum the following information:

- (a) Name, address, and telephone number for the following or their designees: landowner; developer; project engineer for practice design and certification; person(s)

responsible for installation of storm water management practices; and person(s) responsible for maintenance of storm water management practices prior to the transfer, if any, of maintenance responsibility to another party.

(b) A proper legal description of the property proposed to be developed, referenced to the U.S. Public Land Survey system or to block and lot numbers within a recorded land subdivision plat.

(c) Pre-development site conditions, including:

1. One or more site maps at a scale of not less than 1 inch equals [number] feet. The site maps shall show the following: site location and legal property description; predominant soil types and hydrologic soil groups; existing cover type and condition; topographic contours of the site at a scale not to exceed [number] feet; topography and drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the site; watercourses that may affect or be affected by runoff from the site; flow path and direction for all storm water conveyance sections; watershed boundaries used in hydrology determinations to show compliance with performance standards; lakes, streams, wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site; limits of the 100 year floodplain; location of wells and wellhead protection areas covering the project area and delineated pursuant to s. NR 811.16, Wis. Adm. Code.

2. Hydrology and pollutant loading computations as needed to show compliance with performance standards. All major assumptions used in developing input parameters shall be clearly stated. The geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s).

(d) Post-development site conditions, including:

1. Explanation of the provisions to preserve and use natural topography and land cover features to minimize changes in peak flow runoff rates and volumes to surface waters and wetlands.

2. Explanation of any restrictions on storm water management measures in the development area imposed by wellhead protection plans and ordinances.

3. One or more site maps at a scale of not less than 1 inch equals [number] feet showing the following: post-construction pervious areas including vegetative cover type and condition; impervious surfaces including all buildings, structures, and pavement; post-construction topographic contours of the site at a scale not to exceed [number] feet; post-construction drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the

site; locations and dimensions of drainage easements; locations of maintenance easements specified in the maintenance agreement; flow path and direction for all storm water conveyance sections; location and type of all storm water management conveyance and treatment practices, including the on-site and off-site tributary drainage area; location and type of conveyance system that will carry runoff from the drainage and treatment practices to the nearest adequate outlet such as a curbed street, storm drain, or natural drainage way; watershed boundaries used in hydrology and pollutant loading calculations and any changes to lakes, streams, wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site.

4. Hydrology and pollutant loading computations as needed to show compliance with performance standards. The computations shall be made for each discharge point in the development, and the geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s).

5. Results of investigations of soils and groundwater required for the placement and design of storm water management measures. Detailed drawings including cross-sections and profiles of all permanent storm water conveyance and treatment practices.

- (e) A description and installation schedule for the storm water management practices needed to meet the performance standards in S.07.
- (f) A maintenance plan developed for the life of each storm water management practice including the required maintenance activities and maintenance activity schedule.
- (g) Cost estimates for the construction, operation, and maintenance of each storm water management practice.
- (h) Other information requested in writing by the [administering authority] to determine compliance of the proposed storm water management measures with the provisions of this ordinance.
- (i) All site investigations, plans, designs, computations, and drawings shall be certified by a [licensed professional engineer] to be prepared in accordance with accepted engineering practice and requirements of this ordinance.

- (2) ALTERNATE REQUIREMENTS. The [administering authority] may prescribe alternative submittal requirements for applicants seeking an exemption to on-site storm water management performance standards under S.07 (5).

**S.10 MAINTENANCE AGREEMENT.**



- (1) MAINTENANCE AGREEMENT REQUIRED. The maintenance agreement required under S.08 (2) for storm water management practices shall be an agreement between the [administering authority] and the responsible party to provide for maintenance of storm water practices beyond the duration period of this permit. The maintenance agreement shall be filed with the County Register of Deeds as a property deed restriction so that it is binding upon all subsequent owners of the land served by the storm water management practices.
- (2) AGREEMENT PROVISIONS. The maintenance agreement shall contain the following information and provisions and be consistent with the maintenance plan required by S.09(1)(f):
  - (a) Identification of the storm water facilities and designation of the drainage area served by the facilities.
  - (b) A schedule for regular maintenance of each aspect of the storm water management system consistent with the storm water management plan required under S.08 (2).
  - (c) Identification of the responsible party(s), organization or city, county, town or village responsible for long term maintenance of the storm water management practices identified in the storm water management plan required under S.08 (2).
  - (d) Requirement that the responsible party(s), organization, or city, county, town or village shall maintain storm water management practices in accordance with the schedule included in par. (b).
  - (e) Authorization for the [administering authority] to access the property to conduct inspections of storm water management practices as necessary to ascertain that the practices are being maintained and operated in accordance with the agreement.
  - (f) A requirement on the [administering authority] to maintain public records of the results of the site inspections, to inform the responsible party responsible for maintenance of the inspection results, and to specifically indicate any corrective actions required to bring the storm water management practice into proper working condition.
  - (g) Agreement that the party designated under par. (c), as responsible for long term maintenance of the storm water management practices, shall be notified by the [administering authority] of maintenance problems which require correction. The specified corrective actions shall be undertaken within a reasonable time frame as set by the [administering authority].
  - (h) Authorization of the [administering authority] to perform the corrected actions identified in the inspection report if the responsible party designated under par. (c) does not make the required corrections in the specified time period. The [administering authority] shall enter the amount due on the tax rolls and collect the money as a special charge against the property pursuant to subch. VII of ch. 66, Wis. Stats.

**S.11 FINANCIAL GUARANTEE.**

- (1) ESTABLISHMENT OF THE GUARANTEE. The [administering authority] may require the submittal of a financial guarantee, the form and type of which shall be acceptable to the [administering authority]. The financial guarantee shall be in an amount determined by the [administering authority] to be the estimated cost of construction and the estimated cost of maintenance of the storm water management practices during the period which the designated party in the maintenance agreement has maintenance responsibility. The financial guarantee shall give the [administering authority] the authorization to use the funds to complete the storm water management practices if the responsible party defaults or does not properly implement the approved storm water management plan, upon written notice to the responsible party by the [administering authority] that the requirements of this ordinance have not been met.
  
- (2) CONDITIONS FOR RELEASE. Conditions for the release of the financial guarantee are as follows:
  - (a) The [administering authority] shall release the portion of the financial guarantee established under this section, less any costs incurred by the [administering authority] to complete installation of practices, upon submission of "as built plans" by a licensed professional engineer. The [administering authority] may make provisions for a partial pro-rata release of the financial guarantee based on the completion of various development stages.
  - (b) The [administering authority] shall release the portion of the financial guarantee established under this section to assure maintenance of storm water practices, less any costs incurred by the [administering authority], at such time that the responsibility for practice maintenance is passed on to another entity via an approved maintenance agreement.

**S.12 FEE SCHEDULE.**

The fees referred to in other sections of this ordinance shall be established by the [administering authority] and may from time to time be modified by resolution. A schedule of the fees established by the [administering authority] shall be available for review in [location].

**S.13 ENFORCEMENT.**

- (1) Any land disturbing construction activity or post-construction runoff initiated after the effective date of this ordinance by any person, firm, association, or corporation subject to the ordinance

provisions shall be deemed a violation unless conducted in accordance with the requirements of this ordinance.

- (2) The [administering authority] shall notify the responsible party by certified mail of any non-complying land disturbing construction activity or post-construction runoff. The notice shall describe the nature of the violation, remedial actions needed, a schedule for remedial action, and additional enforcement action which may be taken.
- (3) Upon receipt of written notification from the [administering authority] under sub. (2), the responsible party shall correct work that does not comply with the storm water management plan or other provisions of this permit. The responsible party shall make corrections as necessary to meet the specifications and schedule set forth by the [administering authority] in the notice.
- (4) If the violations to a permit issued pursuant to this ordinance are likely to result in damage to properties, public facilities, or waters of the state, the [administering authority] may enter the land and take emergency actions necessary to prevent such damage. The costs incurred by the [administering authority] plus interest and legal costs shall be billed to the responsible party.
- (5) The [administering authority] is authorized to post a stop work order on all land disturbing construction activity that is in violation of this ordinance, or to request the [municipal attorney, corporation counsel] to obtain a cease and desist order in any court with jurisdiction.
- (6) The [administering authority] may revoke a permit issued under this ordinance for non-compliance with ordinance provisions.
- (7) Any permit revocation, stop work order, or cease and desist order shall remain in effect unless retracted by the [administering authority] or by a court with jurisdiction.
- (8) The [administering authority] is authorized to refer any violation of this ordinance, or of a stop work order or cease and desist order issued pursuant to this ordinance, to the [municipal attorney, corporation counsel] for the commencement of further legal proceedings in any court with jurisdiction.
- (9) Any person, firm, association, or corporation who does not comply with the provisions of this ordinance shall be subject to a forfeiture of not less than [number] dollars or more than [number] dollars per offense, together with the costs of prosecution. Each day that the violation exists shall constitute a separate offense.

- (10) Compliance with the provisions of this ordinance may also be enforced by injunction in any court with jurisdiction. It shall not be necessary to prosecute for forfeiture or a cease and desist order before resorting to injunctive proceedings.

**Note to Users:** Injunctive orders are authorized pursuant to s. 59.69(11), 61.35, or 62.23(8), Wis. Stats., for counties, villages and towns with village powers, and cities respectively.

- (11) When the [administering authority] determines that the holder of a permit issued pursuant to this ordinance has failed to follow practices set forth in the storm water management plan, or has failed to comply with schedules set forth in said storm water management plan, the [administering authority] or a party designated by the [administering authority] may enter upon the land and perform the work or other operations necessary to bring the condition of said lands into conformance with requirements of the approved plan. The [administering authority] shall keep a detailed accounting of the costs and expenses of performing this work. These costs and expenses shall be deducted from any financial security posted pursuant to S.11 of this ordinance. Where such a security has not been established, or where such a security is insufficient to cover these costs, the costs and expenses shall be entered on the tax roll as a special charge against the property and collected with any other taxes levied thereon for the year in which the work is completed.

#### **S.14 APPEALS.**

- (1) BOARD OF [APPEALS or ADJUSTMENT]. The board of [appeals or adjustment], created pursuant to section [number] of the [name of municipality] ordinances pursuant to s. [59.694, or 60.65 or 61.354(4)(b) or 62.23(7)(e)], Wis. Stats, shall hear and decide appeals where it is alleged that there is error in any order, decision or determination made by the [administering authority] in administering this ordinance. The board shall also use the rules, procedures, duties, and powers authorized by statute in hearing and deciding appeals. Upon appeal, the board may authorize variances from the provisions of this ordinance that are not contrary to the public interest, and where owing to special conditions a literal enforcement of the ordinance will result in unnecessary hardship.
- (2) WHO MAY APPEAL. Appeals to the board of [appeals or adjustments] may be taken by any aggrieved person or by an officer, department, board, or bureau of the [name of municipality] affected by any decision of the [administering authority].

**S.15 SEVERABILITY.**

If any section, clause, provision or portion of this ordinance is judged unconstitutional or invalid by a court of competent jurisdiction, the remainder of the ordinance shall remain in force and not be affected by such judgment.

**S.16 EFFECTIVE DATE.**

This ordinance shall be in force and effect from and after its adoption and publication. The above and foregoing ordinance was duly adopted by the [governing body] of the [name of municipality] on the [number] day of [month], [year].

Approved: \_\_\_\_\_

Attested \_\_\_\_\_

Published on [day, month, year].

## **APPENDIX B**

### **MODEL ILLICIT DISCHARGE AND CONNECTION ORDINANCE**



## Introduction to the Model Illicit Discharge and Connection Ordinance

The model ordinance provided in this Appendix is intended to be a tool for communities who are responsible for meeting the illicit discharge detection and correction requirements of the National Pollutant Discharge Elimination System (NPDES) regulations. This model ordinance is provided to assist communities in creating their own illicit discharge ordinances. In designing this model, an attempt was made to avoid creating too complex an ordinance, and instead to provide standard language and concepts that a good illicit discharge ordinance might contain. The language was borrowed from a number of ordinances.

Feel free to use and alter any and all portions of this document to meet the needs of the local community. Throughout the ordinance, there are sections in which the name of the agency to which regulatory power over illicit discharges has been given should be filled in to customize it. These sections are denoted by text placed in brackets – [authorized enforcement agency].

Italicized text with this symbol should be interpreted as comments, instructions, or information to assist local governments in tailoring the ordinance. This text would not appear in a final adopted ordinance. This ordinance should not be construed as an exhaustive listing of all the language needed for a local ordinance, but represents

a good base that communities can build upon and customize to be consistent with the staff resources available in their locality. It is recommended that this document be used in conjunction with other sources, such as existing ordinances created by other IDDE programs in the same geographic region and with similar objectives. In addition, several state agencies, councils of governments, and other regional groups have developed model ordinances. Two very comprehensive yet different examples of ordinances are:

- Model Storm Water Ordinance  
Source: North Central Texas Council of Governments  
([www.dfwstormwater.com/illicits](http://www.dfwstormwater.com/illicits))
- Model Illicit Discharge and Illegal Connection Ordinance  
Source: Metropolitan North Georgia Water Planning District  
([www.northgeorgiawater.com](http://www.northgeorgiawater.com))

For those areas where septic systems are commonly used for wastewater treatment, language requiring inspection of these systems should also be added. The Washtenaw County (MI) *Regulation for the Inspection of Residential On-site Water and Sewage Disposal Systems at Time of Property Transfer* is an example of an ordinance that specifies requirements for inspection and maintenance of septic systems.



## MODEL ILLICIT DISCHARGE AND CONNECTION ORDINANCE

ORDINANCE NO. \_\_\_\_\_

### SECTION 1. PURPOSE/INTENT.

The purpose of this ordinance is to provide for the health, safety, and general welfare of the citizens of [jurisdiction] through the regulation of non-storm water discharges to the storm drainage system to the maximum extent practicable as required by federal and state law. This ordinance establishes methods for controlling the introduction of pollutants into the municipal separate storm sewer system (MS4) in order to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process. The objectives of this ordinance are:

- (1) To regulate the contribution of pollutants to the MS4 by storm water discharges by any user.
- (2) To prohibit illicit connections and discharges to the MS4.
- (3) To establish legal authority to carry out all inspection, surveillance, monitoring, and enforcement procedures necessary to ensure compliance with this ordinance.

### SECTION 2. DEFINITIONS.

For the purposes of this ordinance, the following shall mean:

Authorized Enforcement Agency. Employees or designees of the director of the municipal agency designated to enforce this ordinance.

Best Management Practices (BMPs). Schedules of activities, prohibitions of practices, general good house keeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to storm water, receiving waters, or storm water conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Clean Water Act. The federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.

Construction Activity. Activities subject to NPDES Construction Permits. These include construction projects resulting in land disturbance of one acre or more. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Hazardous Materials. Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

## *Appendix B: Model Illicit Discharge and Connection Ordinance*

Illegal Discharge. Any direct or indirect non-storm water discharge to the storm drain system, except as exempted in Section 8 of this ordinance.

Illicit Connections. An illicit connection is defined as either of the following:

- Any drain or conveyance, whether on the surface or subsurface that allows an illegal discharge to enter the storm drain system including but not limited to any conveyances that allow any non-storm water discharge including sewage, process wastewater, and wash water to enter the storm drain system and any connections to the storm drain system from indoor drains and sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved by an authorized enforcement agency or,
- Any drain or conveyance connected from a commercial or industrial land use to the storm drain system that has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Industrial Activity. Activities subject to NPDES Industrial Storm Water Permits as defined in 40 CFR, Section 122.26 (b)(14).

Municipal Separate Storm Sewer System (MS4). The system of conveyances (including sidewalks, roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) owned and operated by the [jurisdiction] and designed or used for collecting or conveying storm water, and that is not used for collecting or conveying sewage.

National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit. means a permit issued by EPA (or by a State under authority delegated pursuant to 33 USC § 1342(b)) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Non-Storm Water Discharge. Any discharge to the storm drain system that is not composed entirely of storm water.

Person. Any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or as the owner's agent.

Pollutant. Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordinances, and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; and noxious or offensive matter of any kind.

Premises. Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Storm Drainage System. Publicly-owned facilities by which storm water is collected and/or conveyed, including but not limited to any roads with drainage systems, municipal streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human-made or altered drainage channels, reservoirs, and other drainage structures.

Storm Water. Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation, and resulting from such precipitation.

Storm Water Management Plan. A document which describes the Best Management Practices and activities to be implemented by a person or business to identify sources of pollution or contamination at a site and the actions to eliminate or reduce pollutant discharges to Storm Water, Storm Water Conveyance Systems, and/or Receiving Waters to the Maximum Extent Practicable.

Wastewater. Any water or other liquid, other than uncontaminated storm water, discharged from a facility.

### **SECTION 3. APPLICABILITY.**

This ordinance shall apply to all water entering the storm drain system generated on any developed and undeveloped lands unless explicitly exempted by the **[authorized enforcement agency]**.

### **SECTION 4. RESPONSIBILITY FOR ADMINISTRATION.**

The **[authorized enforcement agency]** shall administer, implement, and enforce the provisions of this ordinance. Any powers granted or duties imposed upon the **[authorized enforcement agency]** may be delegated in writing by the Director of the **[authorized enforcement agency]** to persons or entities acting in the beneficial interest of or in the employ of the agency.

### **SECTION 5. COMPATIBILITY WITH OTHER REGULATIONS.**

This ordinance is not intended to modify or repeal any other ordinance, rule, regulation, or other provision of law. The requirements of this ordinance are in addition to the requirements of any other ordinance, rule, regulation, or other provision of law, and where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule, regulation, or other provision of law, whichever provision is more restrictive or imposes higher protective standards for human health or the environment shall control.

### **SECTION 6. SEVERABILITY.**

The provisions of this ordinance are hereby declared to be severable. If any provision, clause, sentence, or paragraph of this ordinance or the application thereof to any person, establishment, or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this ordinance.

### **SECTION 7. ULTIMATE RESPONSIBILITY.**

The standards set forth herein and promulgated pursuant to this ordinance are minimum standards; therefore this ordinance does not intend or imply that compliance by any person will ensure that there will be no contamination, pollution, or unauthorized discharge of pollutants.

## SECTION 8. DISCHARGE PROHIBITIONS.

### 8.1. Prohibition of Illegal Discharges.

No person shall throw, drain, or otherwise discharge, cause, or allow others under its control to throw, drain, or otherwise discharge into the MS4 any pollutants or waters containing any pollutants, other than storm water.

The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited except as described as follows:

- (1) The following discharges are exempt from discharge prohibitions established by this ordinance: water line flushing, landscape irrigation, diverted stream flows, rising ground waters, uncontaminated ground water infiltration, uncontaminated pumped ground water, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, dechlorinated swimming pool discharges, and street wash water.
- (2) Discharges or flow from firefighting, and other discharges specified in writing by the **[authorized enforcement agency]** as being necessary to protect public health and safety.
- (3) Discharges associated with dye testing, however this activity requires a verbal notification to the **[authorized enforcement agency]** prior to the time of the test.
- (4) The prohibition shall not apply to any non-storm water discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the United States Environmental Protection Agency (EPA), provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.

*The local government may evaluate and remove any of the above exemptions if it is determined that they are causing an adverse impact.*

### 8.2. Prohibition of Illicit Connections.

- (1) The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited.
- (2) This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.
- (3) A person is considered to be in violation of this ordinance if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.
- (4) Improper connections in violation of this ordinance must be disconnected and redirected, if necessary, to an approved onsite wastewater management system or the sanitary sewer system upon approval of the **[authorized enforcement agency]**.
- (5) Any drain or conveyance that has not been documented in plans, maps or equivalent, and which may be connected to the storm sewer system, shall be located by the owner or occupant of that property upon receipt of written notice of violation from the **[authorized**

**enforcement agency]** requiring that such locating be completed. Such notice will specify a reasonable time period within which the location of the drain or conveyance is to be determined, that the drain or conveyance be identified as storm sewer, sanitary sewer or other, and that the outfall location or point of connection to the storm sewer system, sanitary sewer system or other discharge point be identified. Results of these investigations are to be documented and provided to the **[authorized enforcement agency]**.

## **SECTION 9. WATERCOURSE PROTECTION.**

Every person owning property through which a watercourse passes, or such person's lessee, shall keep and maintain that part of the watercourse within the property free of trash, debris, excessive vegetation, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structures will not become a hazard to the use, function, or physical integrity of the watercourse.

## **SECTION 10. INDUSTRIAL OR CONSTRUCTION ACTIVITY DISCHARGES.**

### **10.1. Submission of NOI to [jurisdiction].**

- (1) Any person subject to an industrial or construction activity NPDES storm water discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the **[authorized enforcement agency]** prior to the allowing of discharges to the MS4.
- (2) The operator of a facility, including construction sites, required to have an NPDES permit to discharge storm water associated with industrial activity shall submit a copy of the Notice of Intent (NOI) to the **[authorized enforcement agency]** at the same time the operator submits the original Notice of Intent to the EPA as applicable.
- (3) The copy of the Notice of Intent may be delivered to the **[authorized enforcement agency]** either in person or by mailing it to:  
Notice of Intent to Discharge Storm Water  
**[authorized enforcement agency]**  
**[street address]**  
**[city, state, zip code]**
- (4) A person commits an offense if the person operates a facility that is discharging storm water associated with industrial activity without having submitted a copy of the Notice of Intent to do so to the **[authorized enforcement agency]**.

## SECTION 11. COMPLIANCE MONITORING

### 11.1. Right of Entry: Inspection and Sampling.

The **[authorized enforcement agency]** shall be permitted to enter and inspect facilities subject to regulation under this ordinance as often as may be necessary to determine compliance with this ordinance.

- (1) If a discharger has security measures in force which require proper identification and clearance before entry into its premises, the discharger shall make the necessary arrangements to allow access to representatives of the **[authorized enforcement agency]**.
- (2) Facility operators shall allow the **[authorized enforcement agency]** ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an NPDES permit to discharge storm water, and the performance of any additional duties as defined by state and federal law.
- (3) The **[authorized enforcement agency]** shall have the right to set up on any permitted facility such devices as are necessary in the opinion of the **[authorized enforcement agency]** to conduct monitoring and/or sampling of the facility's storm water discharge.
- (4) The **[authorized enforcement agency]** has the right to require the discharger to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the discharger at its own expense. All devices used to measure storm water flow and quality shall be calibrated to ensure their accuracy.
- (5) Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the operator at the written or oral request of the **[authorized enforcement agency]** and shall not be replaced. The costs of clearing such access shall be borne by the operator.
- (6) Unreasonable delays in allowing the **[authorized enforcement agency]** access to a permitted facility is a violation of a storm water discharge permit and of this ordinance. A person who is the operator of a facility with an NPDES permit to discharge storm water associated with industrial activity commits an offense if the person denies the **[authorized enforcement agency]** reasonable access to the permitted facility for the purpose of conducting any activity authorized or required by this ordinance.

### 11.2. Search Warrants.

If the **[authorized enforcement agency]** has been refused access to any part of the premises from which storm water is discharged, and he/she is able to demonstrate probable cause to believe that there may be a violation of this ordinance, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this ordinance or any order issued hereunder, or to protect the overall public health, safety, and welfare of the community, then the **[authorized enforcement agency]** may seek issuance of a search warrant from any court of competent jurisdiction.

**SECTION 12. REQUIREMENT TO PREVENT, CONTROL, AND REDUCE STORM WATER POLLUTANTS BY THE USE OF BEST MANAGEMENT PRACTICES.**

[**Authorized enforcement agency**] will adopt requirements identifying Best Management Practices for any activity, operation, or facility which may cause or contribute to pollution or contamination of storm water, the storm drain system, or waters of the United States. The owner or operator of such activity, operation, or facility shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the municipal storm drain system or watercourses through the use of these structural and non-structural BMPs. Further, any person responsible for a property or premise that is, or may be, the source of an illicit discharge, may be required to implement, at said person's expense, additional structural and non-structural BMPs to prevent the further discharge of pollutants to the MS4. Compliance with all terms and conditions of a valid NPDES permit authorizing the discharge of storm water associated with industrial activity, to the extent practicable, shall be deemed compliance with the provisions of this section. These BMPs shall be part of a storm water management plan (SWMP) as necessary for compliance with requirements of the NPDES permit.

**SECTION 13. NOTIFICATION OF SPILLS.**

Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into storm water, the storm drain system, or waters of the United States, said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of such a release of hazardous materials said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the [**authorized enforcement agency**] in person or by phone or facsimile no later than the next business day. Notifications in person or by phone shall be confirmed by written notice addressed and mailed to the [**authorized enforcement agency**] within [\_\_\_] business days of the phone notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least [\_\_\_] years.

Failure to provide notification of a release as provided above is a violation of this ordinance.

**SECTION 14. VIOLATIONS, ENFORCEMENT, AND PENALTIES.**

**14.1. Violations.**

It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this ordinance. Any person who has violated or continues to violate the provisions of this ordinance, may be subject to the enforcement actions outlined in this section or may be restrained by injunction or otherwise abated in a manner provided by law.

In the event the violation constitutes an immediate danger to public health or public safety, the [**authorized enforcement agency**] is authorized to enter upon the subject private property,

without giving prior notice, to take any and all measures necessary to abate the violation and/or restore the property. The **[authorized enforcement agency]** is authorized to seek costs of the abatement as outlined in Section 17.

#### 14.2. Warning Notice.

When the **[authorized enforcement agency]** finds that any person has violated, or continues to violate, any provision of this ordinance, or any order issued hereunder, the **[authorized enforcement agency]** may serve upon that person a written Warning Notice, specifying the particular violation believed to have occurred and requesting the discharger to immediately investigate the matter and to seek a resolution whereby any offending discharge will cease. Investigation and/or resolution of the matter in response to the Warning Notice in no way relieves the alleged violator of liability for any violations occurring before or after receipt of the Warning Notice. Nothing in this subsection shall limit the authority of the **[authorized enforcement agency]** to take any action, including emergency action or any other enforcement action, without first issuing a Warning Notice.

#### 14.3. Notice of Violation.

Whenever the **[authorized enforcement agency]** finds that a person has violated a prohibition or failed to meet a requirement of this ordinance, the **[authorized enforcement agency]** may order compliance by written notice of violation to the responsible person.

The Notice of Violation shall contain:

- (1) The name and address of the alleged violator;
- (2) The address when available or a description of the building, structure or land upon which the violation is occurring, or has occurred;
- (3) A statement specifying the nature of the violation;
- (4) A description of the remedial measures necessary to restore compliance with this ordinance and a time schedule for the completion of such remedial action;
- (5) A statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;
- (6) A statement that the determination of violation may be appealed to the **[authorized enforcement agency]** by filing a written notice of appeal within [\_\_\_] days of service of notice of violation; and
- (7) A statement specifying that, should the violator fail to restore compliance within the established time schedule, the work will be done by a designated governmental agency or a contractor and the expense thereof shall be charged to the violator.

Such notice may require without limitation:

- (1) The performance of monitoring, analyses, and reporting;
- (2) The elimination of illicit connections or discharges;
- (3) That violating discharges, practices, or operations shall cease and desist;
- (4) The abatement or remediation of storm water pollution or contamination hazards and the



restoration of any affected property

- (5) Payment of a fine to cover administrative and remediation costs; and
- (6) The implementation of source control or treatment BMPs.

#### **14.5. Compensatory Action.**

In lieu of enforcement proceedings, penalties, and remedies authorized by this ordinance, the **[authorized enforcement agency]** may impose upon a violator alternative compensatory actions, such as storm drain stenciling, attendance at compliance workshops, creek cleanup, etc.

#### **14.6. Suspension Of MS4 Access.**

##### **14.6.1. Emergency Cease and Desist Orders**

When the **[authorized enforcement agency]** finds that any person has violated, or continues to violate, any provision of this ordinance, or any order issued hereunder, or that the person's past violations are likely to recur, and that the person's violation(s) has (have) caused or contributed to an actual or threatened discharge to the MS4 or waters of the United States which reasonably appears to present an imminent or substantial endangerment to the health or welfare of persons or to the environment, the **[authorized enforcement agency]** may issue an order to the violator directing it immediately to cease and desist all such violations and directing the violator to:

- (1) Immediately comply with all ordinance requirements; and
- (2) Take such appropriate preventive action as may be needed to properly address a continuing or threatened violation, including immediately halting operations and/or terminating the discharge.

Any person notified of an emergency order directed to it under this Subsection shall immediately comply and stop or eliminate its endangering discharge. In the event of a discharger's failure to immediately comply voluntarily with the emergency order, the **[authorized enforcement agency]** may take such steps as deemed necessary to prevent or minimize harm to the MS4 or waters of the United States, and/or endangerment to persons or to the environment, including immediate termination of a facility's water supply, sewer connection, or other municipal utility services. The **[authorized enforcement agency]** may allow the person to recommence its discharge when it has demonstrated to the satisfaction of the **[authorized enforcement agency]** that the period of endangerment has passed, unless further termination proceedings are initiated against the discharger under this ordinance. A person that is responsible, in whole or in part, for any discharge presenting imminent endangerment shall submit a detailed written statement, describing the causes of the harmful discharge and the measures taken to prevent any future occurrence, to the **[authorized enforcement agency]** within [\_\_\_] days of receipt of the emergency order. Issuance of an emergency cease and desist order shall not be a bar against, or a prerequisite for, taking any other action against the violator.

##### **14.6.2. Suspension due to Illicit Discharges in Emergency Situations**

The **[authorized enforcement agency]** may, without prior notice, suspend MS4 discharge access to a person when such suspension is necessary to stop an actual or threatened discharge which presents or may present imminent and substantial danger to the environment, or to the health or welfare of persons, or to the MS4 or waters of the United States. If the violator fails to

comply with a suspension order issued in an emergency, the **[authorized enforcement agency]** may take such steps as deemed necessary to prevent or minimize damage to the MS4 or waters of the United States, or to minimize danger to persons.

#### **14.6.3. Suspension due to the Detection of Illicit Discharge**

Any person discharging to the MS4 in violation of this ordinance may have their MS4 access terminated if such termination would abate or reduce an illicit discharge. The **[authorized enforcement agency]** will notify a violator of the proposed termination of its MS4 access. The violator may petition the **[authorized enforcement agency]** for a reconsideration and hearing.

A person commits an offense if the person reinstates MS4 access to premises terminated pursuant to this Section, without the prior approval of the **[authorized enforcement agency]**.

#### **14.7. Civil Penalties.**

In the event the alleged violator fails to take the remedial measures set forth in the notice of violation or otherwise fails to cure the violations described therein within [\_\_\_] days, or such greater period as the **[authorized enforcement agency]** shall deem appropriate, after the **[authorized enforcement agency]** has taken one or more of the actions described above, the **[authorized enforcement agency]** may impose a penalty not to exceed \$[\_\_\_] (depending on the severity of the violation) for each day the violation remains unremedied after receipt of the notice of violation.

#### **14.8. Criminal Prosecution.**

Any person that has violated or continues to violate this ordinance shall be liable to criminal prosecution to the fullest extent of the law, and shall be subject to a criminal penalty of \$[\_\_\_] per violation per day and/or imprisonment for a period of time not to exceed [\_\_\_] days. Each act of violation and each day upon which any violation shall occur shall constitute a separate offense.

### **SECTION 15. APPEAL OF NOTICE OF VIOLATION.**

Any person receiving a Notice of Violation may appeal the determination of the **[authorized enforcement agency]**. The notice of appeal must be received within [\_\_\_] days from the date of the Notice of Violation. Hearing on the appeal before the appropriate authority or his/her designee shall take place within [\_\_\_] days from the date of receipt of the notice of appeal. The decision of the municipal authority or their designee shall be final.

### **SECTION 16. ENFORCEMENT MEASURES AFTER APPEAL.**

If the violation has not been corrected pursuant to the requirements set forth in the Notice of Violation, or, in the event of an appeal, within [\_\_\_] days of the decision of the municipal authority upholding the decision of the **[authorized enforcement agency]**, then representatives of the **[authorized enforcement agency]** shall enter upon the subject private property and are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent or person in possession of any

premises to refuse to allow the government agency or designated contractor to enter upon the premises for the purposes set forth above.

**SECTION 17. COST OF ABATEMENT OF THE VIOLATION.**

Within [\_\_\_] days after abatement of the violation, the owner of the property will be notified of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within [\_\_\_] days. If the amount due is not paid within a timely manner as determined by the decision of the municipal authority or by the expiration of the time in which to file an appeal, the charges shall become a special assessment against the property and shall constitute a lien on the property for the amount of the assessment.

Any person violating any of the provisions of this article shall become liable to the [jurisdiction] by reason of such violation. The liability shall be paid in not more than [\_\_\_] equal payments. Interest at the rate of [\_\_\_] percent per annum shall be assessed on the balance beginning on the [\_\_\_] day following discovery of the violation.

**SECTION 18. VIOLATIONS DEEMED A PUBLIC NUISANCE.**

In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provisions of this ordinance is a threat to public health, safety, and welfare, and is declared and deemed a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

**SECTION 19. REMEDIES NOT EXCLUSIVE.**

The remedies listed in this ordinance are not exclusive of any other remedies available under any applicable federal, state or local law and it is within the discretion of the [authorized enforcement agency] to seek cumulative remedies.

The [authorized enforcement agency] may recover all attorney's fees court costs and other expenses associated with enforcement of this ordinance, including sampling and monitoring expenses.

**SECTION 20. ADOPTION OF ORDINANCE.**

This ordinance shall be in full force and effect [\_\_\_] days after its final passage and adoption. All prior ordinances and parts of ordinances in conflict with this ordinance are hereby repealed.

PASSED AND ADOPTED this \_\_\_ day of \_\_\_\_\_, 20\_\_, by the following vote:

**APPENDIX L**

**WDNR CONSERVATION PRACTICE STANDARD 1006**

# Method for Predicting the Efficiency of Proprietary Storm Water Sedimentation Devices (1006)

Wisconsin Department of Commerce  
Wisconsin Department of Natural Resources  
Conservation Practice Standard

## Introduction and Organization

Both regulators and the regulated community must be able to predict how well proprietary sedimentation devices will perform in the field. These predictions will be used in storm water management planning and for evaluating compliance with regulatory and grant programs.

The purpose of this standard is to establish a uniform process for predicting the site-specific efficiency of proprietary sedimentation devices. There are two approaches contained in this standard that may be used in Wisconsin to meet state regulatory and grant requirements:

- One is to use an acceptable model that calculates efficiency based on Stokes' Law settling.
- The other is to use an acceptable model that contains device-specific efficiency data in lieu of Stokes' Law settling.

This technical standard is separated into four divisions. The first division is the core of the technical standard, and includes modeling and reporting requirements for predicting device efficiency using either Stokes' Law settling or

device-specific efficiency data. The second division is Appendix A, which establishes criteria for acceptable models. The third division is Appendix B, which establishes laboratory testing criteria for defining device-specific efficiency curves when used in lieu of Stokes' Law settling. The fourth division is Appendix C, the required method for using a coulter counter to quantify small sediment particles under the laboratory testing protocol.

Throughout the text of this standard and its appendices:

- the term "Section" refers to portions of the technical standard proper;
- the term "Part" refers to portions of the appendices;
- criteria are requirements that must be met to comply with the standard; and
- considerations include additional background information and recommendations, which may be followed at the discretion of the user.

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## I. Definition

This standard includes modeling, data and reporting requirements for predicting the efficiency of *proprietary flow-through storm water sedimentation devices (devices)* in reducing *total suspended solids* mass loads and concentrations. This standard also includes device installation and maintenance requirements necessary to assure devices are installed consistent with modeling assumptions. This standard does not constitute a *general product approval method*.

## II. Purpose

This standard is used to predict the reduction in the *average annual* mass load of total suspended solids and to predict the concentration of total suspended solids discharged from a sedimentation device when installed to treat runoff from a specific drainage area of defined characteristics. Application of this standard provides information necessary for regulators and the regulated community to predict the effectiveness of these devices in meeting *regulatory*, grant-based and other storm water management requirements and goals.

## III. Applicability

- A. This standard applies to devices installed to control total suspended solids, through *sedimentation processes*, from *development, new development, re-development and infill areas*.
- B. These methods and procedures are acceptable as a basis for evaluating whether predicted device performance meets State of Wisconsin regulatory and grant requirements for urban storm water management.

**Note:** See Consideration VI.A and VI.B. for information about state requirements.

## IV. Federal, State and Local Laws

Users of this standard shall be aware of applicable federal, state and local laws, rules, regulations or permit requirements governing the installation, maintenance and required treatment efficiency of proprietary devices. This standard does not contain the text of any federal, state or local laws.

## V. Criteria

### A. Modeling Requirements

- 1. **Approved Model Required.** An approved model shall be used to predict the reduction in the average annual mass load of total suspended solids and to predict the

concentration of total suspended solids discharged from a sedimentation device installed to treat runoff from a specific drainage area of defined characteristics.

- a. The Source Loading and Management Model (SLAMM) is approved for this use when applied in accordance with the modeling procedures specified in Appendix A, Parts 1.0 and 2.0.
  - b. The administering authority may approve other models using the approval process set forth in Appendix A, Part 3.0.
- 2. **Model Process Sub-routines.** The model may predict pollution control efficiency based on either of the following:
    - a. **Theoretical Sedimentation Modeling Method.** This method predicts the total suspended solids reduction efficiency of a device based on principles of gravity settling (Stokes' Law and Newton's Law).

**Note:** See Consideration VI.C for a discussion of Stokes' and Newton's law settling.

- b. **Laboratory Data-Based Sedimentation Modeling Method.** This method predicts the total suspended solids reduction efficiency of a device based on device-specific efficiency data generated in a laboratory in lieu of generic gravity settling algorithms.
  - i. The efficiency data for tested devices shall be generated in accordance with the laboratory testing protocol and reporting requirements presented in Appendix B.
  - ii. Laboratory data collected and evaluated in accordance with Appendix B may be scaled for use with untested devices in the same device classification. Scaling shall meet the requirements of Appendix B, Part 3.2.A and the analysis and reporting requirements of Appendix B, Part 6.0.

**Note:** In this method, the device pollutant reduction efficiency reflects the sum total of gravimetric and enhanced settling processes provided by the device. Although scour is not modeled as a separate process, scour testing is required to identify the design treatment flow rate

and by-pass requirements for modeling and installation.

**B. Requirements for Reporting Performance Predictions.**

The following information shall be reported to the *administering state agency* in support of performance predictions for a device installed to control total suspended solids in a drainage area of specified characteristics.

1. Device name, schematic (plan and elevation) diagrams and model number.
2. Device cross-sectional surface area and dimensions used in making the surface area calculation.
3. *Design treatment flow rate* for the device.
4. Sump information, including: depth of clean sump (in feet) as measured from the bottom of the sediment chamber to the outlet invert; and maximum allowable sediment depth (in feet) as measured from the bottom of the sediment chamber to the top of the maximum allowable sediment depth.
5. By-pass information, including: location (internal, external); flow-rated capacity; and justification for selected by-pass capacity.
6. Tributary area size, land use type, acres of the paved and unpaved surfaces, and the connectedness of these areas to the storm drain system.
7. Identity of model input files.
8. Efficiency determinations:
  - a. Average annual % reduction of total suspended solids mass load; and
  - b. Range and mean of the event-mean total suspended solids discharge concentrations.

**C. Device Installation and Maintenance Requirements.**

Proprietary sedimentation devices shall be installed and maintained in a manner consistent with laboratory testing and modeling assumptions used to predict effectiveness. This includes the following requirements:

1. The device shall be installed in accordance with manufacturer recommendations.
2. The installed device shall be equipped with an internal or external bypass to divert flows in excess of the design treatment flow rate.

- a. For the Theoretical Sedimentation Modeling Method, the design treatment flow rate shall not exceed  $.08 \text{ cfs/ft}^2$ , where  $\text{ft}^2$  is the cross sectional area of the primary sedimentation chamber.

**Note:** See Considerations VI.D. for the derivation of this factor.

- b. For the Laboratory Data-Based Sedimentation Modeling Method, the design treatment flow rate shall be determined through the scour verification testing conducted under Appendix B, Part 4.0.

3. Accumulated pollutants shall be removed from the device as recommended by the manufacturer. This includes periodic removal of sediment to maintain device efficiency and reduce scour. Sediment shall not be allowed to accumulate to a depth greater than the *maximum recommended sediment storage depth*.
4. If the device is modeled using the Theoretical Sedimentation Modeling Method, the device shall be equipped with either a permanent pool having a depth at least three (3) feet above the maximum sediment storage depth to reduce scour, or shall be equipped with internal flow control structures to reduce scour velocities.

**Note:** See Consideration VI.E for a discussion of scour.

**VI. Considerations**

- A. Regulations Comm 20, Comm 60, NR 151 and NR 216, Wis. Adm. Code, either contain or make reference to requirements for reducing the average annual mass load of total suspended solids discharged in storm water runoff to waters of the state. Comm 82, Wis. Adm. Code, establishes requirements for the effluent concentrations of total suspended solids discharged from *storm water plumbing systems* to subsurface dispersal or irrigation areas.
- B. Comm 82, Wis. Adm. Code, also includes effluent limitations on the discharge of oil & grease, BOD<sub>5</sub> and fecal coliform from storm water plumbing systems to subsurface dispersal or irrigation systems. This standard does not address the effectiveness of these devices for reducing these pollutants.
- C. The theoretical sedimentation model approach applies the upflow (surface overflow) equation to



a defined particle size distribution. The predicted reductions apply to the influent load estimated for each runoff event. Load reductions are predicted by particle size class. Scour is not typically modeled as a separate process. The model also predicts the event mean total suspended solids discharge concentrations for each runoff event based on the combined effects of device treatment and by-passing.

The method predicts retention efficiency based on the upflow (surface overflow) equation:

$v = Q/A$ , where:

$v$  = critical particle settling velocity

$Q$  = discharge rate from the sedimentation chamber

$A$  = sedimentation chamber surface area

Stokes' law is for laminar flow conditions and is generally applicable to plain settling for particles up to about 100  $\mu\text{m}$  in size. Newton's law is applicable for turbulent settling, generally for particles larger than 5,000  $\mu\text{m}$  in diameter (assuming a specific gravity of about 2.65). Between these sizes, a smooth transition is used to predict settling. Stokes' Law covers the most critical range, where most of the storm water particles are likely present, and the large particles are "easily" captured by the proprietary devices.

- D. For devices modeled using the Theoretical Sedimentation Modeling Method, the design treatment flow rate shall not exceed .08 cfs/ft<sup>2</sup>, where ft<sup>2</sup> is the cross sectional area of the primary sedimentation chamber. This limitation is intended to reduce scour by requiring that larger flows by-pass the treatment chamber. The factor of .08 is based on the settling rate of a 250 micron particle size with a specific gravity of 2.7 in water at a temperature of 68° F, and a safety factor of 1.5. The 250 micron particle size was selected as a basis for scour protection for three reasons. First, an average of 73% of the particles removed from three proprietary devices are 250 microns or greater, thus, limiting the expected mass of material subject to scour (see Table B-7 in Appendix B). Second, it is anticipated that some of the remaining 27% of the trapped load, which would be less than 250 microns in size, would be protected from scour by armoring. Third, an evaluation of design parameters for four selected families of proprietary devices indicates that this by-pass requirement is

practical, as it can be met by nearly all of these devices using their existing by-pass capacities.

- E. The Theoretical Sedimentation Modeling Method assumes no re-suspension (scour) of previously trapped material, which is known to occur and which will decrease efficiency of the device. The requirement for by-pass or internal flow controls is meant to reduce scour so that modeled efficiency is closer to actual operating efficiency. The Theoretical Sedimentation Modeling Method also does not account for any other processes, such as filtration, which can increase pollution control efficiency.

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## VIII. Definitions

*Administering state agency (V.B.):* The state agency or its agents responsible for administering the storm water regulations applicable to the site. Responsible state agencies are the Department of Natural Resources for NR 151 and NR 216, Wis. Adm. Code, and the Department of Commerce for Comm 20, Comm 60 and Comm 82, Wis. Adm. Code.

*Average Annual (II):* A condition (such as rainfall or mass load) characterized by a calendar year of precipitation, excluding snow, which is considered typical. Typical average rainfall years for five regions in Wisconsin are available from the Department of Natural Resources.

*Design treatment flow rate (V.B.3.):* The maximum hydraulic discharge capacity (volume/time) of the sedimentation treatment chamber allowable for installations in Wisconsin. It is the capacity at which scour losses are acceptable, as determined by the requirements of this standard.

**Note:** The design treatment flow rate has a safety factor built in. The safety factor is 1.5 for devices modeled with the Theoretical Sedimentation Modeling Method (See VI.D.). The safety factor is 1.2 for devices that have had a scour verification test under Appendix B, Part 4.0.

*Development (III.A.):* As defined in NR 151.002, Wis. Adm. Code.

*Devices (I):* See definition of *Proprietary flow-through storm water sedimentation device*.

*Device classification (Appendix B, Part 1.1):* A group or “family” of devices that include similar geometry, flow pattern, sedimentation mechanism and high-flow bypass ability. Devices in the same classification are best thought of as a series of devices of different sizes offered under a similar name by the same manufacturer.

*General product approval method (I):* A method that gives blanket approval for use of a device.

*In-fill area (III.A.):* As defined in NR 151.002, Wis. Adm. Code.

*Maximum recommended sediment storage depth (V.C.3.):* This is the maximum depth of sediment accumulation recommended by the manufacturer to

maintain acceptable sediment removal efficiency and reduce scour losses.

For devices modeled using the Theoretical Sedimentation Modeling Method, this depth is specified by the device manufacturer.

For devices modeled using the Laboratory Data-Based Sedimentation Method, it is the sediment depth at which the device passes the scour verification test specified in Appendix B, Part 4.0.

*New development (III.A.):* As defined in NR 151.002, Wis. Adm. Code.

*Proprietary flow-through storm water sedimentation device (I):* A chamber or set of chambers (which may include internal baffles or other equipment and associated piping) that is provided as a defined product by a commercial vendor, and is warranted by that vendor to provide specific storm water pollutant removal performance under specified conditions. These devices can consist of prefabricated equipment supplied by a manufacturer, structures constructed on-site, or a combination thereof.

*Redevelopment (III.A.):* As defined in NR 151.002, Wis. Adm. Code.

*Regulatory (II):* Decisions made in administering state storm water management requirements. This includes sites regulated by the Department of Natural Resources under NR 151 and NR 216, Wis. Adm. Code, and the Department of Commerce under Comm 20, Comm 60 and Comm 82, Wis. Adm. Code.

*Sedimentation processes (III.A.):* Removal of sediment by a device through entrainment in the settling chamber(s). Includes basic gravity settling as well as settling enhanced through other physical processes such as centrifugation or tube settling. It does not include the effects of filtration.

*Storm water plumbing system (VI.A.):* Piping, appliances and devices that convey, hold or treat storm water from building runoff. This includes all piping connected to piping conveying runoff from buildings. The portion of the storm plumbing system under the authority of the Wisconsin Uniform Plumbing Code is that portion conveying storm water to the municipal system or discharging to grade.

*Suspended sediment concentration (Appendix B, Part 3.1.C.):* Operationally defined as the concentration or mass of sediment determined by testing under method ASTM D3977-97 (1989 Standard Methods).

*Total suspended solids (I):* Operationally defined as the concentration or mass of sediment determined by testing under method EPA 160.2 (EPA 1979).

## Appendix A

### Criteria for the Theoretical Sedimentation Modeling Method and Laboratory Data-Based Sedimentation Modeling Method

#### 1.0 Introduction

This appendix contains modeling requirements for predicting the site-specific efficiency of proprietary flow through sedimentation devices. The pollution reduction algorithms used in the model may be based either on basic Stokes' Law settling or on device-specific efficiency data generated under the lab protocol set forth in Appendix B.

SLAMM is an approved model for both the theoretical sedimentation modeling method and the laboratory data-based modeling method. Part 2.0 of this appendix covers requirements for using the Source Loading and Management Model (SLAMM).

An alternative model to SLAMM may be used, but it must be approved by the administering authority under Part 3.0 of this appendix.

#### 2.0 Modeling Procedures

**Note:** See Section V.B of this technical standard for reporting requirements.

**2.1. General Modeling Requirements.** The following requirements apply when using models in either the theoretical sedimentation modeling method or the laboratory data-based sedimentation modeling method.

- A. The NURP particle size distribution shall be assumed for the influent storm water.

**Note:** The NURP particle size distribution is shown in the first two columns of Appendix B, Table B-6.

- B. The rainfall files shall meet those specified by the Department of Natural Resources.

**Note:** DNR requirements for rainfall files can be found either in NR 151, Wis. Adm. Code, or on the DNR Website.

- C. The device shall be modeled to by-pass flows greater than the design treatment flow

rate. The modeled design treatment flow rate of the device shall not exceed the flows allowed under sections V.C.2.a or V.C.2.b of the standard.

- D. Efficiency calculations shall include by-pass effects in final calculations of mass load reduction and concentration of total suspended solids discharged in the device's effluent. Water by-passed around the sedimentation chamber shall be modeled as receiving zero treatment.
- E. The device surface area shall be the plan-view area of the settling chamber where the bulk of the sedimentation occurs.
- F. Credit shall not be given for sedimentation that occurs, or is predicted to occur, in storm water conveyance pipes leading to or exiting the device.

#### 2.2 Additional SLAMM Modeling Requirements for the Theoretical Modeling Method

- A. SLAMM version 9.0.1, or later, shall be used. The SLAMM model is available from PV & Associates at <http://www.winslamm.com>.
- B. For model versions 9.0.1 through 9.2.0, the catch-basin subroutine shall be used to model the device. For model version 9.2.1 or later, the hydrodynamic device subroutine shall be used.
- C. Parameter files appropriate for use in Wisconsin are identified in Table A-1. File selection depends on the version of SLAMM being used. Parameter files shall be selected in accordance with the following Table A-1.

**Table A-1.** Parameter Files Required When Using SLAMM for the Theoretical Sedimentation Modeling Method or the Laboratory Data-Based Sedimentation Modeling Method

Parameter File	Model v. 9.0.1	Model v. 9.1.0 – 9.1.2_____	Model v. 9.2.0
Rainfall (*.ran)	Select files, start & end dates in accordance with s. NR 151.12(1)	Select files, start & end dates in accordance with s. NR 151.12(1)	Select files, start & end dates and winter season range in accordance with s. NR 151.12(1)
Particle Size Distr.	NURP.cpz	NURP.cpz	NURP.cpz
Pollutant File	WI_GEO01.ppd	WI_GEO01.ppd	WI_GEO01.ppd
Delivery File	WI_DL01.prr	WI_DL01.prr	WI_DL01.prr
Particulate Solids Concentration File	WI_AVG01.psc	WI_AVG01.psc	WI_AVG01.psc
Runoff Coefficient File	WI_SL01.rsv	WI_SL01.rsv	WI_SL06 Dec06.rsv
Street Delivery Files	WI_Com Inst Indust May05.std WI_Res and Other Urban May05.std	WI_Com Inst Indust May05.std WI_Res and Other Urban May05.std Freeway.std	WI_Res and Other Urban Dec06.std WI_Com Inst Indust Dec06.std Freeway Dec06.std

**2.3 Additional SLAMM Modeling Requirements for Laboratory Data-Based Modeling Method**

- A. SLAMM version 9.2.1, or later, shall be used.
- B. The hydrodynamic device subroutine shall be used.
- C. The parameter files shown in Table A-1 for model version 9.2.1, or later, shall be used.
- D. Lab tested efficiency input data – The device performance shall be modeled using efficiency data developed from the data collected and analyzed in accordance with Appendix B.

**Note:** The Department of Natural Resources will take the data reported for the laboratory testing under Appendix B, Part 6.0 and incorporate it into SLAMM as device-defined efficiency data. Manufacturer’s reports on performance projections may be reviewed by a technical committee prior to incorporating the device efficiency data into SLAMM. The administering state agency may make revisions to the manufacturer’s performance projections based on comments of the technical committee. The administering state agency will give the manufacturer an opportunity to challenge any such changes.

**3.0 Approval of Alternative Models**

- A. The administering authority may approve the use of a model other than WinSLAMM. In making its determination, the administering authority will use the following process.
- B. The applicant shall submit a written request to the administering authority that identifies the proposed model and justification as to why the alternative model should be accepted.
- C. The justification for acceptance of the alternative model shall be based on one of the following:
  - 1. Comparison of modeled device efficiency to monitored device efficiency. In performing the comparative analysis, the site characteristics of the monitored site shall be used as inputs in the model. To be acceptable, monitoring data shall have been collected and analyzed using the U.S. EPA Environmental Testing Verification Protocol.

**Note:** In 2007, test data sets were available for Stormceptor, Vortechs, and Downstream Defender devices. The Stormceptor, Vortechs, and Downstream Defender were the subject of intensive monitoring efforts designed

to verify the performance of each device and verify the load reductions estimated by WinSLAMM. All the monitoring was conducted by the U.S. Geological Survey (USGS) and the results of the monitoring are available in USGS reports. Verification of the Vortechs and Downstream Defender was part of EPA's Environmental Technology Verification (ETV) program.

2. Comparison of device efficiency determined using the alternative model with the device efficiency determined using WinSLAMM.

D. Comparisons shall be made using the sum of the loads (SOL) method, where:

% Load Reduction =

$(\text{inlet SOL} - \text{outlet SOL}) / \text{inlet SOL} * 100$ , where

**Note:** The SOL is the combined percent load reduction efficiencies for all the modeled events and provides a measure of the overall

performance efficiency for the events sampled during the monitoring period.

- E. The administering authority shall compare the applicant's modeling results with the monitored results or the WinSLAMM results for the test site and make a determination whether the alternative model is acceptable. To be approved, the alternative modeling method must be able to produce an estimate of device efficiency that is within 15 percentage points of the efficiency monitored in the field or within 15 percentage points of the efficiency determined using WinSLAMM.
- F. The administering authority will send a written response to the applicant with a decision concerning the acceptability of the alternative model. Until a written acceptance is determined, the proposed model is not approved for documenting compliance with any regulations at site installations.

## Appendix B

### Wisconsin Laboratory Testing Method for Determining and Reporting The Performance of Proprietary Storm Water Sedimentation Devices

#### 1.0 Introduction

##### 1.1 Purpose and Overview of Testing Method

The purpose of this testing method is to determine the performance of a full-scale device in a lab setting. The data from this testing will be used to prepare pollutant reduction efficiency curves for incorporation into models that will in turn be used to predict the annual efficiency of the device when deployed in a specific location under a specified annual rainfall sequence.

In this appendix, the word “testing” refers to a suite of tests. The suite of tests for each device includes a set of sedimentation tests and a scour verification test. The set of sedimentation tests includes a defined test repeated for each of four specified flow rates.

In the sedimentation tests, total suspended solids (TSS) and suspended solids concentrations (SSC) of the influent and effluent are measured to determine pollution control efficiency. A mass balance of sediment entering and retained in the device provides supplemental data. Performance data is evaluated by particle size class at four flow rates. Performance may also be reported for untested devices within a *device classification* based on scaling relationships determined from the test data. Data may be reported to the Department of Natural Resources for incorporation into the Source Loading and Management Model (SLAMM), or may be incorporated into an alternative model approved in accordance with Appendix A, Part 3.0.

The scour verification test is run once at a stepped, increasing flow rate to identify by-pass requirements for the device.

##### 1.2 Testing Objectives

Objective 1. To quantify the mass, by particle size class, of sediment particles trapped by a device under different flow rates.

Objective 2. To present and analyze data to show device efficiency as a function of particle size and flow rate, and to show scaling relationships for predicting the efficiency of untested devices in the same device classification.

Objective 3. To verify that at flows up to 1.2 times the design treatment flow rate, significant scour of previously deposited sediment does not occur.

#### 2.0 Laboratory and Data Analyst Qualifications

##### 2.1. Laboratory Qualifications

- A. Laboratory testing shall be conducted by an independent laboratory, or shall be overseen by an independent party if conducted at the manufacturer’s own laboratory.
- B. The laboratory conducting the performance testing must be able to provide the range of flows, sediment characteristics, measurement and recording systems, and trained personnel necessary to generate reliable test results. A general statement of laboratory qualifications shall be submitted with the required report (see Part 6.0.)
- C. If the manufacturer is using its own lab and an independent observer, the observer shall meet the following requirements:
  - i) The observer shall have no financial or personal conflict of interest regarding the test results.
  - ii) The observer shall have experience in a hydraulics, sampling and sedimentation lab, be familiar with the test and lab methods specified in this standard and have a professional license in an appropriate discipline.
  - iii) The observer shall approve the experimental set-up and lab testing protocol and observe the test during its full duration.
- D. Prior to initiating tests, the manufacturer shall contact the administering state agency to discuss selection of a laboratory to conduct the required testing. If the manufacturer is using its own lab, it shall contact the administering state agency to discuss selection of an independent observer.
  - i) For the Department of Natural Resources, contact:

Wisconsin Department of Natural Resources  
Attn: State Storm Water Coordinator  
Bureau of Watershed Management

101 South Webster Street  
P.O. Box 7921  
Madison, WI 53707-7921  
General Bureau Phone: (608) 267-7694

ii) For the Department of Commerce, contact:

Wisconsin Department of Commerce  
Attn: Plumbing Product Review  
Safety and Buildings Division  
P.O. Box 7162  
Madison, WI 53707-7162  
Phone: (608) 266-6742

**2.2 Data Analysis**

- A. The analysis of lab data shall be performed by a qualified individual. A statement of qualification for the selected individual shall be submitted with the report required under Appendix B, Part 6.0.
- B. Prior to initiating data analysis the manufacturer shall contact the administering state agency to discuss selection of an individual to perform this task.

**3.0 Sediment Removal Performance Testing**

**3.1 Test Parameters**

**Note:** The scour verification test described under Part 4.0 should be performed first because the results are needed to identify the design treatment flow rate (DTFR). The DTFR is needed to identify flow rates for the sedimentation testing.

- A. Flow Rates. Each device shall be tested at a minimum of four discrete steady-state flow rates. These are 5%, 20%, 50% and 100% of the design treatment flow rate.

**Note:** See Appendix B, Considerations Part 7.0.AA for justification of the selected flow rates.

- i) The design treatment flow rate shall not exceed 83% of the maximum flow rate for which the device passes the scour test requirements in Appendix B, Part 4.0.

**Note:** This provides a safety factor of 1.2.

- B. Test Sediment Composition.

- i) Test sediment shall be comprised of ground silica mixed in accordance with the proportions shown in Table B-1.

**Table B-1.** Test Sediment Mix

<b>Total mixed weight: 15.35 lbs.</b>	
<b>US Silica Product Gradation</b>	<b>Weight</b>
F 65	0.90 lbs
OK 110	1.2 lbs
Sil-Co-Sil 250	0.25 lbs.
Sil-Co-Sil 106	4.0 lbs.
Sil-Co-Sil 52	1.0 lbs
Min-U-Sil 40	2.0 lbs
Min-U-Sil 30	1.0 lbs
Min-U-Sil 15	1.0 lbs
Min-U-Sil 10	4.0 lbs.

**Note:** See Appendix B, Considerations Part 7.A. for the derivation of this mix.

- ii) A particle size distribution analysis of the dry sediment test mix shall be performed prior to running the lab test and the results shall be reported as part of the requirements set forth under Appendix B, Part 6.0.
- C. Influent Concentration. The *suspended sediment concentration* in the influent pipe shall be maintained between 150 mg/l and 250 mg/l. The concentration of inorganic sediment in the influent water prior to adding the test sediment shall be as low as practical.

**Note:** It is recommended that the concentration of inorganic sediment in the influent water be kept below approximately 10 mg/l prior to mixing with the test sediment.

- D. Water Temperature. Water temperature shall be maintained between 50°F and 80°F.

**3.2 Procedure and Data Collection**

- A. Number of Devices. When the purpose of the testing is to characterize the efficiency of a series of devices in the same device classification through scaling, testing shall be performed on at least two of the device models.
  - i) The definition of a device classification shall be the responsibility of the manufacturer. It must be based on technically defensible criteria including similarity between models in geometry, flow pattern, sedimentation mechanism and by-pass.
  - ii) The devices selected to represent the device classification must reasonably represent the range of device models for which the efficiency curves are being defined. The ratio between the primary sedimentation chamber surface areas of the devices tested shall be at least 2.5.

- B. Component tests. For each device model, the required test procedure shall be completed for each of the four flow rates identified in Appendix B, Part 3.1.A.
- C. Chamber. A “false floor” shall be constructed in the sediment chamber to simulate a device that is partially filled. The false floor shall be placed to simulate a sediment accumulation of 50% of the maximum recommended sediment storage depth for the device. At the start of the test, the chamber shall be clean of sediment.
- D. Test length. Each test shall be run for the duration needed to accumulate a mass of trapped sediment adequate to perform the required analyses.  
  
**Note:** It is recommended that each sediment removal performance test be run until approximately 5 pounds of material has been trapped. See Appendix B, Considerations Part 7.B for an example calculation of estimated test time to trap this mass of material. If tests can be performed on less than 5 pounds of material, that is acceptable.
- E. Sediment sampling frequency. For each test, samples shall be collected and analyzed in accordance with Table B-2. Numbers in parentheses are the minimum number of samples that must be collected and reported for each test flow. Influent samples taken during each test

flow may be collected on a random schedule or at equal time intervals. An effluent sample shall be collected immediately after each influent sample.

- F. Particle size analysis. The particle size distribution for material in the sediment supply hopper and for material trapped in the sediment chamber shall be determined in accordance with the ASTM standards C117, C136 and D422.  
  
The particle size distribution for samples taken from the influent and effluent pipes shall be determined as follows:
  - i) Particle sizes 63 microns and greater shall be quantified using ASTM standards C117, C136 and D422.
  - ii) Particle sizes less than 63 microns shall be quantified using a coulter counter method that conforms to the method set forth in Appendix C.
- G. Sample Splitting. Each sample of influent and effluent water shall be collected into three separate bottles to be filled one immediately after the other. One sample bottle is for TSS analysis, one is for SSC analysis and one is for particle size analysis. The TSS, SSC and PSD samples shall be collected in the same order for each flow rate.

**Table B-2.** Sediment Removal Performance Test: Required Sampling for Each Flow Rate

Sampling Location	Particle Size Distribution	Total Sediment Mass	Total Suspended Solids Concentration	Suspended Sediment Concentration
Sediment Supply Hopper	(1)	Total mass weighed at beginning and end of test		
Influent Pipe	(5)		(5)	(5)
Settling Chamber	(composite from 3 sub-samples of collected mass)	Total mass collected		
Effluent Pipe	(5)		(5)	(5)

- H. Flow sampling frequency. Flow shall be monitored throughout the test.
- I. Temperature sampling frequency. Water temperature shall be monitored periodically during the course of the test.

#### 4.0 Scour Verification Testing

##### 4.1 Purpose

The purpose of the scour verification test is to verify that the device will not lose a significant amount of pre-deposited sediment at a flow rate up to 1.2 times the design treatment flow rate. This verification test



will be used to identify the design treatment flow rate to meet modeling and field installation requirements.

**4.2 Pre-loading and Flow**

- A. The sediment chamber shall be pre-loaded to the maximum recommended sediment storage depth. A false floor may be used to create an apparent sediment depth provided that the depth of

sediment placed on the false floor averages at least six (6) inches. Sediment shall be well-mixed and distributed as evenly as practical.

- B. The material used to pre-load the device shall be mixed according to the formula presented in Table B-3.

**Table B-3.** Sediment Specifications for the Scour Verification Test

Material	% by Weight
Concrete Sand (ASTM C33)	15
US Silica: Mauricetown Series – NJ 0 Sand	10
US Silica: Mauricetown Series – NJ 4 Sand	20
US Silica: Ottawa Flint Silica Series-Flint #12	15
US Silica: Ottawa Flint Silica Series-Flint #15	10
US Silica: Ottawa Foundary Sand –F60 Grade	15
US Silica: 20/40 OIL FRAC	10
US Silica: HI-50	5

**Note:** See Appendix B, Considerations Part 7.C. for derivation of this mix.

- C. The device shall be filled with clean water to operating depth prior to initiating the scour test. Sediment suspended during the process of filling the chamber shall be given sufficient time to settle prior to initiating scour test flows.
- D. The concentration of inorganic sediment in the influent water shall be as low as practical.

**Note:** It is recommended that the concentration of inorganic sediment in the influent water be kept below approximately 10 mg/l.

**4.3 Scour Test Sampling**

- A. Once the scour test sediment has been added to the sediment chamber and allowed to settle, the scour test shall be run starting at the lowest test flow and progressing to increasingly greater flows. Do not add new test sediment to the device for each new test flow.

Each test flow shall be constant for a period of 30 minutes or the time it takes to replace 5 volumes of water in the primary sedimentation chamber, whichever is greater. In calculating the volume to be displaced by the test flow, the volume of the sedimentation chamber shall not include any volume below the maximum sediment storage depth.

Samples shall be collected at equal time intervals during each flow. A viewing window shall be installed in the sediment chamber to allow direct observation and video documentation of scour test results. If scour begins between chosen flow

increments, testing shall be adjusted to include the start of scour.

- B. Samples for each flow rate shall be collected and analyzed in accordance with Table B-4. All samples shall be discrete samples unless otherwise noted. Numbers in parentheses are the minimum number of samples that must be collected and reported.

**Table B-4.** Required Sampling for Each Flow Rate of the Sediment Scour Test

Sampling Location	Suspended Sediment Concentration
Influent pipe	(5)
Effluent Pipe	(5)

- C. Flow sampling frequency. Flow shall be monitored periodically throughout the course of the test.
- D. Temperature sampling frequency. Water temperature shall be monitored periodically throughout the course of the test.

**4.4 Analysis**

- A. A device passes the scour test if the average suspended sediment concentration in the effluent pipe does not exceed the average suspended sediment concentration of the influent pipe by more than 25 mg/l.

- B. The design treatment flow rate for modeling under Appendix A, Part 2.1.C. shall not exceed 83% of the maximum flow rate for which the device is determined to pass the scour verification test.

**Note:** This provides a safety factor of 1.2.

## 5.0 Quality Assurance and Control

Laboratory data submitted under this technical standard shall be collected under a quality assurance/quality control plan. The QA/QC plan shall include the following:

- A. Project description.
- B. Project organization & responsibility.
- C. Data quality objectives.
- D. Project test methods.
  - i) Sample collection methods.
  - ii) Methods to adjust for expected background concentrations of material in inflow test water.
  - iii) Calibration of the system used to dose sediment during the sediment removal performance testing, including calibration of sediment dosing equipment and flow pump rates to assure that influent concentrations are maintained within test parameters and that the mass of sediment added to the influent pipe can be accurately measured.
  - iv) Equipment cleaning and blanks.
  - v) Duplicate samples.
  - vi) Sample preservation methods.
  - vii) Chain of custody.
- E. Laboratory procedures.
  - i) Constituents for analysis.
  - ii) Laboratory performance standards.
  - iii) Analysis method references.
  - iv) Frequency and type of lab QA samples.
  - v) Data reporting requirements.
  - vi) Data validation procedures.
  - vii) Corrective actions.

## 6.0 Reporting Test Results

**6.1 Laboratory Report**—A laboratory report shall be prepared and submitted to the administering state agency. The report shall follow the following format. The administering state agency may allow deviation

from this format upon request of the manufacturer or the lab.

### Chapter 1.0 Executive Summary

### Chapter 2.0 Background

- 2.1 Name of laboratory, principal investigator and subcontractors.
- 2.2 Qualifications statements for laboratories and data analysts.
- 2.3 Lab equipment list, including: name, model and dimensions (depth & height) of the device tested; pumps, compressors, mixers, valves, flow and water quality sampling equipment; storage tanks; standpipe and plunge pool; and filtration equipment.
- 2.4 Settling chamber diameter (L<sub>1</sub>) and depth (L<sub>2</sub>) measurements.
- 2.5 Inlet and outlet pipe dimensions.
- 2.6 Results of scour verification test.
- 2.7 Modifications made to the device to enhance transportation or test feasibility and explanation of why these modifications are not expected to affect the lab results.
- 2.8 Process flow diagram showing test device, piping, water source, pump, storage tanks, filters, sediment injection system, sampling locations and flow meter.

### Chapter 3.0 Sedimentation Efficiency Testing and Results

The following shall be reported for each device tested.

- 3.1 Date, flow rate and elapsed time for the test.
- 3.2 Tabular results of test parameters required under Table B-2 (Appendix B, Part 3.2.E). Where particle size data is required, it shall be reported for each of the following 8 particle size classes (in microns):
  - 1) < 20
  - 2) 20 – 40
  - 3) 40 – 63
  - 4) 63 – 80
  - 5) 80 – 125
  - 6) 125 – 250
  - 7) 250 – 300
  - 8) > 300

- a. Test Sediment Introduced. Total mass of test sediment placed in the sediment hopper, total mass remaining in the hopper, and total mass (calculated by difference) of test sediment discharged from the hopper during the test. Component mass by particle size class of test sediment placed in the hopper.
- b. Influent and Effluent Sampling Results. For each discrete influent and effluent sample, the total suspended solids concentration, the suspended sediment concentration, the component mass and concentration by particle size class.

**Note:** For each sample, three separate one-liter bottles will need to be filled and submitted to the lab for a specific analysis (SSC, PSD and TSS). Each analysis will be assigned to one of the three bottles, so the order of the analysis will be the same each time. For example, if the first bottle of the three collected is sent to the lab for SSC analysis, this order should be maintained for all samples.

- c. Test Sediment Retained. Total mass of test sediment removed from the settling chamber. Component mass by particle size class of sediment removed from the settling chamber.

3.3 Performance Efficiency: Concentration Data.

Tabular data for each test flow showing the calculated percent reduction in mass of test sediment based on inlet and outlet concentrations reported in Chapter 3.2 of the lab report. Calculations shall be by total mass and by particle size class.

- a. Percent reduction shall be based on a comparison of inlet and outlet concentrations. Discrete sample results must be combined to perform this analysis.

$$\% \text{ Reduction} = (\text{inlet} - \text{outlet}) / \text{inlet} * 100$$

- b. The report shall describe how the inlet and outlet concentrations determined from discrete sampling are combined in calculating the percent reduction for each test flow.
- c. The tabular analysis shall be presented in the following format:

Flow Rate (cfs)	Total Mass Reduction (%)	% Reduction by Particle Size Class (Microns) Based on Inlet/Outlet Concentrations							
		<20	20-40	40-63	63-80	80-125	125-250	250-300	>300
.10*DTFR <sup>1</sup>									
.20*DTFR									
.50*DTFR									
1.00*DTFR									

<sup>1</sup>DTFR = design treatment flow rate as determined by the scour verification test.

- d. The tabular data set above shall also be presented in graphical form. A separate graph for each particle size class shall be presented that shows the percent reduction (y) as a function of flow rate (x) for the particle size class. A formula shall be developed for each graph.

**Note:** See Appendix B, Considerations Part 7.D. for an example of how these data may be graphically reported.

3.4 Performance Efficiency: Mass Retained. Tabular data for each test flow showing the calculated percent reduction based on mass entering the

device and mass retained. Calculations shall be by total mass and by particle size class. Particle size classes shall include those identified under Chapter 3.2 of the lab report.

- a. Percent reduction shall be based on a comparison of mass of sediment introduced to the sediment chamber and the mass of sediment retained in the sedimentation chamber, where:

$$\% \text{ Reduction} = (\text{mass retained} / \text{mass in}) * 100$$

- b. The tabular analysis shall be presented in the following format:

Flow Rate (cfs)	Total Mass Reduction (%)	% Reduction by Particle Size Class (Microns) Based on Mass Introduced and Mass Retained in the Sediment Chamber							
		<20	20-40	40-63	63-80	80-125	125-250	250-300	>300
.10*DTFR <sup>1</sup>									
.20*DTFR									
.50*DTFR									
1.00*DTFR									

<sup>1</sup>DTFR = design treatment flow rate as determined by the scour verification test.

- c. Graphical representation of this data is not required.

#### Chapter 4.0 Scaling Relationships

##### 4.1 Method Documentation

- a. Scaling formula.
- b. Theoretical basis and verification.

**Note:** See Appendix B, Considerations Part 7.E. for one approach to scaling.

##### 4.2 Application of Formula to Specific Devices

- a. Device characteristics, including critical dimensions and design treatment flow rate.
- b. Tabular and graphic results for device (see 3.3.c and 3.3.d above).

#### Chapter 5.0 Scour Test and Results

- 5.1 Test date and elapsed time for test.
- 5.2 Test flow rate.
- 5.3 Test material used to pre-load the device.
- 5.4 Influent and effluent concentration measurements.
- 5.5 Data interpretation.
- 5.6 Calculated design treatment flow rate for use in Wisconsin.

**Note:** The calculated design treatment flow rate will be 0.83 times the flow rate at which the device passes the scour test.

#### Chapter 6.0 Quality Assurance and Control Test Data

#### Chapter 7.0 Signatures for Report Submittal

The report shall be signed by the laboratory director or his designee, the person responsible for data analysis and reporting and, if applicable, the independent observer. The signers shall attest that the laboratory testing and data analysis has been conducted in accordance with the requirements of this technical standard.

#### 7.0 Considerations

AA. The majority of the annual runoff volume to a properly sized device can be expected to occur during runoff events having peak flow discharges well below the design treatment flow rate. Sediment testing for each device will generate only 4 data points, one for each test flow rate. The flow rates for which data is collected should be reflective of the flow rates that the device will encounter most often when modeled.

Table B.4.A shows modeling results for a theoretical device having a design treatment flow rate of 0.5 cfs and an impervious tributary area of 0.5 acres. The test file included 109 rainfall events. Of the runoff events that did not by-pass the device, most (81%) generated peak flow rates less than or equal to 25% of the DTFR and few events (8%) generated peak flow rates over 50% of the DTFR. This phenomenon has also been observed at actual field installations. Based on this information, test flow rates equal to 5%, 20%, 50%, and 100% of the design treatment flow rate are required. If a manufacturer desires to get additional definition in the efficiency curve for low flows, it can add additional flows at its discretion.

**Table B.4.A.** Frequency Distribution of Runoff Event Peak Flows Modeled for a Theoretical Device Installation Having 109 Rainfall Events, a DTFR of 0.5 cfs and a Tributary Area of 0.5 Impervious Acres

Peak Flow Class (% of the Design Treatment Flow Rate, or DTFR)	Runoff Events in the Class (number)	Portion of Peak Runoff Events in Class
0 – 25%	81	81%
25 – 50%	11	11%
50 – 75%	5	5%
75 – 100%	3	3%

**Note:** This modeling exercise includes 109 rainfall events. Nine (9) events exceeded the DTFR and would have by-passed the device. Statistics are based on 100 events.

- A. The ground silica mixture required for sediment testing is a modification of a base mix prepared to meet the NURP particle size distribution. The base mix formula was calculated by Hydro, International using a selection of standard ground silica products and a computer program. A batch of the base mix was prepared by Hydro and sent to Wisconsin DNR for lab testing to validate that it closely matches the NURP particle size distribution. The base mix formula (shown in the table below) was shown by lab testing to be very close to the NURP particle size distribution. The results of the lab testing are shown in the second table.

**Table B-5.** Base Mix Formula for Sediment Testing

<b>Total mixed weight: 14.3 lbs.</b>	
<b>US Silica Product Gradation</b>	<b>Weight</b>
F 65	0.45 lbs
OK 110	0.6 lbs
Sil-Co-Sil 250	0.25 lbs.
Sil-Co-Sil 106	4.0 lbs.
Sil-Co-Sil 52	1.0 lbs
Min-U-Sil 40	2.0 lbs
Min-U-Sil 30	1.0 lbs
Min-U-Sil 15	1.0 lbs
Min-U-Sil 10	4.0 lbs.

**Note to Table B-5:** Do not use this table to make the test mix.

**Note to Table B-6:** Do not use this table to make the test mix. Although the base mix accurately matches the NURP particle size distribution, there are not enough sand sized particles to allow an evaluation of how the test device deals with these coarser particles. To correct this problem, the base mix was adjusted by doubling the amount of OK110 (from 0.6 to 1.2 pounds) and F65 (from .045 to 0.90 pounds). Almost all the particles in the OK 110 are between 90 and 125 microns, while the F65 contains particles that are primarily in the range of 106 to 250 microns.

**Table B-6.** Results of Verification that Compares Base Mix with the NURP Particle Size Distribution

Particle Size, Microns	NURP, % Finer Than	Test Material, % Finer Than
1	2	11
2	14	17
3	23	23
4	29	31
5	35	35
6	41	40
7	46	45
8	51	49
9	53	52
10	56	54
11	58	56
12	60	-
13	62	-
14	63	62
15	65	63
20	71	68
25	75	73
30	78	76
35	80	80
40	82	83
50	84	86
60	87	88
63	-	88
80	89	90
100	91	93
125	-	95
150	94	96
200	95	97
250	-	98
300	97	99
500	99	100

- B. The sediment removal performance test under Appendix B, Part 3.0 should probably be run until at least 5 pounds of material has been trapped. Assuming an influent concentration of 250 mg/l suspended sediment concentration, a control efficiency of 10% (using the NURP particle size distribution) and a test flow rate of 0.5 cfs, it should take approximately 120 minutes to run this test once the flow has achieved equilibrium assuming there is no significant scour. The mass of test sediment placed in the supply hopper would have to be at least 50 pounds.
- C. The Department of Natural Resources provided Hydro, International with a particle size distribution based on the material measured in the sedimentation chambers of three field installations (Vortechs, Downstream Defender, and StormCeptor). Hydro used a program to develop the specified mix. The average particle
- D. Suggested graphical presentation of sedimentation test data showing data for multiple devices on the same graph.

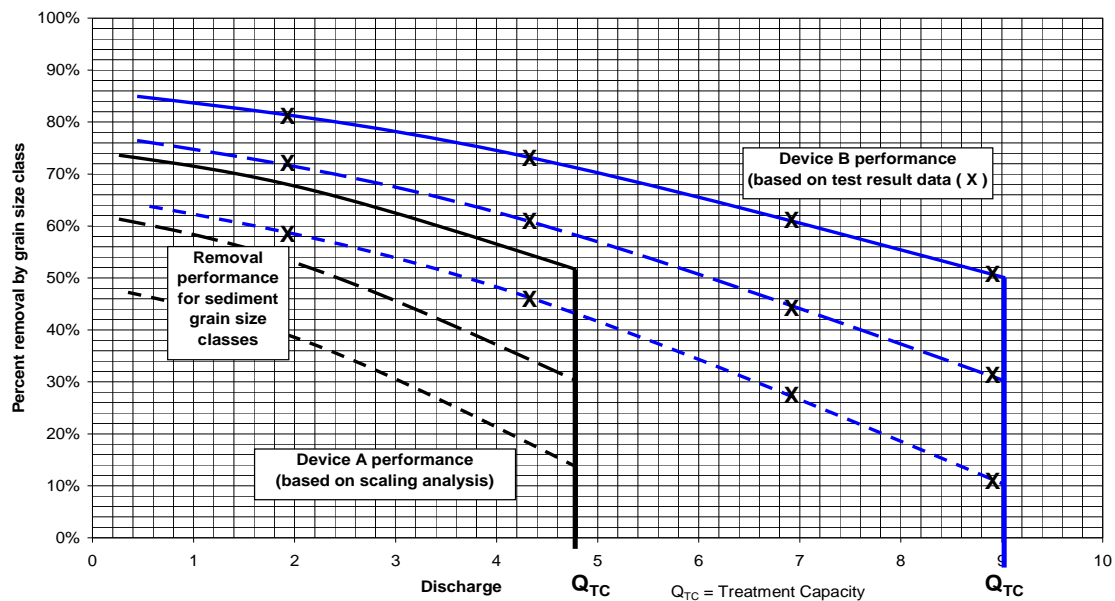
size distribution from monitored devices is shown in Table B-7.

**Table B-7.** Particle Size Distribution for Sediment Removed from Treatment Chambers of Three Proprietary Devices. (Average of data from three devices: Vortechs, Downstream Defender, StormCeptor)

Particle Size, Microns	Percent Finer Than
8000	97
4000	93
2000	86
1000	75
500	56
250	27
125	12
63	6

**Illustration of performance data required for Proprietary Storm Water Sedimentation Devices**

Note: Only three grain size classes shown



- E. Manufacturers are encouraged to consider an approach to developing a predictive formula for scaling device performance using the following format:

$$\text{Percent Reduction} = \text{Function} (L_1 * L_2 * V_s) / Q$$

Where:

- L1 = Device characteristic length 1
- L2 = Device characteristic length 2
- V<sub>s</sub> = Particle size settling velocity
- Q = discharge through the device

Manufacturers are also encouraged to provide the most accurate predictive methodology for their devices, including approaches other than that listed above.

## APPENDIX C

### ESS INO METHOD 355.3 Beckman Coulter Multisizer 3, Particle-Size Counter (Beckman Coulter)

Title: Beckman Coulter Multisizer 3, Particle-Size Counter  
ESS INO METHOD 355.3, Revision 0  
Effective Date: April 2007

Wisconsin State Laboratory of Hygiene, Environmental Health Division, Inorganic Chemistry Department

#### 1. Scope and Application

- 1.1 Evaluating the size distribution of particles <math><32\text{-}\mu\text{m}</math> in diameter has become a critical tool in assessing the environmental impact of point/non-point source pollution runoff in urban areas. The potential effects of the smaller-sized particles on receiving waters are not well understood. Consequently the ability to quantify and characterize this size category is extremely important for designing storm water control devices and future decision-making policy.
- 1.2 There are a wide range of methods available for determining particle size distributions. However, each is based upon different assumptions and principles. Consequently there is not one specific method that is ideal for every application. For example, settling velocities of particles are directly affected by several variables including size, shape, specific gravity, etc. Most standardized methods were established with soils and sediments and ultimately categorize particles <math><32\text{-}\mu\text{m}</math> in diameter into the typical size breaks for sands, silts and clays (15.1, 16.1). Particles carried by storm water runoff may not “fit” into the traditional categories due to their non-terrestrial nature.
- 1.3 Typically the size distribution of particles in water is established by sieving the sample through a series of sieves (15.3). Each sieve is certified by the size of mesh, and the material trapped on the sieve is quantified, gravimetrically, and expressed as a percentage of the entire sample. Quantifying the mass of material smaller than  $32\ \mu\text{m}$  by sieving can be labor intensive, less accurate and at times, impossible due to the small amount of material available for current standard practices (e.g., sieve-pipette method, visual acuity tubes, sediment counters).
- 1.4 The Wisconsin State Laboratory of Hygiene (WSLH) has developed a method for estimating the distribution of particles that are <math><32\text{-}\mu\text{m}</math> in diameter, by combining data from gravimetric analysis with results obtained from a Beckman Coulter® *Multisizer 3*™ Particle Size Counter (15.2).
- 1.5 The original Coulter® Principle (*aka* “Electrical Sensing Zone” method) allows for simultaneous counting and sizing of particles in a homogeneous suspension. The sensing zone is established with two electrodes that are separated by a small cylindrical opening (*aperture*). A small amount of electrical current flows through the aperture and between the electrodes. The resistance created by the restricted area separating the electrodes produces current density within the area of the aperture. Particles passing through the aperture displace the volume of the conducting liquid, which creates changes in electrical impedance. The change in the impedance produces a small but proportional flow of current into an amplifier, which further converts the current fluctuation into voltage. The change in magnitude of the current is small (typically 1 mA) but significant enough to generate a voltage large enough to be measured. The Coulter® Principle states that the amplitude of the voltage pulse is directly proportional to the volume of particle that produced it. This principle was developed in the 1940’s by Wallace Coulter, who originally developed and patented this technique for blood cell analyses. This technology has evolved over the years to include many industrial applications.
- 1.6 The Coulter® Principle is applied to particle-size analysis by adding aliquots of sieved sample to an electrolytic solution (i.e., conducting liquid) to facilitate suspension of the particles.
- 1.7 Urban runoff conditions from specific locations can be monitored both spatially and temporally with WSLH methodology.
- 1.8 With the appropriate aperture, the Coulter® *Multisizer 3*™ Particle Size Counter can provide particle sizing and counting capabilities within an overall size range of 0.4 to 1200  $\mu\text{m}$ .

## 2. Summary of Method

- 2.1 Each sample is processed through a series of standard sieves to trap all particles  $\geq 32 \mu\text{m}$  (15.2). Approximately 250 to 1000 mL of well mixed sample ( $<32\text{-}\mu\text{m}$  in diameter) is recovered after sieving for analysis by the Coulter<sup>®</sup> *Multisizer 3*<sup>™</sup> Particle Size Counter and microfiltration (gravimetric component).
- 2.2 A metered portion of sample suspension (sample + electrolyte) is drawn through a  $50\text{-}\mu\text{m}$  aperture (sensing zone) at a steady rate. The  $50\text{-}\mu\text{m}$  aperture provides sizing and counting resolution to 1 to 60% of aperture size (i.e., 2 -  $30 \mu\text{m}$ ).
- 2.3 Data from the instrument is integrated with software to produce a “percent less than” result based upon size breaks assigned by the analyst.
- 2.4 The percent distribution results from the Coulter<sup>®</sup> *Multisizer 3*<sup>™</sup> Particle Size Counter are applied to gravimetric results from  $0.4\text{-}\mu\text{m}$  filtration data and mathematically converted to concentration (mg/L).
- 2.5 Finally, the estimated concentration data in the size fractions less than  $32 \mu\text{m}$  are compared to the total concentration of particles in the sample. A percent distribution is developed within the Laboratory Information Management System (LIMS) for subsequent report generation.
- 2.6 Coulter<sup>®</sup> *Multisizer 3*<sup>™</sup> Particle Size Counter data combined with the sieve results provides the WSLH with the ability to mathematically estimate the complete particle size distribution in a sample from  $\geq 500$  to below  $0.4 \mu\text{m}$ .
- 2.7 Coulter<sup>®</sup> *Multisizer 3*<sup>™</sup> Particle Size Counter offers a high degree of flexibility in size ranges obtained by simply changing the size of the instrument’s aperture.

## 3. Safety and Waste Management

- 3.1 General safety practices for all laboratory operations are outlined in the Chemical Hygiene Plan for the Environmental Health Division (15.4).
- 3.2 All laboratory waste, excess reagents and samples must be disposed of in a manner that is consistent with applicable rules and regulations.
- 3.3 Waste disposal guidelines are described in the University of Wisconsin Laboratory Safety Guide (15.5).

## 4. Sampling Handling and Preservation

- 4.1 Samples to be processed and analyzed for particle sizing are typically collected in 1-gallon, polyethylene containers.
- 4.2 Prior to analysis commencing, WSLH personnel will weigh the sample container on a high-capacity analytical balance to establish the original mass/volume of sample received at WSLH (15.6).
- 4.3 After sieving, WSLH personnel will recover approximately 250 to 1000 mL of the  $<32\mu\text{m}$  fraction in a WSLH quart bottle. The bottle will be assigned the same WSLH sample Identification number (ID) and reserved for analysis with the Coulter<sup>®</sup> *Multisizer 3*<sup>™</sup> Particle Size Counter and microfiltration at  $0.4\mu\text{m}$ .
- 4.4 Samples are stored at 4C.
- 4.5 Samples collected for particle size determinations are not preserved.
- 4.6 Although a specific holding time for particle size samples has not yet been established, every effort should be made to process the sample within 30 days of collection for best results.

## 5. Interferences

- 5.1 Samples containing a large amount of particles may clog apertures.
- 5.2 Each aperture allows the measurement of particles within 2 to 60% of the nominal diameter of the aperture. For example, a  $100\text{-}\mu\text{m}$  aperture allows sizing of particles between 2 and  $60 \mu\text{m}$ , not inclusive.
- 5.3 Particles in samples may aggregate or clump during storage and can cause clogging of the aperture. For best results, samples should be at room temperature and mixed thoroughly prior to analyzing.
- 5.4 Aliquots of sample should be combined with a diluent to facilitate dispersion and minimize clogging of the aperture.

## 6. Reagents and Standards

- 6.1 ASTM Type-1 Water (MQ).
- 6.2 Conductance/electrolyte solution: ISOTON<sup>®</sup> II diluent (Beckman Coulter<sup>®</sup>).
- 6.3 Particle Characterization/Sizing Standards: Certified sizing standards (e.g., polystyrene latex beads or polymer microspheres in an aqueous medium) are available from Beckman Coulter, Duke Scientific, etc. and should be used for performing or validating the instrument calibration and for use as a Quality Control



Standard. The standards should be NIST traceable. Calibration or verification is only needed at one size for each aperture, preferably between 5 and 20% of the aperture diameter (15.2).

- 6.4 Aperture Instrument Concentration Control (Beckman Coulter®): Control standard used to verify instrument count accuracy performance (units = #Total Particles/mL); acceptable results are typically within ±10% of the assay value.

## 7. Apparatus

- 7.1 Beckman Coulter® *Multisizer 3*™ Particle Size Counter (M3).
- 7.2 Electronic pipette.
- 7.3 Beakers of assorted sizes.
- 7.4 Cuvettes, 20 mL, e.g., Accuvette™ II container (Beckman Coulter®).

## 8. Quality Control

- 8.1 **Corrective Action** documentation for QC failures within analytical runs will include: a) identifying the QC failure and cause, if known; b) specific corrective actions that were performed; c) the next action that will be taken.
- 8.1.1 Attached to each analytical run will be lists of specific analytical items to be checked in the event of a QC failure. The lists will be tailored to the specific method and instrumentation as an aid in documenting corrective action. If the analytical failure cannot be identified, the analyst will note: “*Analytical Checks ok; Unknown cause*” on the benchsheet.
- 8.2 **An instrument logbook** is maintained for each instrument. Maintenance, performance problems, date calibrated, analyst, and other pertinent information are documented in the logbook.
- 8.3 **A Quality Control Standard (QCS)** is analyzed with each run. The analytical result must be within ± 10% of the true value to continue the analysis. If the recommended limits are exceeded, corrective action includes reanalyzing the QCS or the analyst may recalibrate if necessary. Choose a QCS with certified particle size that is within the analytical range of the aperture (15.2).
- 8.4 **A Laboratory Reagent Blank (LRB)**, aka

“Check Blank (CB). For purposes of this method, a LRB/CB is not applicable for particle size determinations in environmental sample. However, if samples of a biological nature are analyzed, the dispersion agent may be utilized as the LRB/CB (aka “Control Blank”).

- 8.5 **Laboratory Fortified Blank (LFB): not applicable for this method.**
- 8.6 **Matrix Duplicates:** Prepare a **minimum of 10%** of the samples, per matrix, as duplicates. **Matrix Spikes are not applicable for this method.** Refer to the QL dataset in LIMS for a detailed listing of all QC limits used for various sample matrices. If the duplicate (precision QA) is not met, the matrix group should be reanalyzed unless clogging of the aperture is a problem. If limits are exceeded a second time, a smaller volume of sample from this matrix group may be added to the diluent (6.2) and reanalyzed. If limits are exceeded a second time, qualify the matrix group (15.8) as a comment or memo. Because M3 data is used for LIMS calculations, data cannot be qualified as “\* *result*.”
- 8.7 **An Instrument Performance Check (IPC)** is not applicable for this method. The instrument performance is based upon a Calibration Verification Check (9.1 – 9.6), which is analyzed at the beginning of each batch. The M3 software will notify the analyst if the instrument is not within calibration based upon the size of aperture installed at the time of calibration. Choose a calibration standard or verification standard as recommended by the manufacturer (15.2). A new calibration check should be performed whenever a new or different aperture is installed.
- 8.8 **Initial Demonstration of Capability (IDOC):** Initial DOC and annual continued proficiency checks are performed according to ESS INO QA 115 (15.9). The QCS (6.3) may be used for this procedure.
- 8.9 **Limit of Detection (LOD, 15.10): not applicable for this method** and is defined by the size limit of the aperture installed at the time of use.
- ## 9. Method Calibration
- 9.1 Allow the instrument to warm up a minimum of 15 minutes prior to operation.
- 9.2 Calibrate every new aperture following the M3 Operator’s manual (15.2). Once a particular aperture has been calibrated, a verification standard should be analyzed prior to each analytical batch. Calibration of an aperture

should be performed whenever a verification procedure fails, or whenever a new aperture is installed.

- 9.3 Prepare a calibration/verification standard by adding approximately 30 drops of standard solution and diluting to the 20-mL mark on the M3 cuvette. Mix thoroughly.
- 9.4 Open the door to the sample compartment on the M3 and lower the sample platform.
- 9.5 Secure the cuvette containing the calibration or verification standard into the platform. Raise the platform until the electrode and aperture are submerged in the standard solution.
- 9.6 Close the door.
- 9.7 Check the concentration level of the suspension by selecting **Preview** from the left-hand status panel. The concentration index bar will be displayed and notify the analyst if the concentration is ok; the manufacturer recommends a concentration of 10% for best results. If the concentration is high, calibration may be incorrect; if too low, the time required for calibration will be too long.
- 9.8 Exit the **Preview** mode by selecting <cancel>.
- 9.9 Activate the **Calibrate** mode via the M3 software.
  - 9.9.1 If calibrating for the first time, choose the appropriate size calibrator and click on the calibration icon. The Calibrator Size box will open; enter the modal value of the calibrator—this is the certified value provided by the manufacturer. Beckman Coulter recommends repeating the calibration ten times and record the **Kd** each time. Calculate the mean **Kd** for the aperture and enter this value into the “Aperture Tube list” along with the serial number of each aperture. The “Aperture Tube list” can be accessed via the <Change Aperture Tube Wizard...>.
  - 9.9.2 Once the calibration standard has been analyzed, the instrument is ready for analyzing samples and need not be calibrated again unless the daily verification standard is exceeded. Future verifications of **this** calibration should always be within  $\pm 4\%$  of the mean value obtained in 9.9.1 (15.2).
- 9.10 If the aperture has already been calibrated, the analyst needs only to **Verify the calibration**.

- 9.10.1 Prepare the verification standard (9.3 – 9.8).
  - 9.10.2 Activate the **Verify** mode via the M3 software.
  - 9.10.3 Enter the modal value of the verification standard in the Calibrator Size box (9.9.1).  
Note: If the same aperture is being used for each batch, the Calibrator Size box will retain the certified modal value of the previous verification standard.
  - 9.10.4 Press <Start> from the Calibrator Size box to activate the **Verification** process.
  - 9.10.5 The software will automatically notify the analyst if the verification has been successful. The software will prompt the analyst of the change between the old **Kd** and the new **Kd**. Record the new **Kd** in the instrument logbook to maintain a record for each specific aperture.
- 9.11 Always verify aperture calibration prior to analyzing samples.
  - 9.12 Recalibrate any time the verification process fails or if a new aperture is installed.

## 10. Procedure

- 10.1 Select the appropriate analytical settings for the M3 from the Main Menu. Alternatively, **Load** the desired Standard Operating Procedure (SOP) by selecting **Settings** from the Main Menu bar.
  - 10.1.1 An M3 SOP consists of pre-selected analytical settings that have been saved as a “Standard Operating Method (SOM).” See the Beckman Coulter Operator’s Manual for detailed directions for creating and/or changing an SOP (15.2).
  - 10.1.2 Although the size settings can be altered at any time, it is helpful to configure the SOM for the desired size breaks in the **Cumulative %** < format for Volume, Number and Surface Area.
    - 10.1.2.1 Check the **Cumulative, %**< data table at the end of each run report. If only “<100%>” shows for each size break on the table, extra digits after the decimal point are needed. In the chart window, select <Analyze>, <Convert Pulses to Size Settings>; select <2% to 60%> to expand the *x* axis on the chart

window to the maximum resolution of the aperture. Turn off the “Multisizer II” edit box, then select <ok>.

- 10.1.2.2 Check the data table again to view the cumulative, %< size breaks on the data table. You should now have values less than 100% for each size break. These percentages are recorded on a *Worklist (WL)* and used by LIMS to estimate the overall percent distribution of particles below 32  $\mu\text{m}$ .
- 10.2 Pipette an aliquot of sample into the cuvette.
  - 10.2.1 The volume of sample may range from one to 15 mL, at the analyst’s discretion. Samples containing noticeably large amounts of particles should be diluted approximately 1:20 with diluent prior to analysis to minimize clogging of aperture.
- 10.3 Dilute the volume of sample to the 20-mL mark on the cuvette with diluent (6.2).
- 10.4 Mix the cuvette by inversion.
- 10.5 Modify the sample and batch information as appropriate under the Sample Information section of the Status Panel.
  - 10.5.1 *Group ID*: Enter the WSLH batch ID.
  - 10.5.2 *Sample ID*: Enter the WSLH sample ID.
  - 10.5.3 *Control Sample*: Check this box whenever a QC sample is being analyzed.
  - 10.5.4 NOTE: If the concentration of particles in the sample (i.e., counts) is a desired result, the following data fields must be completed:
    - 10.5.4.1 Sample volume or mass (weight or volume of sample used for the analysis; the volume or mass combined with electrolyte).
    - 10.5.4.2 Electrolyte volume (volume of electrolyte used).
    - 10.5.4.3 Analytical volume (volume of sample suspension being analyzed, where: *suspension* = *sample* + *electrolyte*).
- 10.6 Open the door to the sample compartment on the M3 and lower the sample platform.

- 10.7 Secure the cuvette into the platform. Raise the platform carefully until the electrode and aperture are submerged into the sample solution. Note: When using the 20-mL cuvette for sample analysis, the glass stirrer should always be adjusted with the stirrer knob such that the paddles are moved to the right of the cuvette; i.e., the stirrer does not fit in the cuvette.
- 10.8 Check the concentration level of the suspension by selecting **Preview** from the left-hand status panel. The concentration index bar will be displayed and notify the analyst if the concentration is ok. Although the manufacturer recommends a concentration of 10% for best results, previous work at WLSH demonstrates that samples prepared at 3 to 5% concentration level perform best (i.e., higher concentration levels tend to clog the aperture).

## 11. Calculations

- 11.1 The raw instrument data for each size break is entered on a *Worklist, WL* (15.15). These results are estimates of the percent size distribution in water samples that have been sieved down to 32  $\mu\text{m}$ .
- 11.2 Once the raw data has been entered into LIMS, the data is processed automatically and mathematically converted to yield both concentration (i.e., mg/L) and percent distribution (i.e., “% <”) for the entire sample, based upon the total mass received.

## 12. Data Management

- 12.1 The *WL* (15.15) and the *QAWRKSHT* (15.14), where all quality control is calculated for pass/fail criteria, will be reviewed for quality control prior to accepting results (see section 8) by an experienced chemist who did not run the original analysis (15.13). The reviewer must initial and date the cover sheet as an indication of the run’s acceptable results.
- 12.2 Final QC-reviewed results will be submitted for manual data entry into LIMS (15.14).
- 12.3 Whenever possible, data will be electronically exported to LIMS.

## 13. Definitions

- 13.1 Definitions of terms in this SOP may be found in the reference method (15.2). General definitions of other terms that may be used in this method are found in Section 19 of the WSLH Quality Assurance Manual (15.8).

## 14. Method Performance

- 14.1 Where applicable, the laboratory's initial accuracy and precision data (LOD's and DOC's) were generated in compliance with the reference method and the Inorganic Chemistry Department's standard operation procedures: ESS INO QA 115 (15.9) and ESS INO QA 116 (15.10). Supporting data will be retained according to the applicable Records Disposition Authority (RDA). Data generated within the last two years will be kept on file within the Inorganic Chemistry Department. Data older than two years may be archived in the basement.

## 15. References

- 15.1 American Society of Testing and Materials (ASTM), 2002. *Standard Test Method for Particle-Size Analysis of Soils*, D 422-63.
- 15.2 Beckman Coulter® *Multisizer 3™* Particle Size Counter, Operator's Manual. Beckman Coulter, Inc. Fullerton, CA 92835.
- 15.3 Wisconsin State Laboratory of Hygiene, ESS INO 355.1. *Particle-Size Determinations by Sieving and Microfiltration*.
- 15.4 Wisconsin State Laboratory of Hygiene, EHD GENOP 026. *Chemical Hygiene Plan for the Environmental Health Division, State Laboratory of Hygiene, Agriculture Drive*.
- 15.5 University of Wisconsin-Madison, Chemical Radiation Protection Office, Safety Department (262-8769). 2004.

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<http://www.fpm.wisc.edu/safety>.

- 15.6 Wisconsin State Laboratory of Hygiene, ESS GENOP 202. *Calibration, Maintenance, and Accuracy Verification Procedure for Balances*.
- 15.7 Wisconsin Department of Natural Resources Lab Certification Program, July 1997 PUBL-TS-007-97.
- 15.8 Wisconsin State Laboratory of Hygiene. *Quality Assurance Procedures and Policies*.
- 15.9 Wisconsin State Laboratory of Hygiene. ESS INO QA 115, Initial DOC and Annual Continued Proficiency Check Procedures.
- 15.10 Wisconsin State Laboratory of Hygiene. ESS INO QA 116, *LOD Procedures*.
- 15.11 Wisconsin State Laboratory of Hygiene. ESS INO GENOP 200, *Pipette Performance Checks*.
- 15.12 Wisconsin State Laboratory of Hygiene. ESS INO QA 101, *Bottle Check Procedure*.
- 15.13 Wisconsin State Laboratory of Hygiene. ESS INO QA 107, *Q.C. Audits of Analytical Runs for ESS Wet Chemistry Area*.
- 15.14 Wisconsin State Laboratory of Hygiene. ESS INO QA 114, *LIMS Quality Assurance Worksheet Procedures*.
- 15.15 Wisconsin State Laboratory of Hygiene. ESS INO GENOP 108. *Procedure for Creating a WL Worklist*.

## 16. Tables, Figures, Diagrams, Charts, Checklists, Appendices, Definitions

16.1 **Table 1.** Recommended scale of particle size breaks for sediment analysis (15.1).

Description	Size ( $\mu\text{m}$ )
Sands:	
Very coarse	1000-2000
Coarse	500-1000
Medium	250-500
Fine	125-250
Very fine	62-125
Silts:	
Coarse	31-62
Medium	16-31
Fine	8-16
Very fine	4-8
Clay:	
Coarse	2-4
Medium	1-2
Fine	0.5-1
Very fine	0.24-0.5

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