STORMWATER MANAGEMENT MASTER PLAN FOR THE CITY OF MEQUON AND VILLAGE OF THIENSVILLE

May 1999

Prepared for:

City of Mequon, Wisconsin
Village of Thiensville, Wisconsin
and
Wisconsin Department of Natural Resources

Prepared by:

Camp Dresser & McKee Inc.
312 E. Wisconsin Avenue, Suite 500
Milwaukee, Wisconsin

Acknowledgment

This Stormwater Management Master Plan has been developed with the assistance of many individuals who devoted numerous hours of their time. A special recognition is due for Bill Hoppe, City Engineer for the City of Mequon, and Guy Hansen, Engineering Technician for the City of Mequon. Jim D'Antuono of Wisconsin Department of Natural Resources was invaluable in his efforts to make this a successful plan. Members of the Stormwater Steering Committee listed in the Executive Summary also provided helpful direction and review approval.

Contents

Appendices

List of Figures

Executive Summary

Introduction

This report presents a storm water management master plan for a 47 square mile portion of the drainage area to the Milwaukee River and the Menomonee River located in the City of Mequon and the Village of Thiensville. This plan addresses flooding, drainage, and quality of storm water discharges. This plan also documents the findings and recommendations of the Storm Water Steering Committee and this Storm Water Management Plan. The water quantity and quality modeling analysis results are presented herein and were used to develop the plan.

This plan was undertaken by the City of Mequon and the Village of Thiensville under a local assistance grant received from the Wisconsin Department of Natural Resources (WDNR). This planning effort is intended to assist in the implementation of both the *Nonpoint Source Control Plan for the Menomonee River Priority Watershed Project,* and the *Nonpoint Source Control Plan for the Milwaukee River South Priority Watershed Project*, which were prepared under the provisions of the Wisconsin Nonpoint Source Pollution Abatement Program by the WDNR in cooperation with affected local units of government and other interested parties.

The purpose of this Plan is to identify an approach for the City of Mequon and the Village of Thiensville to:

- Control storm water drainage and flooding in the primary drainage system, such as in major storm sewers, natural streams and channels, and manmade channels;
- Improve the water quality of storm water runoff from non-point sources; and
- To assist the City of Mequon and the Village of Thiensville in their municipal permitting application and compliance efforts.

The primary tasks conducted to prepare this storm water management master plan include:

- Establishing project objectives to guide the development of the Storm Water Management Plan.
- Establishing a Storm Water Steering Committee.
- Providing guidance to the City of Mequon and the Village of Thiensville regarding the WDNR municipal storm water permit regulations.
- The inventory of existing conditions related to the drainage system and land use.
- Meeting with Mequon and Thiensville to discuss planned future development.
- Conducting the hydrologic-hydraulic analysis.
- Conducting the water quality analysis.
- Developing storm water management options to mitigate major flooding problems, provide sufficient storm water flow capacity, reduce pollutant loading, and improve receiving water quality.
- Developing a recommended Storm Water Management Master Plan which addresses urban development guidelines, flood control recommendations, water quality recommendations, an implementation plan for the recommendations, and evaluation of Mequon ordinances related to storm water management.

Objectives and Criteria

Objectives and criteria guide the development of the Stormwater Management Master Plan. The objectives and criteria developed for the City of Mequon and the Village of Thiensville are compatible with Priority Watershed Plans prepared for the Menomonee River and Milwaukee River south watersheds and address local issues and concerns. The objectives are listed in Table ES-1.

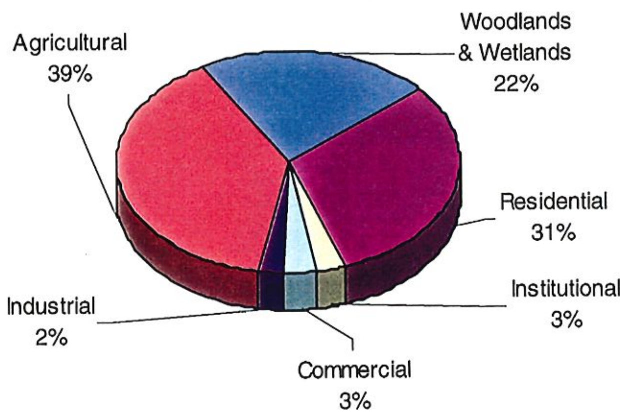
Table ES-1: Objectives for the Mequon/Thiensville Stormwater Management Plan

Objective No. 1	Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little Menomonee Creek, Little Menomonee River, and Fish Creek at the most effective cost.
Objective No. 2	Provide stormwater drainage and flood control facilities to prevent flood damages to property, prevent health and safety hazards, ans reduce drainage-related nuisance and inconvenience at the most effective cost.
Objective No. 3	Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost.
Objective No. 4	Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost.
Objective No. 5	Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost.
Objective No. 6	Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost.
Objective No. 7	Provide effective stormwater management at the most effective cost.

Project Setting

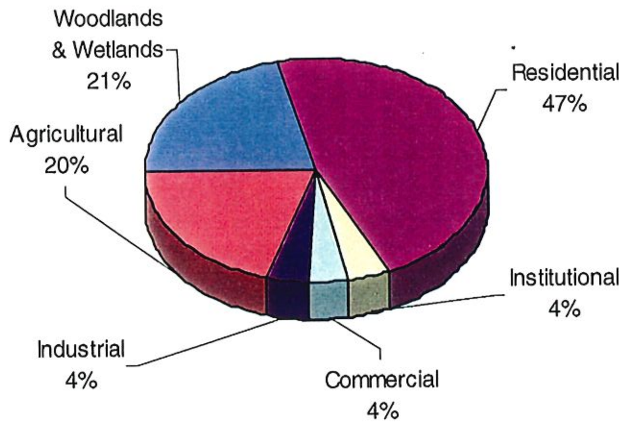
The study area covers 47 square miles within Oazaukee County, Wisconsin including the entire City of Mequon and Village of Thiensville. The study area is generally bordered to the south by County Line Road, by Wausakee Road on the west, by Pioneer Road on the north side, and by Lake Michigan as shown in Figure 1-1.

Figure ES-1: Existing Land Use
within the Mequon/Thiensville Study Area



Land use within the area affects both the quantity and quality of stormwater runoff. Imperviousness, materials exposed to stormwater, and traffic patterns are a few examples of land use characteristics which affect the surface hydrology and potential pollutant loading from an area. The study area is developed in urban and rural land uses. Existing land use was determined from aerial photos obtained from the Southeastern Wisconsin Regional Planning Commission. The future land use projection is based on the 1982 City of Mequon Land Use Plan (revised in 1997) and the assumption that the Village of Thiensville land use will not change because the Village is near full built-out conditions. The future land use predictions indicate that about 52 percent of the current agricultural lands will be developed into residential land uses. A breakdown of the existing and future land uses is shown in Figures ES-1 and ES-2.

Figure ES-2: Future Land Use
within the Mequon/Thiensville Study Area



Stormwater Management System

Stormwater runoff from the area is conveyed by a network of drainage ditches, storm sewers, culverts, streams and wetlands. A majority of the study area is drained by drainage ditch and culvert systems.

Culverts

Culverts are a major conveyance element in the study area stormwater management system. Information regarding nearly 1,800 culverts was obtained from a survey conducted by CDM and the City of Mequon staff during the Spring of 1997. The inventory included documentation of:

- The shape, dimensions, length, and construction material of the culvert,
- The distance from the upstream invert to the top of the roadway,
- The physical and hydraulic condition of each culvert, and
- Observed deterioration, sediment accumulation, erosion, and/or ponding.

Information collected in the field inventory was used to identify blocked culverts and also used in the area-wide culvert capacity analysis. Culverts that are significantly undersized or obstructed reduce the efficiency of the stormwater drainage system and may cause flooding.

Streambanks

Streambank erosion is responsible for the delivery of hundreds of tons of sediments to receiving streams annually. In order to reduce the sediment loading, existing and potential streambank erosion areas must be identified and repaired. Approximately 38 miles of channel were evaluated using field techniques developed by the U.S. Department of Agriculture. Nine stability indicators of the upper and lower bank areas of the stream channel were evaluated and classified as excellent, good, fair, or poor. The inventory of the streambank conditions indicated that:

- Of the streambanks inventoried, the overall reach condition of 30 miles, or 73 percent, is classified good; 10 miles, or 25 percent, is classified fair, and 0.5 miles, or 1 percent, is classified poor.

- Bank rock content is classified as poor for almost all, 98 percent, of the streambanks inventoried. This indicates that 40 miles of streambank have less than 20 percent rock in the bank and is a reflection of the overall geology of the area.

- Vegetative bank protection is the most common indicator, other than bank rock content, to be rated fair or poor. Sixteen miles, or 39 percent, of the streambanks have less then 70 percent plant density.

- No evidence of mass wasting was observed in the 40 miles of the streambank inventoried.

- The Fish Creek, Little Menomonee, and Mequon (MQ) subwatersheds have the greatest percentage of streambanks showing significant signs of erosion, streambanks with an overall classification of fair or poor.

- The Pigeon Creek, Ulao, and Mequon (MU) subwatersheds have the greatest percentage of streambanks in good overall condition.

Wetlands

The value of wetlands includes their capacity to alternate surges of storm water runoff and their ability to remove sediment and nutrients from surface water. The large storage capacity and controlled outfall of many wetlands detain storm water and release it slowly in more evenly distributed flow after a storm event. The long detention time, complex flow patterns, and nutrient uptake by wetland plants combine to make many wetlands very effective for removal and storage of sediment and the removal and transformation of some dissolved nutrients from surface waters.

An inventory was conducted of wetlands greater than two acres located within the study area. The purpose of the inventory was to provide a detailed evaluation of the effectiveness of each wetland in contributing to storm water management and the opportunity to provide additional storm water management benefits with modification or restoration. The wetland inventory included:

- Location and mapping of wetlands over two acres within the study area.
- Field inspection of mapped existing and previously altered/prior converted wetland areas.
- Evaluation of the effectiveness of the wetland areas to provide flood flow detention, sediment retention, nutrient removal, and nutrient transformation.
- Evaluation of the opportunity of each wetland area to perform flow improvement and water quality improvement.

The inventory identified 202 wetland areas within the study area, of which 73 areas are prior converted. The identified wetland areas total over 3,400 acres, or 11-percent, of the study area. The evaluation of the wetland areas indicate that:

- 1,960 acres, 57 percent, of the wetland areas inventoried currently have at least moderately high value for surface water quality and flow improvement

- 2,120 acres, 62 percent, of the wetland areas inventoried currently have at least moderately high additional potential for surface water improvement.

- A majority of the wetland areas with high potential for storm water management in prior converted wetland areas. Many of the prior converted wetlands have been ditched.

- Ditching (channelization) has substantially impacted the hydrology of 64 percent of the wetland areas inventoried.

- The area with the highest potential for wetland related storm water management improvements is located west and southwest of the Village of Thiensville, within the Upper Menomonee Creek and Little Menomonee River subwatersheds.

- The wetlands which are the nearest to being of natural area quality and which have high wildlife value are located within the floodplain forests along the Milwaukee River.

Hydrologic/Hydraulic Analysis

A hydrologic/hydraulic analysis was conducted on the primary storm water drainage network in Mequon. The purpose of this analysis include:

- Identification and verification of overbank flooding problems during different storm events
- Determination of the capacity provided by culverts and hydraulic structures
- Evaluation of alternative flood management solutions

The system analysis consisted of the following tasks:

- Collection of data related to the storm water drainage system
- Development of the hydrologic model
- Development of the hydraulic model
- Review and verification of the models
- Evaluation of existing system
- Identification of system deficiencies
- Evaluation of future system conditions
- Development and identification of storm water management alternatives to mitigate system deficiencies

The analysis was conducted using the Storm Water Management Model (SWMM). SWMM is a computer program developed by the United States Environmental Protection Agency for computation of storm water runoff flows. The SWMM hydrologic and hydraulic models were used to evaluate drainage system performance for rainfalls corresponding to the 2-, 10-, 25-, and 100-year storm events. Where applicable, based on a change in land use conditions, the model run was repeated under anticipated future land use conditions. The main objective of the analysis was to characterize the known flooding and drainage problems and to identify and to identify any deficient components of the storm water drainage system including inadequate bridges or culverts.

Differences between existing and future land use flows were determined in each subwatershed. Flow increases are greatest in Ulao Creek and the Little Menomonee River, while flow increases are the smallest in the tributaries to the Milwaukee MQ System and Fish Creek

Water Quality Analysis

A water quality analysis was conducted to estimate the amount of pollutants that are discharged into the Milwaukee and Menomonee Rivers via storm water runoff. The water quality analysis was conducted using a unit-area loading model which is based in part on the Source Loading and Management Model (SLAMM) developed by the WDNR. The analysis is based on:

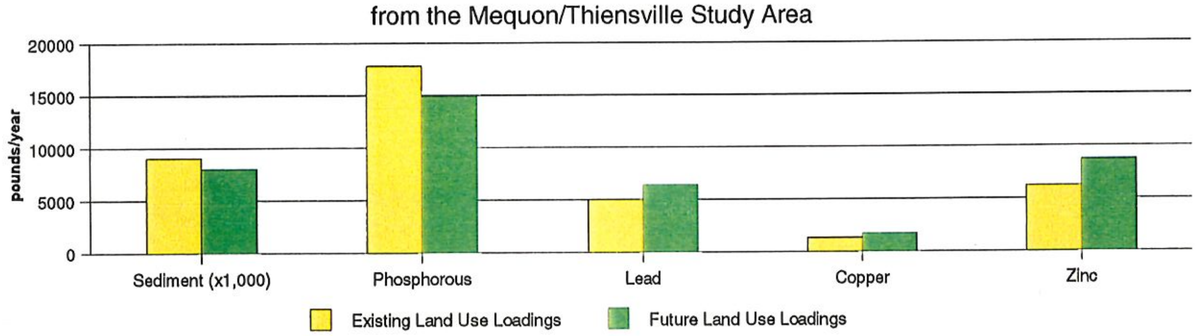
- the study area land use,
- pollutant loading rates for each land use category based on SLAMM, research result, and professional judgement, and
- existing practices, such as the use of drainage swales.

The analysis was conducted for sediment, phosphorus, copper, lead, and zinc, which are typically associated with urban storm water runoff and often cause water quality problems in urban streams. Urban stream water quality problems typically include decreased water clarity, sedimentation, excessive algal growth, and water toxicity.

The estimated annual pollutant loadings under existing and future land use conditions from the water quality analysis are shown in Figure ES-3.

Figure ES-3: Comparison of Existing and Future Annual Pollutant Loadings

from the Mequon/Thiensville Study Area



The pollutant load analysis indicates that:

- agriculture and residential land use account for 65 percent of the sediment loading under existing and future conditions;
- agriculture and park land use account for 72 percent and 54 percent of the phosphorous loading under existing and future conditions, respectively; and
- commercial, industrial, and residential land use account for over 60 percent of the metals loadings under existing and future land use conditions.

Problem Areas

The analysis conducted as part of this storm water management master plan identified potential problem area related to flooding and drainage, streambank stability, culvert capacity, and water quality. The problems identified are described in the following paragraphs.

Flooding and Drainage Problem Areas

Ten major storm water flooding areas were identified by the City of Mequon engineering staff, Village of Thiensville staff, and the storm water steering committee based on citizen complaints from the June 1997 storm event along with other storms, potential for damage, and the flooding history of areas. The primary flooding problems are presented in Table ES-2.

Culvert Capacity Problem Areas

The hydrologic and hydraulic analysis included a capacity analysis of approximately 250 road crossing culverts in Mequon. The SWMM representation incorporates energy losses in the culvert barrel(s) as well as the culvert entrance and departure reaches. Approximately 30 culverts were found to be deficient according to the following criteria: road overtopping exceeding 6-inches in the 100-year storm, overtopping of a main arterial in the 100-year storm, insufficient flow capacity for the 10-year storm, or excessive backwater behind a culvert in a developed area. Several of these deficiencies will be resolved through implementation of the recommended storm water improvements. Three deficient culverts should not be improved because of the potential to increase flooding downstream.

Water Quality Problem Areas

Based on the annual pollutant loadings generated by the analysis, critical land uses and land uses which contribute a majority of the storm water pollutants were identified. Critical land uses which contribute to sediment loading include agriculture, extractive, and residential land use; critical land uses which contribute to phosphorous loading include agriculture, residential, and park land uses; and critical land uses which contribute to metal loading include highway/arterial/, commercial, and industrial land uses.

TABLE ES-2: Flooding Problem Description within the Mequon/Thiensville Study Area

PROBLEM NUMBER	PROBLEM DESCRIPTION	LOCATION	CAUSE	POSSIBLE SOLUTIONS
FS#1 Range 22 Section 31	Frequent yard flooding; 40 houses and 30 condominiums in area.	East of Sunnycrest Drive; West of Port Washington Road; Between Donges Bay Road and Zedler Lane; Fish Creek and area along Clover Lane	Flat topography with three detention basins in area; Inadequate channel capacity and storage.	Add detention north of Donges Bay Road and enlarge culvert downstream at Zedler/Port Washington Road.
FS#2 Range 22 Section 32	Frequent yard flooding; 16 houses adjacent to channel.	East of Waterleaf Drive; West of Lakeshore Drive; Between Donges Bay Road and Zedler Lane; Unnamed Fish Creek Tributary	Development in former wetland; Inadequate storm sewer capacity; Undersized culverts from Zedler to Trillium.	Pump/Pipe system from Waterleaf Drive to Zedler Lane; Increased culvert capacities from Zedler to Trillium; Channel improvement for Waterleaf Drive to Zedler Lane.
FS#3 Range 22 Section 32	I-43 and adjacent properties flooded.	East of Port Washington Road; West of Railroad Tracks; South of Zedler Lane on Fish Creek	Upstream development; Inadequate culvert and channel capacity. Flooding NOT due to Railroad culvert backup at Ravine Baye Road.	Widen and deepen channel or storm sewer channel between I43 and Railroad.
PG#1 Range 21 Section 14	Frequent street and residential flooding in a large area of Thiensville.	Pigeon Creek in Thiensville south of Freistadt Road to Cedarburg Road.	Undersized culverts and flood plain encroachment between Freistadt Road and Main Street.	Restrict culvert at Freistadt Road and back water into gravel pits; Divert flow to gravel quarry and build gravity outlet and pump station.
MU#1 Range 21 Section 32	Frequent yard and street flooding; 19 houses adjacent to channel.	South of Donges Bay Road; West of Swan Road; Between Stanford and Concord Drives; Unnamed MU Tributary	Flat channel slope; New development in former wetland; Channel full of wetland vegetation and minimal channel bank definition.	Expand detention east of Swan Road or northeast of subdivision; Remove channel vegetation /enhance bank slopes; Storm sewer or channel improvement; Rehabilitate ditch and driveway culverts
MQ#1 Range 22 Section 19	Frequent yard and residential flooding; 14 houses adjacent channel.	Hickory Lane, Chestnut Road, and Glenbrook Lane; North of Mequon Road to Milwaukee River along Unnamed Milwaukee River Tributary	Homes constructed in 100-year flood plain and very close to channel; Poorly defined channel banks; Excess vegetation on channel banks. No detention upstream.	Detention basin south of Mequon Road/ East of Range Line Road; Remove channel vegetation/enhance bank slopes; Flood proof homes.

PROBLEM NUMBER	PROBLEM DESCRIPTION	LOCATION	CAUSE	POSSIBLE SOLUTIONS
MQ#2 Range 22 Section 20	Frequent yard flooding with slow drainage; basement backups due to excess I/I;45 houses in area.	East of Union Pacific Railroad; Along Mequon Road; At Prairie View Lane and Revere Road; Unnamed Milwaukee River Tributary	Flat topography; Wetland located downstream; Upstream commercial development at Mequon Road and Port Washington Road.	Regulate further development to include detention; Storm sewer the area; Block culverts under I43 and divert drainage area west of I43 away from wetland directly into channel north of the wetland by I43.
MQ#3 Range 21 Section 35	Frequent yard and street flooding; 24 houses and 1 church adjacent to channel.	East of Wisconsin Central Railroad; West of Cedarburg Road; Between Westfield Road and Willow Roads; Unnamed Milwaukee River Tributary	Homes constructed in Milw. River Flood plain; Commercial development upstream; Flat topography; excess channel vegetation along Meadow Lane; Shallow grassy swail along Kathleen Lane.	Flood-proof homes; Add detention basins near commercial development; Remove channel vegetation/ enhance bank slopes along Meadow Lane. Divert flow north of Donges Bay Road; Ditch rehabilitation and driveway culvert replacement
MQ#4 Range 21 Section 22	Frequent flooding with water entry through basement windows; one house, City Hall, and Library.	East of Buntrock Avenue; Between Division Street and Mequon Road; Unnamed Milwaukee River Tributary	Inadequate storm sewer capacity under library and park; Backup from Milwaukee River not the cause according to FIS maps.	Build detention in Park, west of Buntrock; Flood proof library

Recommended Plan

The recommended storm water management plan for the City of Mequon and the Village of Thiensville is shown on Figure ES-4 and consists of four plan elements:

Storm Water Drainage and Flood Control Element

This element recommends ten storm water drainage and flood control projects that provide a balance between protection against structural flooding in the 100-year storm event and public expenditure of funds. A summary of the selected drainage and flood control plan is presented in Table ES-3.

Culvert Replacement Program

The culvert replacement program includes 34 culverts which either cause road overtopping in excess of six inches in the 100-year storm; cause overtopping of a main arterial in the 100-year storm; or which do not provide sufficient capacity for the 10-year storm. Twelve culverts with significant maintenance or safety problems are also included in the culvert replacement program. A summary of the undersized culverts designated for replacement is presented in Table ES-4.

Water Quality Improvement Element

This element recommends constructing six wet detention ponds, retrofitting a prior converted wetland, constructing a storm water treatment system for parking lots, and using non-structural measures to reduce storm water pollution. Nonstructural measures include commercial parking lot controls, enhanced street cleaning in a limited area, a more aggressive catch basin cleaning program, snow storage practice, agricultural practices, streambank stabilization, a public information and education program, increased enforcement of construction erosion control measures, and industrial best management practices. A summary of the selected water quality source control and treatment measures are presented in Tables ES-5, and ES-6 respectively.

Regulatory/Ordinance Element

This element recommends revisions to the City of Mequon Storm Water ordinance to assist in the effectiveness of the storm water management plan.

Implementation Element

This element identifies the plan implementation of the municipalities, other local and state units of government, and the private sector; presents capital and operation and maintenance cost estimates; and examines institutional mechanisms to help carry out the plan.

The recommended storm water management plan, when fully implemented, will: mitigate flood damages to property, significantly reduce health and safety hazards, and alleviate drainage related nuisance and inconvenience at the most effective cost. The plan provides a level of protection against the 100-year storm in most of the problem areas identified. Water quality will be improved by an approximate 25 to 60 percent reduction in storm water pollutant loadings from the study area. The implementation of the recommended plan would entail an estimated capital cost of $23 million ($13 million local cost plus $10 million cost to developers) and an estimated annual operation and maintenance cost of $144,000. The Village of Thiensville provided a comment letter to the recommended plan that is located in Appendix G.

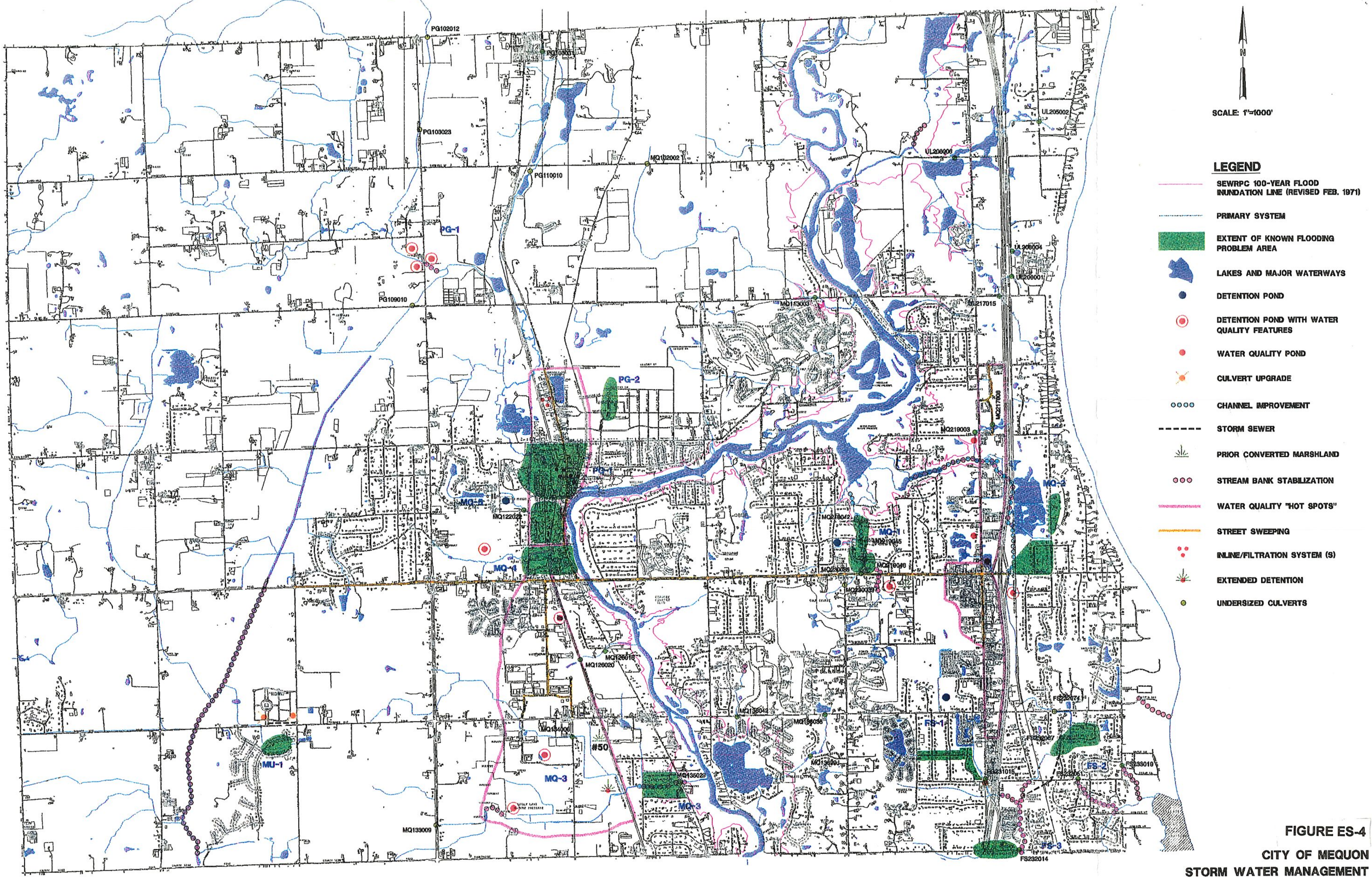


FIGURE ES-4
CITY OF MEQUON
STORM WATER MANAGEMENT
RECOMMENDED PLAN MAP

CDM Camp Dresser & McKee Inc.

Table ES-3: Selected Drainage and Flood Control Plan

Problem Number	Problem Summary	Selected Alternative	Level of Protection
FS-1 *(see Fig. 8-2)*	Frequent yard flooding in Clover Lane / Brookdale Drive area	▸ 30 acre-foot detention basin located north of Donges Bay Road and culvert upgrade at Pt. Washington and Zedler Roads	50 [1]
FS-2	Frequent yard flooding east of Waterleaf Drive; west of Lakeshore Drive; between Donges Bay Road and Zedler Lane	▸ 18-inch storm sewer from Waterleaf Drive to Fish Creek tributary in Katherine Kearney Carpenter Park	25 [1]
MQ-1 *(see Fig. 8-3)*	Frequent yard and residential flooding; 14 homes adjacent to the channel. Hickory Lane, Chestnut Road, and Glenbrook Lane area	▸ Two detention basins providing a total of 80 acre-feet of storage capacity, located east of Range Line School and at St. James School ▸ Channel clean-out from Mequon Road to Hickory Lane and from Ranch Road to the Milwaukee River Floodplain	100 [2]
MQ-2 *(see Fig. 8-4 & Fig. 8-5)*	Frequent yard flooding with slow drainage; basement backups due to excess I/I; east of Union Pacific Railroad, north of Mequon Road, south of Glen Oaks Lane	▸ 90 acre-foot detention basin south of Mequon Road between I-43 and the railroad tracks ▸ Channel cleaning / stream restoration from Mequon Road north past the wetland area to Milwaukee River floodplain	50 [3]
MQ-3 *(see Fig.8-6 & Fig. 8-7)*	Yard and street flooding, 24 homes and 1 church, east of Wisconsin Central RR, west of Cedarburg Rd..	▸ Three detention basins, totaling 90 acre-feet of storage capacity, located north of County Line Road, south of Donges Bay Road, west of the Railroad tracks, and east of Wauwatosa Road ▸ Channel cleaning / stream restoration from Cedarburg Road west to approx. Meadow Lane	100 [2]
MQ-4 *(see Fig. 8-8)*	Flooding with water entry through basement windows; 1 home, Mequon City Hall, and Library	▸ 50 acre-foot detention basin located west of Buntrock Ave. and east of Wauwatosa Rd.	100
MQ-5 *(see Fig. 8-9)*	Yard and street flooding, east of Buntrock Ave., between West and Spring Streets	▸ Construct storm sewer along Spring Street ▸ Maintain drainage way through Stemmeler property	100

Problem Number	Problem Summary	Selected Alternative	Level of Protection
PG-1 *(see Fig. 8-10 and Fig. 8-11)*	Frequent street and property flooding in a large area on Thiensville south of Friestadt Road to Cedarburg Road.	▸ Three detention basins, totaling 100-acre feet of storage capacity, located south of Haw thorne Road at Cedarburg Road. ▸ Remove or upgrade the culvert north of the Harley Dealership in Thiensville ▸ Streambank modification from the Cedarburg Road to the Milwaukee River	100 [2]
PG-2 *(see Appendix G)*	Frequent street and yard flooding; 4 homes on Laurel Drive	▸ Construct a 33 ac-ft basin at MATC ▸ Add 15 ac-ft to existing MATC Basin B	Unknown[4]
MU-1	Frequent yard and street flooding; 19 homes adjacent to channel south of Donges Bay Road; west of Swan Road; between Stanford and Concord Drive	▸ Drainage ditch/storm sewer 1,300 feet from Swan Road to the Little Menomonee River	100

Table ES-4: Undersized Culverts Designated for Replacement

Culvert ID	Road	Shape	Size (in.)	Condition	Comments
FS232014	County Line Road	Arch	101 x 161	High back water	DB
FS231015	Port Washington Road	Box	48 x 96	Major road overtopping in the 100-year event	A
FS233019	Lake Shore Drive	Circular	12	Overtops road by 2 inches in 100-year event	
FS232051	Zedler Lane	Arch	2 @ 18 x 24	Overtops road by 2 inches in 100-year event	
FS232067	Waterleaf Drive	Arch	5 @ different sizes	Damaged culvert, Overtops by 6 inches in 100-year	crushed
FS232074	Donges Bay Road	Arch	2 @ 20 x 28	Major road overtopping in the 100-year event	
MQ134006	Baehr Road	Arch	5 @ 41 x 53	Overtops road > 6 inches in 100-year event	A
MQ133009	Wauwatosa Road	Circular	2 @ 30	Overtops road > 6 inches in 100-year event	
MQ136042	Donges Bay Road	Circular	42	Overtops road > 6 inches in 100-year event	
MQ219042	Hickory Lane	Arch	2 @ 52 x 77	Overtops road > 6 inches in 100-year event	A
MQ219045	Chestnut Road	Arch	3 @ different sizes	Overtops road > 6 inches in 100-year event	A
MQ219046	Glenbrook Lane	Arch	2 @ 43 x 64	Overtops road > 6 inches in 100-year event	A
MQ230085	Mequon Road	Circular	2 @ 48	Overtops road > 6 inches in 100-year event	A
MQ230039	Range Line Road	Arch	47 x 71	Overtops road by 3 inches in 100-year event	A
MQ219003	Glen Oaks Lane	Box	48 x 48	High back water	
MQ217008	Corporate Parkway	Circular	3 @ 18	Overtops road by 6 inches in 100-year event	
MQ126018	Sherwood Drive	Arch	20 x 28	Overtops road by a foot in 100-year event	
MQ126020	WCRR Tracks	Circular	42	Overtops road > 6 inches in 100-year event	
MQ13699J	Range Line Court	Circular	2 @ 24	Overtops road > 6 inches in 100-year event	
MQ136038	Donges Bay Road	Arch	20 x 28	Overtops road > 6 inches in 100-year event	
MQ122022	West Street	Arch	33 x 49	Overtops road > 6 inches in 100-year event	DT
MQ135029	Cedarburg Road	Arch	2 @ 71 x 103	Major road overtopping in the 100-year event	
MQ113003	Yvonne Drive	Arch	2 @ 29 x 42	Overtops road > 6 inches in 100-year event	
MQ102002	Bonniwell Road	Circular	15	Major road overtopping in the 100-year event	
PG110010	WCRR Spur	Circular	24	Overtops by a foot in 100-year event	
PG103031	Concord Street	Circular	28	Overtops road > 6 inches in 100-year event	
PG102012	Pioneer Road	Circular	27	Overtops road > 6 inches in 100-year event	DT

Culvert ID	Road	Shape	Size (in.)	Condition	Comments
PG103023	Wauwatosa Road	Circular	15	Overtops road > 6 inches in 100-year event	
PG109010	Highland Road	Circular	48	Overtops road > 3 inches in 100-year event	
UL208004	Lake Shore Drive	Circular	24	Overtops road > 6 inches in 100-year event	
UL208001	Lake Shore Drive	Circular	36	Excessive back water in 100-year event	
UL205002	Lake Shore Drive	Arch	29 x 42	Overtops road by 6 inches in 100-year event	
UL206006	Bonniwell Road	Arch	29 x 42	Overtops road by 6 inches in 100-year event	
UL217015	Highland Road	Circular	2 @ 36	Excessive back water in 100-year event	

Notes:

A = Problem addressed by Recommended Plan
DT = Do not replace, would increase flooding in Thiensville
DB = Do not replace, would increase flooding in Bayside

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments
Landscape Practices	Implement environmentally friendly landscape practices in park areas, school yards, city and village building yards, and vegetated median strips.	sediment 1% phosphorous 2% lead <0.5%	Examples of environmentally friendly practices include increased turf height, reduced week control, replacement of turf with low maintenance ground cover or perennials, and reduced fertilized application.
Snow Storage Practices	Locate snow storage areas in a well vegetated area at least 200 feet from a drainage way or storm sewer inlet	variable	Implementation of this practice provides the snow melt an opportunity to filter though the vegetated area which will remove a portion of the pollutant loading.
Erosion Control Ordinance	Implement revised ordinance, increase the construction site inspection program, and train inspectors on erosion control techniques.	sediment <0.5%	--
Agricultural Practices	Encourage use of Agricultural BMPs such as conservation tillage and adopt the Ozaukee County shoreline management ordinance	sediment 25% phosphorous 16% lead <0.5%	Ozaukee County is primarily responsible for implementation of agricultural practices.
Streambank Stabilization	Stabilize key streambanks	variable	Streambank stabilization measures may include: vegetation, erosion protection, and debris removal is designated areas.
Public Education and Information Program	Provide information to the general public and industries on the Storm Water Management Plan	variable	Topics may include: Lawn care, pet waste handling, other best management practices, as well as the NR216 requirements. May utilize newsletters, newspaper articles, school programs, cable TV and use of preprinted materials and videos.

Notes: [1] Implementation of the 1997 Land Use Plan is also a required component of the stormwater drainage and flood control plan.

Table ES-6: Selected Water Quality Treatment Measures

Treatment Measure	Description	Estimated Reduction in Total Annual Load	Comments
Wet Detention Pond: Drainage/flooding problem number MQ-2	Include water quality features into detention ponds designated for drainage/flood control.	sediment 2% phosphorous 0.5% lead 4%	--
Wet Detention Pond: Drainage/flooding problem number MQ-4	Include water quality features into detention ponds designated for drainage/flood control.	sediment 2% phosphorous 1% lead 2%	--
Wet Detention Pond: Drainage/flooding problem number MQ-1	Include water quality features into detention ponds designated for drainage/flood control.	sediment 1% phosphorous 1% lead <0.5%	--
Wet Detention Pond: Drainage/flooding problem number PG-1	Include water quality features into detention ponds designated for drainage/flood control.	sediment 1.5% phosphorous 1.5%	--
Wet Detention Pond: Drainage/flooding problem number MQ-3	Include water quality features into detention ponds designated for drainage/flood control.	sediment 4% phosphorous 2% lead 5%	--
Wet Detention Pond: Industrial Park *(see Figure 8-12)*	Include water quality features into detention ponds designated for drainage/flood control.	sediment 0.5% phosphorous 0.1% lead 1%	The City of Mequon has a WDNR grant to fund a portion of this project.
Wet Detention Ponds *(see Figure 8-13)*	Water quality basins as recommended in RA Smith report	sediment 1% phosphorous 0.5% lead 4%	--
Constructed wetland *(see Figure 8-12)*	Retrofit prior converted wetland into stormwater treatment wetland	sediment 0.1% phosphorus<0.5% lead 4%	--
Stormwater Treatment System	Design and construct a stormwater treatment system/s for the major parking lots within Thiensville.	sediment <0.5% phosphorus<0.5% lead <0.5%	Systems considered may include: StormTreat tm, CFS Treatment System tm, Vortechs tm

Storm Water Steering Committee

The recommended storm water management plan was developed through the active participation and involvement of knowledgeable personnel who contributed their experience and expertise throughout the planning process. A Storm Water Steering Committee was established to review the overall approach of the project and to assist the project team in developing and evaluating alternative storm water management strategies. The Steering Committee also reviewed and approved the final recommended plan. Representatives from the City of Mequon, the Village of Thiensville, the Wisconsin Department of Natural Resources, the Wisconsin Department of Transportation, Ozaukee County Land Conservation Department; and various industrial facilities within the study area served on the Steering Committee. The Steering Committee members are:

Eric Bleicher, Mequon
Jim D'Antuono, Wisconsin Department of Natural Resources
Ed Friede, Wisconsin Department of Transportation
Jim Hoffman, Mequon
Andy Holschbach, Ozaukee County Land Conservation
Charles H. Ingwersen, P.E., Mequon
Lawrence Kane, Mequon
Dr. Nina Look, Milwaukee Area Technical College
Ed Meyer, Chairman Business Manager, Concordia College
Richard Northouse, Mequon
Linda Oakes, Exec. Director, Chamber of Commerce
Roger T. Reinemann, Alderman, Mequon
Emory Sacho, Village Administrator, Thiensville
Julie Schlifski, Mequon
Robert G. Stafford, Pres., Telsmith Incorporated

Section 1
Introduction

1.1 Project Background

Stormwater management is a critical municipal responsibility. The effectiveness and efficiency of stormwater management have a direct impact on:

- Public health - polluted and contaminated waters can come into contact with citizens
- Public safety - streets and buildings can become damaged by flood water
- Stormwater system planning design and construction
- Control and reduction of inflow and infiltration of stormwater into the sanitary sewer
- Surface water quality
- Maintenance and enhancement of environmental habitat
- Future development
- Regulatory compliance

The City of Mequon, the Village of Thiensville, and the Wisconsin Department of Natural Resources (WDNR) have joined in a cooperative effort to prepare a Stormwater Management Master Plan for Mequon and Thiensville.

The Mequon/Thiensville study area incorporates 47 square miles including the entire City of Mequon and Village of Thiensville. Approximately two-thirds of the study area is within the Milwaukee River South Priority Watershed and approximately one-fourth of the study area is within the Menomonee River Priority Watershed. The remaining portion of the study area is not within a priority watershed and flows directly to Lake Michigan. The study area and watershed boundaries are shown on Figure 1-1. The Milwaukee River South Watershed and the Menomonee River Watershed, which incorporate 157 and 136 square miles respectively, were designated "priority watersheds" in 1984. These watersheds incorporate major portions of the region including several governmental entities, the requires the Mequon/Thiensville Stormwater Management Master Plan be consistent with, and assist in the implementation of, comprehensive flood control and non-point source plans.

Under the Wisconsin Nonpoint Source Water Pollution Abatement Program, the Wisconsin Department of Natural Resources developed nonpoint source control plans for several priority watersheds. Each nonpoint source control plan: assesses the watershed characteristics including cultural natural resources, surface water, and groundwater features; describes watershed planning methods including evaluation of water quality and aquatic habitat; describes water resource conditions, nonpoint sources, and water resource objectives for the watershed; describes nonpoint control needs for urban and rural sources; and describes a detailed program for implementation. The WDNR prepared *A Nonpoint Source Control Plan for the Menomonee River Priority Watershed Project* and *A Nonpoint Source Control Plan for the Milwaukee River South Priority Watershed*

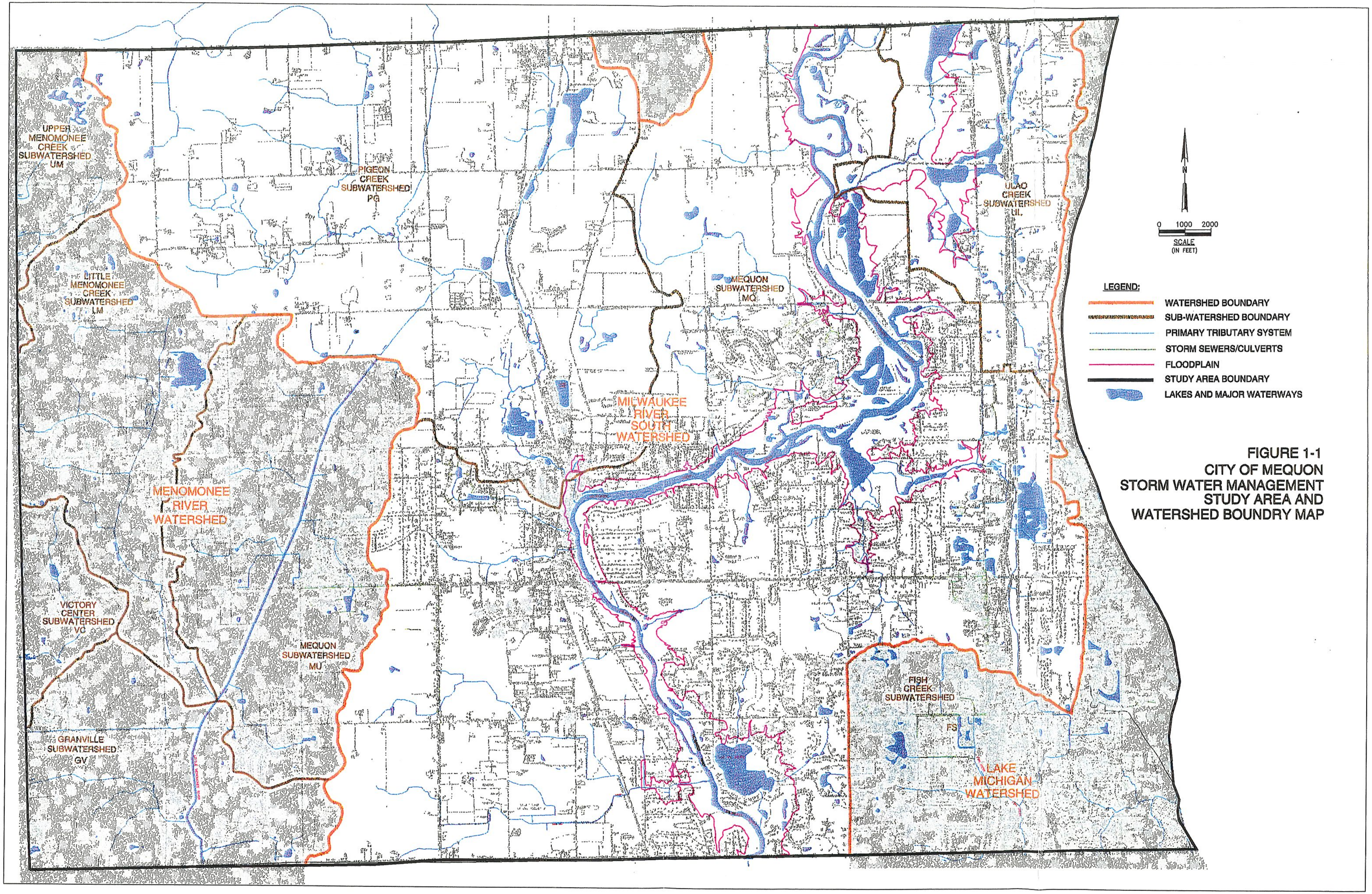


FIGURE 1-1
CITY OF MEQUON
STORM WATER MANAGEMENT
STUDY AREA AND
WATERSHED BOUNDRY MAP

Project in 1992 and 1991, respectively. The Nonpoint Source Control Plans for the Menomonee River and Milwaukee River South priority watersheds include the following specific information

- *Water Resource Objectives:* The overall water resource objective is to contribute to the full attainment of the designated potential recreational and biological uses of the Milwaukee and Menomonee Rivers. Within the study reach, each river is classified to support warm water fish and aquatic life, and full body contact recreational uses.

  The Milwaukee and Menomonee Rivers are currently partially meeting the potential biological use classifications. The WDNR recommends that biological uses be protected in those waters fully meeting their potential, enhanced in those waters partially meeting their potential, and improved in those waters not meeting their potential. In order to achieve the potential uses of the rivers, a 50 percent reduction in sediment loading, a 50 to 70 percent reduction in nutrient loading, and a 55 to 60 percent reduction in the loading of toxic substances, such as lead, was recommended for the Milwaukee and Menomonee Rivers.

- *Critical Urban Land Uses and Significant Rural Sources:* Critical urban land uses for the Mequon Subwatershed in the Menomonee River Watershed were identified as commercial, industrial, and institutional lands. Significant rural nonpoint pollution sources identified include barnyards, winter spread manure, unrestricted livestock access to streams, streambank erosion, and cropland erosion.

- *Recommended Pollution Control Measures:* "Core" urban management measures recommended to achieve pollutant reductions include construction erosion controls, early spring street sweeping, leaf and lawn management, pet waste handling and disposal, used oil management, stream bank erosion control, and stormwater management of new development. Each Nonpoint Source Control Plan recommended a level of pollution control equivalent to providing wet detention (ponds) for 100 percent of the critical urban land uses. Recommended nonpoint source pollution control measures include grassed swales, infiltration basins and trenches, wet detention ponds, construction erosion controls, streambank stabilization, and agricultural land management practices and livestock controls.

To assist in implementation of the Nonpoint Source Control Plans, the WDNR provides local assistance grants to communities. The City of Mequon and Village of Thiensville received a local assistance grant from the WDNR to assist in funding the development of this stormwater management plan. This planning effort is intended to assist in the implementation of the Nonpoint Source Control Plans for the Milwaukee River South and Menomonee River priority watersheds.

1.2 Purpose and Scope

The purpose of this Stormwater Management Master Plan for Mequon and Thiensville is:

- to control stormwater drainage and flooding in the primary system, such as in major storm sewers, natural streams and channels, and manmade channels;
- to improve water quality from nonpoint sources; and
- to assist Mequon and Thiensville in their municipal storm water permitting application and compliance efforts.

The development of the Storm Water Management Master Plan for the City of Mequon and Village of Thiensville includes the following tasks:

- Establishing objectives which are compatible with the WDNR Nonpoint Source Control Plans. Objectives are the goals that the plan will be designed to achieve. Project objectives are developed for water quality improvement, drainage and flood control, effective storm water management, erosion and sedimentation control, environmentally sensitive area protection, habitat preservation, recreational development, and aesthetic enhancement. The plan objectives and supporting criteria are presented in Section 2 of this report.

- Establishing a storm water steering committee including representatives from the City of Mequon, Village of Thiensville, Wisconsin Department of Natural Resources, Wisconsin Department of Transportation, and interested citizens. The primary role of the committee is to guide the planning process by involvement in the plan and to support the plan recommendations.

- Providing guidance to Mequon and Thiensville regarding the WDNR municipal storm water permit regulations including permit application options and requirements.

- Inventory of existing conditions related to the drainage system and land use including a review of available information from Mequon and Thiensville, Ozaukee County, Southeastern Wisconsin Regional Planning Commission (SEWRPC), and WDNR, as well as field inventories of drainage culverts, stream channels, and wetlands. The project setting and storm water management system are described in Sections 3 and 4 of this report.

- Meeting with Mequon and Thiensville to discuss planned future development. The planned future development conditions are used in the hydrologic-hydraulic and water quality analyses.

- Conducting hydrologic-hydraulic analysis to develop peak flow conditions and to identify major storm water drainage and flooding problem areas. The hydrologic-hydraulic analysis methodology and results are presented in Section 5 of this report.

- Conducting water quality analysis to estimate the pollutant loadings to the major receiving streams within the project area. The water quality analysis methodology and results are presented in Section 6 of this report.

- Developing storm water management alternatives to mitigate identified major flooding problems, provide sufficient capacity for storm water flows, reduce pollutant loadings to the receiving waters, and improve receiving water quality. The storm water management alternatives are presented in Section 7 of this report.

- Developing a recommended Storm Water Management Master Plan including urban development guidelines to mitigate the impacts of urban growth expected; flood control recommendations including conveyance and storage facilities; water quality recommendations including structural, nonstructural, and industrial controls; an implementation plan for the recommendations; and evaluation of the City's and Village's ordinances. The recommended Storm Water Management Master Plan is presented in Section 8 of this report. The implementation plan is presented in Section 9 of this report.

- Developing a storm water data reference system which links storm water data, including culvert size and condition, pipe capacity, design flow, and recommended improvements, to the storm water facility map.

Section 2
Objectives and Criteria

Objectives and criteria guide the development of the Storm Water Management Master Plan. The project objectives are the goals that this plan is designed to achieve. Each objective is supported by several criteria. Criteria are used to evaluate the degree to which each objective is achieved, to design plan components, and to measure the effectiveness of the plan.

Objectives and criteria established for this plan, presented on Table 2-1, are compatible with the Priority Watershed Plans prepared for the Milwaukee South and Menomonee River watersheds and address local issues and concerns. The objectives and criteria address surface water quality, storm water drainage and flood control, protection of wetlands and other environmentally sensitive areas, and cost effectiveness.

Table 2-1: Objectives and Criteria for the Mequon/Thiensville Storm Water Management Plan

Objective No. 1 Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little Menomonee Creek, Little Menomonee River, and Fish Creek at the most effective cost.
Criteria a. Target the water quality standards set forth in NR 102, 104, and 105 of the Wisconsin Administrative Code (summary table of regulations is presented in Appendix A) that support the designated use classifications. b. Proportionate share, cost effective, practical pollutant load reduction of sediment, phosphorus, and metals. The pollutant load reductions will be consistent, to the extent practicable, with the goals and objectives set forth in *A Nonpoint Source Control Plan for the Menomonee River Priority Watershed Project* (1992), and *A Nonpoint Source Control Plan for the Milwaukee River South Priority Watershed Project* (1991). c. Develop management measures for the City's and Village's storm water permit under Chapter NR 216 of the Wisconsin Administrative Code.

Table 2-1: Objectives and Criteria for the Mequon/Thiensville Storm Water Management Plan

Objective No. 2
Provide storm water drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost.
Criteria
a. Design the minor storm water drainage system (storm sewers and roadside ditches draining less than 80 acres) to accommodate peak flow from a 10-year recurrence interval storm event. b. Design the major storm water drainage system (major channels and streams draining greater than 80 acres) to accommodate peak flow from a 100-year recurrence interval storm event. c. Design wet detention basins in planned future development areas to maintain peak flows for the 2-year recurrence interval, 24-hour duration storm event at pre-developed 2-year storm levels. d. Establish emergency spillways for detention basins that would safely convey flow during a 100-year recurrence interval storm event. e. Design overland flow routes to accommodate the 100-year recurrence interval storm event without inflicting real property damage.
Objective No. 3
Develop a long term storm water management system that effectively serves both existing and anticipated future land uses at the most effective cost.
Criteria
a. Modify existing drainage facilities and structures where necessary to accommodate the estimated design storm flows under both existing and future land use conditions. b. Design new storm water drainage systems to utilize, where possible and acceptable to the community, the natural drainage and storage system, to complement the proposed street layout and topography, and to accommodate anticipated peak flows and volumes under future land use conditions. c. Provide guidance for the implementation of an effective community information and education program. d. Design and construct new upstream drainage facilities and structures to accommodate the existing capacities where downstream existing conveyance systems have capacities that cannot accommodate the 100-year recurrence interval storm and cannot be economically upgraded. e. Minimize the impacts to property owners resulting from the dual purpose use of property. For example, use of agricultural lands also for storm water retention.

Table 2-1: Objectives and Criteria for the Mequon/Thiensville Storm Water Management Plan

Objective No. 4

Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost.

Criteria

a. Reduce uncontrolled construction site loadings of sediment by properly installing construction site erosion controls in accordance with the community's Erosion Control Ordinance and the Wisconsin Construction Site Handbook, and by adequately maintaining those erosion controls to retain their effectiveness throughout the construction activity.

b. Within environmentally sensitive areas, reduce construction site sediment loadings by utilizing procedures such as those described in the *Special Erosion and Sediment Control issue of Watershed Protection Techniques* (Vol. 2, No. 3, February 1997). These techniques are described in Appendix A of this report.

c. Reduce 1985 agricultural loadings of sediment (provided in Appendix A) , including soil loss and sediment delivery, with the assistance of Ozaukee County. Reductions should be consistent with *A Nonpoint Source Control Plan for the Menomonee River Priority Watershed Project* (1992), and *A Nonpoint Source Control Plan for the Milwaukee River South Priority Watershed Project* (1991).

Objective No. 5

Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost.

Criteria

a. Identify wetlands and woodlands that provide storm water detention and infiltration, sediment retention, or nutrient removal.

b. Protect, enhance, and/or preserve high quality environmentally sensitive areas that provide storm water benefits; for example, maintain low flow through environmentally sensitive areas and established perennial streams.

c. Integrate valuable environmentally sensitive areas into the storm water management plan/zoning.

d. Prevent the discharge of increased storm water flows and pollutant loadings that would damage environmentally sensitive areas.

Table 2-1: Objectives and Criteria for the Mequon/Thiensville Storm Water Management Plan

Objective No. 6 Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost.
Criteria a. Develop urban development guidelines that identify and protect high quality habitat, recreation, and aesthetic resources, and that enhance the visual characteristics of plan elements. b. Incorporate concepts for passive and/or active recreation which could be incorporated into the recommended storm water management plan.
Objective No. 7 Provide effective storm water management at the most effective cost.
Criteria a. Provide for long-term capital and operation/maintenance expenses while at the same time preventing avoidable storm water quantity and quality problems. b. Maximize use of existing facilities and the natural drainage characteristics. c. Phase in the storm water management facilities to complement future projected land use development. d. Utilize, where feasible, structural facilities to provide both water quality and water quantity benefits.

Section 3
Project Setting

3.1 Study Area

The study area incorporates 47 square miles within Ozaukee County, Wisconsin including the entire City of Mequon and Village of Thiensville. Portions of the study area are included in the Milwaukee River South and the Menomonee River watersheds. The easternmost portion of the study area drains to Lake Michigan. Approximately ten miles of the Milwaukee River lies within the study area.

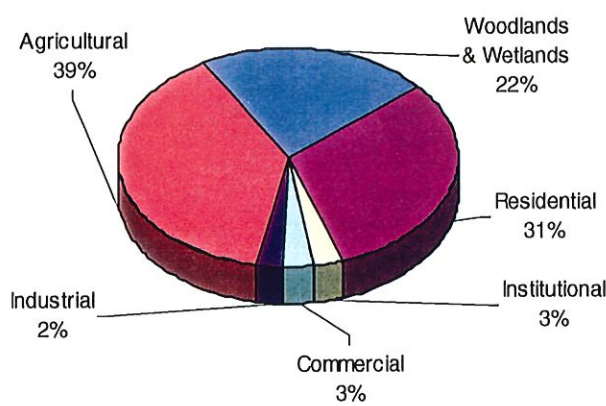
The study area is generally bordered to the south by County Line Road, to the west by Wausakee Road, to the north by Pioneer Road, and to the east by Lake Michigan. The study area is shown on Figure 1-1.

3.2 Land Use

Land use affects both the quantity and quality of storm water runoff. Imperviousness, materials exposed to storm water, and traffic patterns are a few examples of land use characteristics which affect the hydraulics and potential pollutant loading from an area.

The study area is developed in urban and rural land uses. Existing land use conditions (year 1995) are based on information provided by the City of Mequon, Village of Thiensville, and a review of 1995 aerial photographs from the Southeastern Wisconsin Regional Planning Commission (SEWRPC). Future land use conditions (year 2020) within the Village of Thiensville are anticipated to be similar to the existing land use conditions because the Village is fully developed. Future land use conditions within the City of Mequon are based on the City of Mequon Land Use Plan, revised in 1982, and information received from the City of Mequon regarding revisions to the plan. A revised land use plan was adopted by the City of Mequon in 1997. A majority of the analysis which utilizes future land use conditions was completed prior to the adoption of the 1997 land use plan. The future land use conditions used in the analysis are similar to those presented in the 1997 land use plan. Differences between the 1997 land use plan and the land use utilized in the analysis, based on the 1982 land use plan as modified by the City, are not expected to result in significant changes in analysis results. The City of Mequon Land Use Plan adopted in 1997 is shown on Figure 3-1.

Figure 3-2: Existing Land Use
within the Mequon/Thiensville Study Area



A breakdown of the existing and anticipated future land use within the study area is presented in Figures 3-2 and 3-3. Agricultural land comprises about 35 percent, or 10,700 acres, of the existing land use within the study area. The future land use conditions indicate that about 48 percent, or 5,100 acres, of the current agricultural land will be developed by the year 2020. A majority of the future development within the study area is planned to be very low density residential with lot sizes ranging from

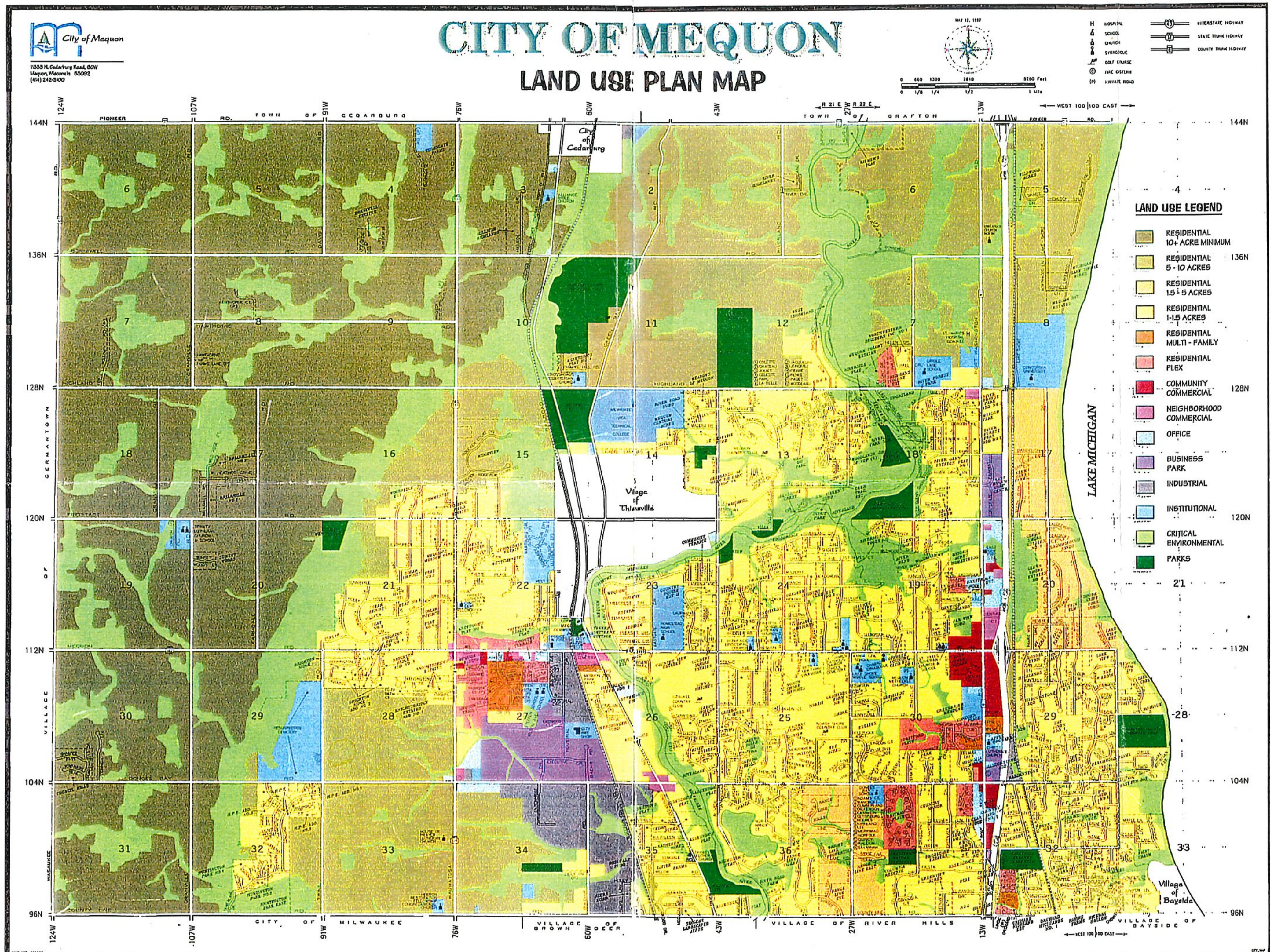
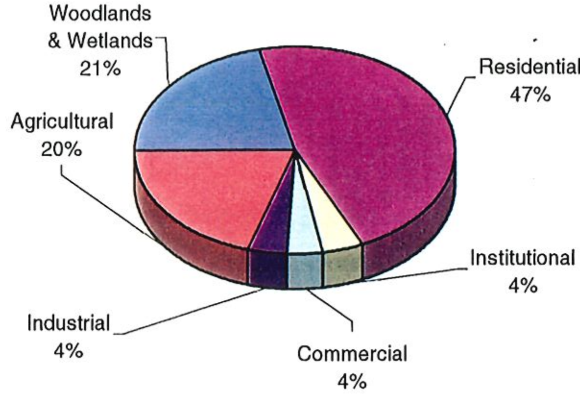


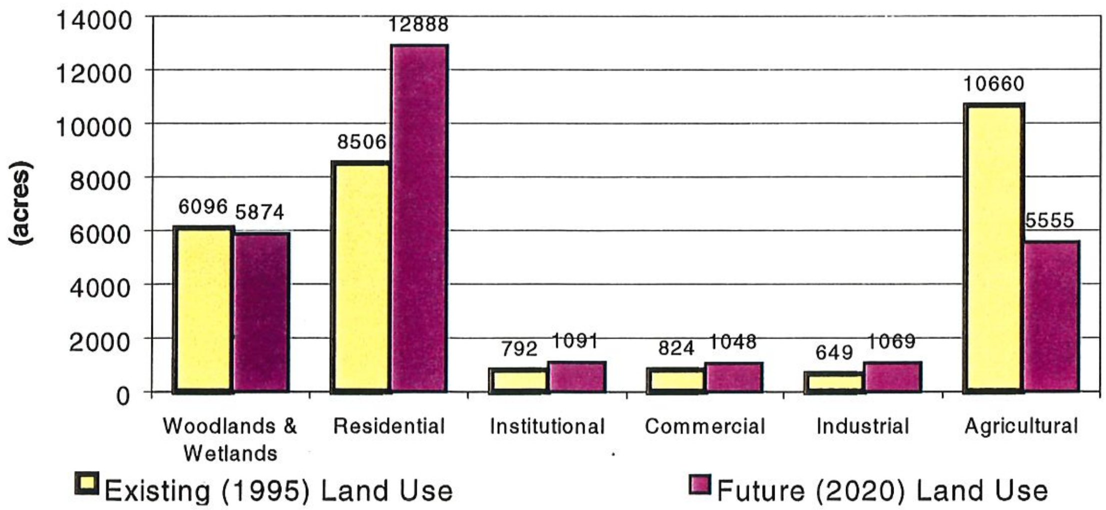
FIGURE 3-1
CITY OF MEQUON
LAND USE PLAN MAP
(1997)

Figure 3-3: Future Land Use
within the Mequon/Thiensville Study Area



five to more than ten acres. The anticipated very low density residential development will occur in existing agricultural areas. It is anticipated that approximately 108 acres per year of the current agricultural land (1% / yr.) will be developed into residential land use. A majority of the current agricultural land is located in the north and west portions of the study area. Urban land uses, such as commercial and industrial, are generally located along Port Washington Road, Cedarburg Road (STH 57) within the Village of Thiensville, and within the business park located at Donges Bay Road and Baehr Road. The future land use conditions indicate that minimal development of new industrial or commercial/business park land use is anticipated. All new urban development within the City of Mequon is required to maintain 40 percent of the development as green space and meet the storm water ordinance requirements. Minimal new development is anticipated within the Village of Thiensville because the Village is near full build out conditions. Figure 3-4 shows a comparison between the existing and future land use conditions within the study area. The hydrologic-hydraulic and water quality analysis were conducted under existing and anticipated future land use conditions.

Figure 3-4: Comparision of Existing and Future Land Use
within the Mequon/Thiensville Study Area



3.2 Climate

Climate affects the quantity and quality of storm water runoff from any given area. Variations in temperature, type of precipitation, and seasonal freezing and thawing all effect the runoff and drainage conditions. Flooding potential and pollutant delivery rates increase when spring thaws combine with rain events or major thaws occur when the ground is frozen. Freezing conditions may also affect the performance of certain types of storm water management best management practices (BMPs).

The Milwaukee area has a wide range of seasonal variation with average temperatures ranging from approximately 19 degrees Fahrenheit in January to 70 degrees Fahrenheit in July. The average annual precipitation (rain, snow, sleet, and/or hail) in the Milwaukee area is 31 inches. Average precipitation amounts vary from 1.4 inches in February to 3.5 inches in April and July. Approximately 50 storm events with at least 0.1 inches of precipitation occur each year. The average monthly temperature and precipitation amounts based on data collected by SEWRPC from 1951 through 1985 are presented in Figures 3-5 and 3-6, respectively.

Figure 3-5: Average Monthly Temperature
Milwaukee, Wisconsin: 1951 - 1985

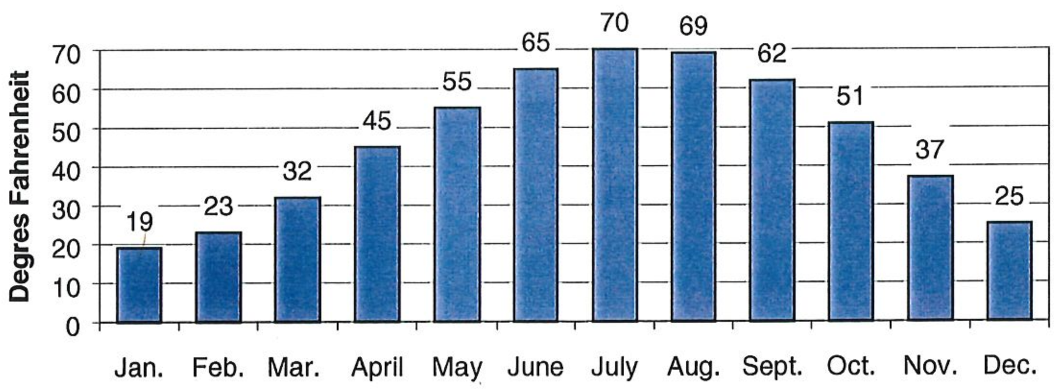
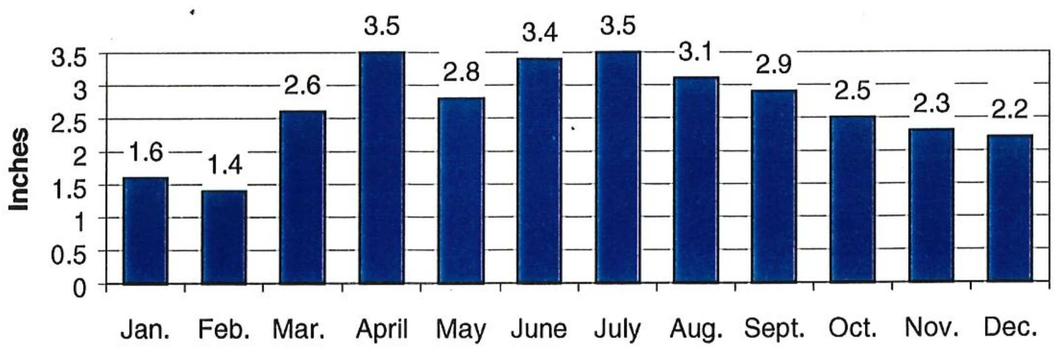


Figure 3-6: Average Monthly Precipitation
Milwaukee, Wisconsin: 1951 - 1985



3.4 Topography

The ground surface within the study area has gently rolling topography which generally slopes downward toward the east. The ground surface elevations range from a maximum of 982 feet above mean sea level, within the Pigeon Creek Subwatershed, to a minimum of 582 feet above mean sea level, within the Fish Creek Subwatershed. A summary of the topography within each major subwatershed is presented in Table 3-1.

3.5 Soils

Soil type influences the storm water infiltration capacity and erosion potential. Infiltration capacity and erosion potential are based on the soil texture, structure, content, permeability, slope, and position on the landscape.

Soils are classified hydrologically by the U.S. Department of Agricultural (USDA) Soil Conservation Service (SCS) as A, B, C, or D. Group A soils are generally well drained and have a low runoff potential; Group B soils are generally moderately drained and have a moderate runoff potential; Group C soils are somewhat poorly drained and have a moderate to high runoff potential; and Group D soils are very poorly drained and have a high runoff potential.

According to the most current edition of the *Soil Survey of Ozaukee County, Wisconsin* (USDA, 1970) the soils in the project area are typically silt loam in either the Kewaunee-Manawa or Ozaukee-Mequon Associations. The characteristics of the soils are presented in Table 3-2. Approximately 61 percent of the soils within the study area are classified as SCS Soil Group C which indicates water infiltration into the soils is low and water runoff is moderately high.

3.6 Surface Water Resources

Predominant surface water resources within the study area include perennial and intermittent streams and Lake Michigan which borders the study area to the east. More than 50 miles of perennial stream channels are located within the study area including approximately ten miles of the Milwaukee River. Numerous intermittent streams, which flow when runoff or groundwater discharge is high, discharge into the perennial streams. One water control structure is located on the Milwaukee River within the Village of Thiensville which results in a 45-acre impoundment. Storm Water runoff from the project area is discharged either through tributary streams or storm sewers to the Milwaukee River, the Menomonee River, and Lake Michigan. Major streams and named streams more than 1.5 miles long, located within the study area are identified in Table 3-3. Surface water resources are shown on Figure 3-7.

Table 3-1: Summary of Subwatershed Topography

Subwatershed	Area (acres)	Maximum Elevation (feet above mean sea level)	Minimum Elevation (feet above mean sea level)	Maximum Change in Elevation (feet)
Little Menomonee	2,042	930	724	206
Fish Creek	1,890	737	582	155
Mequon (MQ)	12,214	796	645	151
Mequon (MU)	2,912	866	724	142
Granville	1,588	850	714	136
Victory Center	421	895	785	110
Ulao Creek	1,491	800	655	145
Pigeon Creek	5,957	982	656	326
		Maximum Elevation in Study Area = 982 feet	*Minimum Elevation in Study Area = 582 feet*	*Maximum Elevation Change in Study Area = 400 feet*

Table 3-2: Soil Characteristics within the Mequon/Thiensville Study Area

Soil Association	Texture	Slope	Drainage	Runoff Rate	Erodibility	SCS Hydrologic Soil Group	Percent of Study Area
Kewaunee-Manawa	Silt Loam to Silty Clay-Kewaunee Series	0-12%	Well	Moderate to High	Slight to Moderate	C	25%
	Silt Loam-Manawa Series	1-3%	Poor	Moderate	Slight	C	7%
Ozaukee-Mequon	Silt Loam-Mequon Series	1-3%	Poor	Slow	Slight	C	6%
	Silt Loam-Ozaukee Series	2-12%	Moderate to Well	Moderate	Moderate	C	23%
Casco-Fabius	Sandy Loam to Loam-Casco Series	2-6%	Well	Slow	Slight	B	4%
	Silt Loam-Fabius Series	1-3%	Poor	Slow	Slight	B	3%
Hocheim-Sisson-Casco	Silt Loam-Hocheim Series	2-20%	Well	Moderate to High	Slight to High	B	14%
Other	Includes mucky peat, silt loam, and alluvial land	Varies	Varies	Varies	Varies	-----	18%

Table 3-3: Major Streams within the Mequon/Thiensville Study Area

Stream Name	Approximate Stream Miles within the Study Area
Milwaukee River South Watershed	
Milwaukee River	10.0
Pigeon Creek	5.0
Trinity Creek	2.1
Ulao Creek	1.7
Menomonee River Watershed	
Little Menomonee River	5.1
Little Menomonee Creek	3.8

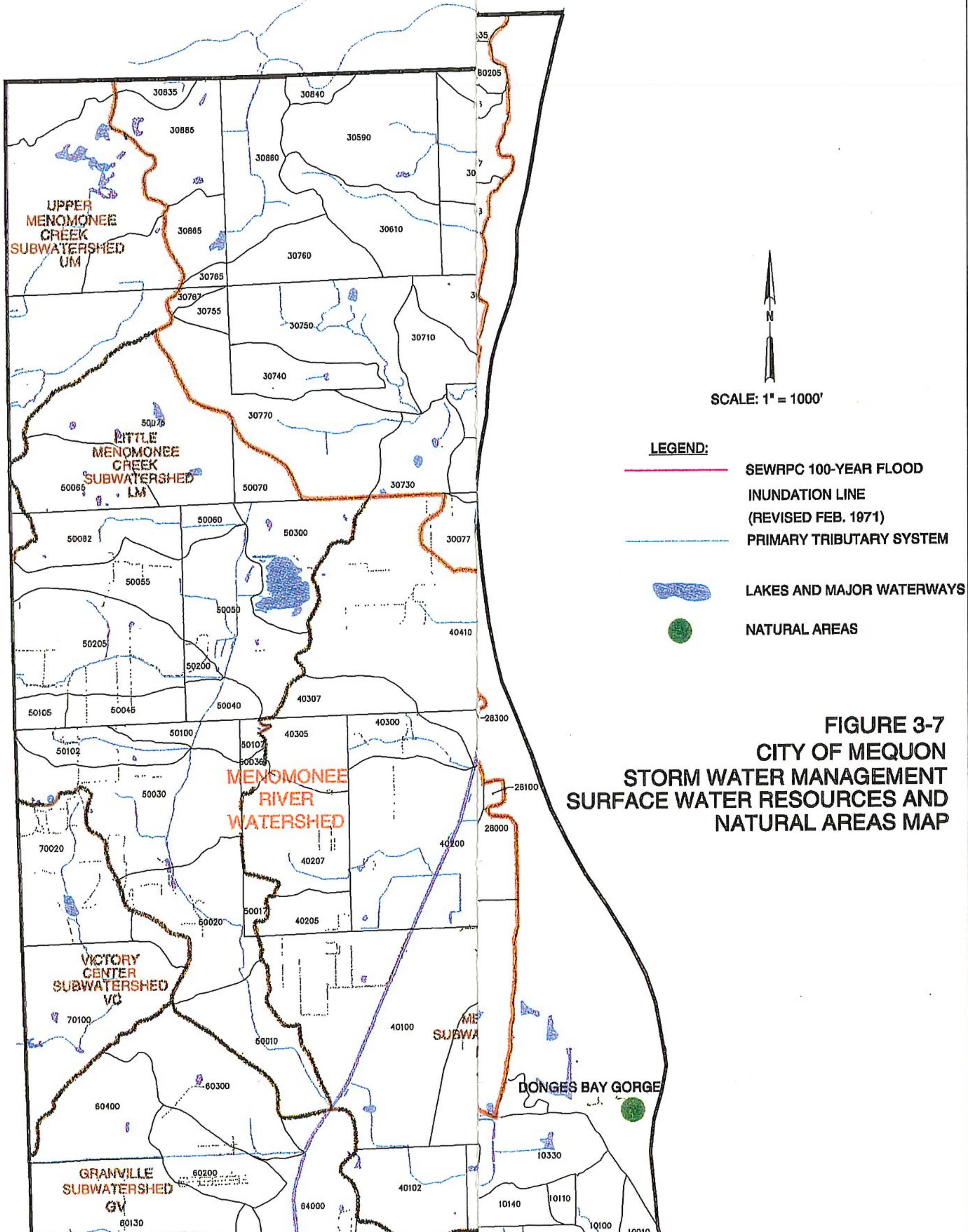


FIGURE 3-7
CITY OF MEQUON
STORM WATER MANAGEMENT
SURFACE WATER RESOURCES AND
NATURAL AREAS MAP

3.7 Wetlands

Wetlands are an important feature of the study area due to their value in supporting wildlife habitat, ability to stabilize storm water runoff and flood flows, and ability to remove sediment and nutrients from surface waters. Approximately 200 wetland areas, incorporating over 3,400 acres, were identified within the Mequon/Thiensville Study area. The City of Mequon is currently in the process of digitizing the wetland location maps which will show the wetland boundaries.

3.8 Natural Areas

Natural areas are defined by the Wisconsin Natural Areas Preservation Council as tracts of land or water so little modified by human activity, or sufficiently recovered from the effects of such activity, that they contain intact native plant and animal communities believed to be representative of the pre-European settlement landscape. Nine natural areas have been designated within the study area. These natural areas are shown on Figure 3-7 and summarized in Table 3-4.

In addition to the natural areas designated by Natural Areas Preservation Council, four nature preserves, Grasslyn, Lilly Lane, River Forest, and Shoreland, are located within the study area.

3.9 Wisconsin Storm Water Regulations

Wisconsin Administrative Code NR216, which contains the storm water regulations, was promulgated on November 1, 1994. These regulations establish criteria for permitting storm water discharges from certain municipalities, industries, and construction sites. Most industries which are covered by the permit are required to prepare a storm water pollution prevention plan, while construction sites which disturb more than five acres are required to prepare a construction site erosion control plan. Municipalities that are covered by the Permit may be required to prepare a storm water pollution prevention plan for certain industrial facilities. Subchapter 1 of NR 216 contains the specific storm water permit requirements for municipalities and requires that the following municipal dischargers of storm water obtain a storm water discharge permit:

- Municipal separate storm sewer systems serving incorporated areas with a population of 100,000 or more:
  - Cities of Madison and Milwaukee

- Municipalities in the Great Lakes Areas of Concern:
  - Cities of Green Bay, Allouez, Ashwaubenon, DePere, Marinette, Sheboygan, and Superior

- Municipalities in priority watersheds with a population of 50,000 or more:
  - Cities of Eau Claire, Racine, West Allis, and Waukesha

- Discharges from a municipal separate storm sewer system which either contribute to a violation of a water quality standard or are a significant contributor of pollutants to waters of the state. Municipalities may either be identified by the WDNR or by a municipality previously listed.

Table 3-4: Designated and Known Natural Areas within the Mequon/Thiensville Study Area

Area Name	Location	Ownership	Size (acres)	Description
Fairy Chasm State Natural Area	City of Mequon (T9N, R22E, Sections 32,33)	The Nature Conservancy and other private	47	An 80-to 100-foot deep wooded ravine which extends approximately 1.25 miles west from its confluence with Lake Michigan. *State Nature Area, Rare Species Habitat, Natural area with statewide or greater significance*
Pigeon Creek Low and Mesic Woods	City of Mequon (T9N, R21E, Section 10)	Private	81	A combination of lowland hardwoods, net-mesic woods, and upland mesic woods, much of which borders the Pigeon Creek. Located on the grounds of a former fox farm. *Rare Species Habitat, Natural area with county wide or regional significance*
Donges Bay Gorge	City of Mequon (T9N, R22E, Section 33)	Private	22	A deep, steep-sided clay ravine on the Lake Michigan shore. *Rare Species Habitat, Natural area with county wide or regional significance*
Highland Road Woods	City of Mequon (T9N, R21E, Section 11)	Private	53	Mesic woods of moderate quality. *Natural area with local significance*
Pigeon Creek Maple Woods	City of Mequon (T9N, R21E, Section 15)	Private	13	Small but good quality mesic woods on sloping uplands above Pigeon Creek. *Rare Species Habitat, Natural area with local significance*
Solar Heights Low Woods	City of Mequon (T9N, R21E, Sections 20,21)	Private	114	Disturbed floodplain forest. *Natural area with local significance*
Triple Woods	City of Mequon (T9N, R21E, Sections 31)	Private	51	Upland Mesic Forest *Natural area with local significance*
Ville du Parc Riverine Forest	City of Mequon (T9N, R22E, Sections 18,19)	City of Mequon & Private	111	One of the last remnants of riverine forest along this portion of the Milwaukee River *Natural area with local significance*
Mequon Wetland	City of Mequon (T9N, R22E, Section 20)	Private	77	A mixed wetland area. *Natural area with local significance*

Source: *A Regional Natural Areas and Critical Species Habitat Protection And Management Plan for Southeastern Wisconsin* (SEWRPC, 1997)

The City of Milwaukee has been under a storm water discharge permit since October 1994. During the permitting process, 29 surrounding municipalities were identified as potential significant contributors of storm water pollution to Wisconsin waters.

The WDNR evaluated all of the designated municipalities using the criteria listed below to determine which municipalities will be required to obtain storm water discharge permits:

- Physical connection between the municipal separate storm sewer system and the City of Milwaukee system.
- Location of the separate storm sewer system discharge relative to the City of Milwaukee's discharge
- The quantity and nature of pollutants discharged to waters of the state
- The nature of the receiving waters
- Protection of the watershed or basin drainage area receiving the discharge
- Population of the municipality

On August 2, 1996 the WDNR notified the City of Mequon, Village of Thiensville, and 18 other municipalities, that they will be required to obtain a Municipal Storm Water Discharge Permit. Mequon and Thiensville submitted a preapplication to the WDNR. WDNR reviewed and approved the Mequon and Thiensville preapplications. Mequon and Thiensville must submit a Permit application to the WDNR by March 13 and February 11, 1999 respectively. The permit application requirements include the following items

- A demonstration that the applicant has legal authority established by statue, ordinance, or series of contract to:
  - control the contribution of pollutants to the municipal separate storm sewer from industrial storm water discharges.
  - prohibit illicit discharges to the storm sewer system.
  - control the discharge of spills, dumping, or disposal of materials to the storm sewer system.
  - control through intermunicipal agreements between co-applicants the contribution of pollutants from one municipal storm sewer system to another.
  - require compliance with conditions in ordinances, permits, contracts, or orders.
  - carry out all inspections, surveillance, and monitoring procedures necessary.

- A storm sewer system map including:
  - identification and outline of the storm water drainage basins, the watersheds, and the municipal separate storm sewer systems.
  - boundary defining the final Urban Storm Water Planning Area and all municipal borders within the area.
  - listing and location of all known municipal separate storm sewer outfalls discharging to waters of the state with pipe size and consideration of "major".
  - location and description of each currently operating or closed municipal landfill or other treatment, disposal, or storage facility for municipal waste
  - the location of major structural controls for storm water discharges.
  - identification of publicly owned parks, recreational areas, and other open lands.

- A description of existing management practices to control pollutants from municipal separate storm sewer systems including the following:
    - existing source area controls and structural Best Management Practices, including operation and maintenance measures.
    - existing programs to identify illicit connections to the municipal separate storm sewer including inspection procedures, methods for detecting and preventing illicit discharges, areas where this program has been implemented, and summary of the results.

- An inventory, by watershed, of the industrial facilities which likely discharge storm water to the municipal separate storm sewer system including:
    - name and address of each facility.
    - Standard Industrial Classification (SIC) or other description of products or services provided by the industry.

- A characterization of the quality and quantity of storm water runoff and the effects on the receiving waters including:
    - monthly mean rainfall and snow fall estimates, or summary of weather bureau data, and monthly average number of storm events.
    - location and description of land use activities, including estimated average runoff coefficient, population densities, and projected growth for a ten year period within the drainage area.
    - if available, quantitative data describing the volume and quality of discharges including a description of the outfalls, sampling procedures, and analytical methods.
    - listing of water bodies that receive discharges from the municipal separate storm sewer system, locations in these water bodies where pollutants from storm water discharges may accumulate and cause water quality degradation, and known water quality impacts.

- A proposed schedule to provide pollutant loading to receiving water bodies and the event mean concentrations.

- A proposed monitoring program for data collection for the term of the permit.

- A schedule to provide a proposed storm water management program that shall be developed and initiated during the term of the permit.

- A fiscal analysis of the estimated capital and operation and maintenance expenditure necessary to implement the proposed management programs, including a description for the source of funds, incorporating any restrictions on the use of the funds.

Permit application requirements will be entirely or partially completed as part of this Storm Water Management Plan. The WDNR will review the Permit application submitted by Mequon and Thiensville and issue a Storm Water Permit. The Permit conditions will likely include requirements for best management practices, pilot studies, ordinance, and monitoring.

3.10 Other Storm Water Management Related Regulations

In addition to the Wisconsin Storm Water Regulations, contained in NR 216 and described in the previous section, there are several federal, state, and local regulations which affect storm water management. A summary of the current regulations and requirements is provided in Table 3-5. It should be noted that regulatory requirements will likely change over time.

Table 3-5: Summary of Storm Water Management Related Regulations

Regulating Authority	Regulation	Description	Regulated Community/Activity
US EPA	Clean Water Act 40 CFR Part 122	40 CFR Part 122 directs regulated municipalities, most industries, and construction sites over 5 acres to obtain and comply with a storm water discharge permit. The WDNR has permitting authority for this regulation and administers the program through NR 216.	• Municipalities • Industries • Construction sites disturbing over 5 acres
US Army Corps of Engineers	Clean Water Act Section 404	Section 404 provides the federal government with the federal authority to administer activities which may impact navigable waters of the United States.	• Dredging within a navigable waterway or wetland • Placing fill within a navigable waterway or wetland • Other activities which may impact a navigable water of the United States
WDNR	NR 216 - Wisconsin Storm Water Regulations	NR 216 requires regulated municipalities, most industries, and construction sites over 5 acres to obtain and comply with a storm water discharge permit. Section 3.9 of this report describes NR 216 more completely.	• Municipalities • Industries • Construction sites over 5 acres
WDNR	NR 120 - Wisconsin Nonpoint Source Pollution Abatement Program	NR 120 establishes the administrative framework for the implementation of the State's Nonpoint Source Pollution Program.	• Governmental units, state agencies, landowners and land operators that receive grants of cost sharing monies from the WDNR
WDNR	NR 116 - Wisconsin Floodplain Management Program	NR 116 requires municipalities to adopt reasonable and effective floodplain zoning ordinances.	• Regulates the type of land use, site design, and structural design of development in floodplains
WDNR	NR 117 - Wisconsin Shoreland - Wetland Protection Program	NR 117 establishes minimum standards for city and village shoreland-wetland zoning ordinances.	• Projects which effect wetlands five acres or larger within shoreland areas of cities and villages
WDNR	NR 103 - State Wetland	NR 103 describes the review process used by WDNR to determine the impacts of projects	• Projects which affect delineated wetlands

Regulating Authority	Regulation	Description	Regulated Community/Activity
	Permit	which may affect delineated wetlands. The review criteria include dependancy on the wetland, potential practical alternatives, impacts on the wetland water quality standard, cumulative wetland impacts, and secondary wetland impacts.	
WDNR	Chapter 30 - State Water Regulation Permit	Chapter 30 regulates activities which affect navigable waterways within Wisconsin.	• Streambank stabilization • Dredging of navigable waterway • Filling of navigable waterway • Channel improvements • Other activities which affect a Wisconsin navigable waterway
City of Mequon	Erosion and Storm Water Runoff Control Ordinance	The erosion and storm water runoff ordinance regulates land disturbing and land developing activities within the City of Mequon.	• Residential development of 5 acres or more • Non-residential development of 1 acre of more
City of Mequon	Standard Specification for Land Development	The Standard Specification for Land Development provides requirements for surveying, construction plans, roadways, sanitary sewer, water distribution system, grading and drainage, and construction record drawings for land development projects within the City of Mequon.	• Land development projects
City of Mequon	Zoning Ordinance	The Zoning Ordinance regulates zoning districts within the City of Mequon.	• Land development projects
Village of Thiensville	Zoning Ordinance	The Zoning Ordinance regulates zoning and erosion control of land disturbing activities within the Village of Thiensville.	Projects which: • Disturb greater that 4,000 square feet • Excavate or fill 400 cubic yards • Disturb greater that 300 linear feet of trenching • Involve any road or waterway

Section 4
Storm Water Management System

4.1 Introduction

The storm water management system within the Mequon/Thiensville study area includes storm sewer, drainage ditches, culverts, streams, and wetlands. An inventory of the storm water management system was conducted as part of the preparation of this Storm Water Management Master Plan. The information gathered is used to provide input into the modeling analyses, help define the existing storm water related problems, and provide the data base needed to develop alternative storm water management measures.

4.2 Hydraulic Structure Inventory

An inventory to identify and document drainage and hydraulic control structures was conducted jointly by CDM and City of Mequon staff during the Spring of 1997. The primary purpose of the inventory was to collect data on the roadway culverts and bridges. Information related to existing storm sewers, detention ponds, and outfalls was also gathered as part of the inventory.

Nearly 1,800 culverts were observed and documented during the inventory. The inventory included culverts with a diameter of 12-inches and larger that crossed public roads. During the inventory, each culvert was assigned an identification number based on its location. The identification number includes the public land survey range and section, and a culvert number. For example culvert 22-32-087 is located in range 22, section 32. The inventory included:

- visual survey of all roadways within the study area to identify culvert crossing locations,
- field inspection of each culvert or structure,
- completion of a culvert inventory worksheet, and
- photographing the culvert or structure.

The field inspection documented:

- the shape, dimensions, length, and construction material of the culvert,
- the distance from the upstream invert to the top of the roadway,
- the physical and hydraulic condition of each culvert, and
- observed deterioration, sediment accumulation, erosion, and/or ponding.

A copy of a completed inventory worksheet is shown on Figure 4-1. The information collected during the field inspection, along with the nearest cross street, is summarized on a database which was provided to the City of Mequon. The culvert information is included in the storm water facility reference system.

Of the 1,800 culverts observed, 551, or 31 percent, were at least partially blocked and 161, or 9 percent, have at least one crushed end. The culverts with the most significant maintenance or safety problems and require maintenance are summarized in Table 4-1.

Figure 4-1 Example of Culvert Inventory Worksheet

RR 24 Apr 26

MEQUON CULVERT INVENTORY WORKSHEET:

LOCATION DESCRIPTION: 2229 084

Date:				
Road(s):			Photo #:	
Number:			#1	85-30 W
Map #:			#2	85-31 E
Mequon #:				

PHYSICAL DESCRIPTIONS:

# of Culverts:

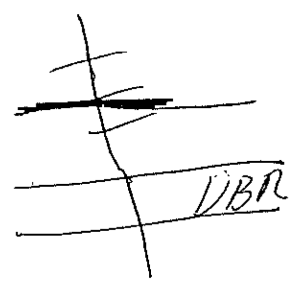
		Culvert: A	B	C	
Shape:		Steel/tri			
Dimensions:					
	Width:				inches
	Height:				inches
	Diameter:	36			inches
	Length:	48'			feet
	Top of road:	9.5			feet
Material Type:		cm			
End Conditions:					

Sketches:

Cross-Section Arrangement

Steel w/ CM mits

Layout



Comments:

A majority of the City of Mequon is serviced by drainage ditches and culverts. The condition and size of the drainage ditches are widely varied. Field inspection indicated that sections of ditch have been filled or otherwise blocked in some areas.

Each subwatershed was divided into subbasins in order to evaluate the hydraulics and water quality impacts. Most of the subbasins vary in size from approximately 10 to 600 acres. The subbasins are delineated based on a review of existing topographic maps, existing storm sewer maps, and, if necessary, field inspection. In general, the subbasins are delineated so that each subbasin contains an area which drains to a specific inflow point or connecting point on the main storm water drainage system.

Major features of the Mequon/Thiensville drainage system are presented in a water resources map shown on Figure 4-2. Major features shown on the map include:

- Primary drainage system
- Primary system culverts
- Storm sewers
- Outfalls
- Watershed Boundaries
- Sub-watershed Boundaries
- Subbasin Boundaries
- Floodplain Boundaries

4.4 Streambank Inventory

Streambank erosion is responsible for the delivery of hundreds of tons of sediments to receiving streams annually. In order to reduce the sediment loading existing and potential streambank erosion areas must be identified and repaired. A detailed field inventory of the stream channels within the study area was conducted to evaluate the channel stability and to prioritize streambank reaches which require stabilization measures. Approximately 38 miles of channel were evaluated using field techniques developed by the U.S. Department of Agriculture. The channels included in the inventory are shown on Figure 4-3. The techniques used, known as the Pfankuch Method, inventoried nine stability indicators of the upper bank and the lower bank areas of the stream reach channel. Each indicator is classified as excellent, good, fair, or poor. The Pfankuch Method assigns a numeric value to each classification which when totaled for all of the indicators results in an overall stream reach classification. A description of the indicators and classifications is presented in Table 4-2.

The streambank inventory included:

- Identification of steams within the study area based on base maps provided by the City of Mequon.
- Field inspection of identified streams including completion of a field form evaluating each stream reach. A copy of a competed field form is presented in Appendix B.
- Evaluation of overall streambank conditions.

Figures 4-4, 4-5, and 4-6 show examples of stream reaches inventoried and the classification ratings. Inventory results for each reach of stream inventoried are presented in Appendix B. A summary of the streambank indicators is shown on Figure 4-7.

Table 4-1: Culvert Maintenance Priority List

Culvert Identification Number	Nearest Cross Street	Maintenance Issue
22-32-087	Deer Run Lane	East side extending 5 feet out from bank without support West side entrance lifted 1 foot above ground surface
21-23-042	Parkview Drive	North side 5 foot deep scour
22-32-021	Shaker Circle	Erosion around outlet pipe at Fish Creek
22-32-045	Juniper Land and Otto Road	South side of 12-inch CM culvert completely buried. Water standing
22-19-016	Woodside Lane	South side 18-inch CM culvert completely blocked
21-22-034	Cedarburg Road at City Hall	North side 6-inch concrete drain completely blocked
21-06-004	Pioneer Road	North side 15-inch CM culvert 50% underwater South side 100 % underwater, culvert appears to be back pitched
22-32-009	Courtland Drive and Auburn Court	Culvert extending from bank 8 feet without support - 4 foot drop to Fish Creek
21-13-020	Ville Du Parc Drive	21.6- by 13.2-inch CM arch with bottom completely rusted away
22-06-005	Bonniwell Road East of Oriole Lane	72- by 41-inch concrete box with severe scour of channel and endwalls
21-21-056	Wauwatosa Road	24-inch CM culvert with bottom completely rusted away
21-36-003	County Line Road	21.6-inch CM culvert in poor overall condition

4.3 Water Resources System

The water resource system within the study area includes waterways, storm sewers, and drainage ditches. Approximately 10 percent of the study area is serviced by storm sewer and the remainder of the study area is serviced by drainage ditches and culverts.

The storm sewered areas are generally located in Thiensville and in the commercial areas of Mequon located along Port Washington Road. Miscellaneous storm sewers are present throughout the City of Mequon. The storm sewer ranges in size from 12- to 36-inch diameter pipe with a majority of the storm sewers ranging from 12- to 24-inch diameter pipe.

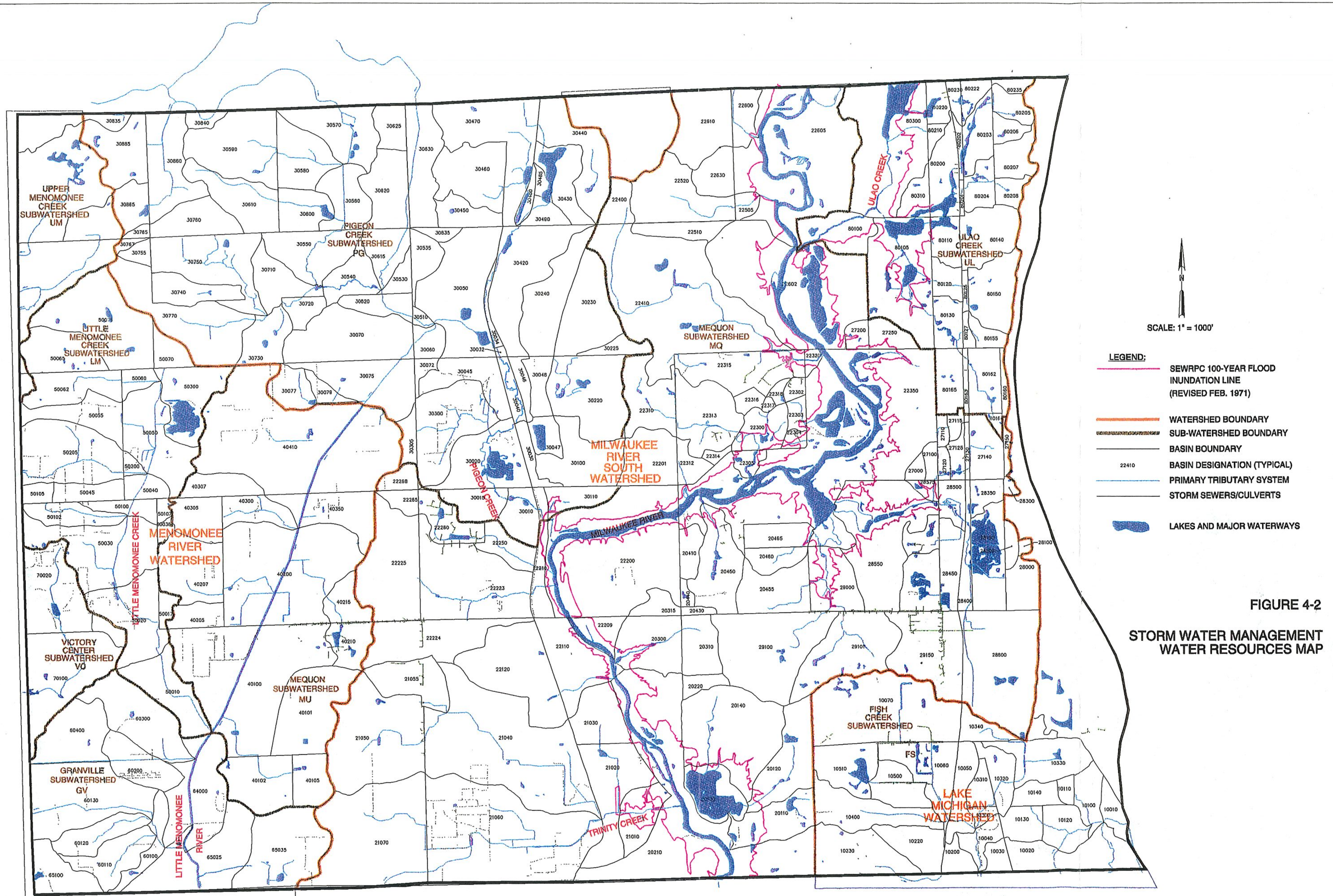


FIGURE 4-2

STORM WATER MANAGEMENT WATER RESOURCES MAP

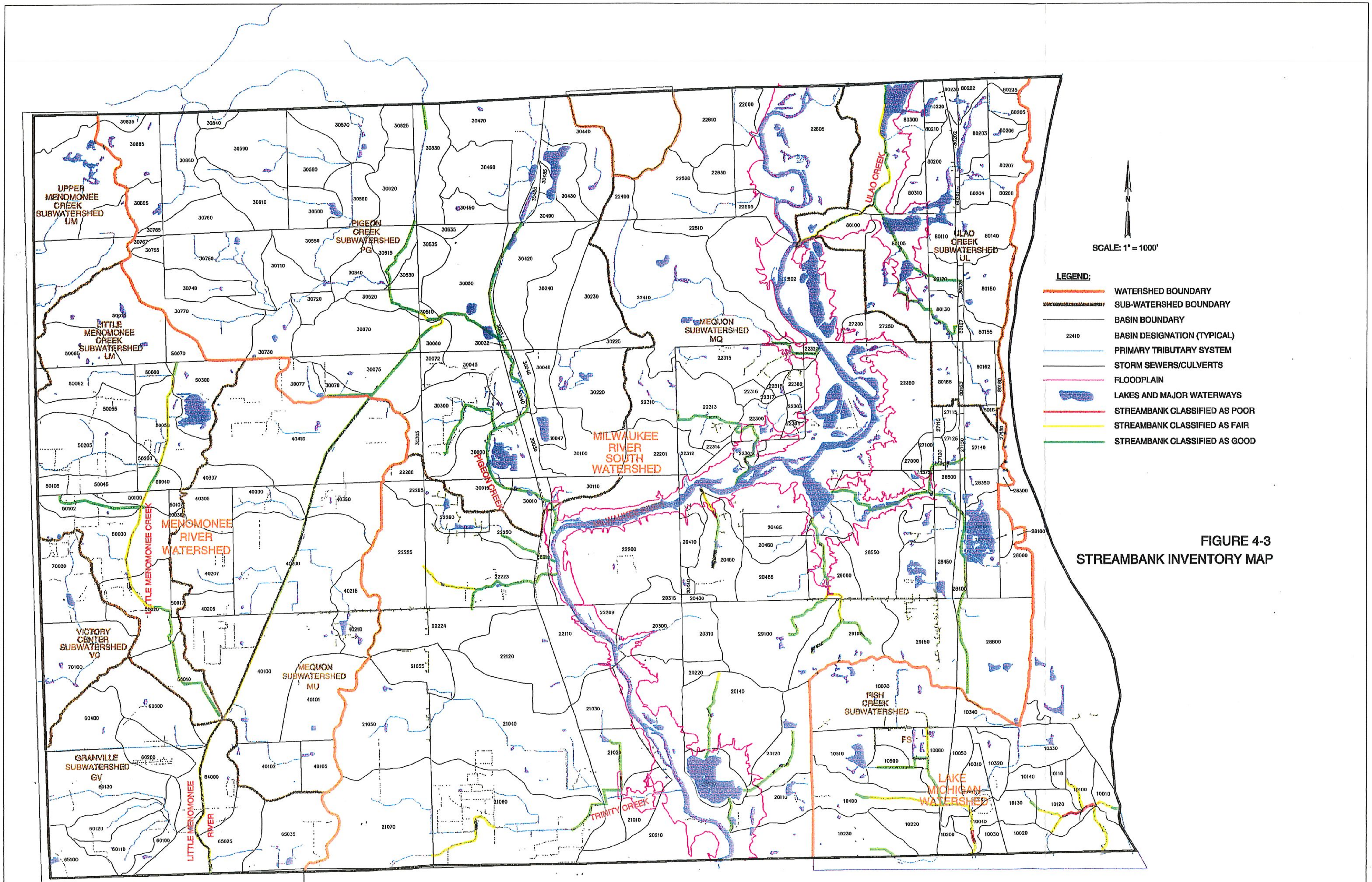


FIGURE 4-3
STREAMBANK INVENTORY MAP

Table 4-2: Summary of Stream Inventory Indicators and Classification

Location	Indicator Item Rated	Classification			
		Excellent	Good	Fair	Poor
Upper Bank - *area between normal high water line and extreme high water line*	Landform Slope - *steepness of land adjacent to the channel, related to extent and ease of erosion*	Slope <30%	Slope 30 - 40 %	Slope 40-60%	Slope >60%
	Mass Wasting or Failure - *detachment of soil and movement downslope, potential for large volumes of material to be introduced into the stream*	No evidence of occurrence	Infrequent or very small occurrences	Moderate frequency and size occurrences	Frequent or large occurrences
	Debris Jam Potential - *floatable objects such as branches or logs located along the bank, potential for the development of flow deflection and creation of debris jams*	Essentially absent	Mostly small twigs and limbs	Present - quantity and size of material increasing	Moderate to heavy amounts - mostly large size materials
	Vegetative Bank Protection - *density of vegetation on the bank, related to stability of bank soils and reduction in erosion potential*	Over 90% plant density	70-90% plant density	50-70% plant density	<50% Plant density
Lower Bank - *area between the waters edge during low flow period to the normal high water line*	Channel Capacity - ability of channel to transmit the volume of water	Ample for present flow and increases	Adequate - Overbank flow rare	Barely contains present peak flow	Inadequate - overbank flow common
	Bank Rock Content - amount and size of rocks in the bank materials, related to the resistance to flow forces which may cause erosion	65% rock - large boulders >12" diameter	40-65% rock - mostly small boulders and cobbles 6-12" diameter	20-40% rock - 3-6" diameter	<20% rock - 1-3" diameter
	Obstructions - objects within the stream channel, obstructions may change in flow direction and velocity	Rocks/old logs embedded - flow pattern without cutting or deposition	Some present - causing erosive cross currents and minor pool filling	Moderately frequent - causing bank cutting and filling of pools	Frequent obstructions - causing yearlong bank erosion and channel migration
	Cutting - loss of vegetation protection on bank or increase in bank steepness	Little or none evident: raw banks infrequent and less than 6" high	Some present: raw banks up to 12" high	Significant: raw banks 12-24" high	Almost continuous cuts: some over 24" high
	Deposition - deposition of sediment resulting in growth of sediment bars, indication of upstream erosion	Little or no evidence	Some new increases	Moderate deposition	Extensive deposition

Source: *Stream Reach Inventory and Channel Stability Evaluation* (U.S. Department of Agriculture Forest Service 1975)

Figure 4-4: Examples of Stream Reaches Rated "Good"

Subwatershed: Mequon -MQ
Reach: MQ-H from River Road West to the Milwuakee River

Subwatershed: Pigeon Creek
Reach: PG-E

Subwatershed: Fish Creek
Reach: FS-I from County Line Road Northwest

Figure 4-5: Examples of Stream Reaches Rated "Fair"

Subwatershed: Lake Michigan
Reach: LM-A from Eastwyn Bay Drive southeast

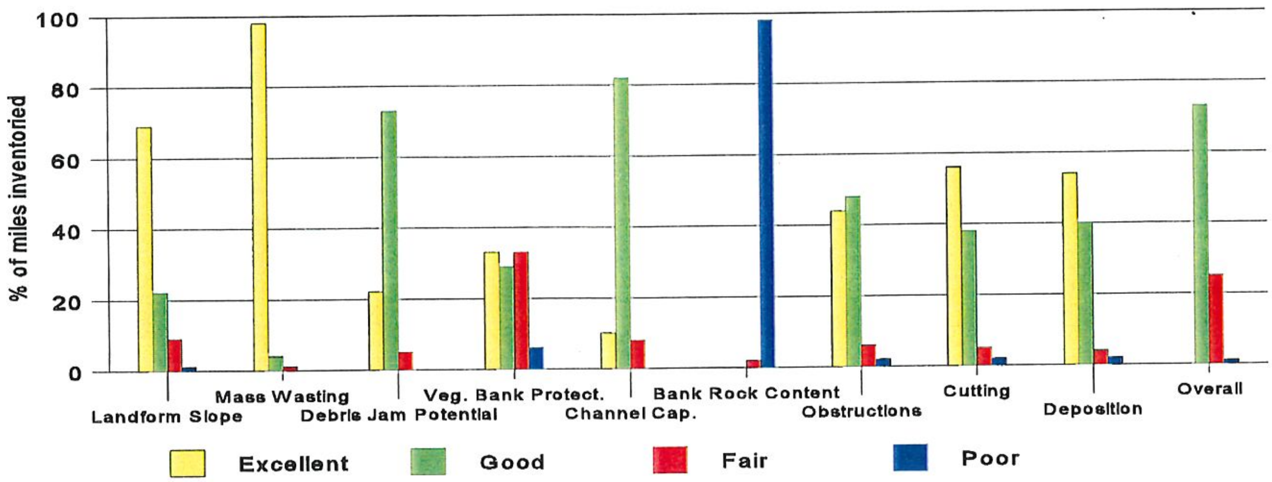
Subwatershed: Fish Creek
Reach: FS-A east of Juniper Circle

Subwatershed: Pigeon Creek
Reach: PG-1 from Sunset Road North

Figure 4-6: Example of a Stream Reach Rated "Poor"

Subwatershed: Fish Creek
Reach: FS-E East of Cedar Court

Figure 4-7: Summary of the Streambank Indicator Classification



The inventory of the streambank conditions indicated that:

- Of the streambanks inventoried, the overall reach condition of 30 miles, or 73 percent, is classified good; 10 miles, or 25 percent, is classified fair, and 0.5 miles, or 1 percent, is classified poor.
- Bank rock content is classified as poor for almost all, 98 percent, of the streambanks inventoried. This indicates that 40 miles of streambank have less than 20 percent rock in the bank and is a reflection of the overall geology of the area.
- Vegetative bank protection is the most common indicator, other than bank rock content, to be rated fair or poor. Sixteen miles, or 39 percent, of the streambanks have less then 70 percent plant density.
- No evidence of mass wasting was observed in the 40 miles of the streambank inventoried.
- The Fish Creek, Little Menomonee, and MQ Mequon subwatersheds have the greatest percentage of streambanks showing significant signs of erosion, streambanks with an overall classification of fair or poor.
- The Pigeon Creek, Ulao, and MU Mequon subwatersheds have the greatest percentage of streambanks in good overall condition.

A summary of the streambank classifications is shown on Figure 4-7 and presented in Table 4-3.

Based on overall condition of the streambanks, the stream reaches with the most significant stability concerns are summarized in Table 4-4. The stability concerns within these reaches should be repaired. Alternatively, streambanks which received the highest ratings, should be protected. The streambank reaches rated highest are summarized on Table 4-5.

Table 4-3: Summary of Streambank Conditions by Subwatershed

	UPPER BANK																LOWER BANK																				Overall Reach Condition			
	Landform Slope				Mass Wasting or Failure				Debris Jam Potential				Vegetative Bank Protection				Channel Capacity				Bank Rock Content				Obstructions				Cutting				Deposition							
	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor
Fish Creek																																								
# of Reaches	6	8	11	1	22	3	1	0	4	18	3	1	5	3	12	6	4	20	2	0	0	0	0	26	13	9	1	3	9	10	3	4	9	10	4	3	0	9	15	2
Miles of Stream	1.1	1.9	1.8	0.4	4.6	0.4	0.2	0	1.1	3.3	0.7	0.1	1.2	0.6	2.3	1.1	1	3.9	0.3	0	0	0	0	5.2	2.4	1.5	0.6	0.7	2.3	1.6	0.6	0.7	2.1	1.4	1.1	0.6	0	1.6	3.1	0.5
Little Menomonee																																								
# of Reaches	9	3	2	0	14	0	0	0	4	8	2	0	2	4	8	0	0	14	0	0	0	0	0	14	7	7	0	0	5	8	1	0	5	8	1	0	0	10	4	0
Miles of Stream	2.6	1.2	1.1	0	4.9	0	0	0	0.9	3.8	0.2	0	0.7	0.7	3.5	0	0	4.9	0	0	0	0	0	4.9	3	1.9	0	0	1.7	2.9	0.3	0	0.6	4	0.3	0	0	2.9	2	0
Mequon																																								
# of Reaches	54	9	2	0	58	6	1	0	13	50	2	0	23	28	14	0	12	47	6	0	0	0	3	62	34	25	5	1	38	21	6	0	45	19	1	0	0	55	10	0
Miles of Stream	11	2.4	0.6	0	13	1	0.1	0	4	9.7	0.3	0	6.5	4.9	2.6	0	2.1	11	0.8	0	0	0	0.4	14	7.6	4.9	1.4	0.1	8.9	4.2	0.9	0	10	3.7	0.1	0	0	12	1.7	0
Pigeon Creek																																								
# of Reaches	23	3	0	0	26	0	0	0	7	18	1	0	10	9	6	1	3	22	1	0	0	0	1	25	14	11	1	0	16	10	0	0	19	7	0	0	0	24	2	0
Miles of Stream	7.9	0.5	0	0	8.4	0	0	0	2.3	6	0.1	0	3	3.4	1.7	0.3	0.9	7.2	0.3	0	0	0	0.3	8.1	4.7	3.6	0.1	0	5.4	3	0	0	5.9	2.5	0	0	0	8	0.4	0
Ulao Creek																																								
# of Reaches	11	1	0	0	11	1	0	0	2	7	3	0	4	6	2	0	0	5	7	0	0	0	1	11	1	9	2	0	5	5	2	0	8	3	0	1	0	8	4	0
Miles of Stream	3.4	0.2	0	0	3.2	0.4	0	0	0.4	2.5	0.7	0	1.8	1.5	0.3	0	0	1.6	2	0	0	0	0.2	3.4	0.1	3	0.5	0	2	1.3	0.3	0	2.5	0.9	0	0.2	0	2.7	0.9	0
Mequon (MU)																																								
# of Reaches	4	3	0	0	7	0	0	0	2	5	0	0	2	1	3	1	0	7	0	0	0	0	0	7	2	5	0	0	4	3	0	0	3	4	0	0	0	5	2	0
Miles of Stream	2.1	1.5	0	0	3.6	0	0	0	0.2	3.4	0	0	0.2	0.6	1.9	0.9	0	3.6	0	0	0	0	0	3.6	0.2	3.4	0	0	2.5	1.1	0	0	0.8	2.8	0	0	0	2.6	1	0
Granville																																								
# of Reaches	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	1	0
Miles of Stream	0	1.3	0	0	1.3	0	0	0	0	1.3	0	0	0	0	1.3	0	0	1.3	0	0	0	0	0	1.3	0	1.3	0	0	0	1.3	0	0	0	1.3	0	0	0	0	1.3	0
Total																																								
# of Reaches	*107*	*28*	*15*	*1*	*139*	*10*	*2*	*0*	*32*	*107*	*11*	*1*	*46*	*51*	*46*	*8*	*19*	*116*	*16*	*0*	*0*	*0*	*5*	*146*	*71*	*67*	*9*	*4*	*77*	*58*	*12*	*4*	*89*	*52*	*6*	*4*	*0*	*111*	*38*	*2*
Miles of Stream	*28*	*9*	*3.5*	*0.4*	*39*	*1.8*	*0.3*	*0*	*8.9*	*30*	*2*	*0.1*	*13*	*12*	*14*	*2.3*	*4*	*34*	*3.4*	*0*	*0*	*0*	*0.9*	*40*	*18*	*20*	*2.6*	*0.8*	*23*	*15*	*2.1*	*0.7*	*22*	*17*	*1.5*	*0.8*	*0*	*30*	*10*	*0.5*
% Based on Miles	*69*	*22*	*9*	*1*	*95*	*4*	*1*	*0*	*22*	*73*	*5*	*0*	*33*	*29*	*33*	*6*	*10*	*82*	*8*	*0*	*0*	*0*	*2*	*98*	*44*	*48*	*6*	*2*	*56*	*38*	*5*	*2*	*54*	*40*	*4*	*2*	*0*	*73*	*25*	*1*

Table 4-4: Summary of Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed /Stream Reach Designation	Reach Length (miles)	Location	Overall Rating	Streambank Stability Concern
Fish Creek/ FS-E	0.7	Tributary to Fish Creek from Zedler Lane to County line Road	Fair/ Poor	poor vegetative bank protection, cutting, deposition, land form slope, mass wasting
Fish Creek/ FS-B	0.5	Tributary to Fish Creek, 0.1 mile east of Otto Road east to Fish Creek	Fair/ Poor	poor vegetative bank protection, cutting, deposition, debris jam potential, landform slope
Fish Creek/ FS-D	0.1	Tributary to Fish Creek, from conduit to FS-B	Fair	poor vegetative bank protection, landform slope
Lake Michigan / LM-A	0.4	Tributary to Lake Michigan, from Eastwyn Bay Drive southeast to Lake Michigan	Fair	poor vegetative bank protection, cutting, deposition, debris jam potential
Mequon - MQ / MQ-W	0.2	Tributary to the Milwaukee River, north of Elmdale Road, from Arrowhead Road extended to the Trinity Lutheran property	Fair	poor vegetative bank protection, debris jam potential, obstructions, cutting, deposition
Ulao Creek / Ulao Creek	0.1	Tributary to the Milwaukee River, north of Bonniwell, from 0.2 miles north of the intersection with UL-B 0.1 mile north	Fair	poor vegetative bank protection, debris jam potential, obstructions, cutting
Mequon - MQ / MQ-W	0.1	Tributary to the Milwaukee River	Fair	cutting, deposition
Fish Creek / FS-C	0.3	Tributary to Fish Creek, from FS-B to east to Zedler Lane	Fair	poor vegetative bank protection, cutting, landform slope
Pigeon Creek / Pigeon Creek	0.9	Tributary to the Milwaukee River, from Mequon Road to junction with Little Menomonee River	Fair	poor vegetative bank protection
Fish Creek / FS-F	0.2	Tributary to Fish Creek, from Kathleen Drive south to FS-E	Fair	obstructions, debris jam potential

Table 4-5: Summary of Stream Reaches Rated Most Stable

Subwatershed/ Stream Reach Designation	Reach Length (miles)	Location	Overall Rating
Mequon - MQ / MQ-W	0.5	Tributary to the Milwaukee River, from Baehr Road east to east of railroad tracks	Good
Mequon - MQ / MQ-W	0.2	Tributary to the Milwaukee River, from Cedarburg Road to the Milwaukee River	Good
Pigeon Creek / PG-A	0.2	Tributary to Pigeon Creek, from Sunset Road north 0.2 miles	Good
Pigeon Creek / PG-E	0.3	Tributary to Pigeon Creek	Good
Mequon - MQ/ MQ-A	0.6	Tributary to the Milwaukee River, from Country Club Drive north 0.6 miles	Good
Mequon - MQ / MQ-H	0.5	Tributary to the Milwaukee River, from River Road west to the Milwaukee River	Good
Mequon - MQ / MQ-R	0.3	Tributary to the Milwaukee River, from MQ-S southeast to Buntrock Avenue	Good
Pigeon Creek / Pigeon Creek	0.1	Tributary to the Milwaukee River, from Mequon Road north 0.1 mile	Good

4.5 Wetlands Inventory

The value of wetlands include their capacity to drain surges of storm water runoff and their ability to remove sediment and nutrients from surface water. The large storage capacity and controlled outfall of many wetlands detain storm water and release it slowly in more evenly distributed flow after a storm event. The long detention time, complex flow patterns, and nutrient uptake by wetland plants combine to make many wetlands very effective for removal and storage of sediment and for the removal and transformation of some dissolved nutrients from surface waters. The physical attributes of wetlands which provide storage capacity and flow control, such as very slow flow and a large storage capacity, also are favorable for water quality improvements.

An inventory of wetlands greater than two acres located within the study area was conducted. The wetlands inventory evaluated existing wetlands, as well as, wetlands which have been previously disturbed and prior converted wetlands. The purpose of the wetland inventory is to evaluate the existing wetland conditions based on:

- effectiveness - the existing wetland capacity to contribute to storm water management, and
- opportunity - the potential of the wetland to provide additional storm water management benefits with modification or restoration.

Wetlands which are currently effective have high functional value and typically possess little opportunity for improvement, while wetlands which are not currently effective have high opportunity for improvement.

The wetland inventory included:

- Location and mapping of wetlands in the study area over two acres based on the following information:
  - topographic maps (1 inch = 200 feet scale)
  - 1995 SEWRPC aerial photographs
  - WDNR, 1986, Final Wetland Inventory Maps for Mequon
  - NRCS Draft Wetland Inventory Maps showing an estimated boundary of wetland, farmed wetland, and prior-converted wetland areas.

- Field inspection of mapped existing and previously altered/prior converted wetland areas

- Evaluation of the effectiveness of the wetland areas to provide flood flow detention, sediment retention, and nutrient removal and transformation based on:
  - wetland acreage,
  - slope,
  - wetland soil elevation relative to the mean water surface elevation,
  - presence of inlets and outlets,
  - outlet water level control and flow characteristics, and
  - flooding extent and duration.

- Evaluation of the opportunity of each wetland area to perform flow and water quality improvement functions based on:
  - sediment and nutrient sources within the drainage basin of the wetland,
  - surface water drainage area of the wetland,
  - size of the wetland relative to its watershed,
  - relationship to other wetlands within the subbasin, and
  - local slope and topography related to delivery of surface water runoff to the wetland.

The inventory identified 202 wetland areas within the study area, of which 73 areas are prior converted. The wetland areas identified total over 3,400 acres, or 11 percent, of the study area. All of the wetland areas identified have been disturbed by development activities. Wetland areas are summarized on Table 4-6.

Table 4-6: Summary of Wetland Areas within the Mequon/Thiensville Study Area

Subwatershed	Total Acres of Wetlands Inventoried	Acres of Existing Wetlands	Acres of Prior Converted Wetlands	Total Value Acres [1]	Total Potential Acres [2]
Fish Creek	67	25	42	46	46
Mequon (MQ)	749	521	228	502	333
Pigeon Creek	742	513	229	484	388
Mequon (MU)	677	246	431	156	677
Little Menomonee	465	336	129	257	347
Granville	127	39	88	29	88
Victory Center	63	48	15	48	15
Ulao Creek	326	326	--	321	115
Menomonee	182	163	19	116	79
Cedar Creek	35	2	33	2	33

notes: 1- total value acres = the total acres with a current value (effectiveness) rating of moderately-high or greater.
2- total potential acres = the total acres with a potential for additional effectiveness (opportunity) rating of moderately high or higher.

A more detailed summary of the analysis results, including the evaluation of each inventoried wetland, is presented in Appendix C.

The evaluation of the wetland areas indicate that:

- 1,960 acres, 57 percent, of the wetland areas inventoried currently have at least moderately high value for surface water quality and flow improvement
- 2,120 acres, 62 percent, of the wetland areas inventoried currently have at least moderately high additional potential for surface water improvement.
- A majority of the wetland areas with high potential for storm water management in prior converted wetland areas. Many of the prior converted wetlands have been ditched.
- Ditching has substantially impacted the hydrology of 64 percent of the wetland areas inventoried.
- The area with the highest potential for storm water management is located west and southwest of the Village of Thiensville, within the Little Menomonee Creek and Little Menomonee River/ Mequon (MU) subwatersheds.
- The wetlands which are the nearest to being of natural area quality and which have high wildlife value are located within the floodplain forests along the Milwaukee River.

Although all of the existing wetland areas identified in the inventory were disturbed by urban development, several areas maintain a high value as a wetland area and should be protected from future disturbance. The wetland areas which are identified as having the greatest value are summarized in Table 4-7.

Table 4-7: Significant Wetland Areas within the Mequon/Thiensville Study Area

Subwatershed	Wetland Reference Number: Location	Area (acres)	Importance
Ulao Creek	315: southwest quadrant of intersection of Bonniwell and Port Washington Rds.	107.8	These floodplain wetlands are important ecologically because they are part of larger, connected systems of primary environmental corridor and wildlife habitat along the stream systems. Many of these wetlands are either forested or adjacent to larger blocks of forested land.
	316: north of Highland Rd. And west of Port Washington Rd.	29.8	
	317: southeast quadrant of Bonniwell and Port Washington Rds.	10.5	
	330: northeast quadrant of Bonniwell and Port Washington Rds.	13.8	
	333: east of Northwest Railroad, north of Bonniwell Rd.	17.7	
	345: south of Pioneer Rd. adjacent to Ulao Creek	49.4	
	346: north of Bonniwell adjacent to Ulao Creek	55.2	
Milwaukee River	90 - 101: twelve wetland areas south of Highland Rd. to south of Glen Oaks Ln., adjacent to the Milwaukee River	103.4	These floodplain wetlands are important ecologically because they are part of larger, connected systems of primary environmental corridor and wildlife habitat along the stream systems. Many of these wetlands are either forested or adjacent to larger blocks of forested land.
	143: west of Pt. Washington Rd., south of Glen Oaks Ln.	30.7	
Pigeon Creek	155: south of Highland Rd., adjacent to Pigeon Creek	17.9	These wetland areas are connected to important upland natural areas (Highland Woods). They also support and are part of the general habitat area for a particularly high concentration of rare plants in this portion of the Pigeon Creek floodplain
	160: north of Highland Rd., east of Wauwatosa Rd., adjacent to Pigeon Creek	29.3	
	161: north of Highland Rd., west of Cedarburg Rd.	5.2	

Section 5
Hydrologic/Hydraulic Analysis

5.1 Introduction

Managing and controlling flood flows are critical activities in an efficient, cost-effective, and environmentally sound stormwater management plan. A hydrologic/hydraulic analysis was conducted on the primary stormwater drainage network in Mequon. The purpose of this analysis includes:

- Identification and verification of overbank flooding problems during different storm events
- Determination of the capacity provided by culverts and hydraulic structures
- Evaluation of alternative flood management solutions

The analysis was conducted using the Stormwater Management Model (SWMM). SWMM is a computer program developed by the United States Environmental Protection Agency for computation of stormwater runoff flows. It currently consists of two main modules. These modules are a hydrologic model called RUNOFF and an unsteady flow hydraulic model called EXTRAN. RUNOFF computes the flow and volume of surface runoff from a specified subwatershed resulting from a particular rainfall event. EXTRAN computes the movement of the runoff through the drainage system using a procedure known as routing. The routing computations yield the depth and flow rates of the flow throughout the drainage network.

The hydrologic/hydraulic analysis addresses only the primary stormwater drainage system. The primary system consists of the major storm sewers and open channels that carry flood runoff. It does not include components that drain only private property or driveway culverts. Components of the primary system generally have a contributing drainage area greater than 40 acres.

The following tasks were completed in the hydrologic/hydraulic analysis:

- Collection of data related to the stormwater drainage system
- Development of the hydrologic model
- Development of the hydraulic model
- Review and verification of the models
- Evaluation of the existing system
- Identification of system deficiencies
- Evaluation of future system conditions
- Development and identification of stormwater management alternatives to mitigate system deficiencies

5.2 Hydrologic/Hydraulic Data

The primary sources of data used to develop the models were the 1-inch = 100-foot scale SEWRPC topographic maps of the City of Mequon and field data collected during the hydraulic structure inventory (Section 4.2). Additional sources of data include:

- City of Mequon Flood Insurance Study
- City of Mequon Flood Insurance Study Computer Models
- Ozaukee County Soil Survey
- 1" = 400' scale Aerial Photographs
- City of Mequon Land Use Plan for 2020
- Village of Thiensville Storm Sewer Atlas
- USGS 7.5 minute Quadrangle Maps
- ISWS Bulletin 71 Rainfall Information

5.3 Hydrologic Model Development

The Mequon/Thiensville study area is divided into major subwatersheds in conjunction with the development of the WDNR priority watershed plans for the Milwaukee River South and Menomonee Rivers. Eight of the major subwatersheds are partially located within the study area as identified on Table 5-1.

Table 5-1: Subwatershed Identification System

Number	Subwatershed	Area (acres)	Identification Code
1	Fish Creek	1,890	FS
2	Milwaukee River Mequon	12,214	MQ
3	Pigeon Creek	5,957	PG
4	Little Menomonee River Mequon	2,912	MU
5	Little Menomonee Creek	2,042	LM
6	Granville/ Upper Menomonee River	1,588	GV
7	Victory Center	421	VC
8	Ulao Creek	1,491	UL

The two letter codes were either assigned by WDNR or determined for the purpose of this study. Hydrologic and hydraulic models were developed for each of the above subwatersheds except for the Granville, Upper Menomonee River, and Victory Center subwatersheds which have insignificant drainage areas. The Fish Creek, Pigeon Creek, and Ulao Creek subwatersheds have substantial drainage area outside of the study area boundaries which are included in the models.

- Control Structures - Control structures are typically weirs, orifices, and pumps. EXTRAN provides the capability to represent several common hydraulic control structures. Weirs are used in the study area model to represent some roadway and detention pond overflows. Orifices and weirs are common methods of regulating detention pond outflows and are used in the representation of several potential stormwater management alternatives.

- Outfalls and Boundary Conditions - Each primary drainage system is generally modeled down to a point where flow leaves the study area or discharges to the Milwaukee River. The Fish Creek system, which flows out of and then returns into the City of Mequon before emptying into Lake Michigan, is modeled to the discharge point of Lake Michigan. The downstream outlet of an EXTRAN model, where the stormwater flow discharges, is called an outfall. A boundary condition, either a fixed water level or a free outfall (no backwater), must be specified for each outfall. The normal Lake Michigan water level (579.0 feet) is used as the boundary condition for the Fish Creek model. Normal Milwaukee River water level, obtained from the SEWRPC topographic maps, is used as the boundary condition for Ulao Creek, Pigeon Creek, and 16 smaller streams of the Mequon-MQ subwatershed. Ten-year event water levels, obtained from the Flood Insurance Study, were used to evaluate the effect of high Milwaukee River stages on each outfall.

5.5 Hydrologic/Hydraulic Analysis Results

The SWMM hydrologic and hydraulic models were used to evaluate drainage system performance for rainfalls corresponding to the 2-, 10-, 25- and 100-year recurrence interval storm events. Where applicable, based on a change in land use conditions, the model run was repeated under anticipated future land use conditions. The main objective of the analysis was to characterize the known flooding and drainage problems and to identify any deficient components of the stormwater drainage system including inadequate bridges or culverts.

5.5.1 Existing Conditions Analysis

The existing conditions analysis is based on land uses taken from the 1-inch = 200-feet scale 1993 aerial photos obtained from SEWRPC. The land use analysis indicated that impervious areas such as roads, roofs, and parking lots covered approximately 22 percent of the Fish Creek subwatershed, 18 percent of the Mequon-MQ subwatershed, and 17 percent of the Ulao Creek subwatershed. The Mequon - MU and Pigeon Creek subwatersheds each have less than 10 percent impervious area.

The computer model was used to compute stream flows and water elevations throughout the primary stormwater system in Mequon. These flows and elevations were based on 24-hour rainfall events having average return frequencies of 2-, 10-, 25-, and 100-years. The model produces complete hydrographs and elevation sequences from the full simulation period of 36 to 48 hours. Although the peak flow and elevation are reported in the results, the hydrograph is available to characterize the duration of high flows. Selected results of the analysis are presented in Table 5-2. The results presented in Table 5-2 represent a small sample of the 435 locations where elevations and flows are computed in the model. Table 5-2 lists the peak elevation and flow at selected locations for each modeled storm frequency. The maximum flow and upstream elevation of each road crossing culvert in the primary system are provided in Appendix D.

Table 5-2: Modeled Peak Flow and Elevation under Existing Conditions

Location	Modeled Peak Flow				Modeled Peak Elevation			
	2-Year (cfs)	10-Year (cfs)	25-Year (cfs)	100-Year (cfs)	2-Year (ft)	10-Year (ft)	25-Year (ft)	100-Year (ft)
Fish Creek at County Line Road	205	326	446	728	656.00	657.03	657.92	659.82
E. Br. Fish Creek at Zedlar Lane	27	44	59	92	675.72	677.85	678.42	679.56
W. Br. Fish Creek at Port Washington Road	151	230	271	376	673.32	675.29	676.42	678.15
MQ Tributary Kathleen Lane at Cedarburg Road	224	310	381	567	648.90	649.48	649.92	650.75
MQ Tributary Baehr Road at Donges Bay Road	50	79	105	198	678.50	678.86	679.14	679.97
MQ Tributary at Chestnut Road	80	117	151	254	664.62	665.58	666.25	666.89
MQ Tributary at Port Washington Road south of Glen Oaks Lane	25	33	43	64	660.58	660.99	661.27	661.73
MQ Tributary near Mequon Road and I-43	32	55	75	128	667.50	667.87	668.25	669.17
MQ Tributary at Cedarburg Road near City Hall	76	116	150	259	659.46	659.93	660.27	660.84
MQ Tributary at Highland Road and Shoreland Drive	20	39	64	173	662.44	663.02	663.63	665.55
Pigeon Creek at Freistadt Road	157	241	302	446	662.97	663.65	664.64	669.01
Pigeon Creek Tributary at Cedarburg Road and Bonniwell Road	27	45	76	221	700.33	700.61	700.94	702.27
Pigeon Creek Tributary at Bonniwell Road and Wauwatosa Road	6	7	15	148	773.80	773.84	774.12	776.05
Pigeon Creek at Wauwatosa Road	2	3	4	41	727.48	727.56	727.61	728.77
Little Menomonee River (MU) at Mequon Road	9	27	85	197	727.23	728.36	728.70	729.83
MU Tributary near Swan Road and Donges Bay Road	4	6	9	30	736.92	737.16	737.75	739.17
Ulao Creek at Bonniwell Road	176	332	532	1020	660.21	661.43	662.64	664.70
Ulao Creek at Pioneer Road	388	639	895	1580	666.32	667.10	667.80	669.38

The existing conditions analysis was used to identify flooding problem areas and reaches of insufficient channel and culvert capacity. Areas where overbank flooding is likely to be a problem are listed below:

- Fish Creek south of Donges Bay Road on both the east and west branches.
- Milwaukee River Kathleen Lane tributary east of Baehr Road.
- Milwaukee River tributary that drains the area east of Port Washington Road.
- Upper Menomonee River tributary through Huntington Park.
- Ulao Creek between Pioneer and Highland Road.

There are many additional areas of localized flooding that are not obvious from the model results. Not all of the above areas have damages associated with the flooding, for example along Ulao Creek.

5.5.2 Future Conditions Analysis

The future conditions analysis is primarily based on the City of Mequon land use plan as discussed in Section 3.2 of this report. Future conditions for the Village of Thiensville are considered to be similar to the existing land use conditions because the Village is fully developed.

A comparison of future and existing land use conditions indicates that future development affects 22 of the 228 modeled subbasins. There is no change under future land use conditions within the Fish Creek subwatershed, while imperviousness increased by 0.1 percent in the Pigeon Creek subwatershed, by 0.5 percent in the Mequon-MU subwatershed, and 1.1 percent in the Mequon-MQ subwatershed. These percentages are extremely small because very little commercial development is planned within the study area and it was assumed that five to ten-acre residential lots would not increase the directly connected impervious area over that of agricultural land. A 4.3 percent increase in impervious area is projected in the Ulao Creek watershed; two-thirds of this watershed is outside of the study area boundaries. Ulao Creek subwatershed areas in Grafton were assumed to develop such that the developed area would increase by 50 percent during the next 20 years.

Representative results from the future conditions water quantity analysis are presented in Table 5-3. Increases in flow and flood elevation which result from future land use conditions are presented in Table 5-4. The flow increases generally range from zero to 30 percent in flow and up to 0.62 feet in flood elevation. The greatest flow increases result from the anticipated future development in the Ulao Creek subwatershed. No flow increase is expected within the Fish Creek subwatershed or within a majority of the Mequon - MQ and Pigeon Creek subwatersheds.

Table 5-3: Modeled Peak Flow and Elevation under Future Conditions

Location	Modeled Peak Flow				Modeled Peak Elevation			
	2-Year (cfs)	10-Year (cfs)	25-Year (cfs)	100-Year (cfs)	2-Year (ft)	10-Year (ft)	25-Year (ft)	100-Year (ft)
Fish Creek at County Line Road	205	326	446	728	656.00	657.03	657.92	659.82
E. Br. Fish Creek at Zedlar Lane	27	44	59	92	675.72	677.85	678.42	679.56
W. Br. Fish Creek at Port Washington Road	151	230	271	376	673.32	675.29	676.42	678.15
MQ Tributary Kathleen Lane at Cedarburg Road	241	332	406	609	649.04	649.62	650.08	650.91
MQ Tributary Baehr Road at Donges Bay Road	50	79	105	198	678.50	678.86	679.14	679.97
MQ Tributary at Chestnut Road	80	117	151	254	664.62	665.58	666.25	666.89
MQ Tributary at Port Washington Road south of Glen Oaks Lane	25	33	43	64	660.68	661.04	661.37	661.82
MQ Tributary near Mequon Road and I-43	32	55	75	128	667.50	667.87	668.25	669.17
MQ Tributary at Cedarburg Road near City Hall	85	125	162	278	659.55	660.03	660.35	660.91
MQ Tributary at Highland Road and Shoreland Drive	20	39	64	173	662.44	663.02	663.63	665.55
Pigeon Creek at Freistadt Road	157	241	302	446	662.97	663.65	664.64	669.01
Pigeon Creek Tributary at Cedarburg Road and Bonniwell Road	28	47	79	227	700.34	700.63	700.97	702.32
Pigeon Creek Tributary at Bonniwell Road and Wauwatosa Road	6	7	15	148	773.80	773.84	774.12	776.05
Pigeon Creek at Wauwatosa Road	2	3	4	41	727.48	727.56	727.61	728.77
Little Menomonee River (MU) at Mequon Road	10	36	97	203	727.41	728.40	728.80	729.89
MU Tributary near Swan Road and Donges Bay Road	4	6	9	30	736.92	737.16	737.77	739.18
Ulao Creek at Bonniwell Road	231	432	643	1140	660.69	662.05	663.18	665.16
Ulao Creek at Pioneer Road	463	763	1060	1810	666.57	667.42	668.17	669.80

Table 5-4: Flow and Stage Increases Resulting from Future Land Use

Location	Peak Flow Increase				Peak Elevation Increase			
	2-Year (percent)	10-Year (percent)	25-Year (percent)	100-Year (percent)	2-Year (ft)	10-Year (ft)	25-Year (ft)	100-Year (ft)
Fish Creek at County Line Road	0%	0%	0%	0%	0.00	0.00	0.00	0.00
E. Br. Fish Creek at Zedlar Lane	0%	0%	0%	0%	0.00	0.00	0.00	0.00
W. Br. Fish Creek at Port Washington Road	0%	0%	0%	0%	0.00	0.00	0.00	0.00
MQ Tributary Kathleen Lane at Cedarburg Road	8%	7%	7%	7%	0.14	0.14	0.16	0.16
MQ Tributary Baehr Road at Donges Bay Road	0%	0%	0%	0%	0.00	0.00	0.00	0.00
MQ Tributary at Chestnut Road	0%	0%	0%	0%	0.00	0.00	0.00	0.00
MQ Tributary at Port Washington Road south of Glen Oaks Lane	0%	0%	0%	0%	0.10	0.05	0.10	0.09
MQ Tributary near Mequon Road and I-43	0%	0%	0%	0%	0.00	0.00	0.00	0.00
MQ Tributary at Cedarburg Road near City Hall	12%	8%	8%	7%	0.09	0.10	0.08	0.07
MQ Tributary at Highland Road and Shoreland Drive	0%	0%	0%	0%	0.00	0.00	0.00	0.00
Pigeon Creek at Freistadt Road	0%	0%	0%	0%	0.00	0.00	0.00	0.00
Pigeon Creek Tributary at Cedarburg Road and Bonniwell Road	4%	4%	4%	3%	0.01	0.02	0.03	0.05
Pigeon Creek Tributary at Bonniwell Road and Wauwatosa Road	0%	0%	0%	0%	0.00	0.00	0.00	0.00
Pigeon Creek at Wauwatosa Road	0%	0%	0%	0%	0.00	0.00	0.00	0.00
Little Menomonee River (MU) at Mequon Road	11%	33%	14%	3%	0.18	0.04	0.10	0.06
MU Tributary near Swan Road and Donges Bay Road	0%	0%	0%	0%	0.00	0.00	0.02	0.01
Ulao Creek at Bonniwell Road	31%	30%	21%	12%	0.48	0.62	0.54	0.46
Ulao Creek at Pioneer Road	19%	19%	18%	15%	0.25	0.32	0.37	0.42

Section 6
Water Quality Analysis

6.1 Introduction

A water quality analysis was conducted to estimate the amount of pollutants that are discharged to the Milwaukee and Menomonee Rivers via storm water runoff. The water quality analysis was conducted using a unit-area loading model which is based in part on the Source Loading and Management Model (SLAMM) developed by the WDNR.

The type and amount of pollutants carried with storm water depend on the types of land use. Transportation, industrial, and commercial areas are typically major contributors of sediments and metals due to vehicular traffic and outside material storage. Residential areas typically contribute sediment and metals, along with pesticides, fertilizers, and bacteria. The pollutant loading rate for residential areas varies with the density of development. Park and open space areas generally contribute relatively minor amounts of metals and sediment. Park areas typically contribute significant amounts of nutrients due to landscaping practices.

The type of storm water conveyance system affects the quality of the storm water runoff. Grassed swales, when properly designed and maintained, filter out pollutants and reduce runoff quantity through infiltration. Engineered storm sewer systems convey runoff and pollutants to the receiving stream without an opportunity for filtration.

The water quality analysis was conducted for five pollutants: sediment, phosphorous, copper, lead, and zinc. These five pollutants are associated with urban storm water runoff and often cause water quality problems in urban streams as identified in Table 6-1.

Table 6-1: Major Storm Water Pollutants, Sources, and Water Quality Impacts

Pollutant	Typical Sources	Water Quality Impacts
Sediment	Soil, atmospheric deposition (dust), litter and debris, particles from automobiles and tires, deteriorated pavement	Decreases water clarity, covers valuable plants and bottom dwelling organisms, destroys breeding sites, reduces aquatic plant photosynthesis
Phosphorous	Fertilizer, organic matter (leaves, grass clippings), soil	Excessive algal growth, dissolved oxygen reduction, odors
Copper	Automobile brake pads, wire, roof materials	Toxic to aquatic life
Lead	Atmospheric deposition, automobiles, paint, medical equipment	Toxic to aquatic life
Zinc	Galvanized steel roof drains and downspouts, coatings, rubber products	Toxic to aquatic life

6.2 Water Quality Analysis Methodology

The amount of pollutants which are contained in storm water runoff discharging to the Milwaukee and Menomonee Rivers from the study area were estimated using a unit-area loading rate model. The analysis was based on the following information:

- Land use in accordance with the aerial photographs, land use maps, and other information provided by the City of Mequon and Village of Thiensville. Land use was calculated for the study area under current (1995) and future (2020) development conditions. Land use conditions are described in Section 3.2 of this report.
- Pollutant loading rates for each land use category based on previous studies using the Source Loading and Management Model, research results, and professional judgement. The pollutant loading rates utilized in the model are presented in Table 6-2.
- Existing storm water control practices and study area characteristics including use of drainage swales or retention ponds, green space requirements in industrial and commercial areas, presence of primarily light industrial facilities within industrial land use areas, and enforcement of an erosion control ordinance.

Table 6-2: Unit Area Pollutant Loading Rates for the Mequon/Thiensville Study Area

Land Use	Unit Area Loading Rates (lb./ac./yr.)				
	Sediment	Phosphorous	Lead	Copper	Zinc
Forest/Preservation	3	0.03	0.01	0.01	0.01
Park	417	2.81	0.01	0.01	0.06
Institutional / Business Park	421	1.80	0.18	0.08	1.09
New Low Density Residential (over 5 acres lots)	123	0.12	0.08	0.03	0.05
Low Density Residential	205	0.19	0.13	0.06	0.08
Medium Density Residential	410	0.38	0.26	0.11	0.16
High Density Residential	574	0.52	0.36	0.16	0.22
Commercial	845	0.86	2.2	0.32	1.68
Industrial	430	0.14	1.2	0.25	3.65
Highway	802	2.71	0.37	2.7	2.23
Arterial	288	1.12	0.15	0.06	0.056
Agriculture	450	0.86	0.01	0.01	0.01
Construction	1,500	0.55	0.02	0.06	0.07
Open Water	185	0.13	0.01	0.01	0.01
Wetland	3	0.3	0.01	0.01	0.01

6.3 Water Quality Analysis Results

The analysis summarizes the annual anticipated pollutant loadings, in pounds per year, by land use category and by subwatershed / subbasin designation. The results can then be used to target appropriate best management practices (BMPs) to effectively reduce the pollutant loadings in critical areas.

The analysis indicates that construction, commercial, and highway land uses contribute the highest loading of sediment per acre, while parks and highways contribute the highest loading of phosphorous per acre, and commercial, industrial, and highways contribute the highest per acre loading of metals. Based on total loadings of pollutants from the study area:

- agriculture and residential land use account for 65 percent of the sediment loading under existing and future conditions;
- agriculture and park land use account for 72 percent and 54 percent of the phosphorous loading under existing and future conditions, respectively; and
- commercial, industrial, and residential land use account for over 60 percent of the metals loadings under existing and future land use conditions.

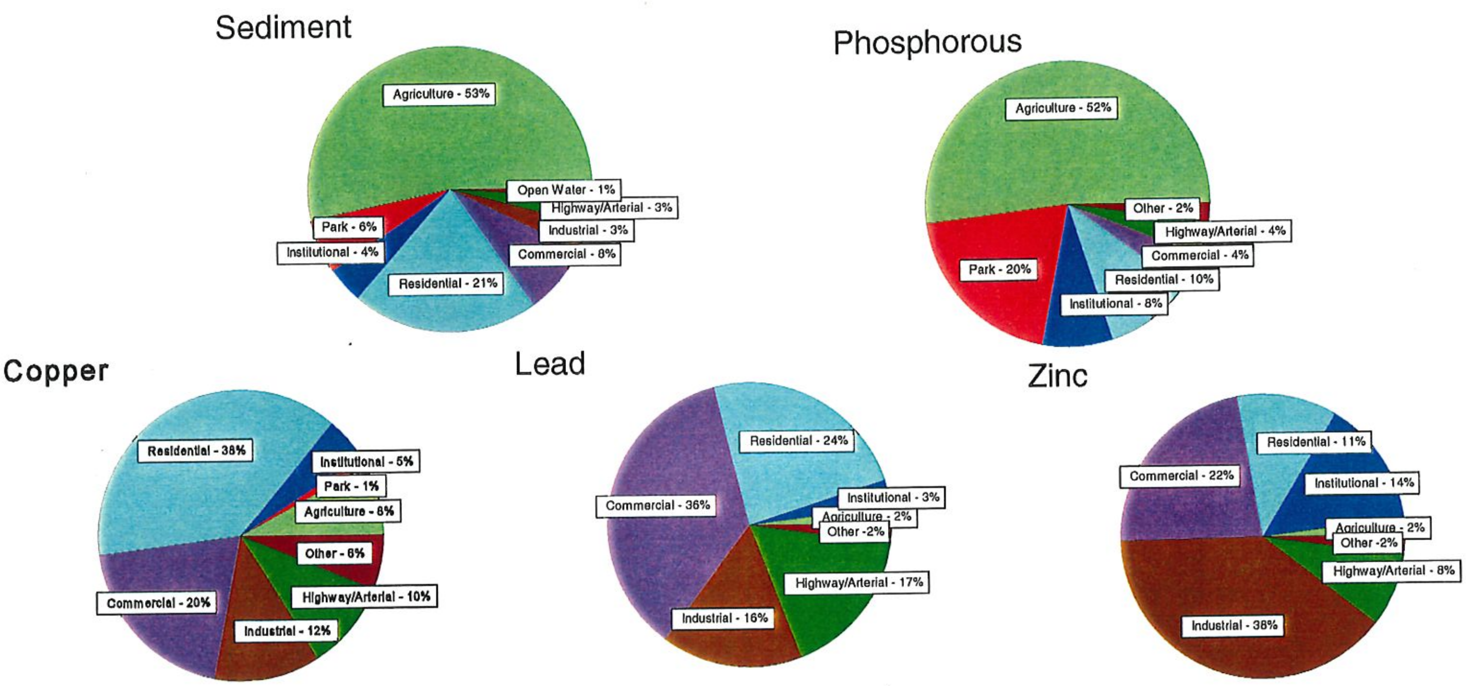
The distribution of the annual pollutant loading by land use for existing and future conditions is shown on Figure 6-1. A comparison of the total annual pollutant loadings under existing and future conditions is shown on Figure 6-2.

Critical land uses, land uses which contribute a majority of the storm water pollutants, based on the annual pollutant loadings are presented in Table 6-3. Tables 6-4 and 6-5 present a summary of the annual anticipated loadings by land use from the Mequon/Thiensville study area under existing and future land use conditions.

Tables 6-6 and 6-7 present a summary of the annual anticipated loadings by subwatershed within the Mequon/ Thiensville study area under existing and future conditions. Generally, the subwatersheds which contribute the highest pollutant loading correlate with the land uses discussed above. The subwatershed loadings are greatly influenced by the size of the subwatershed. The Mequon (MQ) subwatershed encompasses over 40 percent of the study area and therefore contributes a majority (39 to 57 percent) of the pollutant loadings. In order to reduce the influence of the subwatershed size on the pollutant loadings, a pound per acre per year loading was evaluated for each subwatershed. The sediment and phosphorous pollutant loading, based on pounds per acre per year, do not vary significantly between subwatershed. The metals pollutant loading, based on pounds per acre per year, varies in accordance with the percentage of urban land use. A comparison of pollutant loadings based on pounds per acre per year is presented in Figure 6-3.

Figure 6-1: Annual Pollutant Loadings

Existing Conditions



Future Conditions

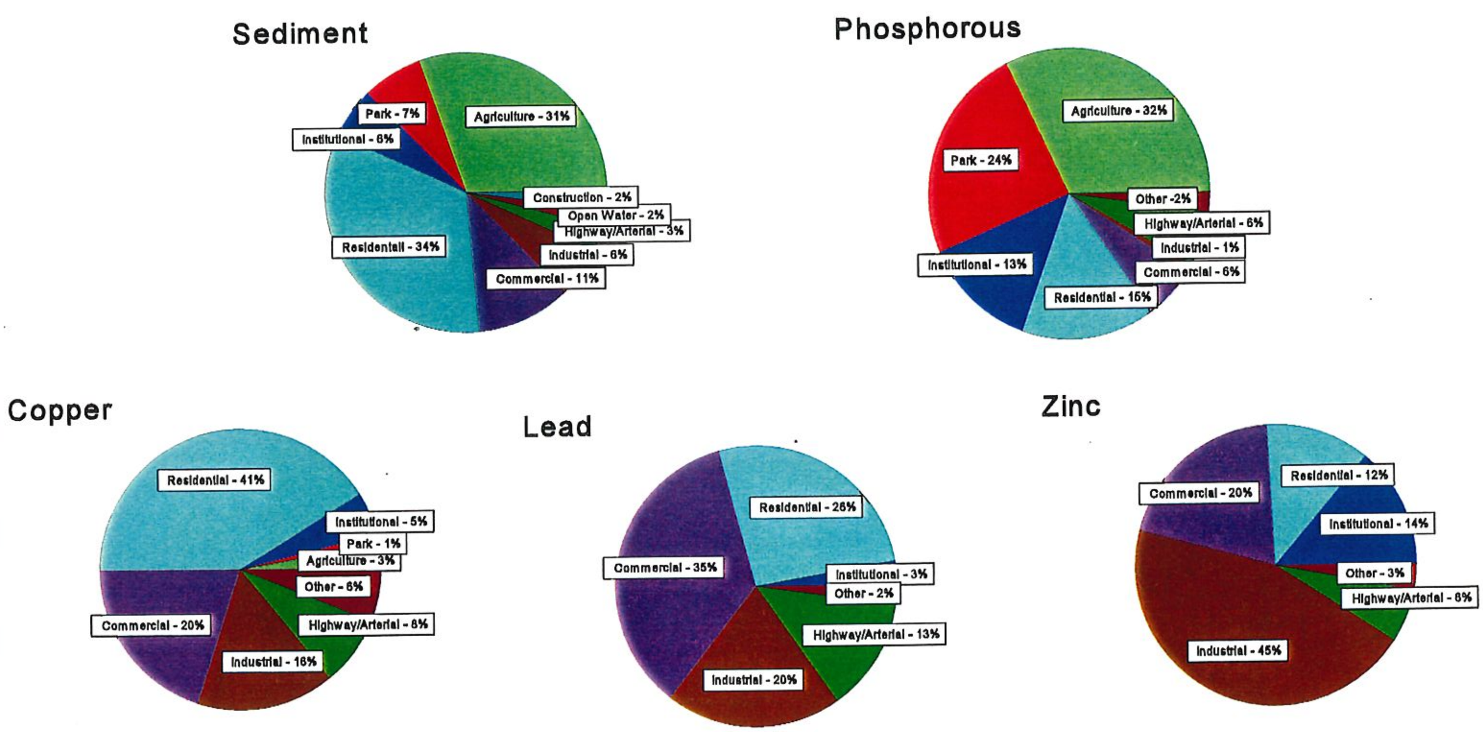


Figure 6-2: Comparison of Existing and Future Annual Pollutant Loadings
from the Mequon/Thiensville Study Area

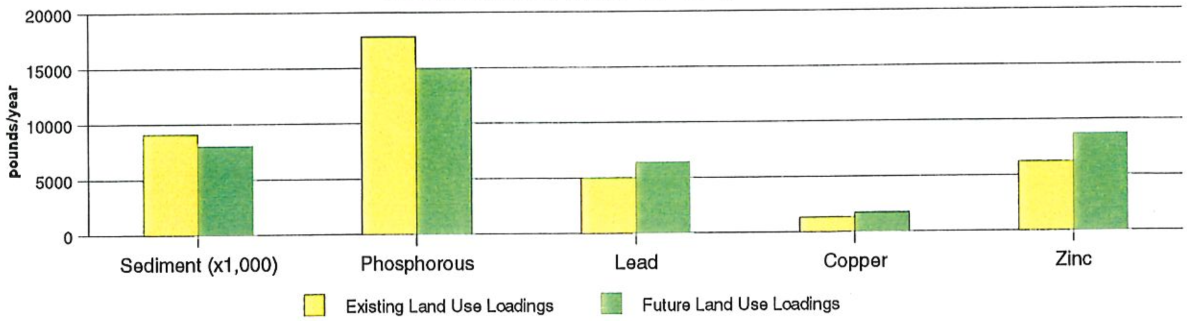


Table 6-3: Critical Land Uses by Pollutant

Pollutant	Critical Land Use - (% of total annual load)	
	Existing Land Use Conditions	Future Land Use Conditions
Sediment	Agriculture (53%); Residential (21%)	Residential (34%); Agricultural (31%)
Phosphorous	Agricultural (51%); Park (20%); Residential (10%)	Agriculture (32%); Park (24%); Residential (15%)
Copper	Residential (39%); Commercial (20%); Industrial (12%)	Residential (41%); Commercial (20%); Industrial (16%)
Lead	Commercial (36%); Residential (24%); Industrial (16%)	Commercial (35%); Residential (26%); Industrial (20%)
Zinc	Industrial (38%); Commercial (22%); Institutional (14%)	Industrial (45%); Commercial (20%); Institutional (14%)

Table 6-4: Annual Pollutant Loadings by Land Use - Existing Conditions

Land Uses	Area	Pollutant Type									
		Sediment		Phosphorous		Lead		Copper		Zinc	
	(acres)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)
Woodlands/Preservation	4,814	14,419	0	144.42	1	45.43	1	45.43	3	45.43	1
Agriculture	10,660	4,784,663	53	9,152.63	51	106.43	2	106.43	8	106.43	2
Park	1,257	524,065	6	3,531.47	20	12.57	0	12.57	1	75.41	1
Institutional/Business Park	792	333,449	4	1,425.67	8	145.74	3	61.23	5	863.32	14
Low Density Residential	7,899	1,619,250	18	1,516.57	9	1,011.04	20	440.46	34	631.90	10
Medium Density Residential	491	201,495	2	184.79	1	125.81	3	55.04	4	78.63	1
High Density Residential	116	66,647	1	60.38	0	41.80	1	18.58	1	26.01	1
Commercial	824	695,908	8	708.26	4	1,778.89	36	263.54	20	1,383.58	22
Industrial	649	278,924	3	87.57	0	778.39	16	162.17	12	2,367.61	38
Highway	131	105,359	1	231.21	1	601.67	12	65.69	5	273.25	4
Arterial	477	137,053	2	534.70	3	267.35	5	71.46	5	267.35	4
Open Water	703	130,007	1	91.36	1	28.11	1	28.11	2	28.11	0
Wetland	1,282	3,846	0	38.46	0	12.82	0	12.78	1	12.82	0
Construction	110	165,000	2	60.50	0	2.48	0	6.30	0	8.25	0
Total	*30,205*	*9,060,000*	*100*	*17,800*	*100*	*5,000*	*99*	*1,300*	*104*	*6,200*	*100*

Table 6-5: Annual Pollutant Loading by Land Use - Future Conditions (Year 2020)

Land Uses	Area	Pollutant Type									
		Sediment		Phosphorous		Lead		Copper		Zinc	
	(acres)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)
Woodlands/Preservation	4,592	13,754	0	137.77	1	45.92	1	45.92	3	45.92	1
V. Low Density Residential	1,889	232,347	3	207.79	1	151.12	2	56.67	3	94.45	1
Park	1,257	524,065	7	3,531.47	24	12.57	0	12.57	1	75.41	1
Institutional/Business Park	1,091	459,294	6	1,963.73	13	200.74	3	85.14	5	1,189.15	14
Low Density Residential	10,390	2,130,009	27	1,994.94	13	1,329.96	21	579.98	34	831.22	10
Medium Density Residential	491	201,495	3	184.79	1	125.81	2	55.04	3	78.63	1
High Density Residential	118	68,008	1	61.61	0	42.65	1	18.96	1	26.54	0
Commercial	1,048	885,484	11	901.20	6	2,263.49	35	335.33	20	1,760.49	20
Industrial	1,069	459,816	6	144.36	1	1,283.21	20	267.34	16	3,903.09	45
Highway	131	105,359	1	231.21	2	601.67	9	65.69	4	273.25	3
Arterial	477	137,053	2	534.70	4	267.35	4	71.46	4	267.35	3
Open Water	703	130,007	2	91.36	1	28.11	0	28.11	2	28.11	0
Wetland	1,282	3,846	0	38.46	0	12.82	0	12.78	1	12.82	0
Agriculture	5,555	2,499,750	31	4,777.30	32	55.55	1	55.55	3	55.55	1
Construction	110	164,396	2	60.50	0	2.50	0	6.30	0	8.20	0
Total	*30,205*	*8,015,000*	*100*	*14,900*	*100*	*6,400*	*100*	*1,700*	*100*	*8,700*	*100*

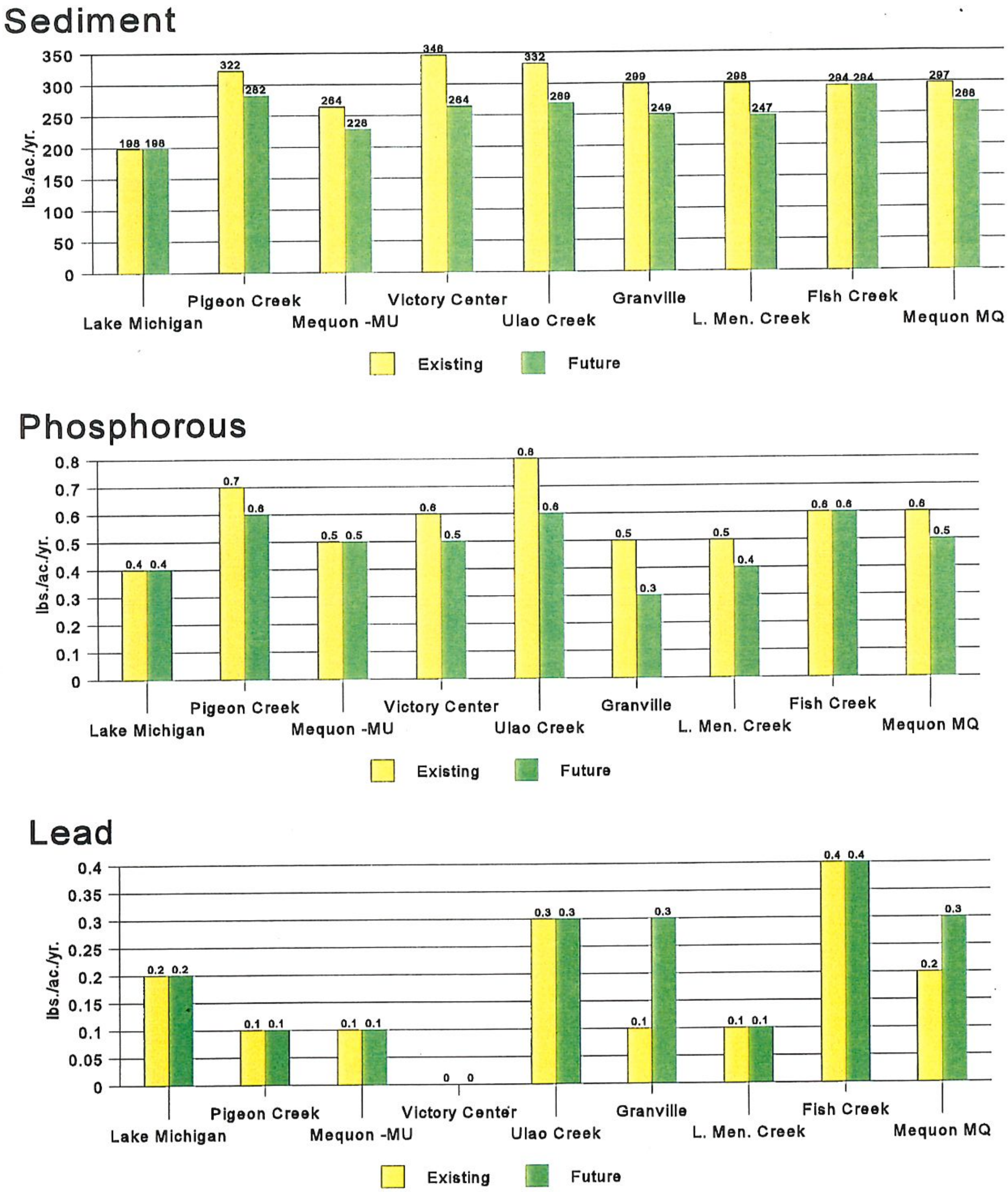
Table 6-6: Annual Pollutant Loadings by Subwatershed - Existing Conditions

Subwatershed	Area (acres)	Pollutant Type: Sediment (lb./yr.)	Sediment (%)	Phosphorous (lb./yr.)	Phosphorous (%)	Lead (lb./yr.)	Lead (%)	Copper (lb./yr.)	Copper (%)	Zinc (lb./yr.)	Zinc (%)
Lake Michigan	823	163,369	2	368.50	2	153.60	3	42.57	3	116.60	2
Pigeon Creek	5,957	1,920,873	21	3,924.19	22	673.86	14	203.39	15	775.23	13
Mequon - MU	2,912	768,650	8	1,456.67	8	144.03	3	70.27	5	194.78	3
Victory Center	421	132,968	1	251.34	1	14.63	0	7.51	1	13.24	0
Ulao Creek	1,494	496,828	5	1,134.30	6	396.63	8	75.66	6	331.19	5
Granville	1,588	475,498	5	791.66	4	189.56	4	57.81	4	440.31	7
Little Menomonee Creek	2,042	608,391	7	1,088.66	6	94.62	2	47.29	3	81.20	1
Fish Creek	1,890	554,955	6	1,075.07	6	703.69	14	160.77	12	544.86	9
West	607	207,325	2	380.91	2	16.68	0	9.89	1	13.96	0
North	254	103,242	1	214.20	1	11.17	0	5.86	0	32.51	1
Mequon - MQ	12,214	3,627,948	40	7,107.29	40	2,564.20	52	670.05	50	3,626.87	59
Total	*30,205*	*9,060,046*	*100*	*17,792.8*	*100*	*4,962.7*	*100*	*1,351.1*	*100*	*6,170.8*	*100*

Table 6-7: Annual Pollutant Loadings by Subwatershed - Future Conditions (Year 2020)

Subwatershed	Area	Pollutant Type									
		Sediment		Phosphorous		Lead		Copper		Zinc	
	(acres)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)	(lb./yr.)	(%)
Lake Michigan	823.46	163,369	2	368.50	2	153.60	2	42.57	3	116.60	1
Pigeon Creek	5957	1,682,002	21	3,333.42	22	763.18	12	235.08	14	827.92	10
Mequon - MU	2912	664,001	8	1,503.94	10	219.90	3	99.36	6	518.95	6
Victory Center	421	111,180	1	204.04	1	19.30	0	8.84	1	15.90	0
Ulao Creek	1494	401,281	5	846.74	6	503.02	8	101.53	6	383.77	4
Granville	1588	396,109	5	464.74	3	447.94	7	114.14	7	1164.65	13
Little Menomonee Creek	2042	505,246	6	845.87	6	122.89	2	56.50	3	97.58	1
Fish Creek	1890	554,955	7	1,075.07	7	703.69	11	160.77	9	544.86	6
West	607	173,148	2	306.68	2	23.99	0	11.97	1	18.13	0
North	254	87,880	1	180.85	1	14.46	0	6.80	0	34.39	0
Mequon - MQ	12214	3,274,955	41	5,807.25	39	3,476.08	54	859.23	51	4927.37	57
Total	*30205*	*8,014,000*	*100*	*14,937*	*100*	*6,448*	*100*	*1,697*	*100*	*8,650*	*100*

Figure 6-3: Comparison of Subwatershed Pollutant Loadings



Note: The pollutant loadings for copper and zinc are not shown because the variation between the subwatersheds is similar to that shown for lead.

Based on an overall consideration of the pollutant loadings, the following areas are significant contributors of pollutants within the study area:

- Commercial/business development along Port Washington Road
- Development within the Village of Thiensville
- Industrial/commercial/business park areas at Donges Bay Road at Baehr Road
- Residential and commercial areas in the Fish Creek Subwatershed

The water quality model results are presented in Appendix E.

Section 7
Storm Water Management Alternatives

7.1 Introduction

Development of an effective and efficient Storm Water Management Master Plan for the City of Mequon and Village of Thiensville requires consideration of alternative practices related to flood control and water quality protection which mitigate the storm water drainage problem areas and improve the water quality. General storm water management alternative approaches include:

- Structural and non-structural measures
- Multi-purpose regional and site specific strategies
- Opportunities to integrate features that provide both water quantity and water quality benefits

The storm water management approaches utilize storm water management measures which may include:

Wet detention basins/ponds - designed to reduce peak runoff flows and provide sedimentation. Wet ponds have a permanent pool, usually with a minimum depth of three to five feet, and an outlet structure. The permanent pool prevents re-suspension of accumulated sediments and provides conditions that enhance biochemical degradation and removal of pollutants. When properly designed, constructed, and maintained, wet detention ponds can retain a large portion of the in flowing pollutants. Wet ponds can be designed to provide either onsite detention or regional detention. Regional detention facilities provide benefits for large areas, thereby reducing the need for numerous onsite controls. A typical wet detention pond is shown in Figure 7-1.

Dry detention basins - designed primarily for flood control. Dry basins impound water only during and immediately after runoff-producing storm events. Because the basins are designed to drain completely following storms, only minor sedimentation occurs, providing minimal water quality benefit.

Extended detention basins - detain a portion of the storm water runoff for up to 24 hours or more after a storm by limiting the capacity of the outlet structure, thereby reducing peak runoff flows. Extended detention allows sedimentation to occur. The basins generally do not have a permanent pool and can by dry between storm events. A typical extended dry-detention basin is shown in Figure 7-2

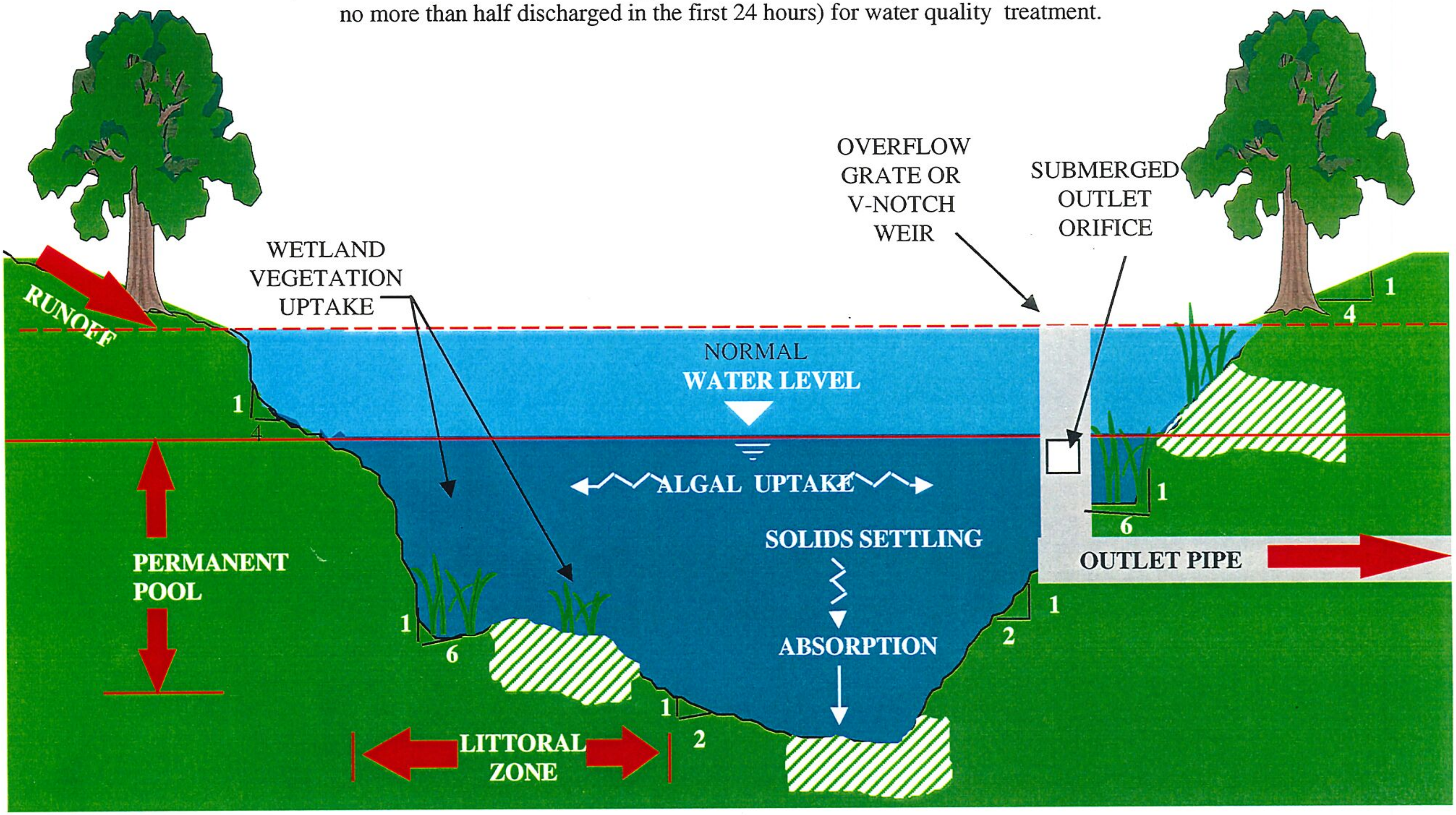
Infiltration systems - reduce storm water runoff volumes and rates and provide pollutant load reductions by allowing storm water to infiltrate into the soil. Some pollutants are removed from the percolating water by adhering to soil particles. Microorganisms that are naturally present in the soil biochemically break down and remove some of the attached pollutants, and also feed on some of the dissolved pollutants. Types of infiltration systems include seepage pits and beds, trenches, porous pavement, and channels and vegetated swales with permeable beds. Pretreatment systems, such as grit chambers or detention ponds, are often used to prevent clogging of the infiltration bed. In some locations, the use of infiltration systems may require the installation of monitoring wells to ensure that contamination of groundwater does not occur.

Filtration systems - provide pollutant load reductions by filtering storm water runoff through media, typically sand or peat. The filter systems typically include a sedimentation area to retain the largest particles and a filter chamber that filters and removes soluble constituents. Filtration systems are typically constructed under ground which minimizes land use requirements.

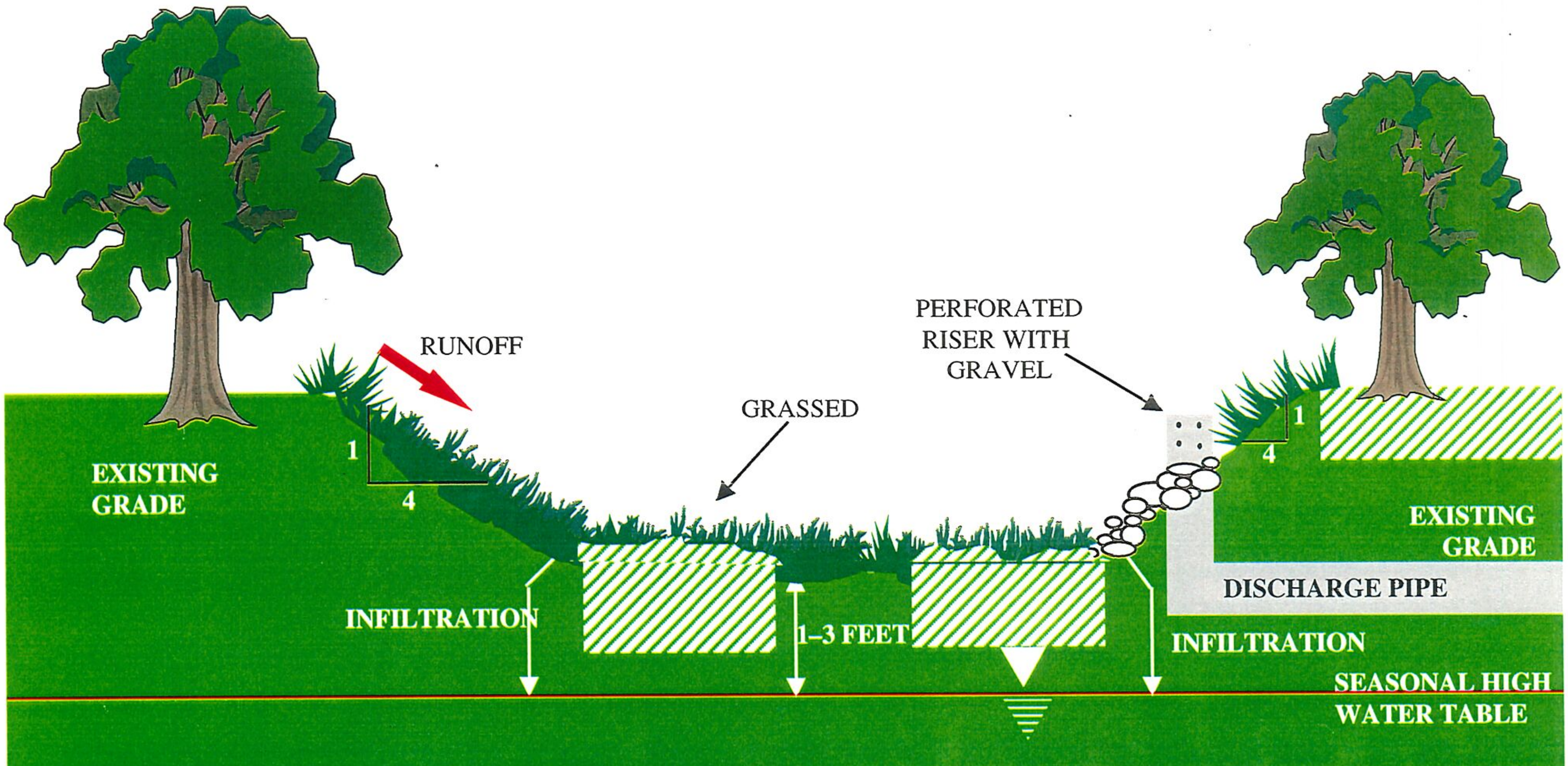
Typical Wet Detention Pond

NOTES:

1. Runoff is directed to the pond and detained for flood control and water quality treatment by algal uptake, solids settling, and absorption.
2. The first 3/4 inch of runoff is typically detained above a permanent pool (with no more than half discharged in the first 24 hours) for water quality treatment.



Typical Extended Dry Detention Pond



NOTES:

1. Runoff is directed to the pond and detained with overflow discharge to downstream through a perforated riser.
2. The first 0.5 to 1.0 inch of runoff is typically detained for treatment.
3. Side slopes should be no steeper than 4 horizontal to 1 vertical.

Grassed swales - reduce storm water runoff volume by allowing infiltration into the soil, and reduce storm water pollutant loads by filtering through vegetation. Vegetation traps sediments and utilizes nutrients, while microorganisms in the soil biochemically remove dissolved pollutants. The sediments trapped by vegetation are not as easily re-suspended during subsequent storm water runoff events as sediments accumulated in storm sewers, which are readily flushed out during later storms.

Constructed or retrofit wetlands - stabilize storm water runoff and flood flows and remove sediment and nutrients from surface water runoff. The wetland configuration slows runoff volume and provides storage opportunity. The wetland vegetation traps sediment and utilizes nutrients to reduce pollutant loadings.

Engineered storm water drainage facilities - efficiently and effectively convey storm water runoff to receiving waters. Engineered facilities include storm sewers, culverts, constructed channels, catch basins, and manholes. Where flooding or drainage problems occur, these facilities can sometimes be upgraded to provide additional capacity to resolve the problems.

Streambank erosion controls - prevent channel degradation, reduce sediment transport and deposition, maintain channel capacity, and enhance water quality. Both structural (i.e., riprap) and vegetative controls may be used. Vegetative bank stabilization measures can enhance aquatic habitats and provide a natural appearance to the channel.

Buffer easements - vegetated zones adjacent to waterways or other environmentally sensitive features that serve to filter out pollutants in overland flow. The easements can also help stabilize streambanks, provide wildlife habitat, and offer stream shading.

Best Management Practices (BMPs) or source controls - include good housekeeping practices, preventive maintenance measure, spill prevention and response procedures, sediment and erosion controls.

Inlet filters - typically consist of a frame with a screen filter or other filtration or absorbent media placed into a storm sewer inlet or catch basin. Storm Water draining to the inlet passes through the filter, which traps sediment, floatable substances, and other pollutants, such as metals, associated with sediments.

Pavement cleaning - with mechanical or vacuum sweepers, removes sediments and associated pollutants from streets and parking lots. The effectiveness of sweeping can be improved by sweeping more frequently or by using improved sweeping techniques or equipment.

Catch basin cleaning - is an effective measure to remove accumulated deposits from catch basins and manholes. Frequent cleaning of the catch basins facilitates the trapping of additional sediments and prevents the scouring and re-suspension of accumulated sediments during subsequent storm events.

Public information and education programs - can increase the public's knowledge and understanding of storm water management, change people's attitudes and actions, and generate support for the implementation of the plan. Examples of public education programs include informational materials, posters, public announcements and press releases, presentations, workshops, video presentations on cable television, direct mailings, and personal contacts.

Water quality monitoring - may include the sampling and analysis of storm water or receiving waters, dry weather testing for non-storm water discharges, bottom sediment testing, biological assessments, and inspection of potential pollution sources and management measures. These monitoring programs may be designed to clarify existing water quality conditions, identify newly developing problems, monitor the implementation of the plan, and evaluate the effectiveness of the controls.

Urban land development guidelines - assist municipalities, residents, and developers in minimizing the adverse environmental impacts of urban development, while providing for safe and efficient urban services. These guidelines help prevent the creation of new storm water problems or the exacerbation of existing storm water problems. These guidelines may include:

- Establishing site grading requirements and zoning restrictions
- Requiring buffer zones or green spaces along streams
- Building setbacks distances from streams
- Defining allowable peak rates and volumes of discharge
- Protecting wetlands and other sensitive areas
- Providing flood protection

7.2 Storm Water Drainage and Flooding Alternatives

Alternatives related to storm water drainage and flood control are typically either detention/storage measures or hydraulic system improvement measures. Detention/storage measures include wet and dry detention ponds and extended detention basins where storm water runoff is collected and detained in a storage area and released slowly during and after the storm event. Detention/storage measures reduce peak runoff flows which reduce the required capacity of the downstream hydraulic system. Hydraulic system improvements focus on system modifications such as channel widening, channel clearing and culvert improvements.

An effective storm water management plan requires the selection of the most appropriate alternative to address the storm water drainage / flooding issues identified. Storm Water drainage / flooding problem areas were identified based on field investigation, review of citizen complaint records, and computer modeling. This study focuses on drainage / flooding problem areas within the primary storm water management system. Basement back up, due to overloading of the sanitary sewer, and local flooding, sideyard or backyard flooding in areas not part of the primary drainage system, are not evaluated as part of this plan and are not considered in the major flooding areas identified.

7.2.1 Storm Water Drainage and Flooding Alternative Criteria

Design criteria for storm water flood control solutions are established based on the storm water management goals and objectives identified in Section 2 of this report. These criteria include:

- Facilities will provide protection against structure flooding in the 100-year storm event. The full range of storm event durations will be considered in the design of flood control facilities.

- Channels and overflows in the primary system should be designed to convey the 100-year storm event. Culverts in the primary system should pass the 100-year flow with less than 6 inches of road overtopping.

- Facilities will provide protection against yard flooding in the 10-year event.

- Flood control improvements will not cause increases in flows or elevations outside the project limits unless appropriate flood easements are obtained.

7.2.2 Description of Storm Water Flooding Alternatives

Ten major storm water flooding areas were identified by the City of Mequon, Village of Thiensville, and storm water steering committee based on:

- Review of citizen complaint records - citizen complaint logs from the June 1997 storm event, as well as other storms, were reviewed and mapped
- Potential for damage - flooding areas which threaten homes or other structures
- History of the severity of the flooding problem - based on the knowledge of the City and Village Staff

The flooding areas and storm water management alternatives are summarized in Table 7-1 and are discussed in the following paragraphs. The flooding area designation refers to the subwatershed identification code. The flooding areas are shown on Figure 7-3.

Problem Area FS-1: Yard flooding in Clover Lane / Brookdale Drive area

Description:

Flooding in this area is caused by inadequate inlets and storm sewer capacity under Zedler Lane, inadequate channel capacity along Fish Creek, and the culvert capacity at Port Washington Road.

Alternatives:

Alternatives considered include storm sewer channel and culvert improvements and additional storm water detention. Neither option is viable on its own because the conveyance improvements cause flows to increase downstream and there is insufficient land available to solve the problem with storage alone. Therefore, a solution was developed consisting of excavated storage north of Donges Bay Road and expansion of the existing Port Washington Road/Zedler Lane culvert.

The estimated cost of the storage facility is $770,000.
The culvert improvements will be completed by the Ozaukee County Highway Department.

Problem FS-2: Frequent yard flooding east of Waterleaf Drive, west of Lakeshore Drive

Description:

Very flat channel slope leads to occasional yard flooding along this tributary to Fish Creek

Alternatives:

Alternatives considered include enhancing existing storage, downstream channel and culvert improvements, and two different storm sewer layouts. Due to full residential build-out of the tributary watershed, there is no land available for expansion of the existing ponds for flood control. Channel improvements and culvert upgrades from upstream of Waterleaf Drive to Zedler Lane were effective in reducing flood height and accelerating the decline in water levels. However, this strategy resulted in higher flows on the main branch of Fish Creek. Thus, excavated storage would be needed at some downstream location. Several solutions involving storm sewers were also considered. A large diameter storm sewer project would be effective but would cause increases in downstream flows as with the channel improvement. Smaller storm sewers are not as effective in reducing flood heights but would accelerate drainage after the flood.

Two alternatives were evaluated in detail. Channel improvement from Waterleaf Drive to Zedler Lane with compensating storage at an estimated cost of $410,000, and an 18-inch storm sewer from upstream of Waterleaf Drive to Katherine Park, at an estimated cost of $154,000.

TABLE 7-1: Flooding Problem Description within the Mequon/Thiensville Study Area

PROBLEM NUMBER	PROBLEM DESCRIPTION	LOCATION	CAUSE	POSSIBLE SOLUTIONS
FS#1 Range 22 Section 31	Yard flooding in Clover Lane/Blackdale Drive Area Frequent yard flooding; 40 houses and 30 condominiums in area.	East of Sunnycrest Drive; West of Port Washington Road; Between Donges Bay Road and Zedler Lane; Fish Creek and area along Clover Lane.	Flat topography with three detention basins in area; Inadequate storm sewer and channel capacity and inadequate culvert capacity at Port Washington Road.	Add detention north of Donges Bay Road and enlarge culvert downstream at Zedler/Port Washington Road.
FS#2 Range 22 Section 32	Frequent yard flooding East of Waterleaf Drive, most of Lakeshore Drive; 16 houses adjacent to channel.	East of Waterleaf Drive; West of Lakeshore Drive; Between Donges Bay Road and Zedler Lane; Unnamed Fish Creek Tributary.	Development in former wetland; very flat channel slope Inadequate storm sewer capacity; Undersized culverts from Zedler to Trillium.	Pump/Pipe system from Waterleaf Drive to Zedler Lane; Increased culvert capacities from Zedler to Trillium; Channel improvement for Waterleaf Drive to Zedler Lane.
FS#3 Range 22 Section 32	I-43 and adjacent properties flooded Flooding of I-43 at County Line Road and surrounding areas.	East of Port Washington Road; West of Railroad Tracks; South of Zedler Lane on Fish Creek.	Upstream development; Inadequate culvert and channel capacity. Flooding NOT due to Railroad culvert backup at Ravine Baye Road.	Widen and deepen channel or storm sewer channel between I-43 and Railroad. Problem is being addressed by the County Highway Department.
PG#1 Range 21 Section 14	Frequent street and residential flooding in a large area of Thiensville.	Pigeon Creek in Thiensville south of Freistadt Road to Cedarburg Road.	Undersized culverts and flood plain encroachment between Freistadt Road and Main Street.	Construct Storage near Hawthorne and Wauwatosa Rd. Restrict culvert at Freistadt Road and back water into gravel pits; Divert flow to gravel quarry and build gravity outlet and pump station.
PG#2 Range 21 Section 14	Frequent street and yard flooding Laurel Drive area; affecting approximately 4 homes.	Laurel drive south of Cairdel Lane.	Inadequate storm sewer capacity form Rosedale Dr. to Grand Ave. And insufficient detention capacity.	Floodproof 4 homes; Improve existing storm sewer or construct new storm sewer from Rosedale Dr. to Grand Avenue.
MU#1 Range 21 Section 32	Frequent yard and street flooding on Huntington Park subdivision; 19 houses adjacent to channel.	South of Donges Bay Road; west of Swan Road; Between Stanford and Concord Drives; Unnamed MU Tributary.	Flat channel slope; New development in former wetland; Channel full of wetland vegetation and minimal channel bank definition.	Expand detention east of Swan Road or northeast of subdivision; Remove channel vegetation enhance bank slopes; Storm sewer or channel improvement; Rehabilitate ditch and driveway culverts.

TABLE 7-1: Flooding Problem Description within the Mequon/Thiensville Study Area

PROBLEM NUMBER	PROBLEM DESCRIPTION	LOCATION	CAUSE	POSSIBLE SOLUTIONS
MQ#1 Range 22 Section 19	Frequent yard and residential flooding; 14 houses adjacent channel.	Hickory Lane, Chestnut Road, and Glenbrook Lane; north of Mequon Road to Milwaukee River along Unnamed Milwaukee River Tributary.	Homes constructed in 100-year flood plain and very close to channel; Poorly defined channel banks; Excess vegetation on channel banks. No detention upstream.	Detention basin south of Mequon Road/east of Range Line Road; Remove channel vegetation/enhance bank slopes; Flood proof or buyout homes.
MQ#2 Range 22 Section 20	Frequent yard flooding, basement backups, east of Union Pacific Railroad, at Lakeshore Drive and Prairie View Lane Frequent yard flooding with slow drainage; basement backups due to excess I/I-45 houses in area.	East of Union Pacific Railroad; Along Mequon Road; at Prairie View Lane and Revere Road; Unnamed Milwaukee River Tributary.	Flat topography; wetland located downstream; Upstream commercial development at Mequon Road and Port Washington Road.	Detention east of I-43, west of Railroad, south of Mequon Road channel improvements; Development on improvement of local drainage system; Storm sewer the area; Block culverts under I-43 and divert drainage area west of I-43 away form wetland directly into channel north of the wetland by I-43.
MQ#3 Range 21 Section 35	Frequent yard and street flooding east of Wisconsin Control Railroad, west of Cedarbury Road; 24 houses and 1 church adjacent to channel.	East of Wisconsin Central Railroad; west of Cedarburg Road; between Westfield Road and Willow Roads; Unnamed Milwaukee River Tributary.	Homes constructed in Milw. River Flood plain; Commercial development upstream; Flat topography; excess channel vegetation along Meadow Lane; Shallow grassy swale along Kathleen Lane.	Flood-proof homes; Add detention basins near commercial development; Remove channel vegetation/ enhance bank slopes along Meadow Lane. Divert flow north of Donges Bay Road; Ditch rehabilitation and driveway culvert replacement.
MQ#4 Range 21 Section 22	Flooding at the Mequon City Hall and library Frequent flooding with water entry through basement windows; one house, City Hall, and Library.	East of Buntrock Avenue; between Division Street and Mequon Road; Unnamed Milwaukee River Tributary.	Inadequate storm sewer capacity under library and park; Backup from Milwaukee River not the cause according to FIS maps.	Build detention in Park, west of Buntrock; Flood proof library; construct or improve the overflow route.
MQ#5 Range 21 Section 22	Frequent yard and street flooding east of Buntrock Ave. between West St. and Spring Ave.	East of Buntrock Avenue; between west Street and Spring Avenue; unnamed Milwaukee River Tributary.	Inadequate storm sewer capacity.	Build dry detention on seminary property; Construction of a storm sewer along Spring Street.

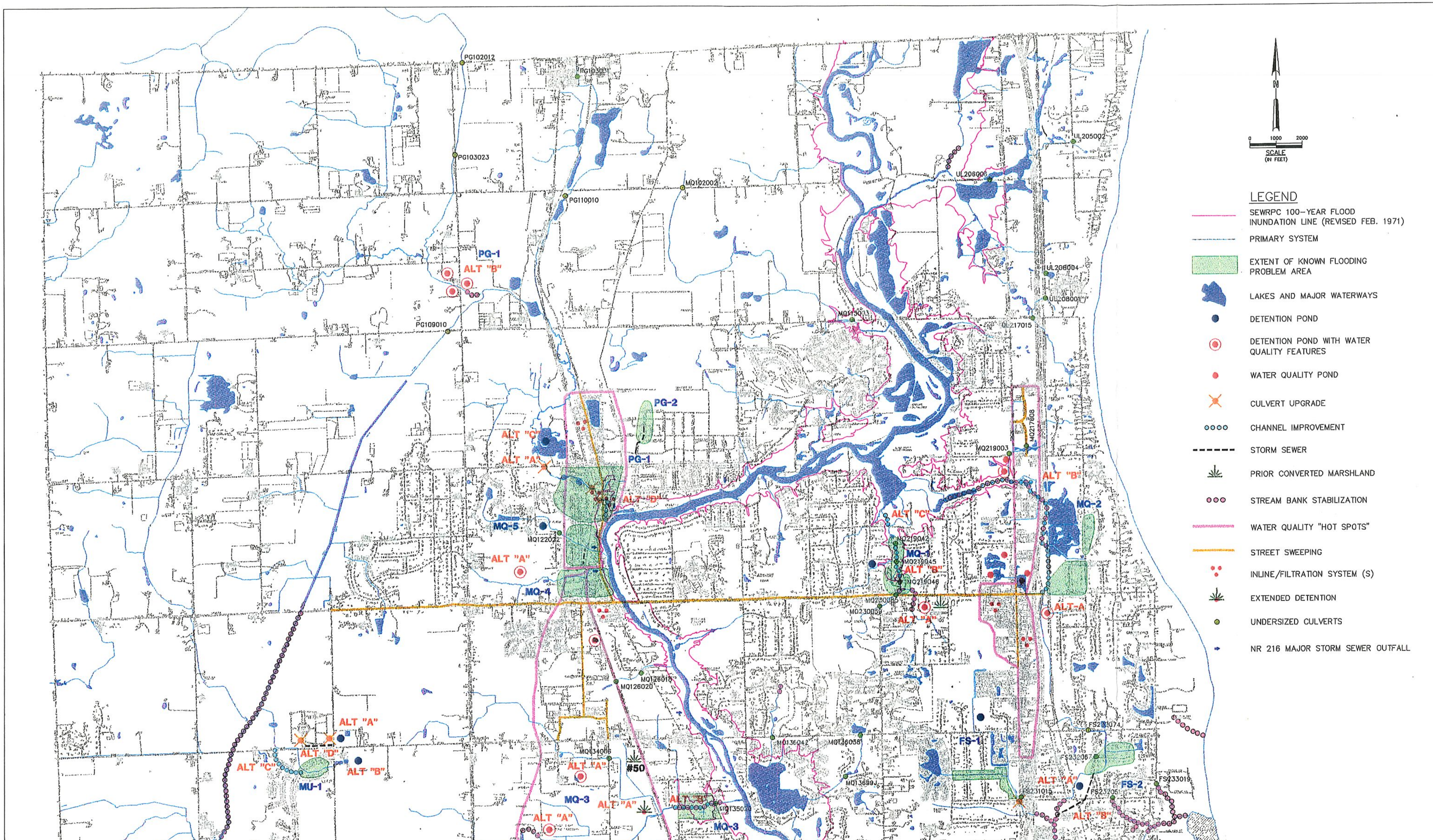


FIGURE 7-3
CITY OF MEQUON
STORM WATER MANAGEMENT
FLOODING PROBLEM AREAS AND ALTERNATIVES

CDM Camp Dresser & McKee Inc.

Problem FS-3: Flooding of I-43 at County Line Road and surrounding area.

Description

Flooding occurs at Interstate Highway 43 and adjacent properties located east of Port Washington Road, west of the railroad tracks and south of Zedlar Land on Fish Creek. The flooding is caused by upstream development and inadequate culvert and channel capacity. This problem is being addressed by the County Highway Department.

Alternatives:

This problem is being addressed by the County Highway Department.

Problem MQ-1: Frequent flooding in Hickory Lane, Chestnut Road, Glenbrook Lane Neighborhood

Description:

This problem is the result of a very flat slope of this tributary to the Milwaukee River. The channel is also subject to backwater from the Milwaukee River. Approximately 12 to 15 homes in the area are located within the 100-year floodplain of the Milwaukee River.

Alternatives:

Flooding during the 100-year recurrence storm event at structures located within the floodplain can only be resolved through buy-out or flood proofing. However, alternatives were developed to reduce the frequency of high water in the area. Alternatives evaluated include cleaning of the existing channel, expansion of the channel, and storage at two sites. The channel expansion alternative was found to be infeasible due to lack of working space. Channel clearing, from north of Mequon Road to Hickory Lane, and from Ranch Road to the Milwaukee River would lead to a small reduction in flood frequency. Analyses were conducted for a potential 60 acre-feet excavated storage facility to be located south of Mequon Road on the Range Line School property. An additional 20 acre-feet could be excavated on the St. James School property. Raising of Ranch Road and installation of a pump station was also evaluated.

The cost of flood proofing is estimated to be $980,000. The total cost of the storage facilities is estimated at $1.6 million. The storage areas are effective for reducing 100-year flood heights as long as Milwaukee River stages remain near normal levels. The estimated channel clearing cost is $500,000. The estimated cost for raising Ranch Road and installation of a pump station is $450,000.

Problem MQ-2: Frequent yard flooding, basement backups, east of Union Pacific Railroad, at Lake Shore Drive and Prairieview Lane Area

Description:

Flat slopes and absence of a well-organized drainage system lead to ponding and slow drainage in several locations in this neighborhood. A large wetland lies west of the area. Elevated water levels in the wetland further inhibit storm water drainage from the area. The ponding is probably responsible for high sanitary sewer infiltration and inflow in the area. The upstream watershed includes commercial areas along Mequon and Port Washington Road thus residents have experienced increasing flows over the past several years.

Several factors contribute to cause these problems. The residential area has little slope and is adjacent to a large wetland. The area tributary to the wetland is rather large (over 500 acres) and there is no upstream detention despite 320 acres of residential and commercial development. The local drainage system of roadside ditches is poorly defined or non-existent in some areas. Thus, there is significant surface ponding in areas with no ditches and restricted capacity due to backwater in the ditches that do exist.

Alternatives:

Alternatives considered for this problem included detention east of I-43 and west of the railroad south of Mequon Road; a channel improvement along I-43; and channel improvement/stream restoration with detention west of Port Washington Road. Any complete solution to the problem will require development or improvement of the local drainage system.

The detention alternative was found to require 90 acre-feet of excavated storage. Local storm sewer or ditch improvements to direct storm water into the pond may also be necessary. The estimated construction cost is $2.1 million. The channel improvement / stream restoration alternative would provide faster drainage of the wetland after heavy rains, while maintaining the existing water level during dry periods. Some in-line storage or floodplain enhancement will be needed to prevent increases in flows downstream. The cost of this channel improvement between Lake Shore Drive and Port Washington Road is estimated to be $600,000. Both of these projects would encounter a difficult permitting process due to the presence of wetlands in the project area.

Problem MQ-3: Frequent yard and street flooding east of Wisconsin Central Railroad, west of Cedarburg Road between Westfield and Willow Roads.

Description:

There is yard and street flooding in many areas in the vicinity of Kathleen Lane, Elmdale Road and Cedarburg Road. This flood prone area is located at the downstream end of a large watershed and is located in the floodplain of the Milwaukee River. The neighborhood is served by roadside ditches and culverts which were observed to be in need of rehabilitation. Therefore, roadside ditch improvements would be part of a complete solution and flood proofing would be needed to protect homes against high Milwaukee River stages. Ditch and culvert rehabilitation will cost $25,000 to $40,000.

Alternatives:

Three storage alternatives were evaluated to reduce flooding caused by the tributary watershed. Also, the City has an ongoing project to divert a 53-acre portion of the watershed north of Donges Bay Road away from the problem area.

Storage facilities investigated included a 25 acre-foot pond in the Enterprise Drive Industrial Park, a 40 acre-foot pont adjacent to the Lilly Lane nature preserve, and a 12 acre-foot storage area in a prior-converted wetland area west of Meadow Lane. Channel maintenance along Meadow Lane and downstream to Cedarburg Road would also be included in the project. All of these facilities would be needed to eliminate 100-year flooding. The estimated total construction cost is $1.2 million. Ditch rehabilitation and driveway culvert replacement will assist in flood reduction. The estimated cost of ditch rehabilitation and driveway culvert replacement is $28,000.

MQ-4: Flooding at the Mequon City Hall and Library

Description:

These public buildings are located at the downstream end of a fairly large tributary watershed. The flow of the tributary is normally carried in a storm sewer that is designed to carry only the 10-year storm.

Alternatives:

Alternative solutions for this problem are flood proofing, construction or improvement of the overflow route, and upstream detention. Due to the many architectural and building access considerations, a cost estimate for flood proofing these structures was not determined. Also, due to the congestion of utilities, buildings and traffic in the area, improvement of the overflow route was deemed infeasible. A potential storage site exists east of Wauwatosa Road. About 50 acre-feet of storage capacity would be needed to solve the flooding problem. The estimated construction cost is $1.02 million.

Problem MQ-5: Frequent yard and street flooding east of Buntrock Avenue between West Street and Spring Avenue

Description:

Flooding occurs east of Buntrock Avenue between West Street and Spring Avenue.

Alternatives:

Two alternatives were considered for this area. Dry detention, located on the seminary property will be effective in reducing the flows. Approximately 30 ac-ft. of storage capacity are necessary. The estimated cost for the dry detention, based on a City of Mequon cost estimate, is $200,000. Preliminary engineering of the site should include a review of the ponds in the Westchester Lakes area. There may be the opportunity for more detention by restricting the channel outlet of the upper pond. Construction of a storm sewer along Spring Street will provide some flood relief. However, a drainage easment would be necessary through the Stemmeler property for flood flows during larger storm events. The estimated cost for storm sewer is $100,000.

Problem PG-1: Flooding in Thiensville, south of Freistadt Road.

Description:

Flooding can occur in Thiensville south of Friestadt Road as a result of three different problems. These are overbank flooding from Pigeon Creek, inadequate storm sewers and high stages on the Milwaukee River. Problem PG-1 refers only to Pigeon Creek overbank flooding. This problem is caused by restrictive bridges and culverts and development of the floodplain in Thiensville. High stages on Pigeon Creek restrict the outflow capacity of storm sewer outlets creating storm water ponding problems throughout the immediate drainage area.

Alternatives:

Alternatives to solve this problem are detention storage at the gravel quarry or storage upstream of Wauwatosa Road. A channel improvement was infeasible due to the lack of space for a flow easement or construction access. The hydraulic analysis determined that 100 acre-feet of flood storage will be needed to provide 100-year capacity for Pigeon Creek flows in Thiensville. This storage could be excavated on sites near the intersection of Hawthorne and Wauwatosa Roads. The construction cost is estimated to be about $2.1 million. There are two alternatives which avoid the cost of excavating a storage facility. One alternative is to acquire the quarry adjacent to the Thiensville Public Works facility and construct facilities to divert flood flow into the quarry and pump it out after the storm event. This project would cost about $240,000. Another alternative is to store water on the upstream side of Friestadt Road by creating a constriction at the Road. The constriction could be built for very little cost (about $12,000) but the storage available behind the bridge up to the top of the road is only about 30 acre-feet, thus 100-year protection is not provided with the constriction alone.

There are two homes that could be threatened by additional backwater. A complete solution would consist of the constriction, raising Friestadt Road and buy out of the two homes and any other flooding easement that might be needed upstream. The total estimated cost of this alternative is $1.25 million.

In addition to the upstream detention removal or upgrade of the culvert north of the Harley dealership the streambank modification from the railroad to the Milwaukee River will improve drainage within the Thiensville area. The estimated cost for these alternatives is $491,000.

Problem PG-2: Frequent street and yard flooding Laurel Drive area

Description:

Frequent yard and street flooding affect about four homes in the Laurel Drive area. The problem is likely cased by the storm sewer capacity.

Alternatives:

Two alternatives were considered to reduce flooding in this area. Flood proofing of the four homes was considered. The estimated cost for flood proofing is $280,000. Improvement of the existing storm sewer or construction of a new storm sewer from Rosedale Drive to Grand Avenue would reduce flooding and is estimated to cost about $100,000.

Problem MU-1: Yard and street flooding in Huntington Park Subdivision

Description:

This problem involves flooding of backyards and streets in the Concord Drive and Stanford Court area. Flooding in this area is mainly caused by development in a low area, probably a former wetland. The storm water drainage channel that serves as the storm water outlet for the subdivision has very little slope. A field inspection of this area showed that the roadside ditches and culverts had not been maintained, thus culvert and ditch improvements may be necessary to solve the problems.

Alternatives:

Alternatives developed to solve this problem were an improvement of the outlet channel, construction of a storm sewer or drainage ditch, or an upstream detention pond. The outlet channel could be cleaned, widened and the slope increased slightly for a cost of approximately $92,000. This project would encounter severe permitting difficulties due to extensive work in and around wetlands. A storm sewer drainage ditch designed to handle 100 year storm flows is estimated to cost $130,000. Hydrologic and hydraulic analysis determined that about 120 acre-feet of storage would be needed to solve the problem using detention. Less storage would be needed if the outflow were discharged along Donges Bay Road rather than through the subdivision. The estimated cost of the detention solution is $720,000 for detention northeast of the subdivision or $890,000 for detention east of Swan Road.

The problem areas, alternative solutions, level of protection, and estimated cost is summarized in Table 7-2.

7.2.3 Culvert Capacity Improvements

The hydrologic and hydraulic analysis included a capacity analysis of approximately 250 road crossing culverts in Mequon. The SWMM representation incorporates energy losses in the culvert barrel(s) as well as the culvert entrance and departure reaches. The model also accounts for backwater (ponding) behind the culvert and the possibility of road overtopping. The culverts were analyzed for the flow conditions generated by the 2-, 10-, 25-, and 100-year rainfalls. Culverts were evaluated for several potential deficiencies including insufficient flow capacity, excessive backwater and road overtopping. Approximately 30 culverts were found to be deficient according to the following criteria:

- Road overtopping exceeding 6-inches in the 100-year storm
- Overtopping of a main arterial in the 100-year storm
- Insufficient flow capacity for the 10-year storm
- Excessive backwater behind a culvert in a developed area

Table 7-2

Summary of Flooding Problem Alternatives

Number	Problem Description	Alternative Solutions	Level of Protection				Estimated Construction Cost	Estimated Op. & Maint. Cost
			100-Year	50-Year	25-Year	10-Year		
Fish Creek FS#1	Frequent yard flooding in Clover Lane/ Brookdale Drive area.	A. Detention basin, 30 ac-ft, north of Donges Bay Road.		X			$770,000	$5,000
		B. Inlet/culvert improvements under Pt. Washington Rd.				X (culvert designed for 100-yr.capacity)	will be implemented as part of Ozaukee Co. Pt. Washington Rd. improvement project	$500
Fish Creek FS#2	Frequent yard flooding east of Waterleaf Drive; west of Lakeshore Drive; between Donges Bay Road and Zedler Lane.	A. Channel improvement with compensatory detention adjacent to Railroad.	X				$410,000	$5,000
		B. 18-inch storm sewer from Waterleaf Dr. to a tributary of Fish Creek.			X		$154,000	$500
Mequon Milw. River MQ#1	Frequent flooding in Hickory Lane, Chestnut Road, Glenbrook Lane neighborhood. Frequent yard and residential flooding; 14 houses adjacent to channel. Hickory Lane, Chestnut Road, and Glenbrook Lane; North of Mequon Road to Milwaukee River.	A. Two detention basins providing a total of 80 ac-ft of storage capacity located east of Range Line School and at St. James School.	X (outside Milwaukee River Floodplain)				$1,600,000	$5,000

Table 7-2
Summary of Flooding Problem Alternatives

Number	Problem Description	Alternative Solutions	Level of Protection				Estimated Construction Cost	Estimated Op. & Maint. Cost
			100-Year	50-Year	25-Year	10-Year		
Mequon Milw. River MQ#1		B. Channel cleaning and flood proofing of 14 at-risk homes.		X (outside Milwaukee River Floodplain)			$20,000 plus $980,000 flood proofing	—
		C. Raise road and install pump station.		X (outside Milwaukee River Floodplain)			$450,000	—
		D. Channel Cleaning from North of Mequon Rd. to Hickory Ln. & from Ranch Rd. to the Milwaukee River.				X	$500,000	—
Mequon Milw. River MQ#2	Frequent yard flooding; basement backups, east of Union Pacific Railroad at Lakeshore Drive and Priarie View Lane.	A. Dention basin, 90 ac-ft, east of I-43, south of Mequon Rd.		X			$2,100,000	$5,000
		B. Channel improvement/stream restoration with detention basin west of Port Washington Rd.		X			$600,000	$5,000
		C. Channel cleaning/stream restoration from Mequon Road to the Milwaukee River Flooplain.	The level of protection is determined by the channel/stream restoration design				$480,000	—
		D. Channel cleaning/stream restoration from wetland area to I-43.	The level of protection is determined by the channel/stream restoration design.				$120,000	—

Table 7-2
Summary of Flooding Problem Alternatives

Number	Problem Description	Alternative Solutions	Level of Protection				Estimated Construction Cost	Estimated Op. & Maint. Cost
			100-Year	50-Year	25-Year	10-Year		
Mequon Milw. River MQ#3	Frequent yard and street flooding east of Wisconsin Central Railroad; west of Cedarburg Road; between Westfield Road and Willow Roads 24 houses and 1 church adjacent to channel.	A. Three detention basins, totalng 90 ac-ft, plus channel cleaning and rehabilitation.	X (outside Milwaukee River Floodplain)				$1,200,000	$5,000
		B. Channel improvements, ditch rehabilitation and driveway culvert replacements.				X	$28,000	—
Mequon Milw. River MQ#4	Flooding at the Mequon City Hall and Library. Frequent flooding with water entry through basement windows; one house, City Hall, and Library. East of Buntrock Avenue; between Division Street and Mequon Road.	A. Detention basin, 50 ac-ft, west of Buntrock Avenue and east of Wauwatosa Rd.	X				$1,020,000	$5,000
		B. Flood proof Library and City Hall.	X				Not Determined	—
Mequon Milw. River MQ#5	Frequent yard and street flooding east of Buntrock Ave. between West Street and Spring Ave.	A. Dry detention, 30 ac-ft, on seminary property-north east of Spring Avenue and West Street and storm sewer along Spring St.	X				$200,000	$5,000

Table 7-2
Summary of Flooding Problem Alternatives

Number	Problem Description	Alternative Solutions	Level of Protection				Estimated Construction Cost	Estimated Op. & Maint. Cost
			100-Year	50-Year	25-Year	10-Year		
		B. Construct storm sewer along Spring Street, maintain the drainage way through the Stemmeler property.				X	$100,000	—
Pigeon Creek PG#1	Flooding in Thiensville south of Freistadt Road. Frequent street and property flooding in a large area of Thiensville south of Freistadt Road to Cedarburg Road.	A. Raise Road profile and restrict culvert at Freistadl Road 2@ 4x4 box culverts to create storage behind Road; includes 2 home buyouts.	X (outside Milwaukee River Floodplain)				$1,250,000	$10,000
		B. Three detention basins providing 100 ac-ft capacity, at Howthorne and Wauwatosa Rds.	X (outside Milwaukee River Floodplain)				$2,100,000	$5,000
		C. Divert flow to gravel quarry adjacent to public works yard and build gravity or pumped outlet.	X (outside Milwaukee River Floodplain)				$240,000-$250,000	$5,000-$6,000
		D. Remove or upgrade culvert north of the Harley dealership.					$218,000	—
		E. Streambank modification from the railroad to the Milwaukee River.					$273,000	—
Pigeon Creek PG#2	Frequent street and yard flooding along Laurel Drive affecting approximately 4 homes.	A. Floodproof 4 homes.	X				$280,000	—

Table 7-2
Summary of Flooding Problem Alternatives

Number	Problem Description	Alternative Solutions	Level of Protection				Estimated Construction Cost	Estimated Op. & Maint. Cost
			100-Year	50-Year	25-Year	10-Year		
Pigeon Creek PG#2		B. Improve existing storm sewer or construct new storm sewer from Rosedale Dr. to Grand Ave.	X				$100,000	—
Mequon Meno. River MU#1	Yard and street flooding in Huntington Park Subdivision; 19 houses adjacent to channel. Huntington Park Subdivisiojn. South of Donges Bay Road; west of Swan Road; between Stanford and Concord Drive.	A. Dention basin, 30 ac-ft, northeast of subdivision with diversion along Donges Bay Rd.	X				$720,000	$5,000
		B. Detention basin, 42 ac-ft, east of Swan Rd.		X			$890,000	$5,000
		C. Channel improvement from Concord Dr. to Donges			X		$92,000	—
		D. Drainage ditch/storm sewer, 1,300 feet from Swan Rd. to the Little Menomonee River.	X				$130,000	—

Culverts identified as being deficient are listed in Table 7-3. Several of these deficiencies will be resolved through implementation of the recommended storm water improvements. Three deficient culverts should not be improved because of the potential to increase flooding downstream.

7.3 Storm Water Quality Alternatives

Alternatives related to water quality improvement generally consist of treatment measures or source control measures. Treatment control measures are designed to treat storm water runoff prior to discharge to a receiving stream. Non-structural measures generally involve a change in procedure and are designed to reduce the amount of pollutants in the storm water runoff from an area.

7.3.1 Source Controls Alternatives for Water Quality Improvement

Source control alternatives considered for the Mequon/Thiensville study area are compared in Table 7-4. Alternatives recommended for consideration in the final recommended plan are described below:

Industrial Best Management Practices

Subchapter 2 of the Wisconsin Administrative Code NR216 regulates industrial storm water dischargers. Industries which are regulated by NR216 are required to identify sources of potential storm water pollution at their facilities and implement best management practices to reduce or eliminate pollutants from the identified sources. The permit issued to industries generally requires the facility to implement the following general types of best management practices:

- Good housekeeping - practices intended to maintain areas in a clean and orderly manner
- Preventive maintenance - practice to maintain equipment and systems
- Spill prevention and response - practices which reduce the potential for a spill to occur and minimize the effect of a spill
- Sediment and erosion control - practice to reduce sedimentation and erosion

Pollutant reductions from the implementation of the industrial storm water regulations are estimated to range from 15 to 20 percent. Individual industries are responsible for the costs related to industrial storm water discharge permit compliance.

Pavement sweeping

The current street sweeping schedule for Mequon and Thiensville is presented below:

Mequon:
- Annual sweeping of all curbed streets
- Semiannual sweeping of curbed streets within the business park
- Semiannual sweeping of Mequon Road from Cedarburg Road to Buntrock

Thiensville:
- From May through October all curbed streets are swept bi-weekly.

Table 7-3: Culvert Capacity Analysis Results - Undersized Culverts

Culvert ID	Road	Shape	Size (in.)	Condition	Comments
FS232014	County Line Road	Arch	101 x 161	High back water	DB
FS231015	Port Washington Road	Box	48 x 96	Major road overtopping in the 100-year event	A
FS233019	Lake Shore Drive	Circular	12	Overtops road by 2 inches in 100-year event	
FS232051	Zedler Lane	Arch	2 @ 18 x 24	Overtops road by 2 inches in 100-year event	
FS232067	Waterleaf Drive	Arch	5 @ different sizes	Damaged culvert, Overtops by 6 inches in 100-year	crushed
FS232074	Donges Bay Road	Arch	2 @ 20 x 28	Major road overtopping in the 100-year event	
MQ134006	Baehr Road	Arch	5 @ 41 x 53	Overtops road > 6 inches in 100-year event	A
MQ133009	Wauwatosa Road	Circular	2 @ 30	Overtops road > 6 inches in 100-year event	
MQ136042	Donges Bay Road	Circular	42	Overtops road > 6 inches in 100-year event	
MQ219042	Hickory Lane	Arch	2 @ 52 x 77	Overtops road > 6 inches in 100-year event	A
MQ219045	Chestnut Road	Arch	3 @ different sizes	Overtops road > 6 inches in 100-year event	A
MQ219046	Glenbrook Lane	Arch	2 @ 43 x 64	Overtops road > 6 inches in 100-year event	A
MQ230085	Mequon Road	Circular	2 @ 48	Overtops road > 6 inches in 100-year event	A
MQ230039	Range Line Road	Arch	47 x 71	Overtops road by 3 inches in 100-year event	A
MQ219003	Glen Oaks Lane	Box	48 x 48	High back water	
MQ217008	Corporate Parkway	Circular	3 @ 18	Overtops road by 6 inches in 100-year event	
MQ126018	Sherwood Drive	Arch	20 x 28	Overtops road by a foot in 100-year event	
MQ126020	WCRR Tracks	Circular	42	Overtops road > 6 inches in 100-year event	
MQ13699J	Range Line Court	Circular	2 @ 24	Overtops road > 6 inches in 100-year event	
MQ136038	Donges Bay Road	Arch	20 x 28	Overtops road > 6 inches in 100-year event	
MQ122022	West Street	Arch	33 x 49	Overtops road > 6 inches in 100-year event	DT
MQ135029	Cedarburg Road	Arch	2 @ 71 x 103	Major road overtopping in the 100-year event	
MQ113003	Yvonne Drive	Arch	2 @ 29 x 42	Overtops road > 6 inches in 100-year event	
MQ102002	Bonniwell Road	Circular	15	Major road overtopping in the 100-year event	
PG110010	WCRR Spur	Circular	24	Overtops by a foot in 100-year event	
PG103031	Concord Street	Circular	28	Overtops road > 6 inches in 100-year event	
PG102012	Pioneer Road	Circular	27	Overtops road > 6 inches in 100-year event	DT

Culvert ID	Road	Shape	Size (in.)	Condition	Comments
PG103023	Wauwatosa Road	Circular	15	Overtops road > 6 inches in 100-year event	
PG109010	Highland Road	Circular	48	Overtops road > 3 inches in 100-year event	
UL208004	Lake Shore Drive	Circular	24	Overtops road > 6 inches in 100-year event	
UL208001	Lake Shore Drive	Circular	36	Excessive back water in 100-year event	
UL205002	Lake Shore Drive	Arch	29 x 42	Overtops road by 6 inches in 100-year event	
UL206006	Bonniwell Road	Arch	29 x 42	Overtops road by 6 inches in 100-year event	
UL217015	Highland Road	Circular	2 @ 36	Excessive back water in 100-year event	

Notes:
A = Problem addressed by Recommended Plan
DT = Do not replace, would increase flooding in Thiensville
DB = Do not replace, would increase flooding in Bayside

Table 7-4: Comparison of Source Control Alternatives

Alternative	Pollutant Removal Effectiveness				Cost		Comments	Recommended for Further Consideration
	Winter Loading	Sediment	Nutrients	Metals	Capitol	Maintenance		
Industrial Best Management Practices	o	o	-	o	o	o	Required for most industries for compliance with NR216	Yes
Sweeping	+	o	-	+	+	o	Frequency and timing determine effectiveness	Yes
Snow/Ice Management	+	o	o	o	o	-	Snow storage locations and deicing techniques	Yes
Landscape Management	-	o	+	+	o	o	Fertilizer and pesticide management	Yes
Catch Basin Cleaning	o	o	o	o	+	+	Frequency and timing determine effectiveness	Yes
Erosion Control Ordinance	-	+	-	-	o	o	Existing ordinance in place	Yes
Public Education and Information	o	o	o	o	+	o	Can use existing materials developed by WDNR and the UW-Extension	Yes

Notes: + *indicates HIGH Pollutant Removal Effectiveness/ LOW Cost*
o *indicates MODERATE Pollutant Removal Effectiveness/MODERATE Cost*
- *indicates LOW Pollutant Removal Effectiveness/ HIGH Cost*

The effectiveness of a sweeping program pollutant reduction is directly related to the frequency of sweeping between storm events. The frequency of early spring street sweeping is critical because studies have indicated that pollutant loadings from spring snowmelt can account for one- to two-thirds of the annual pollutant loadings from urban areas. Pavement sweeping alternatives incorporate:

- Curbed highways and arterials
- Commercial parking lots -
  - Along Port Washington Road at Mequon Road
  - Mequon Road and Wauwatosa Road
  - Along Cedarburg Road in Thiensville
- Curbed roadways within the Village of Thiensville

A comparison of the effectiveness and cost of street sweeping schedules is presented in Table 7-5.

Table 7-5: Comparison of Street Sweeping Schedules

Frequency of Sweeping	Estimated Pollutant Reduction (%)	Cost for arterial and main roadway sweeping
Monthly	10 %	$27,000
Seasonal (weekly - April & May, bi-weekly - June through September; monthly October, November & March)	25 %	$58,500
Bi-Weekly	30%	$87,400

Catch basin cleaning

Catch basins are designed to collect and temporarily store sediment and debris. Regular cleaning, to remove the collected materials, improves the pollutant removal effectiveness of the catch basins. Both Mequon and Thiensville have catch basins within areas of the storm sewer system which are described below:

Mequon: catch basin locations are scattered throughout storm sewered areas.
Thiensville: approximately half of the inlets to the storm sewer system in curbed areas have catch basins.

A catch basin cleaning schedule of twice per year, once in spring and fall of each year was evaluated. The estimated pollutant reduction for semi-annual catch basin cleaning is 17 percent for sediment and 25 percent for metals. Alternatively catch basins could be inspected quarterly and cleaned when about 40 percent full.

Landscape practices

Park and institutional land uses contribute about 28 percent of the study area phosphorous loading. The major source of the phosphorous is landscaping practices. Landscaping practices which will reduce the pollutant loading in this area include: converting high maintenance lawn areas into low impact areas planted with ground cover, trees, shrubs, or perennials; test soils and adjust fertilizer applications accordingly; only water landscaped areas in early morning hours; increase average turf height to three inches to improve turf health and reduce weed growth, consider low toxicity weed control. Implementation of these landscaping practices may result in approximately a 10 percent reduction in phosphorous loadings.

Snow and Ice Management

Parking lots and roadways are plowed to remove snow fall as needed during the winter months. The Village of Thiensville collects snow plowed from Main Street and Green Bay Road. The snow is currently stored at the Village Park parking lot on Elm Street and the Public Works area at 132 West Friestadt Road. The Mequon snow storage area is located west of Buntrock and north of Mequon Road.

In order to provide a reduction in pollutant loadings from the snow melt, a vegetated filter area should be provided between the storage area and the receiving stream. Additional snow and ice management practices include: tailoring the application rate of de-icers to the use of the area; training handlers of road salt to improve the efficiency of deicer application and reduce losses; and sweeping accumulated salt and grit from paved areas as soon as practical after the surface clears.

Implementation of snow and ice management practices can result in pollutant reductions up to 15 percent of the total annual loading.

Erosion Control Ordinance

The City of Mequon and Village of Thiensville currently have an erosion control ordinance which provides adequate authority to control sediment from land disturbing activities. In order to improve compliance with the ordinance a vigorous site inspection program should be implemented by the City and Village. The inspections should be conducted by qualified staff to check for proper implementation of erosion control measures during construction. Inspections should be conducted during or after storm events to observe the effectiveness of the measures implemented. Post construction inspections should also be conducted to check for signs of site erosion, as well as to evaluate the downstream impacts of the project.

In order to increase the enforceability of the ordinances, a severability clause should be incorporated. The purpose of a severability clause is to provide a means of enforcement of applicable parts of the ordinance under circumstances where the full ordinance may not be applicable.

Additional recommendations to improve the City of Mequon Erosion and Storm Water Runoff Control Ordinance include reduction of the applicable site size from five acres to one acre, increased definition regarding on site detention and runoff control, and addition of maintenance responsibilities. The ordinance recommendations were submitted to the City and are presented in Section 8.5.

Additional recommendations to improve the Village of Thiensville include the addition of storm drain inlet protection.

Public Information and Education

A public education and information program established to target the general public and industries will assist Mequon and Thiensville in its efforts to implement a storm water management program. An information and education program will increase public knowledge and understanding of storm water management, change people's attitudes and actions, and generate support for the implementation of this plan. An education program for the general public should include storm water management goals, lawn care and landscaping, pet waste handling, and other best management practices. An industrial education program should focus on compliance with the NR216 industrial storm water regulations and improved selection and implementation of best management practices. A public education program may include informational materials, posters, public announcements and press releases, presentations, workshops, video presentations on cable television, direct mailings, and personal contacts. Information for education programs is available from the University of Wisconsin Extension office.

7.3.2 Treatment Alternatives for Water Quality Improvement

Storm Water treatment alternatives considered for the Mequon/Thiensville study area are compared in Table 7-6. Treatment alternatives recommended for consideration in the final recommended plan are described below.

Wet Detention Basin/Pond

Water quality features should be included in the design of the detention ponds recommended for flooding control. Water quality features include a forebay and adequate sizing to provide the required conditions for pollutant reduction. Flooding areas with detention pond alternatives recommended and which are located in areas which can provide water quality benefits are MQ-1, MQ-2, MQ-3, MQ-4 and PG-1. The locations of the detention ponds are discussed in the previous section. Pollutant removal effectiveness by wet detention ponds is estimated to be 90 percent for sediment, 50 percent for phosphorous, and 70 percent for lead. The detention pond alternatives are summarized in Table 7-7.

A wet detention pond has been constructed east of Industrial Drive and south of Mequon Road. The approximate drainage area to this pond includes high density residential and industrial land use.

Typical maintenance includes routine mowing, debris and litter removal, and erosion control inspection. Non-routine maintenance includes sediment removal and structural repairs.

In-Line Treatment System

An in-line treatment type system such as Vortechs™ or Stormceptor™ will treat storm water entering the basin and discharge the water to the existing storm sewer system. The in-line systems are underground chambers where storm water collects and is treated. Typical maintenance includes regular clean-out of the collected sediment with vacuum trucks. Construction and maintenance costs vary depending on the size of the system. Possible locations for an in-line collection system include:

- Commercial parking lots areas along Port Washington Road and Mequon Road.
- Commercial parking lots areas at the intersection of Cedarburg Road and Mequon Road.
- Commercial parking lot areas along Cedarburg Road within the Village of Thiensville.

Pollutant loadings from the commercial parking lot areas listed above account for approximately 3 to 15 percent of the total annual study area loading. The pollutant removal effectiveness of the in-line treatment systems ranges from 70 to 90 percent of sediment, and 40 to 50 percent of the phosphorous load. Estimated costs are $45,000 to $80,000 per unit.

Standard Catch Basins

Standard catch basins collect sediment and pollutants in a sump prior to discharge of the storm water runoff to the storm sewer. Pollutants collected in the catch basins must be cleaned out to prevent flows from washing collected pollutants into the storm sewer. Catch basins are currently located throughout Thiensville and Mequon in storm sewered areas.

In order to continue the current level of pollutant reduction existing catch basins should be replaced, as necessary, with new catch basins rather than direct storm sewer inlets.

Table 7-6: Comparison of Stormwater Treatment Alternatives

Alternative	Pollutant Removal Effectiveness				Cost		Comments	Recommended for Further Consideration
	Winter Loading	Sediment	Nutrients	Metals	Capitol	Maintenance		
Wet Detention Pond	o	+	+	+	-	o	Can be combined with flood control alternatives	Yes
Extended Detention Basin	o	+	+	+	-	o	Can be combined with flood control alternatives	No
Stormwater Wetlands	-	o	+	o	-	o	Use previously converted wetland areas	Yes
Catch Basins	o	o	-	o	o	o	Use in new developments with storm sewer, replace existing basins as needed	Yes
In-Line Treatment	o	+	o	+	-	o	Vortechnics™, Stormceptor™, Other	Yes
Inlet filters	o	o	-	o	o	-	Potential clogging and damage due to velocity	No
Filter systems	+	+	o	+	-	o	Limited flows can be treated	Yes
Infiltration Systems	o	+	+	+	-	o	Requires sandy soils, potential ground-water contamination	No
Porous Pavement	o	o	-	o	-	o	Practical for very small areas only, potential clogging problems	No
Streambank Stabilizations	-	+	-	-	o	o	Vegetative protection, rip rap, channel clearing and cleaning, deposit removal	Yes
Grassed Swales	o	+	+	+	-	+	Maintain existing swales	No

Notes: + *indicates HIGH Pollutant Removal Effectiveness/ LOW Cost*
o *indicates MODERATE Pollutant Removal Effectiveness/MODERATE Cost*
- *indicates LOW Pollutant Removal Effectiveness/ HIGH Cost*

Table 7-7: Summary of Water Quality Detention Pond Alternatives

Flooding area/ detention pond/basin designation	Location	Existing Annual Pollutant Loadings from drainage area (Percent of Total Loading)	Reduction in Total Study Area Pollutant Load
MQ-1	South of Mequon Road, east of Range Line Road	Sediment - 68,900 lbs. (1%) Phosphorous - 350 lbs.(2%) Lead - 18 lbs. (0.4%)	Sediment - 0.7% Phosphorous -1 % Lead - 0.3%
MQ-2	South of Mequon Rd., east of I-43	Sediment -152,700 lbs. (2%) Phosphorous - 170 lbs. (1%) Lead - 290 (6%)	Sediment - 2% Phosphorous -0.5 % Lead - 4%
MQ-3	South of Donges Bay Road, east of Enterprise Drive	Sediment - 368,600 lbs.(4%) Phosphorous - 522 lbs.(3%) Lead - 351 lbs.(7%)	Sediment - 4% Phosphorous - 2% Lead -5%
MQ-4	East of Buntrock, between Division Street and Mequon Road	Sediment - 187,800 lbs. (2%) Phosphorous - 396 lbs. (2%) Lead - 127 lbs. (2.5%)	Sediment - 2% Phosphorous - 1% Lead - 2%
PG-1	Intersection of Hawthorn and Wauwatosa Rd.	Sediment - 260,000 lbs. (5%) Phosphorous - 850 lbs. (5%)	Sediment - 2% Phosphorous -2 %
MQ-2 *(included in R.A. Smith recommend-ations)*	South of Mequon Road, east of I-43	Sediment - 152,700 lbs. (2%) Phosphorous - 171 lbs. (1%) Lead - 294 lbs. (6%)	Sediment - 2% Phosphorous - 0.5% Lead - 4%
R.A. Smith recommend-ations	North of Mequon Road, East of Port Washington Road	Sediment - 37039 lbs. Phosphorous - 38 lbs. Lead - 74 lbs.	Sediment - 1% Phosphorous - 0.5% Lead - 4%
	Mequon Corporate Center	Sediment - 47,800 lbs. Phosphorous - 138 lbs. Lead - 205 lbs.	
	McDonalds	Sediment - 8,100 lbs. Phosphorous - 8 lbs. Lead - 20 lbs.	
Industrial Park Pond *(under construction)*	South of Mequon Road, west of Wisconsin Central Railroad	Sediment - 47,114 lbs.(0.5%) Phosphorous - 30 lbs. (0.2%) Lead - 117 lbs. (2%)	Sediment - 0.5% Phosphorous - 0.1% Lead - 1%

Standard catch basins should be provided where new development plans include storm sewer. Additional catch basin installation will improve water quality from the drainage area.

Estimated pollutant reduction per catch basin = 20% of sediment loading from drainage area

Estimated construction cost = $ 5,000 per catch basin

Estimated maintenance cost = $ 10 - 15 per catch basin

Construct/Retrofit Wetlands

The wetland inventory described in Section 4 of this report identified numerous wetland areas throughout the Mequon/Thiensville area. Wetlands classified as prior-converted have a very high potential for restoration of wetland features which could result in valuable water quality and flow improvements. Restoration of prior converted wetlands is often very simple. Wetland storm water management areas are identified in Table 7-8.

Table 7-8: Summary of Wetland Alternatives

Wetland Designation/ Location	Wetland Area Available (acres)	Targeted Drainage Area (acres)	Existing Annual Pollutant Loading from Targeted Drainage Area	Pollutant Removal in Total Annual Load
47 / West of Cedarburg Road, north of Donges Bay Road extending north to Sherwood Drive	13.6	13 acres of commercial and arterial land use within subbasin	Sediment - 9,200lbs. (0.1%) Phosphorous - 11 lbs. (0.1%) Lead -23 lbs. (0.5 %)	Sediment -<0.1% Phosphorous-<0.1% Lead - 0.4%
50 /West of Wisconsin Central Railroad Tracks, East of Baehr Road, South of Donges Bay Road	17	285 acres of industrial and arterial land use within subbasin	Sediment - 120,700lbs. (1%) Phosphorous - 53 lbs. (0.3%) Lead -332 lbs. (6%)	Sediment - 0.7% Phosphorous-0.2% Lead - 4%
53,54,55 /West of Wisconsin Central Railroad Tracks, East of Baehr Road, North of County Line Road	30	90 acres of industrial and arterial land use within subbasin	Sediment- 37,700 lbs. (0.4%) Phosphorous - 19lbs. (0.1 %) Lead - 104 lbs. (2 %)	Sediment - 1% Phosphorous-0.3% Lead - 2 %

Prior converted wetland areas should be evaluated for flood control and water quality improvement as new development is considered. The prior converted wetland areas which may be effective for storm water management are discussed in Section 4. The pollutant removal effectiveness for wetland management practices ranges from 80 to 99 percent of sediment loadings, from 50 to 99 percent of phosphorous loadings, and from 60 to 95 percent of lead loadings.

Filtration Alternatives

A below grade sand or sand peat filter will treat storm water runoff entering the filter system and discharge the water to a storm sewer of other drainage way.

Possible locations for a below grade filter system include:

- Commercial parking lot areas along Port Washington Road and Mequon Road.
- Commercial parking lot areas at the intersection of Cedarburg Road and Mequon Road.
- Commercial parking lot areas along Cedarburg Road within the Village of Thiensville.
- Key industrial areas

Pollutant loadings from the commercial parking lot areas listed above account for approximately 3 to 15 percent of the total annual study area loading. The pollutant removal effectiveness of a sand filter system ranges from 70 to 90 percent of sediment, 40 to 70 percent of the phosphorous load, and 50 to 90 percent of the metals.

Streambank Stabilization

Streambank stabilization measures include vegetative protection, rip rap protection, channel clearing and cleaning, and deposit removal. The streambank inventory identified about 10.5 miles of streambank which were classified as fair or poor. Of these reaches 3.5 miles were identified for stabilization measures. The streambank reaches are described in Table 7-9

Table 7-9: Summary of Streambank Stabilization Locations

Stream Reach / Location	Length (miles)	Reach Problems	Actions needed
FS-E / Fish Creek Subwatershed, tributary to Fish Creek from Zedler Lane to County Line Road	0.7	Vegetative bank protection, cutting, deposition, landform slope, mass wasting	Protect banks, repair cut areas, clean out deposition and debris, possible slope repair
FS-B / Fish Creek Subwatershed, tributary to Fish Creek, from 0.1 mile east of Otto Road east to Fish Creek & FS-D	0.5 0.1	Vegetative bank protection, cutting, deposition, debris jam potential, landform slope	Protect banks, repair cut areas, clean out deposition and debris, remove potential jam materials, possible slope repair
LM-A / Lake Michigan Subwatershed, tributary to Lake Michigan, from Eastwyn Bay Drive southeast to Lake Michigan	0.4	Vegetative bank protection, cutting, deposition, debris jam potential	Protect banks, repair cut areas, clean out deposition, remove potential jam materials
MQ-W / Mequon -MQ subwatershed, tributary to the Milwaukee River, north of Elmdale Road, from Arrowhead Road extended to the Trinity Lutheran property	0.2	Vegetative bank protection, debris jam potential, obstructions, cuttings, deposition	Protect banks, repair cuts, clean out deposition and obstruction, remove potential jam materials
Ulao Creek / Ulao Creek subwatershed, tributary to the Milwaukee River, north of Boniwell, from 0.2 miles north of intersection with UL-B 0.1 mile north	0.1	Vegetative bank protection, debris jam potential, obstructions, cutting	Protect bank, repair cuts, remove obstructions and potential jam material

Stream Reach / Location	Length (miles)	Reach Problems	Actions needed
Mequon - MQ / MQ-W Tributary to the Milwaukee	0.1	Cutting, deposition	Repair cuts, clean out deposition
Fish Creek / FS-C Tributary to Fish Creek, from FS-B to east Zedler Lane	0.3	Vegetative bank protection, cutting, landform slope	Protect bank, repair cuts
Pigeon Creek / Pigeon Creek Tributary to the Milwaukee River, from Mequon Road to junction with Little Menomonee River	0.9	Vegetative bank protection	Protect banks
Fish Creek / FS-F Tributary to Fish Creek from Kathleen Drive south to FS-E	0.2	Obstructions, debris jam potential	Remove obstructions and potential debris jam materials

Areas identified by the Ozaukee County Land Conservation Department in the 1996 inventory of the Milwaukee River should also be considered for stabilization. The location of the areas identified by the Ozaukee County Land Conservation Department is presented in Appendix F.

7.3.3 Discussion of Storm Water Quality Alternatives

The above sections describe alternatives which will assist Mequon and Thiensville in improvement of water quality. The water quality objective, as identified in Section 2 of this report, is to provide water quality suitable to support the designated use classification, warm water fish communities and full body contact recreation in the Milwaukee and Menomonee River.

The water quality alternatives effectiveness and cost are summarized in Table 7-10.

The alternatives recommended for incorporation into the storm water management plan for the Mequon/Thiensville study area are presented in Section 8.

7.4 Evaluation and Groupings of Alternatives

The objectives and criteria identified in Section 2 of this plan were designed to guide the development of the Storm Water Management Master Plan. The hydraulic and water quality alternatives described above were evaluated for their effectiveness in achieving each objective. Table 7-11 presents a summary of the evaluation of alternatives and objectives.

Alternatives were grouped together into three scenarios in order to evaluate the overall effectiveness of the alternatives. The groupings were selected based on the level of service provided by an alternative and its effectiveness in achieving the Plan objectives. A summary of the alternative groupings is presented in Table 7-12. In general the basic plan provides a minimal level of flood protection and generally does not meet the objectives of the Plan, the mid-level plan provides flood protection during the 25 to 100-year storm event, provides a moderate reduction in pollutants and partially meets or meet the objectives of the Plan, the high level plan provides flood protection during the 100-year storm event (when considered feasible), provides a high level of pollutant reduction, and generally meets or partially meets the objectives of the Plan.

TABLE 7-10:

Summary of Water Quality Alternatives

Area of Concern	Alternative	Alternative Effectiveness (Pollutant reduction within drainage area)	Estimated Pollutant Reduction (% reduction in total annual study area load)			Estimated Capitol Costs*	Estimated Op. & Maint. Costs
			Sediment (tons)	Phosphorus (lbs.)	Lead (lbs.)		
Entire Study Area	A. Urban planning & zoning in accordance with the land use plan (change from existing to future land use)	variable	500 (11%)	2,800 (16%)	increase 1400 (-28%)	----[1]	----[1]
	B. Enforcement of storm water ordinance	40-80%	500 (11%)	500 (3%)	900 (18%)	----[1]	----[1]
Industrial Areas	A. Industrial BMPs as required by Wisconsin Administrative Code NR216	15%	23 (0.5%)	----	100 (2%)	----[2]	----[2]
Arterials and Main Roadways	A. Monthly sweeping from April thru November of Mequon curbed arterials, Mequon business & industrial parks, and Thiensville arterials and curbed roadways	10%	23 (0.5%)	71 (0.4%)	150 (3%)	----	$27,000 / yr.
	B. Seasonal sweeping(weekly in April & May, bi-weekly from June thru August, monthly from Sept. thru Nov.) of Mequon curbed arterials, Mequon business & industrial parks, and Thiensville arterials and curbed roadways	25%	45 (1%)	150 (1%)	300 (6%)	----	$58,500 / yr.
	C. Bi-weekly sweeping of Mequon curbed arterials, Mequon business & industrial parks, and Thiensville arterials and curbed roadways	30%	45 (1%)	150 (1%)	350 (7%)	----	$87,400 / yr.
Major Parking Lots	A. Monthly sweeping from April thru November of Major parking lots	10%	23 (0.4%)	35 (0.2%)	100 (2%)	----	$15,000 / yr.
	B. Seasonal sweeping (weekly in April & May, bi-weekly from June thru August, monthly from Sept. thru Nov.) of Major parking lots	25%	45 (1%)	89 (0.5%)	200 (4%)	----	$20,000 / yr.
	C. Bi-weekly sweeping from April thru November of Major parking lots	30%	45 (1%)	89 (0.5%)	240 (5%)	----	$26,000 / yr.
Winter pollutant loadings from paved areas	A. Ice management practices including improved salt distribution methods and training of salt truck drivers.	15% in pavement loadings	variable	variable	variable	min.	min.

TABLE 7-10:

Summary of Water Quality Alternatives

Area of Concern	Alternative	Alternative Effectiveness (Pollutant reduction within drainage area)	Estimated Pollutant Reduction (% reduction in total annual study area load)			Estimated Capitol Costs*	Estimated Op. & Maint. Costs
			Sediment (tons)	Phosphorus (lbs.)	Lead (lbs.)		
Storm Sewered Areas w/ Catch Basins	A. Catch basin cleaning (2x/year)	17-25%	18 (0.4%)	-----	50 (1%)	----	$6,000 (based on 300 basins at $20/catch basin / year)
	B. Inspect catch basins quarterly and clean as necessary when basin is approximately 40% full.	17-25%	18 (0.4%)	---	50 (1%)	----	$7,300 (based on $1,300/yr for inspections & 300 basins at $20/catch basin / year)
Institutional and Park Lawn/ High Maintenance Turf Areas	A. Landscaping practices including increased turf height, reduced weed control, replacement of turf with low maintenance ground cover or perennials, reduced fertilizer application	10%	32 (0.7%)	360 (2%)	15 (0.3%)	min.	min.
Snow Storage Areas	A. Locate snow storage areas in a well vegetated areas at least 200 feet from a drainage way of storm sewer inlet	15%	variable	variable	variable	min.	min.
New Construction Areas	A. Implement revised ordinance	additional 10% reduction [3]	5 (0.1%)	----	----	----[1]	----[1]
	B. Increase inspections for construction sites for compliance with the ordinance	additional 10% reduction [3]	8 (0.2%)	----	----	----	$10,000
	C. Provide erosion control techniques training for inspectors	variable	----	----	----	$1,000	----

TABLE 7-10:

Summary of Water Quality Alternatives

Area of Concern	Alternative	Alternative Effectiveness (Pollutant reduction within drainage area)	Estimated Pollutant Reduction (% reduction in total annual study area load)			Estimated Capitol Costs*	Estimated Op. & Maint. Costs
			Sediment (tons)	Phosphorus (lbs.)	Lead (lbs.)		
Agricultural Areas	A. Encourage use of Agricultural BMPs such as conservation tillage	5%	134 (3%)	530 (3%)	----	----[3]	----[3]
	B. Support the County Shoreline Management Ordinance for buffer strips	40-70%	317 (7%)	700 (4%)	10 (0.2%)	----[3]	----[3]
	C. Adopt the County shoreline management ordinance/ establish shoreline management ordinance which requires buffer strips along all perennial and intermittent streams identified on the USGS map and located within agricultural areas. Maintain the buffer during and after development.	40-70%	950 (21%)	2,300 (13%)	24 (0.5%)	----[4]	----[4]
Stream Banks	A. Implement a stream bank stabilization program for approximately 6.2 miles of stream	----	----	----	----	$1,300,000	----
Pt. Washington Rd. Commercial Areas	A. Water Quality features to MQ-2 detention basin	70-90%	91 (2%)	90 (0.5%)	200 (4%)	---[5]	----[5]
	B. On-site water quality systems for major parking lots	60-90%	6 (0.1%)	10 (<0.1%)	20 (0.3%)	$250,000	$1,000
	C. Construct three water quality detention basins recommended in RA Smith report	70-90%	45 (1%)	89 (0.5%)	200 (4%)	$250,000[6]	$500
Thiensville Business District	A. On-site water quality system for major parking lots	60-90%	3 (<0.1%)	3 (<0.1%)	8 (0.1%)	$8,400	$1,000
	B. Regional water quality system at main St. and Pigeon Creek	60-90%	23 (0.5%)	53 (0.3%)	150 (3%)	$500,000 to $800,000	$1,000

TABLE 7-10:
Summary of Water Quality Alternatives

Area of Concern	Alternative	Alternative Effectiveness (Pollutant reduction within drainage area)	Estimated Pollutant Reduction (% reduction in total annual study area load)			Estimated Capitol Costs*	Estimated Op. & Maint. Costs
			Sediment (tons)	Phosphorus (lbs.)	Lead (lbs.)		
Industrial/ commercial/ Business Park area at Donges Bay Rd. & Baehr Rd.	A. Construct/retrofit prior converted wetland, west of Wisconsin Central RR, east of Baehr, south of Donges Bay Rd.	70-90%	32 (0.7%)	35 (0.2%)	200 (4%)	$170,000 - $255,000	$1,000
	B. Construct/ retrofit prior converted wetland, west of Wisconsin Central RR, east of Baehr, north of County Line Rd.	70-90%	13 (0.3%)	17 (0.1%)	100 (2%)	$90,000 - $135,000	$1,000
	C. Construct detention basin in industrial park (construction completed)	70-90%	20 (0.5%)	17 (0.1%)	50 (1%)	construction completed	$1,000
	D. Water quality features in MQ-3 detention basin	70-90%	180 (4%)	350 (2%)	250 (5%)	---[5]	---[5]
Commercial, residential, arterial area north of Mequon Rd., west of Buntrock	A. Water quality features to MQ-4 detention basin	70-90%	90 (2%)	170 (1%)	100 (2%)	---[5]	---[5]
Industrial, residential area south of Mequon Rd. east of Range Line School	A. Water quality features to MQ-1 detention basin	70-90%	32 (1%)	170 (1%)	----	---[5]	---[5]
Agricultural Area northwest portion of Pigeon Creek subbasin	A. Water quality features to PG-1 detention basin	30-50%	65 (2%)	260 (2%)	----	---[5]	---[5]

Notes:

1 - Costs incurred by developers
2 - Costs incurred by industries
3 - Costs incurred by agricultural land owners
4 - Cost to be determined by the County/City in the future
5 - Cost included in cost estimate for construction of the detention basin
6 - per RA Smith December 1993 Report
** costs do not include land acquisition costs*

TABLE 7-11
Effectiveness of Alternatives in Achieving Objectives

Alternatives	*Objective No.1* Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little menomonee Creek and the most effective cost. Criteria a. NR 102,104,105 standards b. Non-point source control plan objectives c. Management measures	*Objective No. 2* Provide stormwater drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost. Criteria a. Design minor system- 10-yr. storm b. Design major system-100-yr. storm c. Design wet detention to maintain 2-yr. 24-hr. flow at 2-yr. predeveloped conditions d. Establish emergency spillways for 100-yr. storm e. Design overland flow rts.- 100-yr. Storm without property damage	*Objective No. 3* Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost. Criteria a. modify existing facilities b. Design new drainage systems c. Provide guidance for info. & educ. Program d. Design new upstream facilities e. Minimize impacts to property owners	*Objective No. 4* Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost. Criteria a. Reduce uncontrolled construction site loadings, erosion control ordinance b. Within env. sensitive areas, utilize additional procedures c. Reduce 1985 agricultural loadings	*Objective No. 5* Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost. Criteria a. Identify wetlands and woodlands that provide benefit b. Protect, enhance, preserve high quality sensitive areas c. Integrate valuable environmental sensitive areas d. Prevent discharge of increase flow and pollutants	*Objective No. 6* Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost. Criteria a. Develop urban development guidelines b. Incorporate concepts for recreation	*Objective No. 7* Provide effective stromwater management at the most effective cost. Criteria a. Provide for long term capital and o/m expenses while avoiding problems b. Make maximum use of existing facilities c. Phase in facilities d. Utilize structural facilities for both quality and quantity benefits.
HYDRAULIC ALTERNATIVES							
FS-1							
A. Detention Basin north of Donges Bay	0	0	+	+	0	+	+
B. Inlet Improvements	–	0	0	–	0	0	0
FS-2							
A. Channel improvements with compensatory detention	0	+	0	0	–	–	0
B. 18-inch storm sewer	–	0	–	–	0	0	–

TABLE 7-11
Effectiveness of Alternatives in Achieving Objectives

Alternatives	*Objective No.1* Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little menomonee Creek and the most effective cost. Criteria a. NR 102,104,105 standards b. Non-point source control plan objectives c. Management measures	*Objective No. 2* Provide stormwater drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost. Criteria a. Design minor system- 10-yr. storm b. Design major system-100-yr. storm c. Design wet detention to maintain 2-yr. 24-hr. flow at 2-yr. predeveloped conditions d. Establish emergency spillways for 100-yr. storm e. Design overland flow rts.- 100-yr. Storm without property damage	*Objective No. 3* Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost. Criteria a. modify existing facilities b. Design new drainage systems c. Provide guidance for info. & educ. Program d. Design new upstream facilities e. Minimize impacts to property owners	*Objective No. 4* Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost. Criteria a. Reduce uncontrolled construction site loadings, erosion control ordinance b. Within env. sensitive areas, utilize additional procedures c. Reduce 1985 agricultural loadings	*Objective No. 5* Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost. Criteria a. Identify wetlands and woodlands that provide benefit b. Protect, enhance, preserve high quality sensitive areas c. Integrate valuable environmental sensitive areas d. Prevent discharge of increase flow and pollutants	*Objective No. 6* Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost. Criteria a. Develop urban development guidelines b. Incorporate concepts for recreation	*Objective No. 7* Provide effective stormwater management at the most effective cost. Criteria a. Provide for long term capital and o/m expenses while avoiding problems b. Make maximum use of existing facilities c. Phase in facilities d. Utilize structural facilities for both quality and quantity benefits.
MQ- 1							
A. Two detention basins providing 80 ac-ft. of storage at Range Line School & St. James School	+	+	+	–	+	0	+
B1 & D. Channel clearing	+	0	–	–	–	–	0
B2. Flood proofing 14 homes	–	0	0	–	0	0	0
C. Raise Ranch Rd. and install a pump station	–	0	0	–	–	–	0

TABLE 7-11
Effectiveness of Alternatives in Achieving Objectives

Alternatives	*Objective No.1* Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little menomonee Creek and the most effective cost. Criteria a. NR 102,104,105 standards b. Non-point source control plan objectives c. Management measures	*Objective No. 2* Provide stormwater drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost. Criteria a. Design minor system- 10-yr. storm b. Design major system-100-yr. storm c. Design wet detention to maintain 2-yr. 24-hr. flow at 2-yr. predeveloped conditions d. Establish emergency spillways for 100-yr. storm e. Design overland flow rts.- 100-yr. Storm without property damage	*Objective No. 3* Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost. Criteria a. modify existing facilities b. Design new drainage systems c. Provide guidance for info. & educ. Program d. Design new upstream facilities e. Minimize impacts to property owners	*Objective No. 4* Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost. Criteria a. Reduce uncontrolled construction site loadings, erosion control ordinance b. Within env. sensitive areas, utilize additional procedures c. Reduce 1985 agricultural loadings	*Objective No. 5* Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost. Criteria a. Identify wetlands and woodlands that provide benefit b. Protect, enhance, preserve high quality sensitive areas c. Integrate valuable environmental sensitive areas d. Prevent discharge of increase flow and pollutants	*Objective No. 6* Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost. Criteria a. Develop urban development guidelines b. Incorporate concepts for recreation	*Objective No. 7* Provide effective stromwater management at the most effective cost. Criteria a. Provide for long term capital and o/m expenses while avoiding problems b. Make maximum use of existing facilities c. Phase in facilities d. Utilize structural facilities for both quality and quantity benefits.
MQ-2							
A. 90 ac.-ft. detention basin east of I-43, south of Mequon Rd.	+	+	+	–	0	0	+
B. Channel improvement with detention basin west of Port Washington Road	0	+	+	–	0	–	0
C. Channel cleaning/ stream restoration	+	0	0	–	–	+	0
MQ-3							
A. Three detention basins totaling 90 ac-ft	+	+	+	–	+	0	+
B1. Channel clearing and rehabilitation	0	0	–	–	–	–	0
B2. Ditch rehabilitation and driveway culvert replacements	0	–	0	–	0	0	

TABLE 7-11
Effectiveness of Alternatives in Achieving Objectives

Alternatives	*Objective No.1* Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little menomonee Creek and the most effective cost. Criteria a. NR 102,104,105 standards b. Non-point source control plan objectives c. Management measures	*Objective No. 2* Provide stormwater drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost. Criteria a. Design minor system- 10-yr. storm b. Design major system-100-yr. storm c. Design wet detention to maintain 2-yr. 24-hr. flow at 2-yr. predeveloped conditions d. Establish emergency spillways for 100-yr. storm e. Design overland flow rts.- 100-yr. Storm without property damage	*Objective No. 3* Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost. Criteria a. modify existing facilities b. Design new drainage systems c. Provide guidance for info. & educ. Program d. Design new upstream facilities e. Minimize impacts to property owners	*Objective No. 4* Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost. Criteria a. Reduce uncontrolled construction site loadings, erosion control ordinance b. Within env. sensitive areas, utilize additional procedures c. Reduce 1985 agricultural loadings	*Objective No. 5* Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost. Criteria a. Identify wetlands and woodlands that provide benefit b. Protect, enhance, preserve high quality sensitive areas c. Integrate valuable environmental sensitive areas d. Prevent discharge of increase flow and pollutants	*Objective No. 6* Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost. Criteria a. Develop urban development guidelines b. Incorporate concepts for recreation	*Objective No. 7* Provide effective stromwater management at the most effective cost. Criteria a. Provide for long term capital and o/m expenses while avoiding problems b. Make maximum use of existing facilities c. Phase in facilities d. Utilize structural facilities for both quality and quantity benefits.
PG-1							
A. Raise road profile at Friestadt Road and construct culverts to create storage area	–	0	0	–	–	–	0
B. Three detention basins at Hawthorne and Wauwatosa Roads	+	+	+	–	–	+	+
C. Divert flow to gravel quarry	–	+	+	–	0	0	0
D. Remove/upgrade culvert north of Harley dealership	–	0	+	–	–	0	0
E. Strembak modification from railroad to Milwaukee River	+	0	0	0	–	+	0

TABLE 7-11
Effectiveness of Alternatives in Achieving Objectives

Alternatives	*Objective No.1* Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little menomonee Creek and the most effective cost. Criteria a. NR 102,104,105 standards b. Non-point source control plan objectives c. Management measures	*Objective No. 2* Provide stormwater drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost. Criteria a. Design minor system- 10-yr. storm b. Design major system-100-yr. storm c. Design wet detention to maintain 2-yr. 24-hr. flow at 2-yr. predeveloped conditions d. Establish emergency spillways for 100-yr. storm e. Design overland flow rts.- 100-yr. Storm without property damage	*Objective No. 3* Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost. Criteria a. modify existing facilities b. Design new drainage systems c. Provide guidance for info. & educ. Program d. Design new upstream facilities e. Minimize impacts to property owners	*Objective No. 4* Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost. Criteria a. Reduce uncontrolled construction site loadings, erosion control ordinance b. Within env. sensitive areas, utilize additional procedures c. Reduce 1985 agricultural loadings	*Objective No. 5* Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost. Criteria a. Identify wetlands and woodlands that provide benefit b. Protect, enhance, preserve high quality sensitive areas c. Integrate valuable environmental sensitive areas d. Prevent discharge of increase flow and pollutants	*Objective No. 6* Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost. Criteria a. Develop urban development guidelines b. Incorporate concepts for recreation	*Objective No. 7* Provide effective stromwater management at the most effective cost. Criteria a. Provide for long term capital and o/m expenses while avoiding problems b. Make maximum use of existing facilities c. Phase in facilities d. Utilize structural facilities for both quality and quantity benefits.
PG-1							
A. Raise road profile at Friestadt Road and construct culverts to create storage area	–	0	0	–	–	–	0
B. Three detention basins at Hawthorne and Wauwatosa Roads	+	+	+	–	–	+	+
C. Divert flow to gravel quarry	–	+	+	–	0	0	0
D. Remove/upgrade culvert north of Harley dealership	–	0	+	–	–	0	0
E. Strembak modification from railroad to Milwaukee River	+	0	0	–	–	+	0

TABLE 7-11
Effectiveness of Alternatives in Achieving Objectives

Alternatives	*Objective No.1* Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little menomonee Creek and the most effective cost. Criteria a. NR 102,104,105 standards b. Non-point source control plan objectives c. Management measures	*Objective No. 2* Provide stormwater drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost. Criteria a. Design minor system- 10-yr. storm b. Design major system-100-yr. storm c. Design wet detention to maintain 2-yr. 24-hr. flow at 2-yr. predeveloped conditions d. Establish emergency spillways for 100-yr. storm e. Design overland flow rts.- 100-yr. Storm without property damage	*Objective No. 3* Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost. Criteria a. modify existing facilities b. Design new drainage systems c. Provide guidance for info. & educ. Program d. Design new upstream facilities e. Minimize impacts to property owners	*Objective No. 4* Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost. Criteria a. Reduce uncontrolled construction site loadings, erosion control ordinance b. Within env. sensitive areas, utilize additional procedures c. Reduce 1985 agricultural loadings	*Objective No. 5* Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost. Criteria a. Identify wetlands and woodlands that provide benefit b. Protect, enhance, preserve high quality sensitive areas c. Integrate valuable environmental sensitive areas d. Prevent discharge of increase flow and pollutants	*Objective No. 6* Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost. Criteria a. Develop urban development guidelines b. Incorporate concepts for recreation	*Objective No. 7* Provide effective stromwater management at the most effective cost. Criteria a. Provide for long term capital and o/m expenses while avoiding problems b. Make maximum use of existing facilities c. Phase in facilities d. Utilize structural facilities for both quality and quantity benefits.
Pg-2							
A. Floodproof 3 homes	–	0	0	–	0	0	–
B. Improve existing storm sewer or construct new storm sewer from Rosedale Dr. to Grand Ave.	–	+	+	–	–	–	0
MU-1							
A. Detention basin northeast of subdivision with diversion along Donges Bay Road	0	0	+	–	0	0	0
B. Detention basin east of Swan Road	0	+	+	–	0	0	0
C. Channel improvement downstream of Concord Drive	0	0	0	–	–	–	0

TABLE 7-11
Effectiveness of Alternatives in Achieving Objectives

Alternatives	*Objective No.1* Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little menomonee Creek and the most effective cost. Criteria a. NR 102,104,105 standards b. Non-point source control plan objectives c. Management measures	*Objective No. 2* Provide stormwater drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost. Criteria a. Design minor system- 10-yr. storm b. Design major system-100-yr. storm c. Design wet detention to maintain 2-yr. 24-hr. flow at 2-yr. predeveloped conditions d. Establish emergency spillways for 100-yr. storm e. Design overland flow rts.- 100-yr. Storm without property damage	*Objective No. 3* Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost. Criteria a. modify existing facilities b. Design new drainage systems c. Provide guidance for info. & educ. Program d. Design new upstream facilities e. Minimize impacts to property owners	*Objective No. 4* Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost. Criteria a. Reduce uncontrolled construction site loadings, erosion control ordinance b. Within env. sensitive areas, utilize additional procedures c. Reduce 1985 agricultural loadings	*Objective No. 5* Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost. Criteria a. Identify wetlands and woodlands that provide benefit b. Protect, enhance, preserve high quality sensitive areas c. Integrate valuable environmental sensitive areas d. Prevent discharge of increase flow and pollutants	*Objective No. 6* Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost. Criteria a. Develop urban development guidelines b. Incorporate concepts for recreation	*Objective No. 7* Provide effective stromwater management at the most effective cost. Criteria a. Provide for long term capital and o/m expenses while avoiding problems b. Make maximum use of existing facilities c. Phase in facilities d. Utilize structural facilities for both quality and quantity benefits.
D. Drainage ditch/storm sewer from Swan Rd. to the Little Menomonee River	–	+	+	–	–	–	0
WATER QUALITY ALTERNATIVES							
Urban Development Guidelines	+	+	0	–	+	+	+
Storm Water Ordinance	+	0	0	–	+	+	0
Industrial BMPs	+	–	–	–	0	–	+
Pavement Sweeping	+	–	–	0	0	–	0
Catch Basin Cleaning	+	–	0	0	0	–	+
Landscaping Practices	+	–	0	–	0	+	0
Snow & Ice Management	+	–	0	–	0	–	0
Erosion Control Ordinance	+	–	+	+	0	–	+

TABLE 7-11
Effectiveness of Alternatives in Achieving Objectives

Alternatives	*Objective No.1* Improve water quality for the Milwaukee River, Pigeon Creek, Ulao Creek, Little menomonee Creek and the most effective cost. Criteria a. NR 102,104,105 standards b. Non-point source control plan objectives c. Management measures	*Objective No. 2* Provide stormwater drainage and flood control facilities to reduce flood damages to property, prevent health and safety hazards, and reduce drainage-related nuisance and inconvenience at the most effective cost. Criteria a. Design minor system- 10-yr. storm b. Design major system-100-yr. storm c. Design wet detention to maintain 2-yr. 24-hr. flow at 2-yr. predeveloped conditions d. Establish emergency spillways for 100-yr. storm e. Design overland flow rts.- 100-yr. Storm without property damage	*Objective No. 3* Develop a long term stormwater management system that effectively serves both existing and anticipated future land uses at the most effective cost. Criteria a. modify existing facilities b. Design new drainage systems c. Provide guidance for info. & educ. Program d. Design new upstream facilities e. Minimize impacts to property owners	*Objective No. 4* Reduce erosion and sedimentation from construction of new development and agricultural activities at the most effective cost. Criteria a. Reduce uncontrolled construction site loadings, erosion control ordinance b. Within env. sensitive areas, utilize additional procedures c. Reduce 1985 agricultural loadings	*Objective No. 5* Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits at the most effective cost. Criteria a. Identify wetlands and woodlands that provide benefit b. Protect, enhance, preserve high quality sensitive areas c. Integrate valuable environmental sensitive areas d. Prevent discharge of increase flow and pollutants	*Objective No. 6* Create opportunities for habitat preservation, recreational development, and aesthetic enhancement at the most effective cost. Criteria a. Develop urban development guidelines b. Incorporate concepts for recreation	*Objective No. 7* Provide effective stromwater management at the most effective cost. Criteria a. Provide for long term capital and o/m expenses while avoiding problems b. Make maximum use of existing facilities c. Phase in facilities d. Utilize structural facilities for both quality and quantity benefits.
Agricultural BMPs	+	–	0	+	0	+	+
Wet Detention Ponds *for water quality purposes only*	+	0	–	–	0	+	0
In-line Treatment System	+	0	–	–	0	–	0
Standard Catch Basins for storm sewered now development	+	–	+	0	0	–	+
Constructed/Retrofit Wetlands	+	0	0	–	0	+	+
On-site system at major parking lots	+	0	–	–	0	–	0
Regional system at Main St. & Pigeon Creek - Thiensville	+	–	0	–	–	0	0
Stream Bank Stabilization	+	–	–	0	+	+	+

Notes: + indicates that the alternative **is effective** in meeting the criteria; 0 indicates that the alternative **is partially effective** in meeting the criteria
– indicates that the alternative **is not effective** in meeting this criteria

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
HYDRAULIC ALTERNATIVES									
FS-1 *yard flooding in Clover Ln. / Brookdale Dr. area*	Inlet improvements (alt. B)	$20,000 of improvement will be completed as part of Ozaukee Co. Pt. Washington Rd. improvement project	$500	Detention basin north of Donges Bay Rd. (alt. A)	$770,000	$5,000	Detention basin north on Donges Bay Rd. & inlet improvements (alt A&B)	$770,000 ($20,000 of inlet improvements conducted as part of Pt. Washington Rd.. improvement project)	$5,500
FS-2 *yard flooding east of Waterleaf Dr., west of Lakeshore*	18-inch storm sewer from Waterleaf Dr. to a tributary to Fish Creek (alt B)	$154,000	$500	18-inch storm sewer from Waterleaf Dr. to a tributary to Fish Creek (alt B)	$154,000	$500	Channel improvement with compensatory detention adjacent to railroad & 18-inch storm sewer (alt A&B)	$564,000	$5,500
MQ-1 *yard & home flooding: 14 homes in Hickory Ln., Chestnut Rd. area*	Channel cleaning and flood proofing 14 homes (alt B)	$1,000,000	----	Channel cleaning and flood proofing 14 homes (alt B)	$1,000,000	----	Two detention basin providing 80 ac-ft. of storage capacity, located east of Range Line School and at St. James School and channel leaning (alt A & D)	$2,100,000	$5,000

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
MQ-2 *yard flooding & basement backups, east of Union Pacific RR, north of Mequon Rd., south of Glen Oaks Ln.*	Channel improvement/ stream restoration with detention basin west of Port Washington Road (alt B)	$600,000	$5,000	Channel improvement/ stream restoration with detention basin west of Port Washington Road (alt B & C)	$720,000	$5,000	Detention basin, 90 ac-ft, east of I-43, south of Mequon Road, west of Railroad tracks and channel cleaning/ stream restoration from Mequon Road to Milwaukee River (alt A & C)	$2,580,000	$5,000
MQ-3 *yard & street flooding: 24 homes, 1 church, east of Wisconsin Central RR, west of Cedarburg Rd.*	Channel improvement, ditch rehabilitation, and driveway culvert replacements (alt B)	$28,000	----	Channel improvement, ditch rehabilitation, and driveway culvert replacements (alt B)	$28,000	----	Three detention basins, totaling 90 ac-ft. of capacity, plus channel cleaning and rehabilitation (alt A)	$1,200,000	$5,000
MQ-4 *flooding with water entry through basement windows: 1 home, City Hall, Library*	Flood proof Library and City Hall (alt B)	$200,000	----	Flood proof Library and City Hall (alt B)	$200,000	----	Detention basin, 50 ac-ft., west of Buntrock Ave. and east of Wauwatosa (alt. A)	$1,020,000	$5,000

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
MQ-5 *yard & street flooding, east of Buntrock Ave., between West & Spring Sts.*	Construct storm sewer along Spring St. and maintain drainage way (alt B)	$100,000	--	Detention basin, 30 ac-ft., on seminary property north of Spring Ave. (alt A)	$880,000	$5,000	Detention basin, 30 ac-ft., on seminary property north of Spring Ave. (alt A)	$880,000	$5,000
PG-1 *street and property flooding in Thiensville, south of Friestadt Rd. to Cedarburg Rd.*	Remove/ upgrade culvert north of the Harley dealership and streambank modification (alt D & E)	$491,000	--	▸ Raise Road profile and restrict culvert at Freistadt Rd. (alt A) -- or -- Divert flow to gravel quarry (alt C) -- or -- Detention basins, 100 ac-ft., at Hawthorne and Wauwatosa Roads (alt B) and-- ▸ Remove/ upgrade culvert north of the Harley dealership and streambank modification (alt D & E)	$731,000 to $2,591,000	$5,000 to $10,000	▸ Raise Road profile and restrict culvert at Freistadt Rd. (alt A) -- or -- Divert flow to gravel quarry (alt C) -- or -- Detention basins, 100 ac-ft., at Hawthorne and Wauwatosa Roads (alt B) and-- ▸ Remove/ upgrade culvert north of the Harley dealership and streambank modification (alt D & E)	$731,000 to $2,591,000	$5,000 to $10,000

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
PG-2 *street and yard flooding: 4 homes along Laurel Dr.*	--	--	--	Flood proof 4 homes (alt A)	$280,000	----	Improve existing storm sewer or construct new storm sewer from Rosedale Dr. to Grand Ave. (alt B)	$100,000	----
MU-1 *yard and street flooding 19 homes, adjacent to channel, south of Donges Bay Rd., west of Swan Rd.*	Channel improvement from Concord Dr. to Donges Bay Rd. (alt C)	$92,000	----	Detention east of Swan Rd., channel improvements from Concord Dr. to Donges Bay Rd., & ditch rehabilitation and driveway culvert replacements (alt B&C)	$982,000	$5,000	▸ Detention northeast of subdivision with diversion along Donges Bay Rd., channel improvements from Concord Dr. to Donges Bay Rd., & ditch rehabilitation and driveway culvert replacements (alt A&C) ---or--- ▸ Drainage ditch/ storm sewer from Swan Rd. to the Little Menomonee River (alt D)	$812,000 $130,000	$5,000 ----
Localized Flooding Areas	Culvert Replacement/ Upgrade	$500,000	----	Culvert Replacement/ Upgrade	$500,000	----	Culvert Replacement/ Upgrade	$500,000	----

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
HYDRAULIC PLAN SUB-TOTAL		*$3,165,000*	*$6,000*		*$6,245,000 to $8,105,000*	*$25,500 to $30,500*		*$10,575,000 to $13,117,000*	*$46,000 to $51,000*
WATER QUALITY ALTERNATIVES									
New Development Areas	Urban Planning & Zoning (alt A)	cost incurred by developers *(sed. 11%, phos. 16%, lead -28%)*	---	▸ Urban Planning & Zoning and Storm water ordinance (alt A & B)	cost incurred by developers *(sed. 22%, phos. 19%, lead -10%)*	---	▸ Urban Planning & Zoning and storm water ordinance (alt A & B)	cost incurred by developers *(sed. 22%, phos. 19%, lead -10%)*	---
Industrial Facilities	Industrial BMPs	costs incurred by industries *(sed 0.5%, phos. 0%, lead 2%)*	costs incurred by indus-tries	Industrial BMPs	costs incurred by industries *(sed. 0.5%, phos. 0%, lead 2%)*	costs incurred by industries	Industrial BMPs	costs incurred by industries *(sed. 0.5%, phos. 0%, lead 2%)*	costs incurred by industries

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
Arterials and main roadways w/ curbing	Sweep Monthly: Mequon arterials w/curb, Mequon business park, Mequon industrial park, and Thiensville arterials and roadways (alt A)	--- *(sed. 0.5%, phos.0.4%, lead 3%)*	$27,000	Sweep Seasonally: Mequon arterials w/curb, Mequon business park, Mequon industrial park, and Thiensville arterials and roadways w/curb (alt B)	--- *(sed. 1%, phos. 1%, lead 6%)*	$58,500	Sweep bi-weekly: Mequon arterials w/curb, Mequon business park, Mequon industrial park, and Thiensville arterials and roadways w/curb (alt C)	--- *(sed. 1%, phos. 1%, lead 7%)*	$87,400
Key Parking Areas	Sweep monthly (alt A)	--- *(sed. 0.4%, phos.0.2%, lead 2%)*	$15,000	Sweep seasonally (alt B)	--- *(sed. 1%, phos. 0.5%, lead 4%)*	$20,000	Sweep bi-weekly (alt C)	--- *(sed. 1%, phos. 0.6%, lead 5%)*	$26,000
Paved Areas	Ice management practices	min.	min.	Ice management practices	min.	min.	Ice management practices	min.	min.
Paved storm sewered areas w/ catch basins	Clean catch basins twice per year (in spring and fall)(alt A)	*(sed. 0.4%, phos. 0%, lead 1%)*	$6,000 based on $20/ basin / year with 300 basins	Clean catch basins twice per year (in spring and fall) (alt A)	*(sed. 0.4%, phos. 0%, lead 1%)*	$6,000 *based on $20/basin /year with 300 basins*	Inspect catch basins quarterly and clean as necessary when basin is approximately 40% full (alt B)	*(sed. 0.4%, phos. 0%, lead 1%)*	$7,300 *based on $1,300/yr. Inspections & $20/basin / year with 300 basins*
Institutional and Park lawn/ high maintenance turf areas	Landscaping practices	min. *(sed. 0.7%, phos. 2%, lead 0.3%)*	min.	Landscaping practices	min. *(sed. 0.7%, phos. 2%, lead 0.3%)*	min.	Landscaping practices	min. *(sed. 0.7%, phos. 2%, lead 0.3%)*	min.

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
Snow storage areas	Locate snow storage areas in a well vegetated area at least 200 feet from a drainage way or storm sewer inlet	min.	min.	Locate snow storage areas in a well vegetated area at least 200 feet from a drainage way or storm sewer inlet	min.	min.	Locate snow storage areas in a well vegetated area at least 200 feet from a drainage way or storm sewer inlet	min.	min.
New Construction	Implement revised ordinance (alt A)	cost incurred by developers *(sed. 0.1%, phos. 0%, lead 0%)*	---	Implement revised ordinance and increase inspections of construction sites (alt A & B)	cost incurred by developers *(sed. 0.3%, phos. 0%, lead 0%)*	$10,000	Implement revised ordinance and increase inspections of construction sites, train inspectors on erosion control techniques (alt A, B, & C)	$1,000 + cost incurred by developers *(sed. 0.3%, phos. 0%, lead 0%)*	$10,000
Agricultural Areas	Encourage agricultural BMPs (alt A)	costs incurred by ag. land owners *(sed. 3%, phos.3%, lead 0%)*	---	Encourage agricultural BMPs and support county shoreline management ordinance for buffer strips (alt A & B)	costs incurred by ag. land owners *(sed. 7%, phos.4%, lead 0.2%)*	---	Encourage agricultural BMPs and adopt/ establish shoreline management ordinance for buffer strips	Costs to be determined by the County/City in the future *(sed. 21%, phos.13%, lead 0.5%)*	$5,000
Stream Bank Erosion	Stabilize key stream banks (2 miles)	$419,500	---	Stabilize key stream banks (4 miles)	$839,000	---	Stabilize key stream banks (4 miles)	$839,000	---

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
Port Washington Rd. Commercial Area	---	---	---	▸ Add water quality features to MQ-2 detention basin or ▸ on-site system for major parking lots	▸cost included in hydraulic alternative *(sed. 2%, phos.0.5%, lead 4%)* ▸$250,000 *(sed. 0.1%, phos. <0.1%, lead 0.3%)*	▸cost included in hydraulic alternative $1,000	▸ Add water quality features to MQ-2 detention basins and RA Smith water quality basins (3)	$250,000 + cost for MQ-2 detention basin included in hydraulic alternative *(sed. 3%, phos. 1%, lead 8%)*	$1,000 + cost included in hydraulic alternative
Thiensville Business District	---	--	--	On-site systems for major commercial parking lots	$8,400 *(sed. <0.1%, phos. <0.1%, lead 0.3%)*	$1,000	Regional system at Main Street and Pigeon Creek	$500,000 - $800,000 *(sed. 0.5%, phos.0.3%, lead 3%)*	$1,000
Industrial/ Commercial/ Business Park Area at Donges Bay Rd. & Baehr Road	---	---	---	Construct/ retrofit prior converted wetland west of RR, south of Donges Bay Rd., construct/ retrofit prior converted wetland west of RR north of County Line Rd, and industrial park pond *(under construction)*	$260,000-$390,000 *(sed. 1.5%, phos.0.4%, lead 7%)*	$2,000	Add water quality features to MQ-3 detention basins, construct/ retrofit prior converted wetland west of RR, south of Donges Bay Rd., and industrial park pond *(under construction)*	$170,000-$255,000 + Cost for MQ-3 Ponds included in hydraulic alternative *(sed. 3%, phos.2%, lead 10%)*	$1,000

Table 7-12:
ALTERNATIVE GROUPINGS FOR BASIC, MID, & HIGH LEVEL HYDRAULIC & WATER QUALITY CONTROL

Problem Number/ Area of Concern	BASIC PLAN			MID-LEVEL PLAN			HIGH LEVEL PLAN		
	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST	ALTERNATIVE	CAPITAL COST	O & M COST
Commercial, arterial, residential areas north of Mequon Rd. & west of Buntrock Av.	--	--	--	--	--	--	Add water quality features to the MQ-4 detention basin	Cost included in the hydraulic alternative *(sed. 2%, phos. 1%, lead 2%)*	Cost included in the hydraulic alternative
Institutional, residential area south of Mequon Rd. & east of Range Line Rd.	--	--	--	--	--	--	Add water quality features to the MQ-1 detention pond	Cost included in the hydraulic alternative *(sed. 0.7%, phos. 1%, lead 0.3%)*	Cost included in the hydraulic alternative
Agricultural area northwest portion of Pigeon Creek subbasin	--	--	--	--	--	--	Add water quality features to the PG-1 detention alternative	Cost included in the hydraulic alternative *(sed. 1.5%, phos. 1.5%, lead 0%)*	Cost included in the hydraulic alternative
WATER QUALITY ALTERNATIVE SUBTOTAL	Anticipated Pollutant Reductions: Sediment 16% (700 tons) Phosphorus 21% (3,700 lbs.) Lead -20% (-1,000 lbs.)	$419,000	$48,000	Anticipated Pollutant Reductions: Sediment 36% (1,600 tons) Phosphorus 27% (4,800 lbs.) Lead 15% (750 lbs.)	$1,107,400 - $1,487,400	$97,000 - $98,000	Anticipated Pollutant Reductions: Sediment 58 % (2,600 tons) Phosphorous 42 % (7,500 lbs) Lead 29 % (1,400 lbs)	$1,760,000 - $2,145,000	$138,700
	TOTAL	$3,584,000	$54,000		$7,352,400 - $9,592,400	$123,000 - $129,000		$12,335,000 - $15,262,000	$184,700 to $189,700

Notes: Cost does not include land acquisition

Section 8
Recommended Storm Water Management Plan

8.1 Alternative Selection

Section 7 of this Storm Water Management Plan presents several alternatives to improve the storm water drainage and storm water quality for the City of Mequon and Village of Thiensville. The alternatives considered and described present a range of effectiveness, as well as a range of cost. The selected storm water management plan includes the alternatives which are recommended for implementation.

The recommended storm water management plan consists of four major elements;

- storm water drainage and flood control,
- culvert replacement,
- water quality improvement, and
- regulatory/ordinance

A variety of structural and non-structural measures have been selected for implementation which will effectively and efficiently meet the goals and objectives of this plan, reduce flooding and drainage problems, and improve the quality of storm water runoff into the Milwaukee River. The selected storm water management plan is based on the adoption and enforcement of the City of Mequon Land Use Plan adopted in 1997 and implementation of a revised and more comprehensive storm water ordinance. Alterations to the 1997 land use plan that proposes a more densely urban area or lack of the enforcement of the storm water ordinance will greatly reduce the effectiveness of the recommended plan and it's ability to meet the stated and accepted goals and objectives (Section 2). The recommended plan is described in the following sections of this report and is shown on Figure 8-1.

8.2 Storm Water Drainage and Flood Control Plan

The storm water drainage and flood control alternatives evaluated include detention/storage measures or hydraulic system improvements which mitigate storm water drainage and flooding problems. The selected storm water drainage and flood control plan will provide a balance between protection against structural flooding in the 100-year storm event and public expenditure of funds.

The selected flood control projects, along with the associated level of protection, is presented in Table 8-1. The detention basin and channel improvement locations are shown on Figures 8-2 through 8-11. Figure 8-12 and 8-13 are water quality improvement recommendations.

The selected alternative generally meets Objective No. 2 by providing storm water drainage and flood control facilities which prevent flood damages to property, prevent health and safety hazards, and prevent drainage - related nuisance and inconvenience at the most effective cost. The selected alternatives will provide a level of protection against the 100-year storm in most of the problem areas identified.

Figure 8-1 already copied

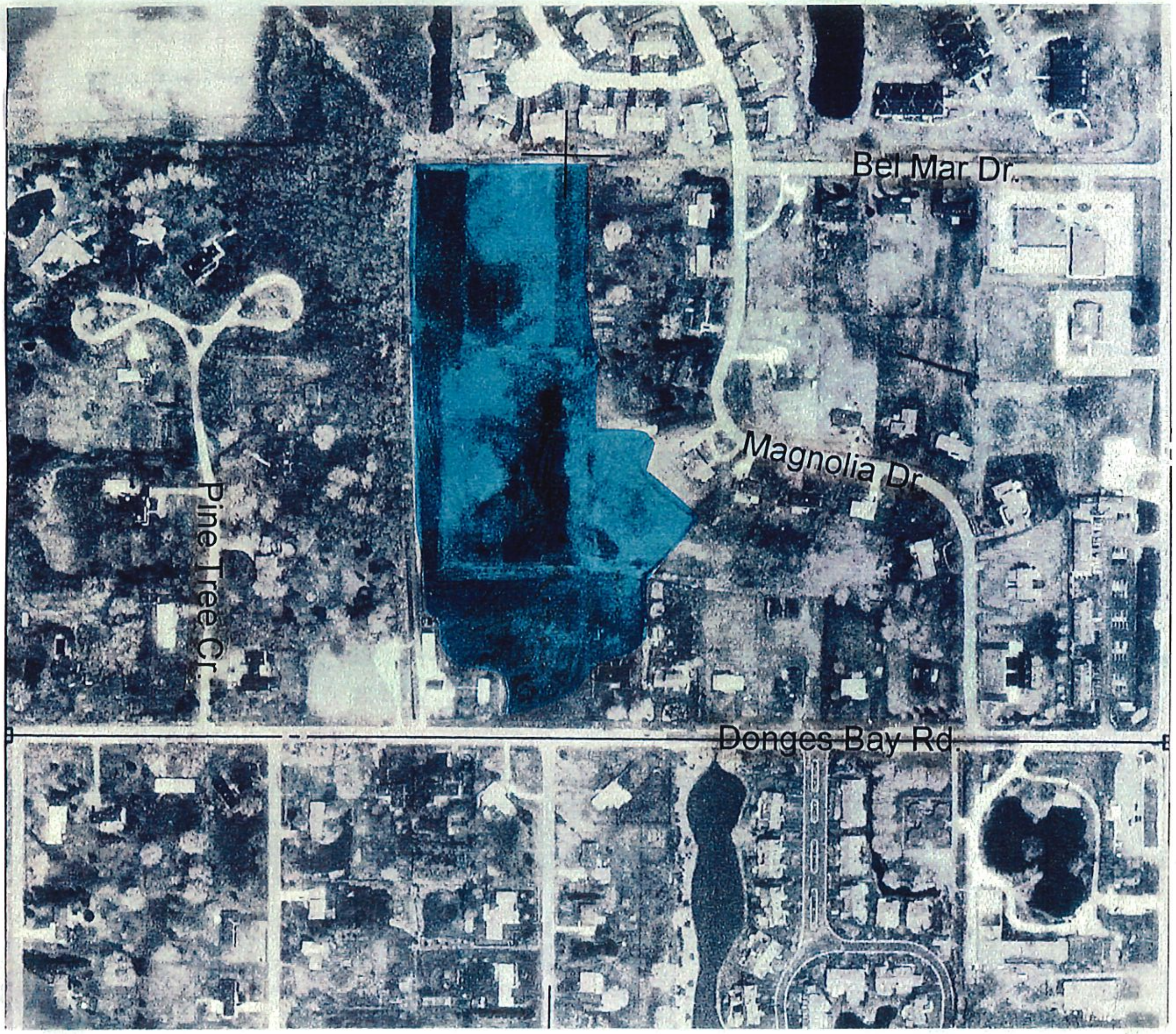
Table 8-1: Selected Drainage and Flood Control Plan

Problem Number	Problem Summary	Selected Alternative	Level of Protection
FS-1 *(see Fig. 8-2)*	Frequent yard flooding in Clover Lane / Brookdale Drive area	▸ 30 acre-foot detention basin located north of Donges Bay Road and culvert upgrade at Pt. Washington and Zedler Roads	50 [1]
FS-2	Frequent yard flooding east of Waterleaf Drive; west of Lakeshore Drive; between Donges Bay Road and Zedler Lane	▸ 18-inch storm sewer from Waterleaf Drive to Fish Creek tributary in Katherine Kearney Carpenter Park	25 [1]
MQ-1 *(see Fig. 8-3)*	Frequent yard and residential flooding; 14 homes adjacent to the channel. Hickory Lane, Chestnut Road, and Glenbrook Lane area	▸ Two detention basins providing a total of 80 acre-feet of storage capacity, located east of Range Line School and at St. James School ▸ Channel clean-out from Mequon Road to Hickory Lane and from Ranch Road to the Milwaukee River Floodplain	100 [2]
MQ-2 *(see Fig. 8-4 & Fig. 8-5)*	Frequent yard flooding with slow drainage; basement back-ups due to excess I/I; east of Union Pacific Railroad, north of Mequon Road, south of Glen Oaks Lane	▸ 90 acre-foot detention basin south of Mequon Road between I-43 and the railroad tracks ▸ Channel cleaning / stream restoration from Mequon Road north past the wetland area to Milwaukee River floodplain	50 [3]
MQ-3 *(see Fig.8-6 & Fig. 8-7)*	Yard and street flooding, 24 homes and 1 church, east of Wisconsin Central RR, west of Cedarburg Rd..	▸ Three detention basins, totaling 90 acre-feet of storage capacity, located north of County Line Road, south of Donges Bay Road, west of the Railroad tracks, and east of Wauwatosa Road ▸ Channel cleaning / stream restoration from Cedarburg Road west to approx. Meadow Lane	100 [2]
MQ-4 *(see Fig. 8-8)*	Flooding with water entry through basement windows; 1 home, Mequon City Hall, and Library	▸ 50 acre-foot detention basin located west of Buntrock Ave. and east of Wauwatosa Rd.	100
MQ-5 *(see Fig. 8-9)*	Yard and street flooding, east of Buntrock Ave., between West and Spring Streets	▸ Construct storm sewer along Spring Street ▸ Maintain drainage way through Stemmeler property	100

Problem Number	Problem Summary	Selected Alternative	Level of Protection
PG-1 *(see Fig. 8-10 and Fig. 8-11)*	Frequent street and property flooding in a large area on Thiensville south of Friestadt Road to Cedarburg Road.	▸ Three detention basins, totaling 100-acre feet of storage capacity, located south of Hawthorne Road at Cedarburg Road. ▸ Remove or upgrade the culvert north of the Harley Dealership in Thiensville ▸ Streambank modification from the Cedarburg Road to the Milwaukee River	100 [2]
PG-2 *(see Fig. 8-14 and Appendix G)*	Frequent street and yard flooding; 4 homes on Laurel Drive	▸ Construct a 33 ac-ft basin at MATC ▸ Add 15 ac-ft to existing MATC Basin B	Unknown[4]
MU-1	Frequent yard and street flooding; 19 homes adjacent to channel south of Donges Bay Road; west of Swan Road; between Stanford and Concord Drive	▸ Drainage ditch/storm sewer 1,300 feet from Swan Road to the Little Menomonee River	100

Notes: [1] an alternative to achieve 100-year level of protection was not considered economically feasible.
[2] level of protection provided for areas outside of the Milwaukee River floodplain.
[3] The level of protection provided may increase based on the channel cleaning/stream restoration design.
[4] Preliminary design done by others (see Appendix G).

FS-1

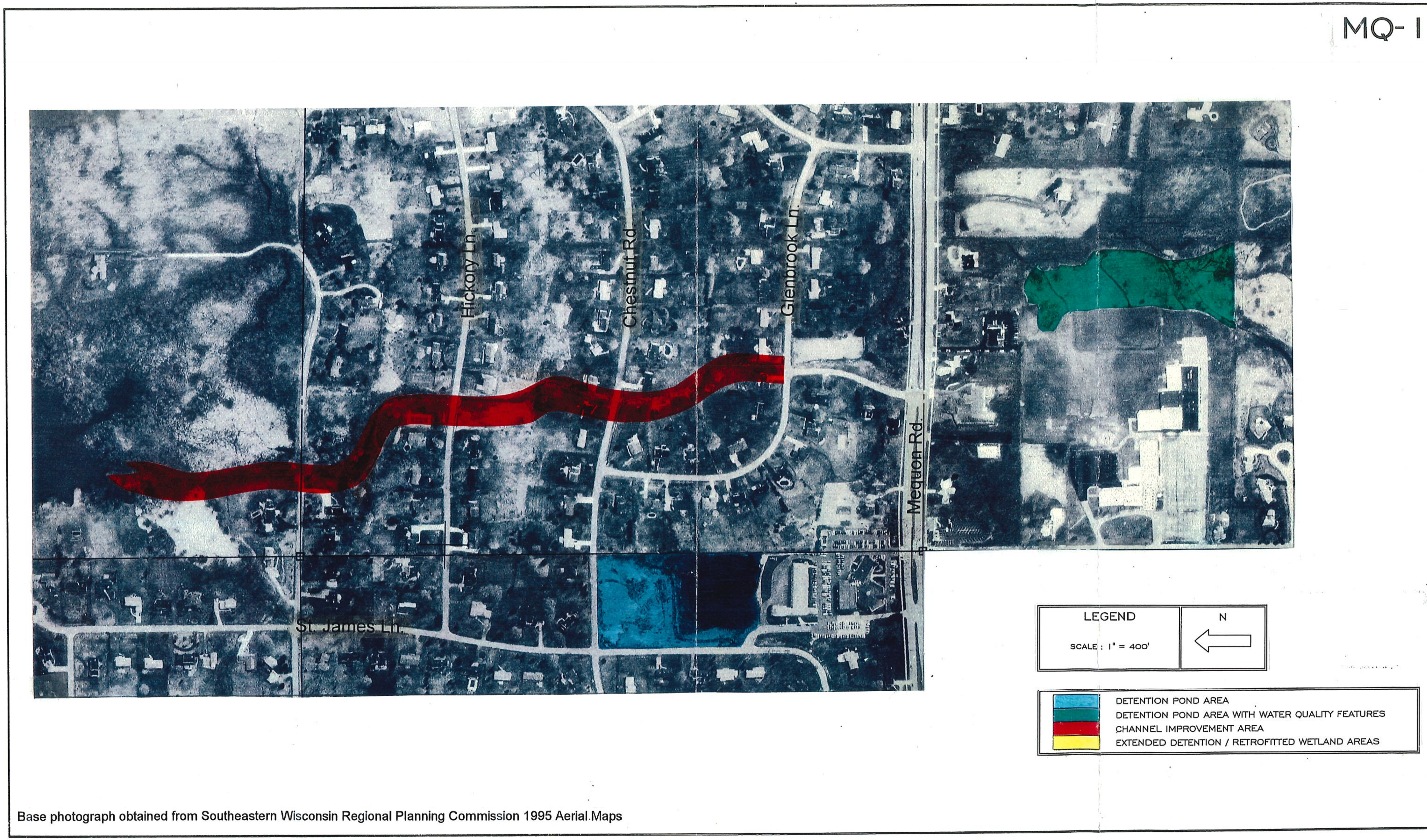


LEGEND	N	
SCALE : 1 " = 400'	⇧	DETENTION POND AREA DETENTION POND AREA WITH WATER QUALITY FEATURES CHANNEL IMPROVEMENT AREA EXTENDED DETENTION / RETROFITTED WETLAND AREAS

Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial Maps

CDM Camp Dresser & McKee Inc.

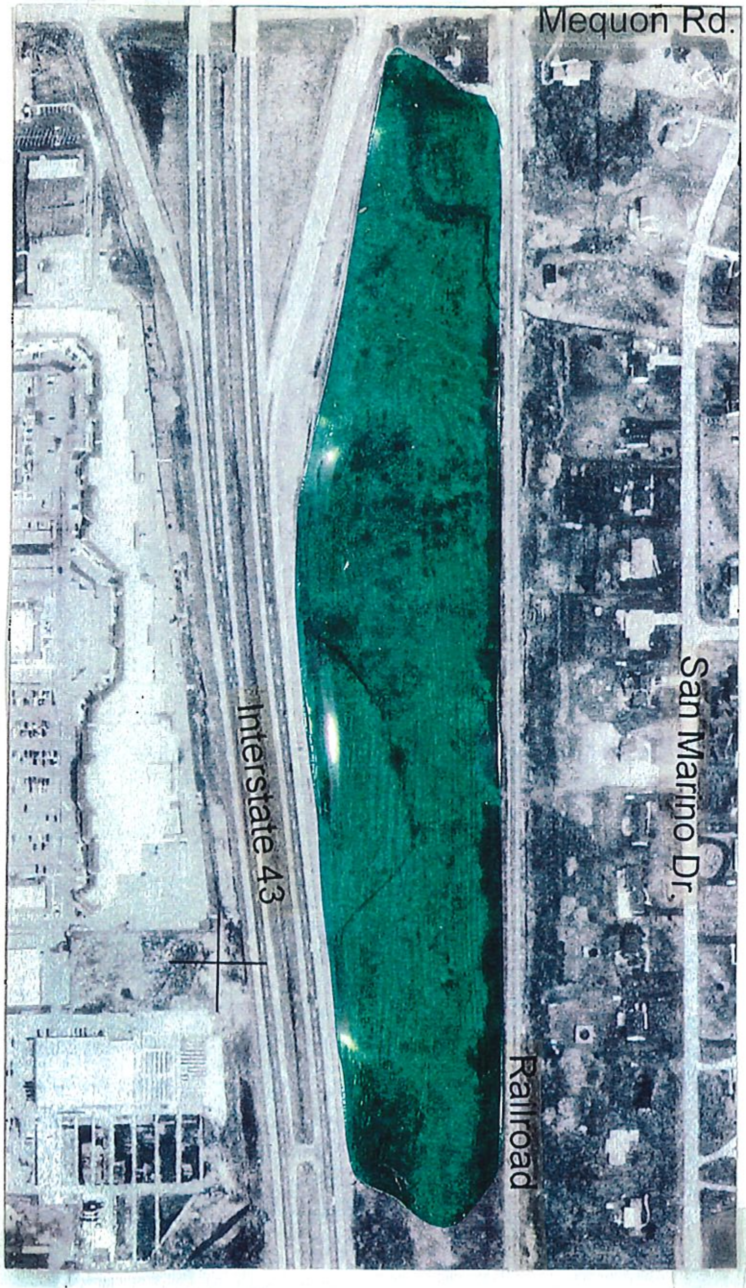
Figure 8-2
Problem FS-1 Selected Alternative
Stormwater Management Master Plan for the City of Mequon and the Village of Thiensville



CDM Camp Dresser & McKee Inc.

Figure 8-3
Problem MQ-1 Selected Alternative
Stormwater Management Master Plan for the City of Mequon and Village of Thiensville

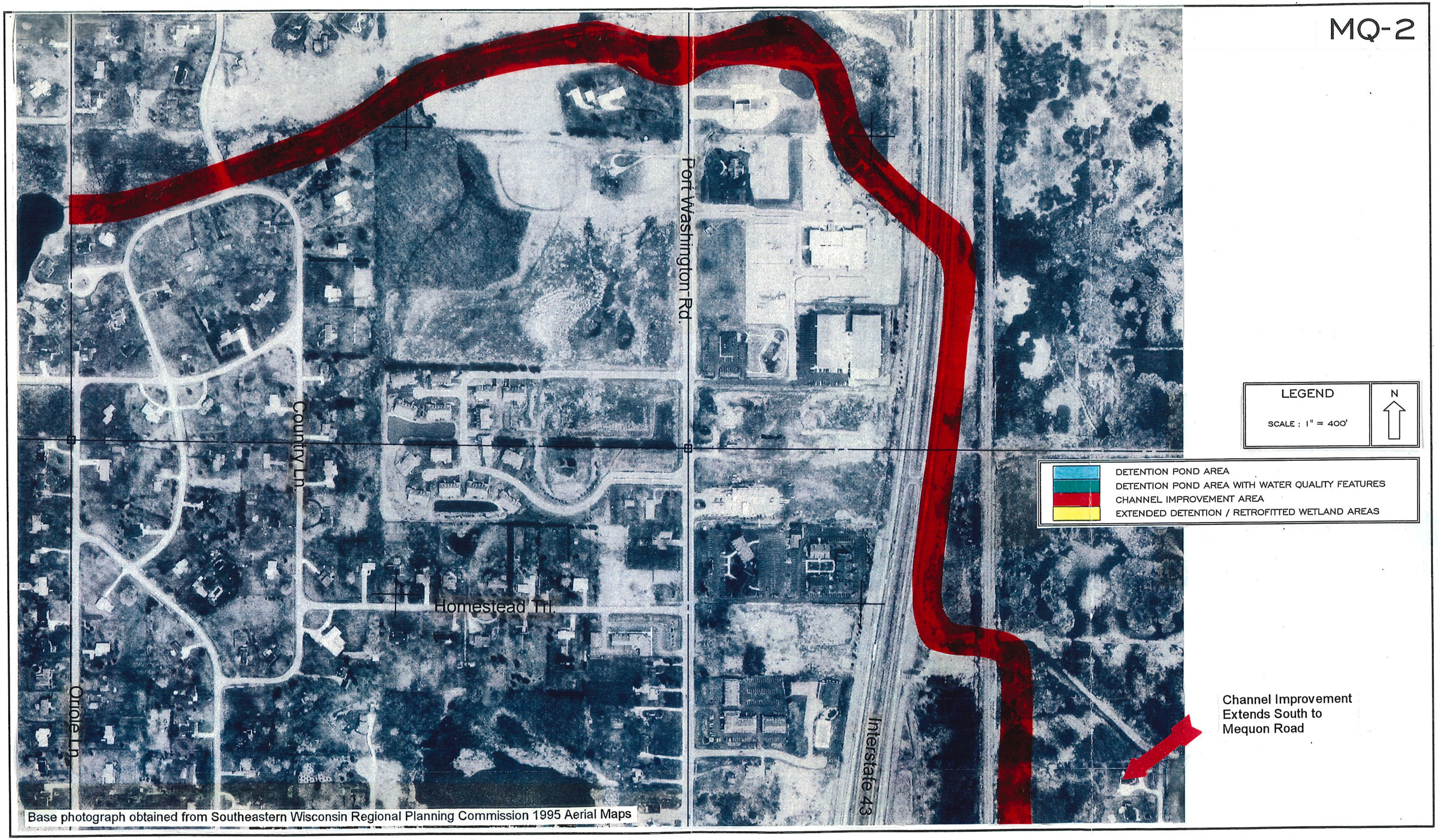
MQ-2



LEGEND SCALE : 1 " = 400'	N	
		DETENTION POND AREA
		DETENTION POND AREA WITH WATER QUALITY FEATURES
		CHANNEL IMPROVEMENT AREA
		EXTENDED DETENTION / RETROFITTED WETLAND AREAS

Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial Maps

Figure 8-4
Problem MQ-2 Selected Alternative
Stormwater Management Master Plan for the City of Mequon and the Village of Thiensville



CDM Camp Dresser & McKee Inc.

Figure 8-5
Problem MQ-2 Selected Alternative
Stormwater Management Master Plan for the City of Mequon and Village of Thiensville

CDM Camp Dresser & McKee Inc.

Figure 8-6
Problem MQ-3 Selected Alternative
Stormwater Management Master Plan for the City of Mequon and Village of Thiensville

MQ-3

LEGEND	N		
SCALE : 1 " = 400'	⇧	[light blue]	DETENTION POND AREA
		[teal]	DETENTION POND AREA WITH WATER QUALITY FEATURES
		[red]	CHANNEL IMPROVEMENT AREA
		[yellow]	EXTENDED DETENTION / RETROFITTED WETLAND AREAS

Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial Maps

CDM Camp Dresser & McKee Inc.

Figure 8-7

Problem MQ-3 Selected Alternative

Stormwater Management Master Plan for the City of Mequon and the Village of Thiensville

MQ-4

Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial Maps

Figure 8-8
Problem MQ-4 Selected Alternative
Stormwater Management Master Plan for the City of Mequon and the Village of Thiensville

PG- I

LEGEND	N	
SCALE : 1 " = 400'	⇧	DETENTION POND AREA DETENTION POND AREA WITH WATER QUALITY FEATURES CHANNEL IMPROVEMENT AREA EXTENDED DETENTION / RETROFITTED WETLAND AREAS

Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial Maps

Figure 8-10
Problem PG-1 Selected Alternative

PG- I

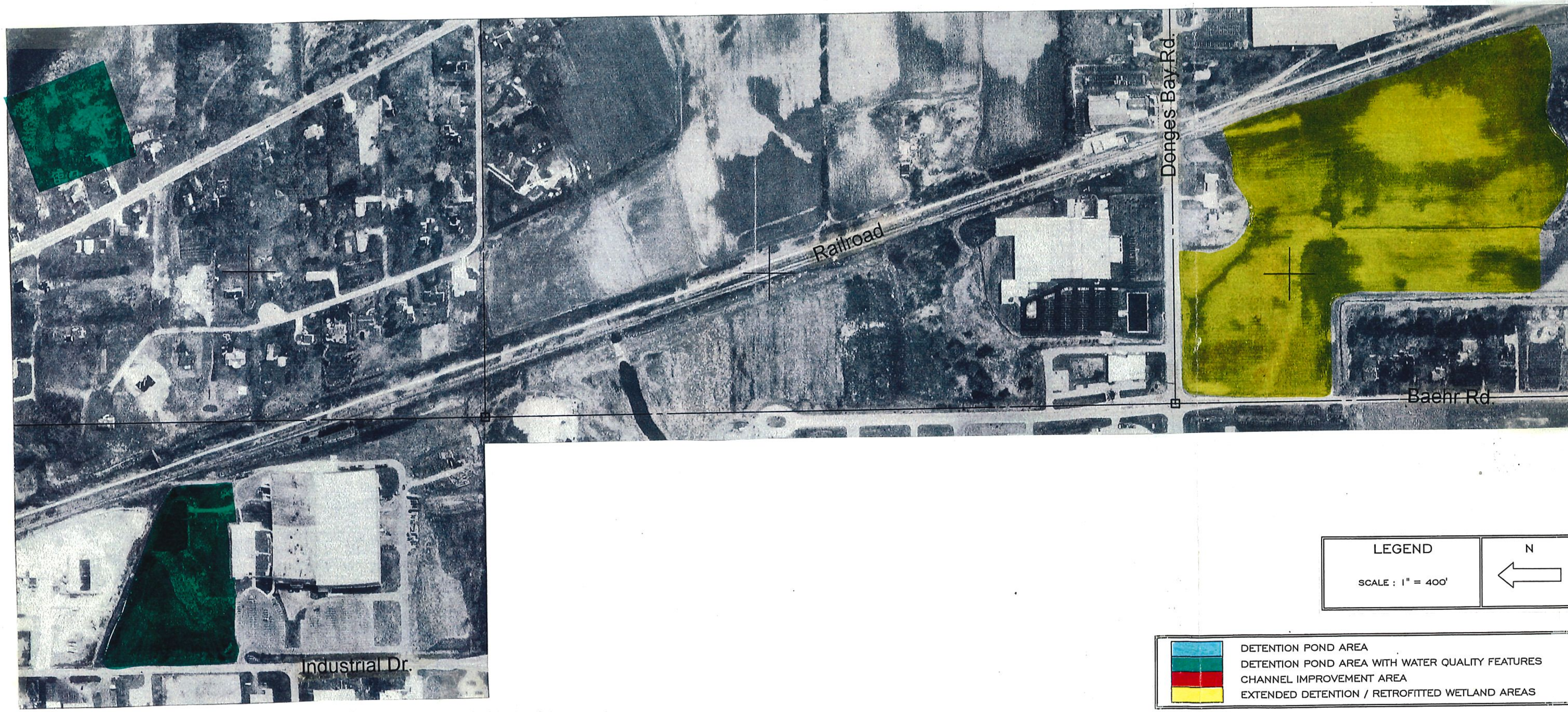
LEGEND	N	
SCALE : 1 " = 400'	⇧	DETENTION POND AREA
		DETENTION POND AREA WITH WATER QUALITY FEATURES
		CHANNEL IMPROVEMENT AREA
		EXTENDED DETENTION / RETROFITTED WETLAND AREAS

Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial Maps

CDM Camp Dresser & McKee Inc.

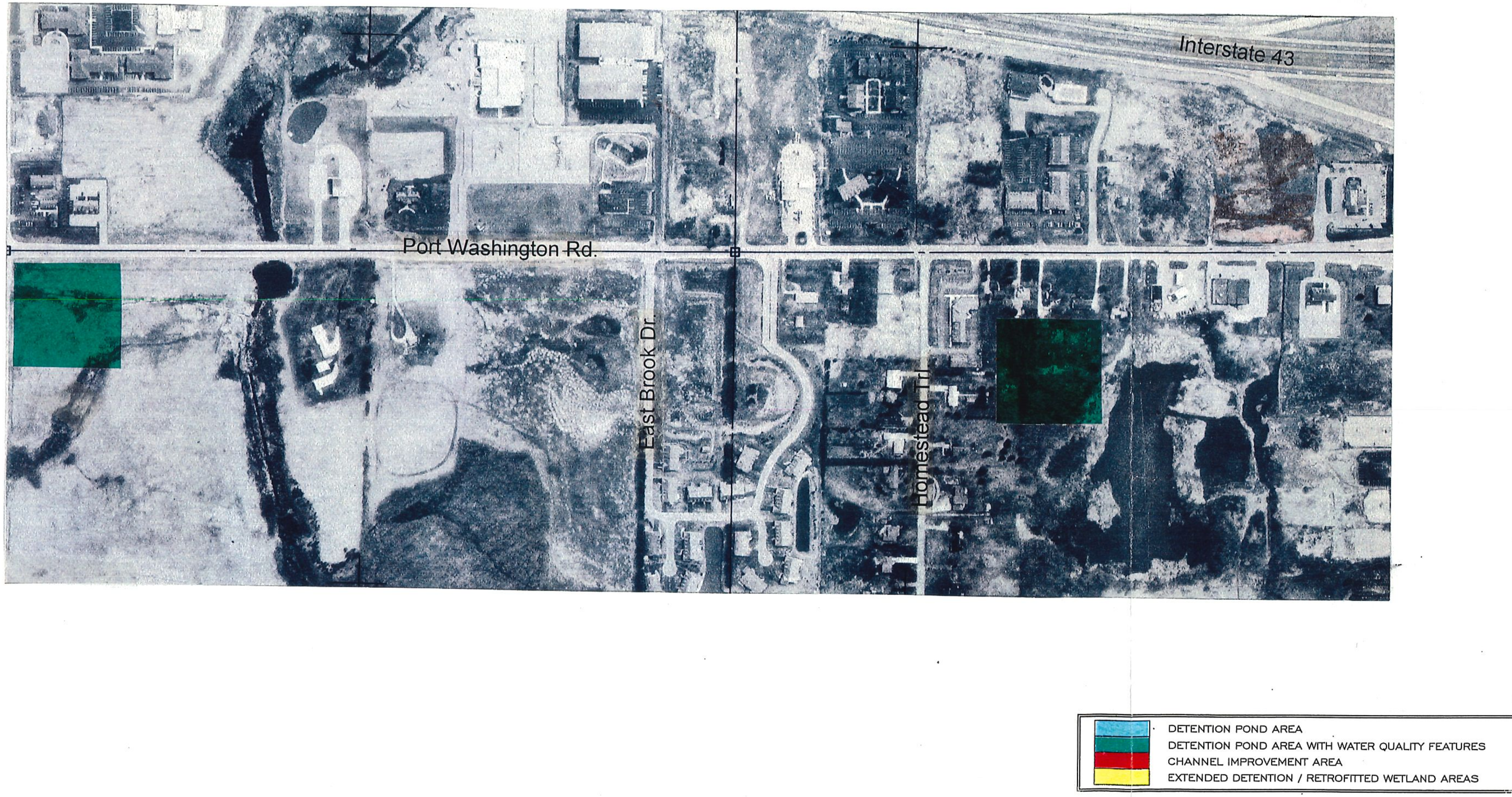
Figure 8-11
Problem PG-1 Selected Alternative

Retrofitted Wetland #50 and Industrial Park Basin



Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial Maps

R.A. Smith Water Quality Basins



Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial Maps

CDM Camp Dresser & McKee Inc.

Figure 8-13
R.A. Smith Detention Ponds Selected Alternative
Stormwater Management Master Plan for the City of Mequon and Village of Thiensville

PG-2

LEGEND	N		
SCALE : 1 " = 400'	⇧	(light blue)	DETENTION POND AREA
		(teal)	DETENTION POND AREA WITH WATER QUALITY FEATURES
		(red)	CHANNEL IMPROVEMENT AREA
		(yellow)	EXTENDED DETENTION / RETROFITTED WETLAND AREAS

Base photograph obtained from Southeastern Wisconsin Regional Planning Commission 1995 Aerial maps

8.3 Culvert Replacement Program

In order to reduce localized flooding problems, culverts which are considered undersized are selected for replacement. The culvert replacement program includes 34 culverts which either cause road overtopping in excess of 6-inches in the 100-year storm; cause overtopping of a main arterial in the 100-year storm; or which do not provide sufficient capacity for the 10-year storm. The culverts designated for replacement are listed in Table 8-2.

Culverts identified in Section 4.2 with significant maintenance or safety problems should be included and prioritized with the culvert replacement program.

8.4 Storm Water Quality Improvement Plan

The storm water quality alternatives evaluated include pollution source control measures and pollution treatment measures. A combination of treatment and source control measures are selected to meet the objectives and criteria in Section 2. The selected source control and treatment control measures are presented in Tables 8-3 and 8-4, respectively.

The selected water quality alternatives will result in the following approximate reductions in the existing total annual pollutant loadings from the study area: sediment 60 percent, phosphorous 45 percent, and lead 25 percent.

The selected plan will result in a significant reduction in pollutant loadings to the Milwaukee and Menomonee Rivers. However, the reduction criteria presented in the Nonpoint Source Control Plan for the Milwaukee River South and Menomonee River Priority Watersheds will not be met for phosphorous and lead. The recommended level of pollutant reduction in the Nonpoint Source Control Plans is 50 percent for sediment, 50 to 70 percent for nutrients, and 55 to 60 percent for toxics, such as lead.

Table 8-2: Undersized Culverts Designated for Replacement

Culvert ID	Road	Shape	Size (in.)	Condition	Comments
FS232014	County Line Road	Arch	101 x 161	High back water	DB
FS231015	Port Washington Road	Box	48 x 96	Major road overtopping in the 100-year event	A
FS233019	Lake Shore Drive	Circular	12	Overtops road by 2 inches in 100-year event	
FS232051	Zedler Lane	Arch	2 @ 18 x 24	Overtops road by 2 inches in 100-year event	
FS232067	Waterleaf Drive	Arch	5 @ different sizes	Damaged culvert, Overtops by 6 inches in 100-year	crushed
FS232074	Donges Bay Road	Arch	2 @ 20 x 28	Major road overtopping in the 100-year event	
MQ134006	Baehr Road	Arch	5 @ 41 x 53	Overtops road > 6 inches in 100-year event	A
MQ133009	Wauwatosa Road	Circular	2 @ 30	Overtops road > 6 inches in 100-year event	
MQ136042	Donges Bay Road	Circular	42	Overtops road > 6 inches in 100-year event	
MQ219042	Hickory Lane	Arch	2 @ 52 x 77	Overtops road > 6 inches in 100-year event	A
MQ219045	Chestnut Road	Arch	3 @ different sizes	Overtops road > 6 inches in 100-year event	A
MQ219046	Glenbrook Lane	Arch	2 @ 43 x 64	Overtops road > 6 inches in 100-year event	A
MQ230085	Mequon Road	Circular	2 @ 48	Overtops road > 6 inches in 100-year event	A
MQ230039	Range Line Road	Arch	47 x 71	Overtops road by 3 inches in 100-year event	A
MQ219003	Glen Oaks Lane	Box	48 x 48	High back water	
MQ217008	Corporate Parkway	Circular	3 @ 18	Overtops road by 6 inches in 100-year event	
MQ126018	Sherwood Drive	Arch	20 x 28	Overtops road by a foot in 100-year event	
MQ126020	WCRR Tracks	Circular	42	Overtops road > 6 inches in 100-year event	
MQ13699J	Range Line Court	Circular	2 @ 24	Overtops road > 6 inches in 100-year event	
MQ136038	Donges Bay Road	Arch	20 x 28	Overtops road > 6 inches in 100-year event	
MQ122022	West Street	Arch	33 x 49	Overtops road > 6 inches in 100-year event	DT
MQ135029	Cedarburg Road	Arch	2 @ 71 x 103	Major road overtopping in the 100-year event	
MQ113003	Yvonne Drive	Arch	2 @ 29 x 42	Overtops road > 6 inches in 100-year event	
MQ102002	Bonniwell Road	Circular	15	Major road overtopping in the 100-year event	
PG110010	WCRR Spur	Circular	24	Overtops by a foot in 100-year event	
PG103031	Concord Street	Circular	28	Overtops road > 6 inches in 100-year event	
PG102012	Pioneer Road	Circular	27	Overtops road > 6 inches in 100-year event	DT

Culvert ID	Road	Shape	Size (in.)	Condition	Comments
PG103023	Wauwatosa Road	Circular	15	Overtops road > 6 inches in 100-year event	
PG109010	Highland Road	Circular	48	Overtops road > 3 inches in 100-year event	
UL208004	Lake Shore Drive	Circular	24	Overtops road > 6 inches in 100-year event	
UL208001	Lake Shore Drive	Circular	36	Excessive back water in 100-year event	
UL205002	Lake Shore Drive	Arch	29 x 42	Overtops road by 6 inches in 100-year event	
UL206006	Bonniwell Road	Arch	29 x 42	Overtops road by 6 inches in 100-year event	
UL217015	Highland Road	Circular	2 @ 36	Excessive back water in 100-year event	

Notes:
A = Problem addressed by Recommended Plan
DT = Do not replace, would increase flooding in Thiensville
DB = Do not replace, would increase flooding in Bayside

Table 8-3: Selected Water Quality Source Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments
Implement 1997 Land Use Plan[1]	The 1997 land use plan designates a majority of the new urban development to be very low density residential.	sediment 11% phosphorous 16% lead -28%	As new areas are developed the land use will transform from agricultural to primarily residential. Sediment and phosphorous loading will be reduced. However, due to the more urban land use, the metals loading is expected to increase.
Implement and enforce storm water ordinance	The storm water ordinance has been revised to require new development to provide storm water detention for water quality improvement	sediment 11% phosphorous 3% lead 18%	The storage and water quality requirements will be essential in eliminating new flooding or water quality problems caused be urban development.
Industrial Best Management Practices	Industries regulated by NR216 are required to implement best management practices	sediment 0.5% lead 2%	To ensure we achieve the estimated pollutant reduction, routine monitoring/reporting should be accomplished.
Roadway Pavement Sweeping	Seasonal sweeping program (weekly from April through May, bi-weekly June through August, monthly from September through November and during March)	sediment 1% phosphorous 1% lead 6%	--
Major Parking Lot Sweeping	Seasonal sweeping program (weekly from April through May, bi-weekly June through August, monthly from September through November and during March)	sediment 1% phosphorous 0.5% lead 4%	Major parking lots are those contiguous areas in excess of 1,500 square feet.
Ice Management Practices	implement improved salt distribution methods, train personnel involved with salt distribution	variable	Ice management should involve a policy decision on the part of the common council regarding the frequency, level, extent of deicing.
Catch Basin Cleaning	Inspect catch basins quarterly and clean as necessary when the basin is approximately 40% full.	sediment <0.5% lead 1%	--

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments
Landscape Practices	Implement environmentally friendly landscape practices in park areas, school yards, city and village building yards, and vegetated median strips.	sediment 1% phosphorous 2% lead <0.5%	Examples of environmentally friendly practices include increased turf height, reduced week control, replacement of turf with low maintenance ground cover or perennials, and reduced fertilized application.
Snow Storage Practices	Locate snow storage areas in a well vegetated area at least 200 feet from a drainage way or storm sewer inlet	variable	Implementation of this practice provides the snow melt an opportunity to filter though the vegetated area which will remove a portion of the pollutant loading.
Erosion Control Ordinance	Implement revised ordinance, increase the construction site inspection program, and train inspectors on erosion control techniques.	sediment <0.5%	--
Agricultural Practices	Encourage use of Agricultural BMPs such as conservation tillage and adopt the Ozaukee County shoreline management ordinance	sediment 25% phosphorous 16% lead <0.5%	Ozaukee County is primarily responsible for implementation of agricultural practices.
Streambank Stabilization	Stabilize key streambanks	variable	Streambank stabilization measures may include: vegetation, erosion protection, and debris removal is designated areas.
Public Education and Information Program	Provide information to the general public and industries on the Storm Water Management Plan	variable	Topics may include: Lawn care, pet waste handling, other best management practices, as well as the NR216 requirements. May utilize newsletters, newspaper articles, school programs, cable TV and use of preprinted materials and videos.

Notes: [1] Implementation of the 1997 Land Use Plan is also a required component of the storm water drainage and flood control plan.

8.5 Regulatory/Ordinance Element

Revisions to the current City of Mequon storm water ordinance are recommended for implementation. The recommended ordinance revision includes the following:

- The 100-year, 24 hour, the 10-year, 24 hour; and the 2-year, 24 hour peak rate of runoff after the proposed activities may no exceed the peak rate of runoff which would have resulted from the 100-year, 24 hour, the 10-year, 24 hour; and the 2-year, 24 hour event respectively occurring over the site with the land in presettlement state, with the presettlement state curve number being no greater than 70 for hydrologic soil group C, not greater than 55 for hydrologic soil group B, not greater than 30 for hydrologic soil group A, and not greater than 77 for hydrologic soil group D.

- Where on site detention is required for runoff control, the detention facilities shall safely contain and/or safely pass the runoff of a 100-year storm event of any duration through a v-notch weir control structure as practicable.

- A permanent pool equal to the runoff volume under developed condition from the 1.5 inch, 4-hour event shall be created. Additionally, an active storage volume equal to one-half of the runoff volume under developed condition from the 1.5-inch, 4-hour event shall be created. No more that one-half of the active storage volume shall be discharged in the first 24 hours of the storm event and that discharge control structure shall be submerged.

- Design and specification shall be based on established and accepted procedures, and/or must conform to the standards set forth by the City Engineer. Any deviation from accepted procedures must be approved by the City Engineer.

In addition to the above revisions, the land disturbance area which requires temporary sediment basins was recommended to be reduced from 5 acres to 1 acre. All of the revisions are essential to minimize the creation of new flooding problems or further degradation of water quality because of new development.

8.6 Cost Estimate for the Recommended Plan

The total capital cost is estimated to be $22,409,000 which includes $10,300,000 which will be paid by developers. A summary of the estimated costs for the selected plan elements is presented in Table 8-5. The recommended plan components and associated costs are also presented in Table 8-6. It should be noted that the cost for the wet detention basins is included in the drainage/flood control element, however significant water quality benefits are obtained by construction of the basins. The costs for ordinance will be paid by developers, not by Mequon, Thiensville, or the WDNR.

These estimated costs are for planning purposes only and do not include land acquisition, construction site erosion control, unknown environmental constraints, legal fees, or utility relocation cost which may be associated with the plan.

Table 8-5: Recommended Plan Estimated Costs

Plan Component	City of Mequon		Village of Thiensville		Developers or Other		Total	
	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M
Drainage / Flood Control Plan								
FS-1: Detention Basin and culvert Improvements	$777,000	$5,500	--	--	--	--	$777,000	$5,500
FS-2: Storm sewer	$154,000	--	--	--	--	--	$154,000	--
MQ-1: Two detention basin w/ water quality features and Channel cleaning/restoration *	$2,100,000	$5,000	--	--	--	--	$2,100,000	$5,000
MQ-2:Detention basin w/ water quality features and Channel Cleaning/restoration*	$2,580,000	$5,000	--	--	--	--	$2,580,000	$5,000
MQ-3: Three detention basins w/ water quality features, and channel cleaning/restoration * [1]	$1,200,000	$5,000	--	--			$1,200,000	$5,000
MQ-4: Detention basin w/ water quality features* *(costs will be shared with the developer of the property)*	$1,020,000	$5,000	--	--			$1,020,000	$5,000
MQ-5: Storm sewer and drainage way *(cost for storm sewer only)*	--	--	$100,000	--	--	--	$100,000	--
PG-1: Three detention basins with water quality, culvert upgrade/removal, and streambank modification * [1]	$1,295,500	$2,500	$1,295,500	$2,500	--	--	$2,591,000	$5,000
PG-2: Construct one detention basin and modify an existing detention basin to provide additional 48 ac-ft of storage capacity	--	--	to be determined (design not done by CDM)	--	--	--	--	--
MU-1: Drainage way	--	--	$160,000	--	--	--	$160,000	--

Plan Component	City of Mequon		Village of Thiensville		Developers or Other		Total	
	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M
Culvert Replacement Program (no water quality benefits)								
Replace/repair culverts	$30,000 to $50,000 /year	--	--	--	--	--	$30,000 to $50,000/ year	--
Water Quality Improvement Plan								
Implement 1997 Land Use Plan	--	--	--	--	--	--	--	--
Implement and enforce storm water ordinance / erosion control ordinance	$1,000	$10,000	--	--	--	--	$1,000	$10,000
Industrial Best Management Practices	--	--	--	--	cost will vary by industry/ cost paid by industry	cost will vary by industry/ cost paid by industry	--	--
Roadway Pavement Sweeping	--	$58,500	--	--	--	--	--	$58,500
Major Parking Lot Sweeping	--	$20,000	--	--	--	--	--	$20,000
Ice Management Practices	Variable		Variable		--	--	Variable	
Catch Basin Cleaning	--	$7,300	--	--	--	--		$7,300
Landscape Practices	Variable		Variable		--	--	Variable	
Snow Storage Practices	Variable		Variable		--	--	Variable	
Agricultural Practices	Variable		Variable				Variable	

Plan Component	City of Mequon		Village of Thiensville		Developers or Other		Total	
	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M
Streambank Stabilization	$839,000	--	--	--	--	--	$839,000	--
Public Education and Information Program	Variable		Variable		--	--	Variable	
Wet Detention Pond: Industrial Park	--	--	--	--	cost already incurred		--	--
Wet Detention Ponds (RA Smith)	$250,000	$5,000	--	--	--	--	$250,000	$5,000
Constructed wetland	$213,000	$2,000	--	--	--	--	$213,000	$2,000
Storm Water Treatment System	--	--	$84,000	$500	--	--	$84,000	$500
Regulatory/Ordinance Program								
Compliance with the revised ordinance*	--	--	--	--	$10,300,000	--	$10,300,000	--
Drainage/ Flood Control Plan	***$9,126,500***	***$28,000***	***$1,655,500***	***2500***	—	—	***$10,782,000***	***$30,500***
Culvert Replacement Program	***$40,000***	—	—	—	—	—	***$40,000***	—
Water Quality Improvement Plan	***$1,303,000***	***$102,800***	***$84,000***	***500***	—	—	***$1,387,000***	***$103,300***
Regulatory / Ordinance Plan	—	—	—	—	—	—	***$10,300,000***	—
Sub-Total *for Plan Elements with Water Quality Benefits*	*$9,498,500*	*$125,300*	*$1,279,500*	*$8,000*	*$10,300,000*	--	*$21,178,000*	*$133,300*
Sub-Total for Plan Elements with Drainage/Flooding Benefits Only	*$971,000*	*$5,500*	*$360,000*	--	--	--	*$1,331,000*	*$5,500*
TOTAL	*$10,469,500*	*$130,800*	*$1,639,500*	*$8,000*	*$10,300,000*	--	*$22,409,000*	*$138,800*

Notes: * indicates that the plan element provides both water quality and drainage/flood control benefits.
[1] *The Mequon/Thiensville cost split for this alternative is assumed to be 50/50. The final cost allocation will be determined at the time of implementation through an intergovernmental agreement.*

Table 8-6: Summary of Recommended Plan

Recommendation	Mequon/ Thiensville	Capital Cost[1]	O&M Cost	Flood Reduction	Sediment Reduction	$/lbs. Reduced
Culvert Replacement/Upgrade	M	$30,000-50,000/yr.	-	X	-	-
FS-1: Detention Basin and inlet Improvement	M	$777,000	$5,500	X	-	-
FS-2: Storm Sewer	M	$154,000	-	X	-	-
MQ-1: Basin with WQ and Channel Cleaning	M	$2,100,000	$5,000	X	0.7%	$33
MQ-2: Basin and Channel Cleaning/Stream	M	$2,580,000	$5,000	X	2.0%	$12
MQ-3: Three Detention Basins	M/T	$1,200,000	$5,000	X	4.0%	$3
MQ-4: Detention Basin and Channel	M	$1,020,000	$5,000	X	2.0%	$6
MQ-5: Storm Sewer, Drainage Way	T	$100,000	-	X	-	-
PG-1: Three Detention Basins with WQ and Culvert Upgrade/Removal	M/T	$2,591,000	$5,000	X	1.5%	$20
PG-2 Detention Basin	T	To be determined[2]	$5,000	X	2	2
MU-1 Drainage Ditch	M	$160,000	-	X	-	-
Implement Future Land Use Plan	M	-	-		11.0%	-
Seasonal Sweeping - Curbed Roadways	M/T	-	$58,500		1.0%	-
Seasonal Sweeping - Key Parking Areas	M/T	-	$20,000		1.0%	-
Industrial BMPs	M/T	-	-		0.5%	-
Ice Management Practices	M/T	-	-		-	-
Inspect and Clean Catch Basins	M/T	-	$7,300		0.4%	-
Landscaping Practices	M/T	-	-		0.7%	-
Snow Storage Areas	M/T	-	-		-	-
Erosion Control Techniques	M/T	$1,000	$10,000		0.3%	-
Develop Public Information and Education Program	M/T	-	-		-	-
Agricultural BMPs	M	To be determined[3]	-		11.0%	-
Stream Bank Stabilization	M	$839,000	-		*	-
R.A. Smith WQ Basins in MQ Subbasin	M	$250,000	$5,000		1.0%	$3
WQ System - Thiensville Parking Lots	T	$84,000	$500		<0.1%	$14
Retrofit Wetland #50 and Ind. Park Basin	M	$213,000	$2,000		1.2%	$2
Sub-Total		$12,109,000	$138,800		37.3%	$4
Revise Ordinance (Developers Cost)	M	$10,300,000 [4]	-		11.0%	$5
Total		**$22,409,000**	**$138,000**		**48.3%**	**$4/lb**

1 Estimated cost for planning purposes only. Does not include land acquisition costs. Land acquisition cost estimated at $3,000,000

2 Preliminary engineering not done by CDM; see Appendix G

3 To be determined by the County/City in the future.

4 Proportional increase

* Significant in-stream sediment not quantified.

Section 9
Plan Implementation

This Storm Water Management Plan prepared for the City of Mequon / Village of Thiensville is designed to practically achieve the objectives and criteria presented in Section 2. Implementation of the plan will require a long term commitment by the City of Mequon and Village of Thiensville, matched with a high level of cooperation with the WDNR, developers, businesses, industries, schools, and private property owners. Implementation of this plan should be coordinated with the WDNR's Nonpoint Source Control Plan for the Milwaukee River South Priority Watershed Project and the Nonpoint Source Control Plan for the Menomonee River Priority Watershed Project.

9.1 Prioritization of Plan Components

The plan consists of four major elements: storm water drainage and flood control, culvert replacement, water quality improvement, and regulatory ordinance. The elements include non-structural, structural, and annual maintenance components. In general, the greatest cost of the recommended plan is associated with the structural components. Although all of the structural components are considered necessary in development of an effective storm water management plan, it is not practical to expect implementation of all of the structural components at once. In order to assist in effective implementation of the plan, the structural plan components have been prioritized based on water quality improvement, drainage improvement, and cost effectiveness.

The prioritized structural components are presented in Table 9-1. The flooding damage points are based on the number of homes estimated to have flood damage, yard damage, and roadway flooding. The water quality benefit points are based on the reduction in sediment loadings. The projects, listed in Table 9-1, which have the most points are considered to be the projects which will have the most significant overall benefit. The cost per point of each project indicates the cost effectiveness of the project.

Table 9-1. Prioritized Structural Recommended Plan Components

Problem Number/ Area of Concern	Project	Flooding Damage Points [1]	Water Quality Benefit Points[2]	Total Points	Cost / Point
MQ-3 yard & street flooding: 24 homes, 1 church, east of Wisconsin Central RR, west of Cedarburg Rd.	Three detention basins, totaling 90 ac-ft., plus channel cleaning and rehabilitation	27	40	67	$17,910
MQ-4 *flooding with water entry through basement windows: 1 home, City Hall, Library*	Detention basin, 50 ac-ft., west of Buntrock Ave. and east of Willowbrook	4	20	34	$30,000

Table 9-1. Prioritized Structural Recommended Plan Components

Problem Number/ Area of Concern	Project	Flooding Damage Points [1]	Water Quality Benefit Points[2]	Total Points	Cost / Point
MQ-1 *yard & home flooding: 14 homes in Hickory Ln., Chestnut Rd. area*	Two detention basin providing 80 ac-ft. of storage capacity, located east of Range Line School and at St. James School and channel cleaning	15	7	22	$75,000
MQ-2 *yard flooding & basement backups, east of Union Pacific RR, north of Mequon Rd., south of Glen Oaks Ln.*	Detention basin, 90 ac-ft, east of I-43, south of Mequon Road, west of Railroad tracks and channel cleaning/ stream restoration	2	20	22	$100,909
MU-1 *yard and street flooding 19 homes, adjacent to channel, south of Donges Bay Rd., west of Swan Rd.*	Ditch rehabilitation and driveway culvert replacements	21	--	21	$6,190
PG-1 *street and property flooding in Thiensville, south of Friestadt Rd. to Cedarburg Rd.*	Detention basin, at Hawthorne and Wauwatosa Roads and remove/ upgrade culvert north of the Harley dealership and streambank modification	2	15	17	$152,411
Industrial/ Commercial/ *Business Park Area at Donges Bay Rd. & Baehr Road*	Construct/ retrofit wetland #50		12	12	$17,750
Port Washington Rd. Commercial Area	RA Smith water quality basin		10	10	$25,000
PG-2 *street and yard flooding: 4 homes along Laurel Dr.*	Construct one detention basin and modify an existing detention basin to provide an additional 48 ac-ft of storage capacity. [3]	6	--[3]	6	$16,666
Thiensville Business District	On-site system for major commercial parking lots		5	5	$16,800

Table 9-1. Prioritized Structural Recommended Plan Components

Problem Number/ Area of Concern	Project	Flooding Damage Points [1]	Water Quality Benefit Points[2]	Total Points	Cost / Point
MQ-5 *yard & street flooding, east of Buntrock Ave. Between West & Spring Sts.*	Construct storm sewer along Spring St. and maintain drainage way	2	--	2	$50,000
FS-2 *yard flooding east of Waterleaf Dr., west of Lakeshore*	18-inch storm sewer	1	--	1	$154,000
FS-1 *yard flooding in Clover Ln. / Brookdale Dr. area*	Detention basin north on Donges Bay Road & inlet improvements	1	--	1	$770,000

Notes: [1] *flooding damage points based on number of structures flooded plus 1 point for yard flooding and 1 point for road flooding*
[2] *Water quality benefit points based on the percent reduction in total annual sediment loading multiplied by 10.*
[3] *Design not done by CDM; see Appendix G.*

The streambank stabilization program is essential to reduce sediment loading directly into the streams due to erosion. This project should be annually funded.

The culvert replacement program is considered an annual maintenance program which should be included in the annual schedules and budgets.

Typically the cost for non-structural measures is significantly lower than for structural measure. The non-structural measures are prioritized in Table 9-2 based on sediment removal.

Table 9-2. Prioritized Non-Structural Recommended Plan Projects

Component	Description	Water Quality Benefit
Agricultural practices	Encourage use of Agricultural BMPs such as conservation tillage and adopt the Ozaukee County shoreline management ordinance	sediment 25% phosphorous 16% lead <0.5%
Implement 1997 land use plan[1]	The 1997 land use plan designates a majority of the new urban development to be very low density residential	sediment 11% phosphorous 16% lead -28%
Implement and enforce storm water ordinance	The storm water ordinance has been revised to require new development to provide storm water detention for water quality improvement	sediment 11% phosphorous 3% lead 18%

Erosion control ordinance	Implement revised ordinance, increase the construction site inspection program, and train inspectors on erosion control techniques.	sediment <0.5% *Note: although the estimated increase in pollutant reduction is relatively low, the overall benefit of the Erosion Control Ordinance is considered significant and the practice is essential.*
Roadway pavement sweeping	Seasonal sweeping program (weekly from April through May, bi-weekly June through August, monthly from September through November and during March)	sediment 1% phosphorous 1% lead 6%
Major parking lot sweeping	Seasonal sweeping program (weekly from April through May, bi-weekly June through August, monthly from September through November and during March)	sediment 1% phosphorous 0.5% lead 4%
Landscape practices	Implement environmentally friendly landscape practices in park areas, school yards, city and village building yards, and vegetated median strips.	sediment 1% phosphorous 2% lead <0.5%
Industrial best management practices	Industries regulated by NR216 are required to implement best management practices	sediment 0.5% lead 2%
Catch basin cleaning	Inspect catch basins quarterly and clean as necessary when the basin is approximately 40% full.	sediment <0.5% lead 1%
Ice management practices	Implement improved salt distribution methods, train personnel involved with salt distribution	variable
Snow storage practices	Locate snow storage areas in a well vegetated area at least 200 feet from a drainage way or storm sewer inlet	variable
Public education and information program	Provide information to the general public and industries on the Storm Water Management Plan	variable

9.2 Implementation Schedule

The implementation schedule recommended implementation schedule for the storm water management plan is based on water quality improvement, drainage /flooding improvement, and cost effectiveness. The structural components are scheduled based on the prioritization discussed in the previous section. The recommended general implementation schedule is presented in Table 9-3.

Table 9-3: Implementation Schedule

Plan Component	Short Range	Medium Range	Long Range
Water Quality Improvement Plan			
Implement 1997 land use plan	✓		
Implement and enforce storm water ordinance	✓		
Industrial best management practices	✓		
Roadway pavement sweeping	✓		
Major parking lot sweeping	✓		
Ice management practices	✓		
Catch basin cleaning	✓		
Landscape practices	✓		
Snow storage practices	✓		
Erosion control ordinance	✓		
Agricultural practices	✓		
Streambank stabilization	✓	✓	✓
Public education and information program	✓	✓	✓
Wet detention pond: Industrial Park		✓	
Wet detention ponds (RA Smith)		✓	
Constructed wetland		✓	
Storm Water treatment system			✓
Regulatory/Ordinance Program			
Compliance with the revised ordinance	✓		
Drainage/Flood Control Plan			
FS-1: Detention basin and culvert improvements			✓
FS-2: Storm sewer			✓

Plan Component	Short Range	Medium Range	Long Range
MU-1: Drainage way		✓	
MQ-1: Two detention basin w/ water quality features and channel cleaning/restoration		✓	
MQ-2: Detention basin w/ water quality features and channel cleaning/restoration		✓	
MQ-3: Three detention basins w/ water quality features, and channel cleaning/restoration		✓	
MQ-4: Detention basin w/ water quality features		✓	
MQ-5: Storm sewer and drainage way			✓
PG-1: Three detention basins with water quality, culvert upgrade/removal, and streambank modification		✓	
PG-2: Construct and modify two detention basins providing an additional 48 ac-ft of storage capacty. [1]		✓	
MU-1: Drainage way		✓	
Culvert Replacement Program (no water quality benefits)			
Replace/repair culverts	✓	✓	✓

Short Range is based on obtaining policy by the city council as soon as possible and including required financial and staff resources in the next city budget.
Medium Range - financial and staff resources should be included in the annual city budget in the next 3 to 5 years.
Long Range - financial and staff resources should be included in the annual city budget in the next 5 to 10 years or at the direction of the elected officials/
1. Design not done by CDM; see Appendix G

9.3 Authorities and Partnerships for Plan Implementation

9.3.1 City of Mequon

The City of Mequon is ultimately responsible for the implementation of this storm water management plan within the City. Mequon has the authority needed to implement plan components as outlined in Section 8. Support from all levels of the City's administration are necessary for the success of this plan. Mequon implementation responsibilities include administration of the plan as well as operation and maintenance of the plan components. Mequon is also responsible for several of the plan components such as pavement sweeping, catch basin cleaning, implementation of the land use plan, and enforcement of the Erosion Control Ordinance.

Mequon is also responsible for completion of a Municipal Storm Water Discharge Permit application. The permit application must be submitted to the WDNR by March 13, 1999. Information presented in this storm water management plan will provide information for completion of the application. Implementation of this plan will assist Mequon in compliance with the conditions of the storm water permit.

Intermunicipal agreements between Mequon and Thiensville will be required for cost sharing of several plan components. Additionally, joint permit conditions may be applied.

9.3.2 Village of Thiensville

The Village of Thiensville is ultimately responsible for the implementation of this storm water management plan within the Village. Thiensville has the authority needed to implement plan components as outlined in Section 8. Support from all levels of the Village's administration are necessary for the success of this plan. Thiensville implementation responsibilities include administration and operation and maintenance of the plan components. Thiensville will also be responsible for several of the plan components such as pavement sweeping, catch basin cleaning, and enforcement of the Erosion Control Ordinance.

Thiensville is also responsible for completion of a Municipal Storm Water Discharge Permit application. The permit application must be submitted to the WDNR by February 11, 1999. Information presented in this storm water management plan will provide information for completion of the application. Implementation of this plan will assist Thiensville in compliance with the conditions of the storm water permit.

9.3.3 Wisconsin Department of Natural Resources

The WDNR has broad authority for water quality control, natural resource protection, and water and wetlands regulation. WDNR's authority includes the establishment of water quality criteria and effluent limits, the administration of the Wisconsin Pollutant Discharge Elimination System (WPDES) permitting program, and the conduct of water quality research studies. Natural resource protection responsibilities include the management of fish, wildlife, and habitat resources. The Department also prepared the Milwaukee River South and Menomonee River Priority Watershed Project reports and administers the Nonpoint source priority watershed planning program, which assisted in funding of this study. WDNR can also provide technical assistance on the design and application of best management practices. They also have the authority to authorize regulatory approvals on plan components requiring permits. Responsibilities of the WDNR in implementation of this plan are summarized in Table 9-3.

9.3.4 Developers

Developers are responsible for compliance with the City and Village ordinances as well as planning development in accordance with the 1997 Land Use Plan. Compliance with the ordinance will require use of appropriate erosion control techniques for sites greater than 1 acre and storm water detention to maintain runoff flows at the presettlement condition and improve runoff water quality. Responsibilities of developers in implementation of this plan are summarized in Table 9-3.

9.3.5 Wisconsin Department of Transportation

The Wisconsin Department of Transportation (WDOT) is responsible for addressing water quantity and quality issues whenever they maintain or upgrade a roadway within their jurisdiction. By working with

Mequon/Thiensville in this storm water management effort, opportunities have been identified for WDOT and Mequon/Thiensville to partner in implementation of selected plan elements, including the detention basin located at Interstate Highway 43 and Mequon Road. Open communication of future WDOT projects with Mequon/Thiensville will facilitate the identification of additional joint projects which will be mutually beneficial. Partnership opportunities for WDOT to assist in implementation of this plan are summarized in Table 9-3.

9.3.6 University of Wisconsin - Extension

The University of Wisconsin - Extension can assist Mequon and Thiensville in providing information and education programs, and by providing technical advice and guidance on storm water related issues. The extension also may assist Mequon/Thiensville facilitate public meetings, and develop newsletters, bulletins, and research information. Responsibilities of the University of Wisconsin - Extension in implementation of this plan are summarized in Table 9-3.

9.3.7 Private Property Owners

Industrial, commercial, and residential landowners are responsible for management activities within their boundaries. Private property owners can assist in implementation of this plan by utilizing best management practices and implementing appropriate component of this plan. Responsibilities of private property owners in implementation of this plan are summarized in Table 9-3.

9.3.8 Milwaukee Area Technical College

The Milwaukee Area Technical College (MATC) should partner with the communities in their storm water management efforts. Opportunities for the MATC to provide education regarding storm water management programs should be explored. Additional storm water detention or water quality improvement measures could also be evaluated by MATC in order to assist Mequon and Thiensville in effective storm water management.

Table 9-3: Storm Water Management Plan Implementation Responsibilities

Component	City of Mequon	Village of Thiensville	WDNR	Developers	WDOT	Private Property Owners	Others	Comments
Water Quality Improvement Plan								
Implement 1997 Land Use Plan	✓	✓		✚				
Implement and enforce storm water ordinance	✓	✓		✓				
Industrial Best Management Practices	✚	✚	✚				✓(1)	
Roadway Pavement Sweeping	✓	✓						
Major Parking Lot Sweeping	✓	✓					✓(2)	
Ice Management Practices	✓	✓						
Catch Basin Cleaning	✓	✓						
Landscape Practices	✓	✓		✓	✚	✓	✚(3)	
Snow Storage Practices	✓	✓			✚		✚(3)	
Erosion Control Ordinance	✓	✓					✚(3)	
Agricultural Practices			✓			✓	✚ (3)(4)	
Streambank Stabilization	✚	✚	✚			✚	✚(4)	
Public Education and Information Program	✓	✓					✚(3)	
Wet Detention Pond: Industrial Park	✓		✚					

Component	City of Mequon	Village of Thiensville	WDNR	Developers	WDOT	Private Property Owners	Others	Comments
Wet Detention Ponds (RA Smith)	✓		✚					
Constructed wetland	✓		✚	✚				
Storm Water Treatment System		✓	✚					
Regulatory/Ordinance Program								
Compliance with the revised ordinance	✓	✓		✓				
Drainage/Flood Control Plan								
FS-1: Detention Basin and culvert Improvements	✓		✚					
FS-2: Storm sewer	✓							
MQ-1: Two detention basin w/ water quality features and Channel cleaning/restoration	✓		✚		✚	✚ school district		
MQ-2:Detention basin w/ water quality features and Channel Cleaning/restoration	✓		✚		✚			
MQ-3: Three detention basins w/ water quality features, and channel cleaning/restoration[1]	✓	✓	✚	✚		✚		
MQ-4: Detention basin w/ water quality features	✓		✚	✚	✚			WDOT involvement with the Wauwatosa Road project
MQ-5: Storm sewer and drainage way	✓	✓	✚			✚ Seminary		

Component	City of Mequon	Village of Thiensville	WDNR	Developers	WDOT	Private Property Owners	Others	Comments
PG-1: Three detention basins with water quality, culvert upgrade/removal, and streambank modification	✓	✓	✚		✚	✚		WDOT involvement with the Wauwatosa Road project
PG-2: Storm Sewer		✓						
MU-1: Drainage way	✓							
Culvert Replacement Program (no water quality benefits)								
Replace/repair culverts	✓	✓						

Notes: ✓ *indicates primary responsibility;* ✚ *indicates secondary responsibility.*
(1) indicates industrial property operators; (2) Commercial property owners; (3) UW - Extension; (4) Ozaukee County Land Conservation Department

9.4 Funding the Recommended Plan

Funding sources for the implementation of the Storm Water Management Plan can come from a combination of sources. Potential funding options may include:

- *Property Taxes - City/Village Funds:* funds are accumulated through property taxes and are used for a variety of services throughout the City and Village and are used to pay debt service on financial instruments, such as bonds to pay for larger structural components. Competition for funding of other municipal services may cause significant variation in the amount of funds available for implementation of the Plan.

- *Cost-Share Grants - WDNR:* available to help offset the local cost of implementing the recommended plan under the Wisconsin Nonpoint Source Priority Watershed Program. Not all components of the storm water management plan are eligible for the grant funds. The state may fund through a direct grant up to 100 percent of the design for water quality elements and up to 70 percent of the installation of urban control such as wet detention ponds. WDNR typically funds up to 70 percent of the design cost and 50 percent of the construction costs for wet detention ponds. Accelerated street sweeping programs may also be eligible for cost sharing. Grant funds are made available through the bi-annual state of Wisconsin budget process and therefore are impacted by state priorities.

  Under the State Nonpoint Source Priority Watershed Program, cost-share grants for eligible controls must be entered into and implemented within eight years after formal approval of the Priority Watershed Plan. The Milwaukee River South Priority Watershed Plan was approved by the Wisconsin Natural Resources Board on September 19, 1991. The Menomonee River Priority Watershed Plan was approved by the Wisconsin Natural Resources Board on April 23, 1991. Therefore, to qualify for cost sharing, eligible practices must be implemented by September 19, 1999 and April 23, 1999 within the Milwaukee River South and Menomonee River watersheds, respectively.

- *Sales Tax - Special Tax District:* development of a local sales tax, if authorized by the voting public. The revenue generated is used for improvements within the taxed district. The revenue generated can be used for capital improvements and/or operation and maintenance.

- *Bonds:* general obligation, revenue, or special assessment bonds are normally used by municipalities to fund large capital improvement programs. Repayment of the bond is typically through the general municipality fund. Bonds allow large-scale capital improvement programs to be initiated when the facilities are needed rather than delaying the program until funding is available. These funds cannot be used for operations and maintenance costs.

- *Storm Water Utility:* accumulated by a user charge system. The utility charge system is based on the premise that property owners are responsible for their storm water runoff. Fees are assessed to property owners based on the estimated amount of storm water discharged from the facility.

- *Pay-As-You Go Sinking Fund:* adjunct to the revenue bond financing. The fund accumulates revenues until sufficient funding is available for a selected project. The project funds are then removed from the fund and the fund restarts accumulation for the next selected project. This method is generally associated with capital improvements where it is not advantageous to incur long-term debt.

- *Fees/Licenses/Permits:* generally the revenue generated is used to cover the costs of permit review or inspections required. These funds are used for administrative and staff cost.

- *Penalties/Fines:* limited funds. The best use of the funding generated by penalties and fees may be utilization in correction of the violation.

Sources of funding considered feasible for the implementation of this plan are summarized in Table 9-4.

Table 9-4: Funding Options for Implementation of the Storm Water Management Plan.

Funding Option	Administration of Plan	Design of Components	Construction of Components	Operation & Maintenance
Property Tax - City / Village Funds	✓	✓	✓	✓
Cost-Share Grants - WDNR		✓	✓	
Sales Tax - Special Tax District		✓	✓	✓
Bonds	✓	✓	✓	
Storm Water Utility	✓	✓	✓	✓
Pay-as-you-go Sinking Fund		✓	✓	
Fees/ Licenses/Permits	✓			
Penalties/Fines	✓			

Only three of the funding methods have the ability to fund implementation of all components of the recommended plan; property tax, sales tax, and storm water utility. Numerous combinations of funding sources can be used to fund plan implementation. However, successful plan implementation requires an equitable, long term funding method.

9.5 Plan Re-Evaluation and Updating

The storm water management plan should be periodically re-evaluated based on changes within the subwatershed or within the City of Mequon / Village of Thiensville. Plan components should be revised as necessary to reflect development or redevelopment changes and storm water management requirements.

APPLICABLE WISCONSIN WATER USE CLASSIFICATIONS AND WATER QUALITY CRITERIA

WATER USE CLASSIFICATION	WATER QUALITY CRITERIA									
	Temperature	pH	Dissolved Oxygen	Fecal Coliform	Lead[1]		Copper[1]		Zinc[1]	
					Acute	*Chronic*	*Acute*	*Chronic*	*Acute*	*Chronic*
Warm Water Sport Fish	89°F Maximum	6 - 9 Standard Units	5.0 mg/l Minimum	--	Maximum 169.1 ug/l	Maximum 10.09 ug/l	Maximum 16.58 ug/l	Maximum 11.51 ug/l	Maximum 103.3 ug/l	Maximum 49.59 ug/l
Warm Water Forage Fish	89°F Maximum	6 - 9 Standard Units	5.0 mg/l Minimum	--	Maximum 169.1 ug/l	Maximum 10.09 ug/l	Maximum 16.58 ug/l	Maximum 11.51 ug/l	Maximum 103.3 ug/l	Maximum 49.59 ug/l
Limited Forage Fish	89°F Maximum	6 - 9 Standard Units	3.0 mg/l Minimum	--	Maximum 169.1 ug/l	Maximum 10.09 ug/l	Maximum 16.58 ug/l	Maximum 11.51 ug/l	Maximum 112.8 ug/l	Maximum 49.59 ug/l
Limited Aquatic Life	89°F Maximum	6 - 9 Standard Units	1.0 mg/l Minimum	--	Maximum 169.1 ug/l	Maximum 10.09 ug/l	Maximum 16.58 ug/l	Maximum 11.51 ug/l	Maximum 112.8 ug/l	Maximum 49.59 ug/l
Full Body Contact Recreational Uses	--	--	--	200-400 MFFCC/ 100ml	--	--	--	--	--	--

General Standards:

A. Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

B. Floating or submerged debris, oil, scum, or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

C. Materials producing color, odor, taste, or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state.

D. Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present which are acutely harmful to animal, plant, or aquatic life.

E. No waters of the state shall be lowered in quality unless it has been affirmatively demonstrated to the department that such a change is justified as a result of necessary economic and social development, provided that no new or increased effluent interferes with or becomes injurious to any assigned uses made of or presently possible in such waters.

Note:

1 Toxicity calculated at a water hardness of 100 mg/l

(Source: NR 102, 104, and 105 of the Wisconsin Administrative Codes)

Chapter NR 102

WATER QUALITY STANDARDS FOR WISCONSIN SURFACE WATERS

History: Chapter NR 102 as it existed on September 30, 1973 was repealed and a new chapter NR 102 was created, effective October 1, 1973. Corrections made under s. 13.93 (2m) (b) 7., Stats., Register, August, 1997, No. 500.

NR 102.01 Purpose. (1) The purpose of this chapter is to establish, in conjunction with chs. NR 103 to 105, water quality standards for surface waters of the state pursuant to s. 281.15 (2) (b), Stats. This chapter describes the designated use categories for such waters and the water quality criteria necessary to support these uses. This chapter and chs. NR 103 to 105 constitute the water quality standards for the surface waters of Wisconsin.

(2) Water quality standards shall protect the public interest, which includes the protection of public health and welfare and the present and prospective uses of all waters of the state for public and private water supplies, propagation of fish and other aquatic life and wild and domestic animals, domestic and recreational purposes, and agricultural, commercial, industrial, and other legitimate uses. In all cases where the potential uses are in conflict, water quality standards shall protect the general public interest.

(3) Water quality standards serve as a basis for developing and implementing control strategies to achieve legislative policies and goals. Water quality standards are the basis for deriving water quality based effluent limitations. Water quality standards also serve as a basis for decisions in other regulatory, permitting or funding activities that impact water quality.

History: Cr. Register, February, 1989, No. 398, eff. 3-1-89.

NR 102.02 Applicability. The provisions of this chapter are applicable to surface waters of Wisconsin.

History: Cr. Register, February, 1989, No. 398, eff. 3-1-89.

NR 102.03 Definitions. (1) "Mixing zone" means a region in which a discharge of different characteristics than the receiving water is in transit and progressively diluted from the source to the receiving system.

(2) "Natural conditions" means the normal daily and seasonal variations in climatic and atmospheric conditions, and the existing physical and chemical characteristics of a water or the course in which it flows.

(3) "Natural temperature" means the normal existing temperature of a surface water including daily and seasonal changes outside the zone of influence of any artificial inputs.

(4) "Resource management" means the application of control techniques to enhance or preserve a surface water in accordance with statutory provisions and in the general public interest.

(5) "Sanitary survey" means a thorough investigation and evaluation of a surface water including bacteriological sampling to determine the extent and cause of any bacterial contamination.

(6) "Surface waters" means all natural and artificial named and unnamed lakes and all naturally flowing streams within the boundaries of the state, but not including cooling lakes, farm ponds and facilities constructed for the treatment of wastewaters (the term waters as used in this chapter means surface waters).

(7) "Unauthorized concentrations of substances" means pollutants or other chemicals introduced into surface waters without prior permit or knowledge of the department, but not including accidental or unintentional spills.

(8) "Best practicable control technology" means that level of treatment established by the department under s. 283.13 (2) (a), Stats., for categories and classes of point sources to be achieved by not later than July 1, 1977.

(9) "Best available control technology" means that level of treatment established by the department under s. 283.13 (2) (b) 1., Stats., for categories and classes of point sources to be achieved by not later than July 1, 1983.

(10) Class I and Class II trout waters are as defined in s. NR 1.02 (7).

History: Cr. Register, September, 1973, No. 213, eff. 10-1-73; r. (1), renum. from NR 102.01, Register, February, 1989, No. 398, eff. 3-1-89; cr. (10), Register, May, 1993, No. 449, eff. 6-1-93.

NR 102.04 Categories of standards. (1) GENERAL. To preserve and enhance the quality of waters, standards are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all waters including the mixing zone and the effluent channel meet the following conditions at all times and under all flow conditions:

(a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

(b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

(c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state.

(d) Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

(2) REVISED STANDARDS. It should be recognized that these standards will be revised as new information or advancing technology indicate that revisions are in the public interest. Water used for hydropower and commercial shipping depends mainly on quantity, depth and elevation; consequently, no specific quality standards for these uses have been prepared.

(3) FISH AND OTHER AQUATIC LIFE USES. The department shall classify all surface waters into one of the fish and other aquatic life subcategories described in this subsection. Only those use subcategories identified in pars. (a) to (c) shall be considered suitable for the protection and propagation of a balanced fish and other aquatic life community as provided in the federal water pollution control act amendments of 1972, P.L. 92-500; 33 USC 1251 et seq.

(a) *Cold water communities.* This subcategory includes surface waters capable of supporting a community of cold water fish and other aquatic life, or serving as a spawning area for cold water fish species. This subcategory includes, but is not restricted to, surface waters identified as trout water by the department of natural resources (Wisconsin Trout Streams, publication 6–3600 (80)).

(b) *Warm water sport fish communities.* This subcategory includes surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for warm water sport fish.

(c) *Warm water forage fish communities.* This subcategory includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.

(d) *Limited forage fish communities.* (Intermediate surface waters). This subcategory includes surface waters of limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of forage fish and other aquatic life.

(e) *Limited aquatic life.* (Marginal surface waters). This subcategory includes surface waters of severely limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of aquatic life.

(4) STANDARDS FOR FISH AND AQUATIC LIFE. Except for natural conditions, all waters classified for fish and aquatic life shall meet the following criteria:

(a) *Dissolved oxygen.* Except as provided in par. (e) and s. NR 104.02 (3), the dissolved oxygen content in surface waters may not be lowered to less than 5 mg/L at any time.

(b) *Temperature.* 1. There shall be no temperature changes that may adversely affect aquatic life.

2. Natural daily and seasonal temperature fluctuations shall be maintained.

3. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature shall not exceed 5° F for streams and 3° F for lakes.

4. The temperature shall not exceed 89° F for warm water fish.

(c) *pH.* The pH shall be within the range of 6.0 to 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum.

(d) *Other substances.* Unauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish or other aquatic life. Surface waters shall meet the acute and chronic criteria as set forth in or developed pursuant to ss. NR 105.05 and 105.06. Surface waters shall meet the criteria which correspond to the appropriate fish and aquatic life subcategory for the surface water, except as provided in s. NR 104.02 (3).

(e) *Temperature and dissolved oxygen for cold waters.* Streams classified as trout waters by the department of natural resources (Wisconsin Trout Streams, publication 6–3600 (80)) or as great lakes or cold water communities may not be altered from natural background temperature and dissolved oxygen levels to such an extent that trout populations are adversely affected.

1. There shall be no significant artificial increases in temperature where natural trout reproduction is to be protected.

2. Dissolved oxygen in classified trout streams shall not be artificially lowered to less than 6.0 mg/L at any time, nor shall the dissolved oxygen be lowered to less 7.0 mg/L during the spawning season.

3. The dissolved oxygen in great lakes tributaries used by stocked salmonids for spawning runs shall not be lowered below natural background during the period of habitation.

(5) STANDARDS FOR RECREATIONAL USE. A sanitary survey and/or evaluation to assure protection from fecal contamination is the chief criterion in determining the suitability of a surface water for recreational use.

(a) *Bacteriological guidelines.* The membrane filter fecal coliform count may not exceed 200 per 100 ml as a geometric mean based on not less than 5 samples per month, nor exceed 400 per 100 ml in more than 10% of all samples during any month.

(b) *Exceptions.* Whenever the department determines, in accordance with the procedures specified in s. NR 210.06, that wastewater disinfection is not required to protect recreational uses, the recreational use criteria and classifications as established in this subsection and in chs. NR 103 and 104 do not apply.

(6) STANDARDS FOR PUBLIC HEALTH AND WELFARE. All surface waters shall meet the human threshold and human cancer criteria specified in or developed pursuant to ss. NR 105.08 and 105.09, respectively. The applicable criteria vary depending on whether the surface water is used for public drinking water supplies and vary with the type of fish and other aquatic life subcategory. All surface waters providing public drinking water supplies or classified as cold water or warm water sport fish communities as described in sub. (3) shall meet the taste and odor criteria specified in or developed pursuant to s. NR 102.14.

(7) STANDARDS FOR WILDLIFE. All surface waters shall be classified for wildlife uses and meet the wildlife criteria specified in or developed pursuant to s. NR 105.07.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; am. (3), Register, December, 1977, No. 264, eff. 1–1–78; renum. from NR 102.02, r. (3) (d) 1. to 3., and (5), renum. (3) (intro.) to (d) (intro.) and (e) and (4) to be (4) (intro.) to (e) and (5) and am. (4) (a), (d), (e) (intro.) and (5), cr. (6) and (7), Register, February, 1989, No. 398, eff. 3–1–89; am. (3) (intro.), (6), (7), r. (3) (a), renum. (3) (b) to (f) to be (3) (a) to (e) and am. (3) (a), Register, August, 1997, No. 500, eff. 9–1–97.

NR 102.05 Application of standards. (1) ANTIDEGRADATION. (a) No waters of the state shall be lowered in quality unless it has been affirmatively demonstrated to the department that such a change is justified as a result of necessary economic and social development, provided that no new or increased effluent interferes with or becomes injurious to any assigned uses made of or presently possible in such waters.

(b) *Classification system.* For the purposes of this subsection, all surface waters of the state, or portions thereof, shall be classified as one of the following:

1. Outstanding resource waters as listed in s. NR 102.10,

2. Exceptional resource waters as listed in s. NR 102.11,

3. Great Lakes system waters as listed in s. NR 102.12 (1),

4. Fish and aquatic life waters as described in s. NR 102.13, or

5. Waters listed in tables 3 through 8 in ss. NR 104.05 to 104.10.

(2) STREAMFLOW. Water quality standards will not be maintained under all natural occurrences of flow, temperature, or other water quality characteristics. The determination of water quality based effluent limitations or other management practices shall be based upon the following conditions except as provided in ch. NR 106 for toxic and organoleptic substances and whole effluent toxicity:

(a) The average minimum 7–day low streamflow which occurs once in 10 years (7–day Q_{10}); or,

(b) In the case of dissolved oxygen and wherever sufficient data on streamflow and temperature are available, by application of a 0.274% level of nonattainment. This is equivalent to an expected nonattainment of the dissolved oxygen criterion of one day per year.

(3) MIXING ZONES. Water quality standards shall be met at every point outside of a mixing zone. The size of the mixing zone cannot be uniformly prescribed, but shall be based on such factors as effluent quality and quantity, available dilution, temperature, current, type of outfall, channel configuration and restrictions to fish movement. For toxic and organoleptic substances with water quality criteria or secondary values specified in or developed pursuant to chs. NR 102 and 105, allowable dilution shall be determined as specified in ch. NR 106 in addition to the requirements specified in this subsection. As a guide to the delineation of a mixing zone, the following shall be taken into consideration:

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

(a) Limiting mixing zones to as small an area as practicable, and conforming to the time exposure responses of aquatic life.

(b) Providing passageways in rivers for fish and other mobile aquatic organisms.

(c) Where possible, mixing zones being no larger than 25% of the cross–sectional area or volume of flow of the stream and not extending more than 50% of the width.

(d) Final acute criteria and secondary values specified in or developed pursuant to s. NR 105.05 for the fish and aquatic life subcategory for which the receiving water is classified not being exceeded at any point in the mixing zone.

(e) Mixing zones not exceeding 10% of a lake's total surface area.

(f) Mixing zones not interfering with spawning or nursery areas, migratory routes, nor mouths of tributary streams.

(g) Mixing zones not overlapping, but where they do, taking measures to prevent adverse synergistic effects.

(h) Restricting the pH to values greater than 4.0 s.u. and to values less than 11.0 s.u. at any point in the mixing zone for the protection of indigenous fish and fish food organisms.

(4) EXEMPTIONS. The thermal mixing zone provisions of this chapter are not applicable to municipal waste and water treatment plants, to vessels, or to discharges to enclosed harbors.

(5) RESOURCE MANAGEMENT EXEMPTIONS. Application of chemicals for water resource management purposes in accordance with statutory provisions is not subject to the requirements of the standards except in case of water used for public water supply.

(6) ANALYTICAL PROCEDURES. (a) The criteria in the Radiation Protection Code, s. HSS 157.15, shall apply to the disposal and permissible concentrations of radioactive substances.

(b) Methods used for analysis of samples shall be as set forth in ch. NR 219 unless alternative methods are specified by the department.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; renum. (5) and (6) to be (6) and (7), cr. (5), Register, July, 1975, No. 235, eff. 8–1–75; r. and recr. (3), Register, August, 1981, No. 308, eff. 9–1–81; correction in (7) made under s. 13.93 (2m) (b) 7., Stats., cr. (4) (h), Register, September, 1984, No. 345, eff. 10–1–84; renum. from NR 102.03, r. (1), cr. (1) (b), renum. (2) to (7) to be (1) (a) to (6) and am. (2), (3) (intro.) and (d) and (6), Register, February, 1989, No. 398, eff. 3–1–89; am. (1) (b) 3., (3) (intro.) and (d), Register, August, 1997, No. 500, eff. 9–1–97.

NR 102.06 Phosphorus. In addition to the requirements established in ch. NR 217, any wastewater discharger, regardless of population, volume or type of waste discharge, or geographic location, may be required to remove excess amounts of phosphorus. Effluent limitations for total phosphorus based on surface water quality may be established where, in the best professional judgment of the department, such limitations will result in an improvement in water quality, or preserve the quality of surface waters where long–term discharges may result in impairment of water quality. Such limitations for phosphorus shall include an evaluation of the discharges from point sources, nonpoint sources, background sources, tributaries, and a consideration of a margin of safety.

History: Cr. Register, July, 1975, No. 235, eff. 8–1–75; am. Register, October, 1986, No. 370, eff. 11–1–86; renum. from NR 102.04, Register, February, 1989, No. 398, eff. 3–1–89; am. Register, November, 1992, No. 443, eff. 12–1–92.

NR 102.07 Lake Michigan and Lake Superior thermal standards. For Lake Michigan and Lake Superior the following thermal standards are established so as to minimize effects on the aquatic biota in the receiving waters.

(1) (a) Thermal discharges shall not raise the receiving water temperature more than 3°F above the existing natural temperature at the boundary of mixing zones established in pars. (b) and (c).

(b) 1. The mixing zone for a shoreline thermal discharge shall be the area included within the perimeter of a rectangular figure extending 1,250 feet in both directions along the shoreline from the outfall and 1,250 feet into the lake.

2. The mixing zone for an offshore thermal discharge shall be the area within a 1,000–foot radius circle with its center at the point of discharge.

(c) The department may, upon request from the owner of a source of thermal discharge, adjust the boundaries of the mixing zone established in par. (b) for that source. In no case may any mixing zone so established include an area greater than 72 acres nor may it include more than 2,800 feet of shoreline.

(2) In addition to the limitation set forth in sub. (1), but excepting the Milwaukee Harbor, Port Washington Harbor and the mouth of the Fox River, thermal discharges to Lake Michigan shall not raise the temperature of the receiving waters at the boundary of the established mixing zone above the following limits:

January	45°F
February	45°
March	45°
April	55°
May	60°
June	70°
July	80°
August	80°
September	80°
October	65°
November	60°
December	50°

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; r. and recr. Register, July, 1975, No. 235, eff. 8–1–75; renum. from NR 102.05, Register, February, 1989, No. 398, eff. 3–1–89.

NR 102.08 Mississippi river thermal standards. In addition to the standards for fish and aquatic life, the monthly average of the maximum daily temperature in the Mississippi river outside the mixing zone shall not exceed the following limits:

January	40°F
February	40°
March	54°
April	65°
May	75°
June	84°
July	84°
August	84°
September	82°
October	73°
November	58°
December	48°

History: Cr. Register, July, 1975, No. 235, eff. 8–1–75; renum. from NR 102.06, Register, February, 1989, No. 398, eff. 3–1–89.

NR 102.09 Review of thermal standards. (1) Whenever the owner of any source of thermal discharges that existed on or before July 31, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

(2) Any owner desiring a review pursuant to sub. (1) shall submit a demonstration to the department no later than June 30, 1976. The department shall reach a decision no later than December 31, 1976.

(3) In the event the owner fails to make a satisfactory demonstration pursuant to sub. (1), the department shall establish a compliance date for the thermal component to be achieved no later than July 1, 1979.

(4) Whenever the owner of any source of thermal discharges that commenced on or after August 1, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

(5) In the event an owner fails to make a satisfactory demonstration pursuant to sub. (4), the discharge shall be in compliance with the thermal requirements of this chapter upon commencement of the discharge.

(6) The department may require the reduction of thermal discharges or the size and configuration of a mixing zone if it finds that environmental damage is imminent or existent.

History: Cr. Register, July, 1975, No. 235, eff. 8–1–75; am. Register, February, 1977, No. 254, eff. 3–1–77; renum. from NR 102.07, Register, February, 1989, No. 398, eff. 3–1–89.

NR 102.10 Outstanding resource waters. (1) The following surface waters are designated as outstanding resource waters:

(a) *National wild and scenic rivers.* All rivers designated under the national wild and scenic rivers act, as amended, 16 USC 1271 to 1287, except those portions flowing through Indian reservations, including:

1. St. Croix river between the northern boundary of the Hudson city limits and the St. Croix flowage dam in Douglas county except that the portion of the St. Croix river from the northern boundary of the St. Croix Falls city limits to a distance one mile below the STH 243 bridge at Osceola shall be classified exceptional resource waters under s. NR 102.11.

2. Namekagon river between its confluence with the St. Croix river and the outlet of Lake Namekagon in Bayfield county.

(b) *State wild and scenic rivers.* All state wild and scenic rivers designated under s. 30.26, Stats., including:

1. Pike river in Marinette county.

2. Pine river and its tributary Popple river in Florence and Forest counties.

(c) Wolf river upstream of the northern Menominee county line.

(d) The following Class I trout waters:

1. Adams county — Big Roche–a–Cri creek

2. Barron county — Yellow river

3. Bayfield county — Flag river, Sioux river

4. Burnett county — North Fork Clam river, South Fork Clam river

5. Chippewa county — Duncan creek, Elk creek, McCann creek

6. Door county — Black Earth creek above the easternmost CTY KP crossing

7. Door county — Logan creek

8. Douglas county — Bois Brule river and its tributaries

9. Dunn county — Elk creek

10. Florence county — Brule river including Montagne creek and Riley creek tributaries; tributaries to the Pine–Popple rivers including Chipmunk, Cody, Haley, Haymarsh, LaMontagne, Lepage, Lunds, Martin, Olson, Patten, Pine, Riley, Rock, Simpson, Seven Mile, Wakefield and Woods creeks; Little Popple river

11. Forest county — Brule river

13. Kewaunee county — Little Scarboro creek

14. Langlade county — Clearwater creek, Drew creek, Evergreen river, South Branch Oconto river

15. Lincoln county — Center fork New Wood creek, Little Pine creek, Prairie river

16. Marathon county — Holt creek, Spranger creek, Plover river

17. Marinette county — Cedarville creek, Otter creek, Holmes creek, East Thunder creek, North fork Thunder river, Eagle creek, Little Eagle creek, Plumadore creek, Meadow brook, Upper Middle Inlet creek, Middle Inlet creek, Wausaukee river, Little Wausaukee creek, Coldwater brook, Medicine brook, South Branch Miscauno river, Miscauno river, Swede John creek, South Branch Pemebonwon river, Spikehorn creek, Silver creek, Little Silver creek, Sullivan creek; tributaries to the Pike river including Little South Branch Pike river, Camp D creek, Camp F creek, Camp 9 creek, Cole creek, Glen creek, Harvey creek, North Branch Harvey creek, South Branch Harvey creek, Hemlock creek, Holloway creek, K.C. creek, Little Harvey creek, Lost creek, MacIntire creek, Phillips creek, Sackerson creek, Shinns creek, Sidney creek, Smeesters creek, Springdale brook, Whiskey creek

18. Marquette county — Chaffee creek, Lawrence creek, Tagatz creek

19. Monroe county — Rullands Coulee creek

20. Oconto county — First South Branch Oconto river, Second South Branch Oconto river, South Branch Oconto river, Hills Pond creek

21. Polk county — Clam river, McKenzie creek

22. Portage county — Emmons creek, Radley creek, Sannes creek, Tomorrow river, Trout creek

23. Richland county — Camp creek

24. Sheboygan county — Nichols creek

25. St. Croix county — Kinnickinnic river above STH "35"

26. Vernon county — Rullands Coulee creek, Spring Coulee creek, Timber Coulee creek

27. Vilas county — Deerskin river, Plum creek

28. Walworth county — Bluff creek, Potawatomi creek, Van Slyke creek

29. Waupaca county — Emmons creek, Griffin creek, Jackson creek, Leers creek, Peterson creek, Radley creek, Sannes creek, Spaulding creek, Trout creek, Whitcomb creek, North Branch Little Wolf river

30. Waushara county — Willow creek north of Redgranite, Mecan river north of Richford, Little Pine creek, West Branch White river

(e) The following Class II trout waters:

1. Barron county — Yellow river

2. Burnett county — North Fork Clam river

3. Forest county — Brule river, Peshtigo river

4. Grant county — Big Green river, Castle Rock creek

5. Marinette county — Peshtigo river

6. Polk county — McKenzie creek

7. Vilas county — Plum creek

(f) The following cold or warm water streams and rivers or portions thereof:

1.	Barron	Engle Creek	Class I & II Portions
		Hickey Creek	Class I & II Portions
		Upper Pine Creek	Above Dallas Flowage
2.	Bayfield	Bark River	All–Class I Portion
		Big Brook	All
		Cranberry River & Tribs.	All–Class I Portion
		East Fork Iron River & Tribs.	All–Class I Portion
		East Fork White River	All–Class I Portion
		Eighteen Mile Cr. & Tribs.	All–Class I Portion
		Fish Creek (Main)	All
		Long Lake Branch & Tribs.	From below Drummond Lake to White River
			All–Class I Portions
		No. Fork Fish Creek & Tribs.	All–Class I & II Portions
		Onion River & Tribs.	All–Class I Portions
		Pikes Creek & Tribs.	All–Class I Portion
		Sioux River & Tribs.	All–Class I & II Portions
		So. Fork White River	All–Class I Portion
		Thompson Creek	All–Class I Portion
		Twenty Mile Creek	All–Class I & II Portions
		White River	All–Class I Portion
		Whittlesey Creek & Tribs.	All–Class I Portions
3.	Burnett	Tributaries to the N. & S. Forks of the Clam River	All–Class I & II Portions
4.	Dane	Mt. Vernon Creek	All–Class I Portion
5.	Door	Mink River	All
6.	Forest	Allen Creek	All
		Brule Creek	All
		Elvoy Creek	All
		Jones Creek	Class I & II portions
		North Otter Creek	All
7.	Grant	Little Green River	All
8.	Iron, Ashland & Price	No. Fork Flambeau River	From Turtle–Flambeau Flowage Dam downstream to Park Falls
9.	LaCrosse	Berge Coulee Creek	All
10.	Langlade	Elton Creek	Class I Portion
		Little Evergreen Creek	All
		Mayking Creek	All
		Michelson Creek	All
		Mid Branch Embarrass River	Class I Portion
11.	Marathon	Falstad Creek	Class II Portion
		So. Branch Embarrass River	Class I Portion
12.	Marinette	No. Branch Beaver Creek	Entire River & tributaries
13.	Oneida	Noisy Creek	Class II Portion
14.	Pierce	Kinnickinnic River	From Powell Dam to St. Croix River
15.	Polk	Sand Creek & Tribs	All–Class I & II Portions
16.	Price, Rusk & Sawyer	So. Fork Flambeau River	All–Round L. Dam downstream to Jxn with No. Fork Flambeau R.
17.	Richland	Elk Creek	All
18.	Rusk	Devils Creek	All–Class I & II Portions
		So. Fork Main Creek	Class I & II Portions (T35N R3W S28 downstream to T34N R4W S11)
19.	Sauk	Otter Creek	From headwaters to southern section line of T11N R6E S33
		Parfrey's Glen	From headwaters to CTH DL
20.	Sawyer	Benson Creek	All–Class I Portion
		Eddy Creek	All–Class I Portion
		Grindstone Creek	All–Class I Portion
		Little Weirgor Creek & Tribs	All–Class I & II Portions
		McDermott Creek	All
		Mosquito Brook	All–Class I Portion
21.	Shawano	Middle Br. Embarrass R.	Origin to but not including Homme Pond
		No. Br. Embarrass R.	Origin to CTH J
		So. Br. Embarrass R.	Origin to but not including Tigerton Pond
22.	Vilas	Allequash Springs	Class I & II Portions
		Brule Creek	All
		East Br. Blackjack Cr.	All
		Elvoy Creek & Springs	Class I & II Portions
		Mishonagon Creek	Class I & II Portions

		Siphon Creek	All
		Spring Meadow Creek	Class I Portion
		Tamarack Creek	All
23.	Wash-burn	Beaver Brook	All–Class I Portion
		Sawyer Creek	All–Class I & II Portions
		So. Fork Bean Brook	All–Class I Portion

(1m) The following lakes are designated as outstanding resource waters:

1.	Ashland	Bad River Slough
		Kakagon Slough
2.	Barron	Bear Lake (T36N R12W S2)
		Red Cedar Lake
		Sand Lake
		Silver Lake
3.	Bayfield	Bark Bay Slough
		Diamond Lake
		Middle Eau Claire Lake
		Namekagon Lake
		Owen Lake
		Pike Chain of Lakes (Pike, Millicent, Buskey Bay, Hart, Twin Bear, Eagle, Flynn and Hildur Lakes)
		Star Lake
		Upper Eau Claire Lake
4.	Burnett	Big Mckenzie Lake
		Big Sand Lake
		Sand Lake (T40N R15W S25)
5.	Columbia	Crystal Lake
6.	Douglas	Bond Lake
		Lower Eau Claire Lake
		Nebagamon Lake
		St. Croix (Gordon) Flowage
		Upper St. Croix Lake
		Whitefish Lake (Bardon)
7.	Florence	Edith Lake
		Keyes Lake
		Lost Lake
		Perch Lake
		Riley Lake, South
8.	Forest	Butternut Lake
		Franklin Lake
		Lucerne Lake (Stone)
		Metonga Lake
9.	Iron	Catherine Lake
		Cedar Lake
		Gile Flowage
		Hewitt Lake
		Owl Lake
		Trude Lake
		Turtle–Flambeau Flowage
9m.	Marinette	Caldron Falls Flowage
10.	Oconto	Archibald Lake
		Bass Lake (T32N R15E S9)
		Bear Paw Lake
		Boot Lake
		Chain Lake
11.	Oneida	Big Carr Lake
		Clear Lake (T39N R7E S16)
		Little Tomahawk Lake
		Tomahawk Lake
		Two Sisters Lake
		Willow Flowage
12.	Polk	Pipe Lake
13.	Price	Cochram Lake
		Tucker Lake
14.	Rusk	Bass Lake (T34N R9W S16)
		Fish Lake
		Island Chains of Lakes (Chain, Clear, McMann, and Island Lakes)
		Three Lakes No. 1 (T36N R9W S25)
15.	St. Croix	Bass Lake (T30N R19W S23)
		Perch Lake
16.	Sauk	Devils Lake
17.	Sawyer	Barker Lake
		Blaisdell Lake
		Camp Smith Lake
		Evergreen Lake
		Grindstone Lake
		Lac Court Oreilles
		Lake Chippewa (Chippewa Flowage)
		Nelson Lake
		Osgood Lake
		Perch Lake (T42N R6W S25)
		Round Lake (Big Round)
		Sand Lake
		Spider Lake
		Teal Lake
		Whitefish Lake
18.	Vilas	Black Oak Lake
		Crab Lake
		Crystal Lake (T41N R7E S27)
		Lac Vieux Desert
		North Twin Lake
		Pallette Lake (Clear)
		Partridge Lake
		Plum Lake
		South Twin Lake
		Star Lake
		Stormy Lake
		Trout Lake
		White Sand Lake (T24N R7E S26)
19.	Walworth	Lulu Lake
20.	Washburn	Bass Lake (T40N R10W S17)

		Long Lake
		Middle McKenzie Lake
		Shell Lake
		Stone Lake (T39N R10W S24)
21.	Waukesha	Spring Lake (T5N R18E S9)
22.	Waupaca	Graham Lake (Nelson)
		North Lake
23.	Waushara	Gilbert Lake
		Lucerne Lake (Egans)
		Norwegian Lake
		Pine Lake (Springwater)

(2) The waters in sub. (1) and (1m) may not be lowered in quality.

(3) Surface waters, or portions thereof, may be added to, or deleted from, the outstanding resource waters designation through the rule making process under the provisions of ch. 227, Stats., and s. NR 2.03.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; am. (1) (d), cr. (1) (e), Register, July, 1989, No. 403, eff. 8–1–89; cr. (1) (f) and (1m), am. (2), Register, May, 1993, No. 449, eff. 6–1–93; **am. (1m) 6., 9. and 11., cr. (1m) 9m., Register, February, 1998, No. 506, eff. 3–1–98.**

NR 102.11 Exceptional resource waters. (1) Surface waters which provide valuable fisheries, hydrologically or geologically unique features, outstanding recreational opportunities, unique environmental settings, and which are not significantly impacted by human activities may be classified as exceptional resource waters. All the following surface waters are designated as exceptional resource waters:

(a) Class I trout waters listed in Wisconsin Trout Streams publication 6–3600 (80) that are not listed in s. NR 102.10.

(b) Other Class I trout waters:

1. Abraham Coulee creek in section 29, township 20 north, range 8 west from its headwaters to the Abraham Coulee road bridge in Trempealeau county.

2. Bear creek originating in section 3, township 20 north, range 7 west in Trempealeau county.

3. Biser creek originating in section 19, township 12 north, range 3 west in Sauk county.

4. Bostwick creek from CTH M upstream 6.2 miles to the headwaters in LaCrosse county.

5. Bufton Hollow creek originating in section 23, township 12 north, range 2 west in Richland county.

6. Columbus creek originating in section 29, township 20 north, range 6 west in Jackson county.

7. Dutch creek originating in section 12, township 19 north, range 8 west in Trempealeau county.

8. Joe Coulee creek originating in section 1, township 20 north, range 7 west in Trempealeau county.

9. Little creek originating in section 21, township 20 north, range 6 west in Jackson county.

10. Marble creek originating in section 30, township 10 north, range 3 east in Sauk county.

11. Marshall creek originating in section 4, township 11 north, range 1 west in Richland county.

12. Martin creek originating in section 22, township 6 north, range 2 east in Iowa county.

13. South Bear creek originating in section 2, township 12 north, range 2 west in Richland county.

14. Spring brook downstream from CTH Y south of Antigo to its confluence with the Eau Claire river in Marathon county.

15. Spring Coulee creek from the headwaters to SE 1/4, SE 1/4, section 33, township 16 north, range 1 east in Monroe county.

16. Unnamed creek 2–12 originating in section 36, township 20 north, range 7 west of Trempealeau county.

17. Unnamed creek 4–9 originating in section 4, township 11 north, range 1 west in Richland county.

18. Unnamed creek 5–6 originating in section 6, township 19 north, range 8 west in Trempealeau county.

19. Unnamed creek 7–4 originating in section 6, township 20 north, range 7 west in Trempealeau county.

20. Unnamed creek 8–9 originating in section 5, township 20 north, range 7 west in Trempealeau county.

21. Unnamed creek 8–14 originating in section 1, township 20 north, range 8 west in Trempealeau county.

22. Unnamed creek 9–13 originating in section 4, township 20 north, range 6 west in Jackson county.

23. Unnamed creek 10–8 originating in section 10, township 11 north, range 1 west in Richland county.

24. Unnamed creek 10–10 originating in section 14, township 20 north, range 6 west in Jackson county.

25. Unnamed creek 11–4 originating in section 1, township 20 north, range 7 west in Trempealeau county.

26. Unnamed creek 11–7 originating in section 2, township 20 north, range 7 west in Trempealeau county.

27. Unnamed creek 13–3a originating in section 19, township 20 north, range 6 west in Trempealeau county.

28. Unnamed creek 13–3b originating in section 6, township 20 north, range 6 west in Trempealeau county.

29. Unnamed creek 15–13 originating in section 1, township 20 north, range 8 west in Trempealeau county.

30. Unnamed creek 15–4 originating in section 3, township 20 north, range 6 west in Trempealeau county.

31. Unnamed creek 16–2 originating in section 22, township 20 north, range 6 west in Jackson county.

32. Unnamed creek 17–5 originating in SE 1/4, section 5, township 20 north, range 6 west in Jackson county.

33. Unnamed creek 24–3a originating in section 24, township 11 north, range 1 west in Richland county.

34. Unnamed creek 26–7 originating in section 2, township 20 north, range 6 west in Jackson county.

35. Unnamed creek 34–2 originating in section 17, township 20 north, range 8 west in Trempealeau county.

36. Unnamed creek 34–15 originating in section 27, township 20 north, range 7 west in Trempealeau county.

37. Unnamed stream originating in section 29, township 10 north, range 3 east in Sauk county.

38. Washington Coulee creek originating in section 29, township 20 north, range 6 west in Jackson county.

(c) The following Class II trout waters:

1. Ashland county — White river above the Bad River Indian reservation

2. Bayfield county — White river

3. Dane county — Mt. Vernon creek

4. Forest county — North Branch Oconto river

5. Grant county — Blue river

6. Iowa county — Blue river

7. Langlade county — Prairie river, South Branch Oconto river

8. Lincoln county — Prairie river

9. Marquette county — Mecan river

10. Oconto county — North Branch Oconto river, South Branch Oconto river

11. Pierce county — Rush river

12. Portage county — Tomorrow river

13. Richland county — Willow creek

14. St. Croix county — Willow river, Race Branch

15. Waushara county — Mecan river

(d) The following cold or warm water streams and rivers or portions thereof:

1.	Barron	Brill River	All–Class II Portion
2.	Crawford	Copper Creek	All
		Plum Creek	All
		Sugar Creek	From headwaters to T10N R6W S10
		Tainter Creek	From Vernon County Line to CTH B
3.	Dane	Blue Mounds Branch	All
		Deer Creek	All
		Dunlap Creek	All
		Elvers Creek (Bohn Cr.)	All
		Flynn Creek	All
		Fryes Feeder Creek	All
		Garfoot Creek	All
		Milum Creek	All
		Rutland Branch	All
		Ryan Creek	All
		Schalpbach Creek	All
		Sixmile Creek	All
		Spring Creek (Lodi)	All
4.	Dane, Sauk, Iowa, Grant, Richland, Crawford	Wisconsin River	From below Prairie du Sac to Prairie du Chien
5.	Dane & Green	Little Sugar River	Above New Glarus
		Story Creek (Tipperary)	All, originating in T5N R8E S36
		Sugar Creek	All
6.	Dunn	Sand Creek	From Chippewa County Line to mouth
7.	Eau Claire	Lowes Creek	From Hwy 37 & 85 upstream to headwaters
8.	Fond du Lac	Feldner's Creek	From headquarters to Mischo's Millpond
		Lake Fifteen Creek	Entire Creek above & below Lake Fifteen
9.	Forest	Armstrong Creek	All
		Middle Br. Peshtigo R.	All
		North Br. Peshtigo R.	All
		North Br. Popple R.	All
		West Br. Armstrong Creek	Class II Portion
10.	Grant	Doc Smith Branch	All
		Little Platte River	From Arthur downstream to Platte River
11.	Grant & Iowa	Big Spring Branch	From Springhead to Blue River
12.	Green	Burgy Creek	All
		Gill Creek	All
		Hefty Creek, North Branch	All
		Hefty Cr., Center Branch	All
		Liberty Creek	All
		Norwegian Creek	All
		Richland Creek	All
		Ross Crossing	All
		Sylvester Creek	All
		Spring Valley Creek	All
		Ward Creek	All
13.	Green & Rock	Allen Creek	Below Evansville
14.	Iowa	Harker–Lee–Martin System	From headwaters to T6N R2ES10
15.	Iron	Maintowish River	All
16.	Jackson	Trempealeau River	From STH 95 at Hixton to CTHP at Taylor
17.	Jefferson	Allen Creek	All
18.	Kewaunee	Casco Creek	From T24N R24E S19 downstream of Rock Ledge to Kewaunee River
19.	La Crosse	Bostwick Creek	From headwaters to County Hwy 'O'
		Coon Creek	All
		Dutch Creek	From headwaters to Russian Coulee Road (section 8)
20.	Lafayette	Galena River	From headwaters to Buncombe Road
21.	Langlade	East Br. Eau Claire R.	From STH 64 upstream to firelane crossing in T33N R11E S35 SW1/4
		Hunting River	From Fitzgerald Dam Road downstream to T33N R11E S1
22.	Lincoln	North Br. Prairie River	From headwaters to CTHJ to T33N R8E
		Silver Creek	All
23.	Manitowoc	Branch River	All
24.	Monroe	Big Creek	From headwaters to Acorn Rd (S7)
		Farmers Valley Creek & Tribs	From headwaters to I–90 (S19)

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

		Soper Creek	All
25.	Oneida	Bearskin Creek	From Tomahawk River to Little Bearskin Lake
26.	Pierce	Big River	Class I Portion
		Cady Creek	From CTH P upstream
		Trimbelle River	All
27.	Richland	Babb Hollow	All–Trib to Mill Creek
		Hanzel Creek (Hansell)	All–Trib to Melancthon Cr.
		Melancthon Creek	Class II Section
		Coulter Hollow Creek	All–Trib to Mill Creek
		E. Branch Mill Creek	All
		Happy Hollow Creek	All–Trib to Willow Creek
		Higgins Creek	All–Trib to Mill Creek
		Hood Hollow Creek	All–Trib to Mill Creek
		Jacquish Hollow Creek	All–Trib to Willow Creek
		Kepler Branch	All–Trib to Mill Creek
		Mill Creek	From headwaters to above Boaz
		Miller Branch	All–Trib to Mill Creek
		Pine Valley Creek	All–Trib to Mill Creek
		Ryan Hollow	All–Trib to West Branch Mill Creek
		Wheat Hollow Creek	All
		W. Branch Mill Creek	All
28.	Rock	Bass Creek	All
		East Fork Raccoon Cr.	All
		Little Turtle Creek	All
		Raccoon Creek	All
		Spring Brook	All
		Turtle Creek	All
		Unnamed Creek T2N R14E S31	All
29.	Rusk	Big Weirgor Creek	All–Class III Portion
30.	Rusk, Taylor & Chippewa	Jump River	From Village of Jump River downstream to Holcombe Flowage
31.	Sauk	Beaver Creek (Trib to Dell Creek)	All
		Camels Creek (Trib to Dell Creek)	All
		Dell Creek	All
32.	Shawano	Kroenke Creek	Class II Portion
		Red River	From Lower Red Lake Dam to Wolf River
		West Br. Red River	Class II Portion
33.	Sheboygan	Ben Nutt Creek	Class II Portion to Junction with Mill Creek
34.	St. Croix	Apple River	From NSP plant below CTH I to Mouth
		Cady Creek	All
		Willow River	Extend Class II Portion into Delta in Lake Mallileau
35.	St. Croix & Pierce	St. Croix River	From No. Boundary of Hudson City limits to the river mouth in Pierce Co.
36.	Trempealeau	Buffalo River	From Hwy 53 to Strum Pond
37.	Vernon	Bishop Branch	All
		Cheyenne Valley Creek	All
		Coon Creek	From La Crosse county line to Chaseburg
		Frohock Valley Creek	All
		Hornby Creek	All
		Reads Creek	All
		Tainter Creek	All
38.	Vilas	Manitowish River	From Rest Lake Dam downstream to Iron County line
39.	Washington	E. Branch Milwaukee R.	From Long Lake outlet to STH 28
40.	Waukesha	Genesee Creek	Above STH 59
		Mukwonago River	From Eagle Springs Lake to Upper Phantom Lake
		Oconomowoc River	From below North Lake to Okauchee Lake
41.	Waupaca	Blake Brook & Branches	Class II Portion
		Little Wolf River	From junction with Wolf River upstream to Manawa Dam
		Waupaca River	Class II portion
42.	Waupaca & Shawano	Embarrass River	From Wolf River upstream to dam at Pella
43.	Waushara	Lower Pine River	From below Wild Rose Mill pond to dam at Poy Sippi

(2) The waters identified in sub. (1) may not be lowered in quality except as provided in ch. NR 207.

(3) Surface waters, or portions thereof, may be added to, or deleted from, the exceptional resource waters designation through the rule making process under the provisions of ch. 227, Stats., and s. NR 2.03.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; cr. (1) (c), Register, July, 1989, No. 403, eff. 8–1–89; cr. (1) (d), Register, May, 1993, No. 449, eff. 6–1–93.

NR 102.12 Great Lakes system. **(1)** The Great Lakes system includes all the surface waters within the drainage basin of the Great Lakes.

(2) For the purpose of administering ch. NR 207 and consistent with chs. NR 105 and 106, the waters identified in sub. (1) are to be protected from the impacts of persistent, bioaccumulating toxic substances by avoiding or limiting to the maximum extent practicable increases in these substances.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; r. and recr. (1), am. (2), Register, August, 1997, No. 500, eff. 9–1–97.

NR 102.13 Fish and aquatic life waters. All surface waters not included in s. NR 102.05 (1) (b) 1., 2., 3. or 5. are fish and aquatic life waters.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89.

NR 102.14 Taste and odor criteria. **(1)** At certain concentrations, substances may not be toxic to humans, but may impart undesirable taste or odor to water or aquatic organisms ingested by humans. The taste and odor criterion is derived to prevent substances from concentrating in surface waters or accumulating in aquatic organisms to a level which results in undesirable tastes or odors to human consumers.

(2) The taste and odor criterion is derived as follows:

(a) For substances which impart tastes and odors to waters, the taste and odor criterion shall equal that threshold concentration (TC_w) below which objectionable tastes or odors to human consumers do not occur. Threshold concentrations for substances imparting tastes and odors to water are listed in Table 1.

Table 1
Threshold Concentrations (TC_w) for Substances Causing Taste and Odor in Water

Substance	Threshold Concentration (ug/L)1
Acenaphthene	20
Chlorobenzene	20
2–Chlorophenol	0.1
3–Chlorophenol	0.1
4–Chlorophenol	0.1
Copper	1000
2,3–Dichlorophenol	0.04
2,4–Dichlorophenol	0.3
2,5–Dichlorophenol	0.5
2,6–Dichlorophenol	0.2
3,4–Dichlorophenol	0.3
2,4–Dimethylphenol	400
Hexachlorocyclopentadiene	1
2–Methyl–4–Chlorophenol	1800
3–Methyl–4–Chlorophenol	3000
3–Methyl–6–Chlorophenol	20
Nitrobenzene	30
Pentachlorophenol	30
Phenol	300
2,3,4,6–Tetrachlorophenol	1
2,4,5–Trichlorophenol	1
2,4,6–Trichlorophenol	2
Zinc	5000

[1] A threshold concentration expressed in micrograms per liter (ug/L) can be converted to milligrams per liter (mg/L) by dividing the threshold concentration by 1000.

(b) For substances which impart tastes or odors to aquatic organisms, the taste and odor criterion shall be calculated as follows:

$$TOC = \frac{TC^{l}}{BAF}$$

Where:

TOC = Taste and odor criterion in milligrams per liter (mg/L).

TC = Threshold concentration in milligrams of substance per kilogram of wet tissue weight (mg/kg) of the aquaticorganism being consumed below which undesirable taste and odor is not detectable to human consumers as derived in par. (d).

BAF = Aquatic life bioaccumulation factor with units of liter per kilogram (L/kg) as derived in s. NR 105.10.

(c) The lower of the taste and odor criteria derived as specified in pars. (a) and (b) is applicable to surface waters classified as public water supplies. The taste and odor criteria derived as specified in par. (b) are applicable to cold water and warm water sport fish communities.

(d) Threshold concentrations for substances imparting tastes or odors to water (TC_w) other than those listed in Table 1 and threshold concentrations for substances imparting tastes or odors to aquatic organisms (TC_f) shall be selected by the department using its best professional judgment.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; am. (2) (b) and (c), Register, August, 1997, No. 500, eff. 9–1–97.

Chapter NR 104

USES AND DESIGNATED STANDARDS

Note: Chapter NR 104 as it existed on September 30, 1976 was repealed and a new chapter NR 104 was created effective October 1, 1976. **Corrections made under s. 13.93 (2m) (b) 7., Stats., Register, August, 1997, No. 500.**

Subchapter I—Intrastate Waters

NR 104.01 General. (1) "It is...the goal of the state of Wisconsin that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water be achieved by 1983. . ." s. 283.001 (1) (b), Stats. The long–range goal of Wisconsin water quality standards is, therefore, to permit the use of water resources for all lawful purposes. Surface waters which because of natural conditions are not conducive to the establishment and support of the complete hierarchy of aquatic organisms shall not be degraded below present levels, but shall be upgraded as necessary to support assigned uses. Most surface waters within the state of Wisconsin already meet or exceed the goals specified above. However, certain waters of the state may not meet these goals for the following reasons:

(a) The presence of inplace pollutants,

(b) Low natural streamflow,

(c) Natural background conditions, and

(d) Irretrievable cultural alterations.

(1m) Where it is determined that one or more of these factors may interfere with the attainment of the statutory objectives, a variance from the criteria necessary to achieve those objectives is provided.

(2) Surface waters within the boundaries of the state shall meet the standards for fish and aquatic life and recreational use with the variances and additions listed below in ss. NR 104.05 to 104.10. A system is provided within which small streams and other surface waters which cannot support high quality uses are granted a variance from the high quality criteria.

(3) Effluent limitations specified in this chapter shall be achieved by industrial, private and municipal dischargers by July 1, 1983 unless an earlier date is otherwise provided in a permit issued under s. 283.31, Stats. Municipal dischargers eligible for state or federal grant–in–aid shall achieve the specified effluent limitations upon completion of construction or modification of facilities approved by the department of natural resources subsequent to adoption of this chapter unless otherwise provided in a permit issued under s. 283.31, Stats.

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76; am. (1), Register, December, 1977, No. 264, eff. 1–1–78.

NR 104.02 Surface water classifications and effluent limitations. (1) HYDROLOGIC CLASSIFICATION. "Surface waters" as defined in s. NR 102.03 (6), may be classified according to their hydraulic or hydrologic characteristics. For purposes of this chapter, surface waters will be classified by the department into one of the following categories:

(a) *Lakes or flowages.* This classification includes bodies of water whose current is more or less stagnant or which lacks a unidirectional current.

(b) *Diffused surface waters.* This classification includes any water from rains, intermittent springs or melting snow which flows on the land surface, through ravines, etc., which are usually dry except in times of runoff. This category does not include waters at the land surface in the vicinity of agricultural or wastewater irrigation disposal systems.

(c) *Wetlands.* This classification includes areas where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which have soils indicative of wet conditions.

(d) *Wastewater effluent channels.* This classification includes discharge conveyances constructed primarily for the purpose of transporting wastes from a facility to a point of discharge. Drainage ditches (including those established under ch. 88, Stats.) constructed primarily for the purposes of relieving excess waters on agricultural lands shall not be construed as effluent channels. Modifications made to natural watercourses receiving wastewater effluents for the purpose of increasing or enhancing the natural flow characteristics of the stream shall not be classified as effluent channels.

(e) *Noncontinuous streams.* This classification includes watercourses which have a defined stream channel, but have a natural 7–day Q flow of less than 0.1 cfs and do not exhibit characteristics of being perpetually wet without wastewater discharges.

(f) *Continuous streams.* This classification includes watercourses which have a natural 7–day Q flow of greater than 0.1 cfs or which exhibit characteristics of a perpetually wet environment, are generally capable of supporting a diverse aquatic biota and flow in a defined stream channel.

Note: The application of this classification system is not dependent on the the navigability properties of the watercourse, but is dependent upon the quantity–quality relationships of the surface water.

(2) WATER QUALITY CLASSIFICATION. (a) Whenever the goals as specified in s. 283.001 (1) (b), Stats., cannot be attained because of conditions enumerated in s. NR 104.01 (1), a variance may be provided. Variances from a specific water quality criteria may be given in s. NR 104.05 et. seq. or a variance under one of the categories provided in this chapter may be specified.

(b) Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development, or other activities shall be controlled so that waters regardless of their hydrologic and water quality classifications meet the general aesthetic and acute toxicity conditions in s. NR 102.04 (1).

(3) VARIANCE CATEGORIES. (a) *Limited forage fish communities (intermediate surface waters).* 1. Applicability. This category of variance may be applied to either the continuous or noncontinuous stream hydrologic classification.

2. Surface water criteria. The following water quality criteria shall be met in all surface waters included in this variance category:

a. Dissolved oxygen shall not be less than 3 mg/L.

b. Ammonia nitrogen (as N) at all points in the receiving water shall not be greater than 3 mg/L during warm temperature conditions nor greater than 6 mg/L during cold temperatures to minimize the zone of toxicity and to reduce dissolved oxygen depletion caused by oxidation of the ammonia.

c. The pH shall be within the range of 6.0 to 9.0.

d. All other substances shall meet the acute and chronic toxicity criteria for limited forage fish communities specified in or developed pursuant to ss. NR 105.05 and 105.06.

3. Effluent criteria. a. The effluent limitations determined necessary to meet the surface water criteria listed above are enumerated in table 1.

TABLE 1

Parameter	Monthly Average (mg/L)	Daily Maximum (mg/L)	Weekly Average (mg/L)	Other (mg/L)
BOD_5	15	30	–	–
Total Suspended Solids	20	30	–	–
NH3\N (May–October)	–	–	3	–
NH3\N (November–April)	–	–	6	–
Dissolved Oxygen	–	–	–	4 (minimum)

b. Unless otherwise specified in table 1 above, effluent limitations for sewage treatment works shall be as adopted in ch. NR 210.

c. In addition to the effluent limitations enumerated in table 1, effluent limitations for these and any other substance necessary to protect assigned uses shall be met, including water quality based effluent limitations necessary to meet the criteria specified in or developed pursuant to ss. NR 105.05 and 105.06 for limited forage fish communities.

(b) *Limited aquatic life subcategory (marginal surface waters).* 1. Applicability. This variance category may be applied to the continuous or noncontinuous stream hydrologic classification, except that it shall be applied to all surface waters classified as effluent channel, wetland or diffuse surface water.

2. Surface water criteria. The following surface water quality criteria shall be met in all surface waters included in this variance category:

a. Dissolved oxygen shall not be less than 1 mg/L.

b. The pH shall be within the range of 6.0 to 9.0.

c. All other substances may shall meet the acute and chronic toxicity criteria for the limited aquatic life subcategory specified in or developed pursuant to ss. NR 105.05 and 105.06.

3. Effluent criteria. a. The effluent limitations determined necessary to meet the surface water criteria listed above are enumerated in table 2.

TABLE 2

Parameter	Monthly Average (mg/L)	Weekly Average (mg/L)	Other (mg/L)
BOD_5	20	30	–
Total Suspended Solids	20	30	–
Dissolved Oxygen	–	–	4 (minimum)

b. Unless otherwise specified in table 2 above, effluent limitations for sewage treatment works shall be as adopted in ch. NR 210.

c. In addition to the effluent limitations enumerated in table 2, effluent limitations for these and any other substance necessary to protect assigned uses shall be met, including water quality based limitations necessary to meet the criteria for limited aquatic life surface water specified in or developed pursuant to ss. NR 105.05 and 105.06.

(4) OTHER CLASSIFICATIONS AND EFFLUENT CRITERIA. (a) *Surface waters significant to the environmental integrity of the state or region.* Under all hydrologic categories, the department reserves the right to require other effluent limitations, including allocation of wasteloads for organic material, toxicants and chlorine residuals if it is determined that the specified surface water is important to the overall environmental integrity of the area. In waters identified as trout streams, located in scientific areas or wild and scenic areas, providing endangered species habitat or of high recreational potential, effluent criteria will be evaluated on a case–by–case basis.

(b) *Surface waters classified for fish and aquatic life.* 1. Streams. Where flowing streams or rivers are specified to achieve fish and aquatic life criteria, wasteload allocation for organic material, toxicants and chlorine residuals shall determine effluent criteria necessary to achieve that standard.

2. Lakes and flowages. Effluent characteristics for discharges to lakes or flowages shall be based upon an evaluation of water quality necessary to protect fish and aquatic life taking into account mixing zone and nutrient removal criteria.

3. Minimum effluent criteria. If it can be reasonably demonstrated that the quality of the surface water is independent of a wastewater discharge, effluent limitations established under ss. 283.13 and 283.19, Stats., shall apply.

(c) *Wastewater treatment lagoons.* Effluents from fill–and–draw wastewater treatment lagoons or domestic waste stabilization ponds discharging to waters receiving a variance in this chapter may be permitted to vary from the limitations specified in table 1 or 2 provided the following conditions are met:

1. The discharge occurs only during the spring and fall of the year when the flow in the receiving water is normally high, and the temperature is low. The rate of discharge shall not exceed that specified in a permit under s. 283.31, Stats., or where no rate is indicated, the allowable discharge quantities shall be determined by the department based upon current evaluation of the receiving water.

2. In lieu of the previous conditions, the discharge from a fill–and–draw lagoon may occur at any time provided the rate does not exceed the assimilative capacity of the receiving water as specified in a permit under s. 283.31, Stats.

3. The dissolved oxygen in the effluent is maintained at a level greater than or equal to 4 mg/L, and the permitted rate of discharge shall be such that the dissolved oxygen and ammonia nitrogen criteria necessary to sustain fish and aquatic life are maintained in the stream during the period of discharge.

4. The effluent limitations do not exceed those established under ss. 283.13 and 283.19, Stats.

(5) CHANGES IN CLASSIFICATION. Surface waters which exhibit changing hydrologic and quality characteristics shall be classified accordingly. Effluent criteria for upstream discharges shall be based upon the most critical downstream classification and shall be specified by the department either on the basis of justified inference or by the application of a wasteload allocation analysis. Any subsequent changes in a stream's morphology or potential may necessitate the reevaluation of the classification.

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76; am. Tables 1 and 2, (2), (3) (a) 2a and d., (3) (b) 2a and c., (4) (c), Register, December, 1977, No. 264, eff. 1–1–78; am. (3) (a) 2a, Register, June, 1978, No. 270, eff. 7–1–78; am. (1) (c), Register, June, 1984, No. 342, eff. 2–1–84; r. (3) (a) 2. b. to d., (b) 2. b. and c., renum. (3) (a) 2. e. to g. and (3) (b) 2. d. and e. to be (3) (a) 2. b. to d. and (3) (b) 2. b. and c. and am (3) (a) 2. g. and (3) (b) 2. c., am. (3) (a) 3. a. and (3) (b) 3. a., Register, October, 1986, No. 370, eff. 11–1–86; am. (1) (intro.), (2) (b), (3) (a) (intro.) and 3. c., and (3) (b) 3. c., r. and recr. (3) (a) 2. d. and (3) (b) 2. c., Register, February, 1989, No. 398, eff. 3–1–89.

NR 104.04 Provision for changes. The surface waters specified in this chapter are not intended to be an exclusive listing nor do the specified effluent criteria purport to meet the 1983 water quality goals set forth in ch. 283, Stats. Additions to or deletions from these listings may be made based upon the accumulation of information necessary to make such determination and in accordance with the requirements of ch. 227, Stats.

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76.

NR 104.05 Variances and additions applicable in the southern district. Subject to the provision of s. NR 104.04, intrastate surface waters in the southern district counties of Columbia, Dane, Dodge, Grant, Green, Iowa, Jefferson, Lafayette, Richland, Rock and Sauk shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows:

(1) ADDITION. The public water supply standard shall be met on the Wisconsin river in section 8, township 10 north, range 7 east.

(2) VARIANCE. Surface waters in the southern district subject to a variance under s. NR 104.02 (3) are listed in table 3.

TABLE 3
SOUTHERN DISTRICT

	Surface Water (Facility Affected)	Reach Description	Hydrologic Classification	Applicable Criteria (1)	Effluent Limitations (2)
1.	Goose Lake Tributary (Arlington)	Tributary upstream from Goose Lake	Noncontinuous	II	Effluent limitations to be determined
2.	Tributary – East Branch Pecatonica River (Barneveld)	From the Barneveld STP downstream to the East Branch Pecatonica River	Noncontinuous	II	B
3.	Williams Creek (Blue Mounds)	From the Blue Mounds STP downstream to the east line of Sec. 14, T6N, R5E	Noncontinuous	I	A
4.	Sanders Creek (Boscobel)	From the Boscobel STP downstream to the Wisconsin River	Continuous	I	A
5.	Allen Creek (Brooklyn)	Upstream from Butts Corner Road	Continuous	I	A
6.	Kummel Creek (Brownsville)	From Brownsville STP downstream to CTH "HH"	Noncontinuous	I	A
7.	Spring Brook and Tributary (Clinton)	Tributary from the Clinton STP to Spring Brook	Effluent ditch	II	B
		Spring Brook in Clinton Township	Continuous	II	NA
8.	Tributary – Dead Creek (Clyman)	Tributary from Clyman STP downstream to Dead Creek	Noncontinuous	II	B
9.	West Branch Pecatonica River (Cobb)	From the Cobb STP downstream to confluence with an unnamed tributary NE1/4 , NW1/4 ,Sec. 2, T5N, R1E.	Continuous	I	A
10.	Door Creek (Cottage Grove)	Door Creek upstream from STH 12 &18	Noncontinuous	I	A
		From STH 12 & 18 downstream to Lake Kegonsa	Continuous	I	NA
11.	Coon Branch (Cuba City)	Upstream from westerly tributary approximately 1 mile above STH 11	Noncontinuous	II	B
		Downstream from above tributary to confluence with Galena River	Continuous	I	NA
12.	Mud Creek and Tributary (Deerfield)	Tributary from Deerfield STP to confluence with Mud Creek	Effluent ditch	II	B
		Mud Creek from above tributary downstream to confluence with Koshkonong Creek	Continuous	I	
13.	Indian Creek and Tributary (Dickeyville)	Tributary from Dickeyville STP to confluence with Indian Creek	Noncontinuous	II	NA
		Indian Creek from above tributary downstream to confluence with Platte River	Continuous	I	A
14.	Dodge Branch (Dodgeville)	Upstream from a point approximately 3,500 feet downstream from STH 191	Noncontinuous	I	A
15.	Tributary – North Branch Crawfish River (Fall River)	Tributary from the Fall River STP downstream to the North Branch Crawfish River	Noncontinuous	II	Effluent limitations to be determined
16.	Gregory Branch (Fennimore)	Upstream from STH "61"	Continuous	I	A
17.	Tributary – Rock River (Hidden Meadows Mobile Home Park)	Tributary from the Hidden Meadows Mobile Park STP discharge downstream to the Rock River	Noncontinuous	II	B
18.	Big Spring Branch (Highland)	Upstream from the North line of Sec. 19, T7N, R1E	Noncontinuous	I	A
19.	Pedler Creek (Iowa Co. Nursing Home)	From the Iowa Co. Nursing Home STP downstream to the confluence with an unnamed tributary, SE$^1/_4$, SE$^1/_4$, Sec. 34, T6N, R2E	Noncontinuous	I	A
20.	Tributary – Wildcat Creek (Iron Ridge)	From the Iron Ridge STP downstream to Wildcat Creek	Noncontinuous	II	B
21.	Tributary & Rock River Tributary	From the Ixonia San. Dist. STP downstream to the juncture with the Rock River Tributary	Noncontinuous	II	B

	(Ixonia San. Dist.)	Rock River Tributary from above tributary to confluence with Rock River	Continuous	II	NA
22.	Tributary – Menominee River (Jamestown San. Dist. #2)	From Jamestown San. Dist. #2 STP to the Menominee River	Diffused surface water	II	B
23.	Dead Creek (Juneau)	Upstream from CTH "M"	Effluent ditch	II	B
		From CHT M to St. Helena Rd.	Continuous	I	NA
24.	Sinnipee Creek (Kieler San. Dist. #1)	From Kieler lagoon outfall to Bluff Road	Continuous	I	A
25.	Rock Creek (Lake Mills)	From the Lake Mills STP downstream to CTH "V"	Noncontinuous	I	A
		From CTH "V" to Harper's Mill Pond	Continuous	I	NA
26.	Tributary – Pigeon Creek (Lancaster)	Tributary from Lancaster STP downstream to south line of section 10	Continuous	II	Effluent limitations to be determined
		Tributary from above point downstream to confluence with Pigeon Creek	Continuous	I	
27.	Tributary – Baker Creek (Lebanon San. Dist.)	From Lebanon STP downstream to Baker Creek	Noncontinuous	II	B
28.	Little Platte River (Livingston)	From Livingston STP downstream to New California Road	Noncontinuous	I	A
29.	Tributary–East Branch Rock River (Lomira)	Tributary upstream from confluence with East Branch Rock River.	Noncontinuous	I	A
30.	(Madison Metro Sewerage Commission)	From the STP outfall aerator to the Oregon Branch	Effluent ditch	II	Effluent limitations to be determined
31.	Brewery (Furnance) Creek (Mineral Point)	Brewery Creek upstream from confluence with Mineral Point Branch	Continuous	II	B (Note: the above limitation shall remain in effect until significant nonpoint source problems can be corrected)
32.	Tributary – Blue River (Montfort)	From the Montfort STP downstream to the Blue River	Continuous	I	A
33.	Little Grant River (Mount Hope)	From the Mt. Hope STP downstream to the west boundary of Sec. 10, T5N, R4W	Noncontinuous	I	A
34.	West Branch Sugar River (Mt. Horeb)	From Mt. Horeb STP downstream to CTH "JG."	Continuous	I	A
35.	Tributary – Austin-Branch (Orchard Manor)	Drainage from Orchard Manor outfall to Austin Branch	Diffused surface waters	II	Effluent limitations to be determined
36.	Oregon Branch – Badfish Creek (Oregon)	From the Oregon outfall downstream to juncture with the Madison Met effluent ditch	Noncontinuous	II	Effluent limitations to be determined
		From this point downstream to CTH "A"	Continuous	I	
37.	Swan Creek and Tributary	Tributary from Orfordville ST Poutfall to Swan Creek.	Effluent ditch	II	NA
	(Orfordville)	Swan Creek from confluence with above tributary to Dicky Road.	Noncontinuous	I	A
38.	Tributary – Blake Fork (Patch Grove)	Tributary from the Patch Grove STP downstream to Blake Fork	Noncontinuous	I	A
39.	Tributary – Honey Creek (Plain)	From the Plain STP downstream to Honey Creek	Continuous	I	Effluent limitations to be determined
40.	Randolph Branch – Tributary	From the Randolph STP downstream to Beaver Creek Tributary	Noncontinuous	II	Effluent limitations to be determined
	Beaver Creek (Randolph)	Tributary to Beaver Creek upstream from Beaver Creek	Noncontinuous	I	
41.	Tributary – Beaver Dam River (Reeseville)	Tributary from Reeseville STP to confluence with Beaver Dam River	Noncontinuous	I	A
42.	Conley – Smith Creek (Ridgeway)	From the Ridgeway STP downstream to the south boundary of Sec. 14, T6N, R4E	Noncontinuous	I	Effluent limitations to be determined
43.	Tributary – Rocky Run Creek (Rio)	From the Rio STP downstream to Rocky Run Creek	Noncontinuous	II	B
44.	Tributary – Narrows Creek (Sauk Co. Health Care Center)	From the Sauk County Health Care Center STP downstream to Narrows Creek	Noncontinuous	I	A
45.	Duck Creek and Tributary (Sullivan)	Tributary from the Sullivan STP to Duck Creek	Effluent channel	II	Effluent limitations to be determined

		Duck Creek from the effluent ditch downstream juncture with northerly drainage ditch in Sec. 5, T6N, R16E	Noncontinuous	I	
46.	Koshkonong Creek (Sun Prairie)	Koshkonong Creek upstream from first bridge above Sun Prairie STP	Noncontinuous	II	Effluent limitations to be determined
		Koshkonong Creek from above location to CTH 'T'.	Continuous	II	
47.	Badger Mill Creek (Verona)	Badger Mill Creek from road at Verona STP downstream to STH "69".	Continuous	I	A
48.	Tributary – Murphy Creek (Wisconsin Department of Health & Family Services – Oakwood State Camp)	Tributary from Oakwood State Camp STP downstream to Murphy Creek	Noncontinuous	II	B

(1) Criteria I requires the maintenance of surface water criteria specified in NR 104.02 (3) (a)2.
Criteria II requires the maintenance of surface water criteria specified in NR 104.02 (3) (b)2.

(2) Effluent limitation A requires those limits specified in NR 104.02 (3) (a)3.
Effluent limitation B requires those limits specified in NR 104.02 (3) (b)3.
NA—Not applicable

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76; am. table 3, r. (3), Register, December, 1977, No. 264, eff. 1–1–78.

NR 104.06 Variances and additions applicable in the southeast district. Subject to the provisions of s. NR 104.04, intrastate surface waters in the southeast district counties of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington and Waukesha shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows.

(1) VARIANCE. Surface waters in the southeast district subject to a variance under s. NR 104.02 (3) are listed in table 4.

(2) OTHER VARIANCES. (a) The following surface waters in the southeast district shall meet the standards for fish and aquatic life except that the dissolved oxygen shall not be lowered to less than 2 mg/L at any time, nor shall the membrane filter fecal coliform count exceed 1,000 per 100 ml as a monthly geometric mean based on not less than 5 samples per month nor exceed 2,000 per 100 ml in more than 10% of all samples during any month:

1. Underwood creek in Milwaukee and Waukesha counties below Juneau boulevard.
2. Barnes creek in Kenosha county.
3. Pike creek, a tributary of Pike river, in Kenosha county.
4. Pike river in Racine county.
5. Indian creek in Milwaukee county.
6. Honey creek in Milwaukee county.
7. Menomonee river in Milwaukee county below the confluence with Honey creek.
8. Kinnickinnic river in Milwaukee county.
9. Lincoln creek in Milwaukee county.

(b) The following surface waters in the southeast district shall meet the standards for fish and aquatic life except that the dissolved oxygen may not be lowered to less than 2 mg/L at any time, nor may the membrane filter fecal coliform count exceed 1,000 per 100 mL as a monthly geometric mean based on not less than 5 samples per month nor exceed 89°F at any time at the edge of the mixing zones established by the department under s. NR 102.05 (3):

1. Milwaukee river in Milwaukee county downstream from the North Avenue dam.
2. South Menomonee canal and Burnham canal in Milwaukee county.

TABLE 4
SOUTHEAST DISTRICT

	Surface Water (Facility Affected)	Reach Description	Hydrologic Classification	Applicable Criteria (1)	Effluent Limitations (2)
1.	Tributary – Onion River (Belgium)	From Belgium to the Onion River	Noncontinuous	II	B
2.	Tributary – Des Plaines River (Bristol)	Tributary from Bristol to the Des Plaines River	Noncontinuous	II	Effluent limitations to be determined
3.	Tributary – Darien Creek –	Darien Creek tributary from the origin to Darien Creek	Effluent ditch	II	B
	Little Turtle Creek (Darien)	Darien Creek from its origin to Little Turtle Creek	Continuous	I	NA
		Little Turtle Creek from its origin to Turtle Creek	Continuous	I	NA
4.	Eagle Creek	From Eagle Lake to CTH "J"	Noncontinuous	II	B
	(Eagle Lake San. Dist.)	From CTH "J" to the Fox River	Noncontinuous	I	NA
5.	East Branch Root	Upstream from STH "20"	Noncontinuous	II	B
	River Canal (Fonk Mobile Home Park #1)	From STH "20" downstream to the West Branch Root River Canal	Noncontinuous	I	NA
6.	Tributary – Des Plaines River (Fonk Mobile Home-Park #2 and Union Grove Ind.)	From Fonks tributary downstream to the Union Grove Industrial tributary	Noncontinuous	II	Effluent limitations to be determined
		The Union Grove Industrial tributary to the juncture of Fonks tributary	Effluent ditch	II	
		The Union Grove tributary below Fonks Trib.	Noncontinuous	I	NA
7.	Hales Corners Tributary (Hales Corners)	Upstream from the Hales Corners STP (except for Upper Kelly Lake)	Noncontinuous	II	NA
		From Hales Corners STP downstream to Whitehall Park Pond	Noncontinuous	I	A

8.	Dover Ditch – Goose Lake Branch Canal (Holy Redeemer College)	Dover Ditch upstream from Dover Line Road	Noncontinuous	II	B
9.	Tributary–Muskego Lake (Muskego)	From the Muskego STP downstream to wetland near Muskego Lake	Effluent ditch	II	Effluent limitations to be determined
		Drainage from above location to Muskego Lake	Wetland	II	
10.	Tess Corners Creek (Muskego NE District)	Upstream from STH "45"	Noncontinuous	I	A
		From STH "45" downstream to Whitnall Park Pond	Continuous	I	NA
11.	Poplar Creek (New Berlin High School &	From the treatment plant outfalls downstream to the Chicago & Northwestern railroad bridge	Noncontinuous	II	B
	Cleveland Heights School)	From the railroad bridge downstream to the confluence of The Fox River	Continuous	I	NA
12.	Drainage and Tributary – Root River	From the New Berlin Memorial Hospital STP to Root River tributary	Diffuse Surface Waters	II	B
	(New Berlin Memorial Hospital)	Tributary to the Root River downstream from New Berlin Memorial Hospital STP	Noncontinuous	II	NA
13.	Deer Creek (New Berlin–Regal Manor)	Deer Creek from its origin to Poplar Creek	Noncontinuous	II	B
14.	Tributary – Lake Michigan (North Park)	Tributary from its origin to Lake Michigan	Noncontinuous	I	A
15.	Drainage – Tributary –	Drainage at Paddock Lake STP and near Brighton Creek	Wetland	II	B
	Brighton Creek (Paddock Lake)	Tributary between above wetlands areas	Noncontinuous	II	NA
16.	Drainage – Mud Lake (Paramski Mobile Home Park)	From the Mobile Home STP to Mud Lake	Wetland	II	B
17.	Tributary – Lake Michigan (Pleasant Park San. Dist.)	From the Pleasant Park STP to the Illinois State line	Noncontinuous	II	B
18.	Pleasant Prairie Tributary (Pleasant Prairie Util. District D)	Pleasant Prairie Tributary from its origin to the Des Plaines River	Noncontinuous	II	Effluent limitations to be determined
19.	Tributary – Des Plaines (Pleasant Prairie S.D. #73–1)	From its origin to the Illinois State line	Noncontinuous	II	B
20.	Tributary and Hoods Creek	Tributary up from Hoods Creek towards Ives Grove	Noncontinuous	II	B
	(Racine County Hwy. & Park Comm.)	Hoods Creek from STH "20" downstream to confluence with Root River	Noncontinuous	I	NA
21.	Tributary – Root River (Rawson Homes Sanitary Trust)	From the Rawson Homes STP to the Root River	Noncontinuous	II	B
22.	Salem Branch (Salem Utility District 1)	Salem Branch from Salem Utility District 1 STP down stream to 216th Avenue.	Noncontinuous	I	A
23.	Little Turtle River (Sharon)	Little Turtle River from Sharon STP downstream to Rock– Walworth County line	Noncontinuous	II	B
24.	Drainage – Kenosha County (Sienadale Motherhouse)	From the Sienadale STP downstream to an intermittent stream	Effluent ditch	II	Effluent limitations to be determined
		Intermittent stream in Secs. 13, 14,23, T1N, R22E	Noncontinuous	II	
25.	Tributary–Rubicon River (Slinger)	Rubicon River from origin downstream to easterly tributary confluence in NW1/4 ,NE1/4 , Section 13, T10N, R18E	Noncontinuous	II	Effluent limitations to be determined
		Easterly tributary which flows into the Rubicon River at above location.	Wetland	II	
		Rubicon River from above location downstream to confluence with Slinger tributary	Noncontinuous	I	Effluent limitations to be determined
		Tributary of the Rubicon River from the Slinger STP downstream to the wetland adjacent to Slinger Road.	Effluent ditch	II	Effluent limitations to be determined
		Wetland adjacent to Slinger Road downstream from Slinger STP	Wetland	II	
		Tributary from above location downstream to Rubicon River	Noncontinuous	II	
26.	Tributary – South Branch Pike River	Tributary from its origin to South Branch Pike	Noncontinuous	II	Effluent limitations to be determined
	River (Somers Util Dist. 1)	South Branch Pike River from Somers Tributary to Pike River	Continuous	I	
27.	Tributary – Pike River (St. Bonaventure School)	Tributary from St. Bonaventure School STP downstream to Sturtevant tributary	Noncontinuous	II	Effluent limitations to be determined
28.	Wayne Creek (St. Killian Cheese Factory)	Wayne Creek from its origin to the Kohlsville River	Noncontinuous	I	A

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

29.	Tributary – Pike River (Sturtevant)	Tributary from Sturtevant STP downstream to first railroad crossing at S.C. Johnson Co.	Effluent ditch	II	NA
		Tributary from above location downstream to confluence with Pike River	Continuous	I	A
30.	West Branch Root River Canal (Union Grove)	West Branch Root River Canal from 67th Drive downstream to CTH "C"	Noncontinuous	II	NA
		West Branch Root River Canal from above location downstream to STH "20."	Noncontinuous	I	A
31.	Tributary – Des Plaines River (Wis. DOT Kenosha Rest Area 26)	From the Information Center STP to the Des Plaines River	Noncontinuous	II	B

(1) Criteria I requires the maintenance of surface water criteria specified in NR 104.02 (3) (a) 2.
Criteria II requires the maintenance of surface water criteria specified in NR 104.02 (3) (b) 2.

(2) Effluent limitation A requires those limits specified in NR 104.02 (3) (a) 3.
Effluent limitation B requires those limits specified in NR104.02 (3) (b) 3.
NA—Not applicable

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76; am. Table 4, Register, December, 1977, No. 264, eff. 1–1–78; reprinted to correct error in table 4, line 11, Register, August, 1982, No. 320; am. (2) (b), Register, February, 1989, No. 398, eff. 3–1–89.

NR 104.07 Variances and additions applicable in the Lake Michigan district. Subject to the provisions of s. NR 104.04, intrastate surface waters in the Lake Michigan district counties of Brown, Calumet, Door, Florence, Fond du Lac, Green Lake, Kewaunee, Manitowoc, Marinette, Marquette, Menominee, Oconto, Outagamie, Shawano, Sheboygan, Waupaca, Waushara and Winnebago shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows:

(1) ADDITION. The public water supply standard shall be met in the following surface waters:

(a) Lake Winnebago.

(b) Fox river from Lake Winnebago downstream to the upper dam in the city of Appleton.

(c) West branch Wolf river at Neopit.

(d) Rainbow lake in Waupaca county.

(2) VARIANCE. Surface waters in the Lake Michigan district subject to a variance under s. NR 104.02 (3) are listed in table 5.

TABLE 5
LAKE MICHIGAN DISTRICT

	Surface Water (Facility Affected)	Reach Description	Hydrologic Classification	Applicable Criteria (1)	Effluent Limitations (2)
1.	Ditch – Tributary – Rock River (Alto Co–op Creamery)	Ditch from the Alto Co–op process water discharge to the tributary	Effluent ditch	II	Effluent limitations to be determined
		Tributary from its origin to the Rock River	Noncontinuous	I	
2.	Tributary – Dutchman Creek	Tributary upstream from CTH "GH"	Noncontinuous	II	B
	(Austin Straubel Field)	From CTH "GH" to Dutchman Creek	Noncontinuous	I	NA
3.	Bear Creek (Bear Creek)	From the Bear Creek STP to the Embarrass River	Continuous	I	A
4.	Tributary – Fox River (Beucher & Sons of WI, Inc.)	From the discharge location downstream to the Fox River	Noncontinuous	II	B
5.	Black Creek (Black Creek)	Black Creek from Black Creek STP to confluence with Shioc River (see Black Creek at Seymour)	Noncontinuous	I	A
6.	Drainage to Gallagher Marsh (Brandon)	Upstream from STH "49" to Brandon	Effluent ditch	II	B
		Drainage from STH "49" to Diffuse surface water	Diffuse surface water	II	NA
7.	Tributary–Spring Creek (Brillion)	Channel from Brillion STP to Spring Creek	Effluent ditch	II	NA
		Spring Creek upstream from Brillion Marsh	Continuous	I	A
8.	Burr Creek–Tributary (Cedar Grove)	Burr Creek and tributary to Cedar Grove STP upstream from Lake Michigan	Noncontinuous	II	B
9.	Tributary – Taycheedah Creek (Congregation of St. Agnes Utilities)	Tributary from the Congregation of St. Agnes Utilities STP to Taycheedah Creek	Noncontinuous	II	B
10.	Tributary – Rat River (Dale S.D. #1)	Tributary from Dale to the Winnebago–Outagamie County Line	Noncontinuous	II	B
		From the County Line to the Rat River	Continuous	I	NA
11.	Tributary–Neshota River (Denmark)	Tributary from Denmark downstream to Neshota River	Noncontinuous	I	A
12.	Tributary and Red River (Du Vall Farmers Co–op)	Tributary from the cheese factory discharge to the Red River	Diffused surface water	II	B
		Red River upstream from Green Bay	Noncontinuous	I	NA
13.	Tributary–DeNeveu Creek (Eden)	DeNeveu Creek tributary from Eden STP downstream to confluence with DeNeveu Creek	Continuous	I	A
14.	Tributary – Grand River (Fairwater)	Tributary from the STP to the Grand River	Noncontinuous	II	Effluent limitations to be determined
15.	Tributary – West Twin River (Francis Creek)	Tributary from the Francis Creek STP to CTH "Q"	Noncontinuous	II	B

16.	Tributaries and Duck Creek	Ditch leading from the STP to the tributary of Duck Creek	Effluent ditch	II	B
	(Freedom Elementary School)	Tributary to Duck Creek at Freedom Elementary School	Noncontinuous	II	NA
	(Freedom San. Dist.)	Duck Creek upstream from CTH "J"	Noncontinuous	I	A
17.	Seven Mile Creek (Haven San. Dist.)	Seven Mile Creek upstream from confluence with Meeme River	Noncontinuous	II	B
18.	Tributary–North Branch Manitowoc River (Hilbert)	Tributary to Hilbert upstream from confluence with North Branch Manitowoc River	Noncontinuous	I	A
19.	Tributary – Wolf River (Hillshire Farms Co.)	From the upstream CTH 'D' crossing downstream for 1/2 mile	Noncontinuous	II	Effluent limitations to be determined
		From above location downstream to marsh at Wolf River	Noncontinuous	I	
20.	Tributaries–Plum Creek (Holland San. Dist.)	Tributary from CTH "D" downstream to Plum Creek	Noncontinuous	II	B
		Tributary from Holland Sanitary District STP downstream to above named tributary	Noncontinuous	II	B
21.	Tributary – Suamico River (Howard–Suamico School)	Tributary from the STP to the Suamico River	Noncontinuous	II	B
22.	Tributary–Kriwaniks Creek (Kellnersville)	Tributary from Kellnersville downstream to Kriwaniks Creek	Noncontinuous	I	A
23.	Drainage Ditch (Lakeview Mobile Home Park)	From Lakeview Mobile Home Park STP downstream to Lake Winnebago	Noncontinuous	II	B
24.	Arrowhead River (Larsen San. Dist. #1)	Arrowhead River upstream from a point one–half mile upstream from STH "110"	Noncontinuous	II	B
		From STH 110 to CTH "M"	Continuous	I	NA
25.	Jones Creek (Lena)	Jones Creek upstream from CTH "J"	Noncontinuous	II	B
		Jones Creek from CTH J downstream to confluence with Little River	Continuous	I	NA
26.	Meeme River (Town of Liberty San. Dist.)	From Little Pigeon Lake outlet to Spring Valley Dam	Continuous	I	A
27.	School Creek (Luxemburg)	School Creek upstream from confluence with Kewaunee River	Noncontinuous	I	A
28.	Tributary–Grand River (Markesan)	Ditch tributary from Markesan STP outfall to Grand River	Effluent ditch	II	Effluent limitations to be determined
29.	Neenah Slough (Menasha Corporation)	From the Menasha Corporation STP to the Neenah Slough	Effluent ditch	II	Effluent limitations to be determined
		Neenah Slough downstream to 500 feet below the Hwy 41 bridge	Noncontinuous	I	
30.	Tributary – Sheboygan River (Mt. Calvary)	From the Mt. Calvary STP to the Sheboygan River	Noncontinuous	I	A
31.	Tributary – Jordan Creek – Pine Creek	Tributary from Tecumseh Products to Jordan Creek	Effluent ditch	II	B
	(New Holstein)	Jordan Creek from its origin to Pine Creek	Noncontinuous	II	B
		Pine Creek upstream from Danes Road	Continuous	I	NA
32.	Black River (Oostburg)	From Oostburg STP to Wilson–Lima Road	Noncontinuous	II	B
33.	Tributary – Mud Creek (Outagamie County	From Outagamie County Airport STP to tributary	Effluent ditch	II	B
	Airport)	Tributary upstream from Casloma Rd.	Noncontinuous	II	NA
34.	Wetland – Door County (Peninsula State Park)	Wetland adjacent to Peninsula State Park STP	Wetlands	II	B
35.	Drainage Ditch – Wolf River (Peters Poultry	From the discharge location downstream to the east–west drainage ditch	Effluent ditch	II	B
	Dressing)	Drainage ditch upstream from the Wolf River	Noncontinuous	II	NA
36.	Tributary – Little Suamico River (Pickle–Rite, Inc.)	From the Pickle–Rite, Inc. discharge downstream to the Little Suamico River	Noncontinuous	II	B
37.	Tributary – North Branch Manitowoc River (Potter San. Dist.)	Tributary from the STP to the North Branch of the Manitowoc River	Effluent ditch	II	B
38.	Tributary–Beaver Creek (Pound)	Tributary of Beaver Creek from Pound STP downstream to confluence with Beaver Creek.	Noncontinuous	I	A
39.	Little Suamico River (Pulaski)	Little Suamico River upstream from Jaworski Road	Noncontinuous	II	B
40.	Silver Creek (Random Lake)	Silver Creek from Random Lake STP downstream to first crossing of Creek Road	Continuous	I	A
41.	Mud Creek – Manitowoc River (Reedsville)	From the Reedsville STP downstream to the Manitowoc River	Noncontinuous	II	B
42.	Tributary – Arrowhead River (Ridgeway Country Club)	Tributary to the Arrowhead River from the Ridgeway Country Club STP	Noncontinuous	II	B

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

43.	Tributary – Mud Creek (Town of Rockland	From the Rockland STP downstream to Mud Creek	Effluent ditch	II	B
	San. Dist. #1)	From Mud Creek downstream to the Manitowoc River	Noncontinuous	II	NA
44.	Tributary–West Branch Fond du Lac River (Rosendale)	Tributary from Rosendale STP downstream to confluence with West Branch Fond du Lac River	Noncontinuous	I	A
45.	Tributary – Vincent Point	Tributary from the golf course pond downstream to Vincent Point Creek	Effluent ditch	II	B
46.	Vincent Point Creek (Royal Scott San. Dist. #1)	Vincent Point Creek upstream from Green Bay	Noncontinuous	II	NA
47.	Maple Creek (Sevastopol San. Dist. #1)	Maple Creek from the Sevastopol S.D. STP to the center of Sec. 19, T28N, R27E	Noncontinuous	II	B
		From the center of Sec. 19 to Mud Lake	Wetlands	II	NA
48.	Black Creek (Seymour)	Black Creek from Seymour STP downstream to confluence with Shioc River (see Black Creek at Black Creek)	Noncontinuous	I	A
49.	Tributary – Onion River (Sheboygan Co. Comprehensive Health Center)	Tributary upstream from the Onion River	Noncontinuous	II	B
50.	Diffused surface runoff to Sheboygan River	For approximately 100 yards below the discharge location	Effluent ditch	II	B
	(Sheboygan Falls–Kohler Incinerator)	For the remainder of the distance to the Sheboygan River	Diffused surface water	II	NA
51.	Drainage – Kankapot Creek (Sherwood)	Drainage tributary from Sherwood STP downstream to wetland	Noncontinuous	II	B
		Wetland receiving above tributary	Wetland	II	NA
52.	Bear Creek (Stephensville San. Dist.)	Bear Creek from STH 76 to the tributary in Sec. 19, T22N, R17E	Noncontinuous	II	B
	(Greenville San. Dist.)	Bear Creek from above location downstream to the Wolf River	Continuous	I	A
53.	Pine Creek (Stock Mfg. Corp. & Dinner Club)	From Carstens Lake outlet downstream to tributary east of Hwy 141 in Sec.27, T18N, R23E	Noncontinuous	II	B
		From tributary downstream to Lake Michigan	Continuous	II	NA
54.	Drainage to Mud Creek (Stockbridge Sanitary	Immediate vicinity of discharge before appearance of defined channel	Wetland	II	B
	District)	Tributary from wetland area above to Mud Creek	Effluent ditch	II	NA
		Mud Creek upstream from confluence with Lake Winnebago	Noncontinuous	I	NA
55.	Tributary – Manitowoc River (Valders)	Tributary from Valders STP downstream to Manitowoc River	Noncontinuous	II	B
56.	Tributary – Hempton's Lake (Whitelaw)	Tributary from Whitelaw downstream to Hempton's Lake	Noncontinuous	II	Effluent limitations to be determined
57.	Tributary – Rat River (Winchester San. Dist.)	Tributary from Winchester to the Rat River	Noncontinuous	II	B
58.	Tributary – East River (Wrightstown San. Dist. #1)	Drainage from STP Tributary from Green leaf to East River	Effluent ditch Continuous	II I	Effluent limitations to be determined
59.	Birch Creek (Wrightstown San. Dist. #2)	Birch Creek from Norgaard's Pond downstream to the St. Paul & Pacific RR tracks	Noncontinuous	II	B
		From the RR tracks downstream to the East River	Continuous	II	NA

(1) Criteria I requires the maintenance of surface water criteria specified in NR 104.02 (3) (a) 2.
Criteria II requires the maintenance of surface water criteria specified in NR 104.02 (3) (b) 2.

(2) Effluent limitation A requires those limits specified in NR 104.02 (3) (a) 3.
Effluent limitation B requires those limits specified in NR 104.02 (3) (b) 3.
NA—Not applicable

(3) OTHER VARIANCES. (b) The Oconto river from the bridge in Oconto Falls to the county highway "J" bridge shall meet the standards for fish and aquatic life and recreational use except that the dissolved oxygen shall not be lowered to less than 3.0 mg/L at any time.

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76; am. Table 5, Register, December, 1977, No. 264, eff. 1–1–76; r. entry 46, Table 5, Register, July, 1981, No. 307, eff. 8–1–81; r. and recr. (3) Register, August, 1981, No. 308, eff. 9–1–81; r. (3) (a), Register, May, 1986, No. 365, eff. 6–1–86.

NR 104.08 Variances and additions applicable in the north central district. Subject to the provisions of NR 104.04, intrastate waters in the north central district counties of Adams, Forest, Juneau, Langlade, Lincoln, Marathon, Oneida, Portage, Vilas and Wood shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows:

(1) ADDITION. The public water supply standards shall be met in Lake Nepco in Wood county.

(2) VARIANCE. Surface waters in the north central district subject to a variance under s. NR 104.02 (3) are listed in table 6.

TABLE 6
NORTH CENTRAL DISTRICT

	Surface Water (Facility Affected)	Reach Description	Hydrologic Classification	Applicable Criteria (1)	Effluent Limitations(2)
1.	Elm Brook	Upstream from Lincoln Road	Noncontinuous	II	B
	(Abbotsford)	From Lincoln Road downstream to Dill Creek	Noncontinuous	I	NA
2.	Hemlock Creek (Arpin)	Hemlock Creek above junction with tributary in NW1/4 , NW1/4 , Sec. 26, T24N,R4E	Noncontinuous	II	B
		From above location downstream to Dawes Creek	Noncontinuous	I	NA
3.	Little Bear Creek (Auburndale)	From Auburndale STP downstream to a tributary in the NW1/4 , SW1/4 , Sec. 24, T25N,R4E	Noncontinuous	II	B
		Little Bear Creek from above location downstream to CTH H		I	NA
4.	Dill Creek (Colby)	Upstream from confluence with Elm Brook	Noncontinuous	I	A
		Dill Creek from Elm Brook to the town road between sections 29 and 32,T28N, R2E	Continuous	I	NA
5.	Tributary – Peshtigo Lake (Crandon)	From the Crandon STP to Peshtigo Lake	Noncontinuous	II	Effluent limits to be determined
6.	Scotch Creek (Edgar)	From CTH H downstream to Soda Creek	Noncontinuous	I	A
7.	Tributary – Mill Creek (Junction City)	From the Junction City STP downstream to Mill Creek	Noncontinuous	II	B
8.	Tributary – Wisconsin River (Land O Lakes)	From outfall to unnamed lake in the NW1/4, SW1/4, Sec. 2, R10E,T42N	Noncontinuous	II	B
		From the above location to Wisconsin River	Continuous	I	NA
9.	Tributary – North Branch Prairie River (Lincoln Hills School)	From outfall to small pond in the NW1/4, SW1/4 of Sec. 15, T33N, R7E	Noncontinuous	II	B
10.	Mill Creek (Marshfield)	Mill Creek upstream from CTH K.	Effluent ditch	II	B
11.	Randall Creek (Milan) or the 2nd alternative Marsh Creek (Milan S.D.)	From the discharge location to the middle north half of Sec. 21, T29N, R3E	Wetland	II	B
		From proposed discharge site to the middle of Section 19, T29N, R3E	Diffused surface water	II	B
		From that point to the town road bridge between Sections 25 & 36	Noncontinuous	II	NA
		From above location to Randall Creek	Noncontinuous	I	NA
12.	Spirit Lake Drainage (Northernaire Lake Terrace)	The area between the Northernaire Lake Terrace discharge and Spirit Lake	Wetland	II	B
13.	Tributary – Deerskin River (Phelps)	From the Phelps STP discharge to STH 17	Wetland	II	B
		From STH 17 to the town road between Secs. 12 & 13, T41N, R11E	Noncontinuous	II	NA
		From above location to Deerskin River	Noncontinuous	I	NA
14.	Tributary – Wild Creek (Rozellville)	From STP to tributary of Wild Creek	Diffused surface waters	II	B
		Tributary upstream from Wild Creek	Noncontinuous	II	NA
		Wild Creek upstream from Eau Pleine River	Noncontinuous	I	NA
15.	Tributary – Wisconsin River (Rudolph)	From the Rudolph STP downstream to the town road in Sec. 16, T23N, R6E	Effluent ditch	II	B
		From above road down to tributary in Sec. 26, T23N,R3E	Noncontinuous	II	NA
		From above tributary downstream to the Wisconsin River	Continuous	I	NA
16.	Tributary – Little Eau Pleine River (Spencer)	From the Spencer STP to the tributary in the NE corner of Sec. 8, T26N, R2E	Effluent ditch	II	B
		From above location downstream to the Little Eau Pleine River	Noncontinuous	II	NA
17.	Tributary–Big Eau Pleine River (Stratford)	Tributary from Stratford downstream to Big Eau Pleine R.	Noncontinuous	II	B
18.	Drainage to Town Line Lake (Three Lakes Sanitary District)	Drainage area between Three Lakes Sanitary District STP and Town Line Lake	Wetland	II	B
19.	Tributary – Hemlock Creek (Vesper)	From Vesper STP to the confluence with Hemlock Creek	Noncontinuous	II	NA
		Hemlock Creek from the Vesper Dam to Dawes Creek	Noncontinuous	I	A

(1) Criteria I requires the maintenance of surface water criteria specified in NR 104.02 (3) (a)2.
Criteria II requires the maintenance of surface water criteria specified in NR 104.02 (3) (b)2.

(2) Effluent limitation A requires those limits specified in NR 104.02 (3) (a) 3.
Effluent limitation B requires those limits specified in NR 104.02 (3) (b) 3.
NA—Not applicable

(3) VARIANCE. (a) The Wisconsin river from the Rhinelander dam downstream to Crescent creek shall meet the standards for fish and aquatic life and recreational use except that the dissolved oxygen shall not be lowered to less than 3.0 mg/L at any time. This variance to the 5.0 mg/L dissolved oxygen criterion provided by this subsection shall expire on June 30, 1984.

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76; am. Table 6, Register, December, 1977, No. 264, eff. 1–1–78; am. Table 6, entry 10, Register, June, 1978, No. 270, eff. 7–1–78; r. and recr. (3), Register, August, 1981, No. 308, eff. 9–1–81.

NR 104.09 Variances and additions applicable in the west central district. Subject to the provisions of s. NR 104.04, intrastate waters in the west central district counties of Barron, Buffalo, Chippewa, Clark, Crawford, Dunn, Eau Claire, Jackson, La Crosse, Monroe, Pepin, Pierce, Polk, St. Croix, Trempealeau and Vernon shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows:

(1) ADDITION. The public water supply standard shall be met in the following surface waters:

(a) Black river at Neillsville.

(b) Town creek at Black River Falls.

(2) VARIANCE. Surface waters in the west central district subject to a variance under s. NR 104.02 (3) are listed in table 7.

TABLE 7
WEST CENTRAL DISTRICT

	Surface Water (Facility Affected)	Reach Description	Hydrologic Classification	Applicable Criteria (1)	Effluent Limitations (2)
1.	Drainage Area – CR. 31–16, Meyer's Valley Creek (Arcadia)	Drainage area south of railroad tracks and west of stabilization ponds in N1/2, NE1/4, Sec. 1, T20N, R10W	Wetland	II	B
		Cr. 31–16 (Meyer's Valley Creek) North of railroad tracks to Trempealeau River	Continuous	I	NA
2.	Baldwin Creek–Rush River (Baldwin)	Baldwin Creek–upstream from confluence with Rush River.	Noncontinuous	I	A
		Rush River–upstream from St. Croix–Pierce County line.	Noncontinuous	I	A
3.	Tributary – Hay Creek (Boyd)	Tributary from Boyd STP downstream 1,300 feet	Noncontinuous	II	Effluent limitations to be determined
		Tributary from above location to Hay Creek	Continuous	I	
4.	Little La Crosse River (Cashton)	Little La Crosse River upstream from 0.2 miles north of line between Sections 24 and 25, T15N, R4W.	Noncontinuous	I	A
5.	Drainage Area Tributary – South Branch Yellow River (Chili)	Drainage area in center of sec. 22, T25N, R1E	Wetland	II	B
6.	Drainage – Tributary – South Branch Beaver Brook (Clayton)	Drainage area east of railroad tracks in W1/2, SE1/4, NE1/4, Sec. 13, T33N, R15W	Diffused surface waters	II	B
7.	Tributary – Willow River (Clear Lake)	Tributary from Clear Lake STP downstream to Yellow River	Noncontinuous	I	
8.	Hay River (Cumberland)	Hay River from dam at Beaver Dam Lake downstream to Town Road at northwest corner of Section 9.	Noncontinuous	I	A
9.	Drainage – Tributary – East Fork Poplar	Drainage area in center of S1/2 , NW1/4 , Sec. 32, T29N,R1E	Wetland	II	B
	River (Curtiss)	Tributary from 500 feet north of STH "29" to 500 feet south of STH "29"	Noncontinuous	II	NA
10.	Tributary – North Fork Poplar River (Dorchester)	Tributary from Dorchester STP to North Fork Poplar River	Noncontinuous	I	A
11.	Drainage Area – Tributary to Fish Hatchery Creek (Dresser)	Drainage area upstream from constructed drainage ditch to the tributary of Fish Hatchery Creek.	Wetland	II	B
		Drainage ditch and tributary to Fish Hatchery Creek.	Noncontinuous	I	A
12.	Drainage – Tributary – Muddy Creek	Drainage Area from Elk Mound STP to culvert under I–94	Wetland	II	Effluent limitations to be determined
	(Elk Mound)	Tributary from I–94 downstream to Muddy Creek	Noncontinuous	I	
13.	Isabella Creek (Ellsworth)	Isabella Creek upstream from Town Road between Sections 28 and 33.	Noncontinuous	II	B
		Isabella Creek in Section 33.	Noncontinuous	I	NA
		Isabella Creek from above location downstream to CTH V.	Continuous	I	NA
14.	Drainage Area – Tributary Hutton Creek	From Emerald STP discharge to E/W town road in Sec. 13, T30N, R16W	Effluent ditch	II	B
	(Emerald, Emerald and Glenwood S.D.)	From E/W town road to Hutton Creek tributary	Diffused surface waters	II	NA
		Tributary to Hutton Creek and Hutton Creek	Noncontinuous	II	NA

15.	Tributary – Schoolhouse Creek (Fairchild)	From Fairchild STP to railroad grade in NW1/4, Sec. 2, T24N,R5W	Effluent ditch	II	Effluent limitations to be determined
		From above location along railroad grade to spring flow	Noncontinuous	I	
		From spring flow to Schoolhouse Creek	Continuous	I	
16.	Brown Brook Tributary – Trade River (Frederic)	Tributary from Frederic STP to confluence with Trade River	Noncontinuous	I	A
17.	Drainage Area (Hammond)	Drainage area in center of N1/2, Sec. 28, T29N, R17W	Diffused surface waters	II	B
18.	Tributary – Yellow River (Lakeland San. Dist.)	Tributary from Lakeland stabilization ponds to Yellow River	Noncontinuous	I	A
19.	Bear Creek (Loyal)	Bear Creek from Loyal STP downstream to Town Road on north line of Section 8.	Noncontinuous	I	A
20.	Drainage – North Star Creek tributary to Trade River (Luck)	Tributary from Luck STP downstream to center of Section 21	Effluent ditch	II	B
21.	Drainage Area Tributary Rice Lake (Milltown)	Drainage area north of Rice Lake in Section 17	Wetland	II	B
22.	Drainage Area – Duncan Creek (New Auburn)	Drainage Area in S1/2, SE1/4, Sec. 36, T32N, R10W	Wetland	II	B
23.	Tributary – Allen Creek (Oakdale)	From Oakdale stabilization pond discharge south 375 feet to drainage ditch	Effluent ditch	II	B
		Drainage ditch south 900 feet and east to Allen Creek	Noncontinuous	II	NA
		Allen Creek	Continuous	I	NA
24.	Twin Lakes (Roberts)	Twin Lakes (east lake)	Wetland	II	B
25.	Drainage – La Crosse River (Rockland)	Drainage area in N1/2, NW1/4, Sec. 36, T17N, R5W	Wetland	II	B
26.	Tributary – Mormon Creek (St. Joseph)	Tributary from St. Joseph STP to Mormon Creek	Noncontinuous	I	A
27.	Tributary – North Fork Eau Claire River (Thorp)	Tributary from Thorp STP downstream to North Fork Eau Claire River	Noncontinuous	I	A
29.	Tributary to Springville Branch Bad Axe River (Vernon County Home)	Tributary from Vernon County Home in Sec. 29 downstream to large spring above Springville	Noncontinuous	II	B
30.	Tributary to Springville Branch Bad Axe River (Viroqua)	Tributary from Viroqua STP in Sec. 31 downstream to large spring above Springville.	Noncontinuous	II	Effluent limitations to be determined.
31.	Tributary to North Fork Bad Axe River (Westby)	Tributary from Westby STP downstream to line between Sec. 35 and 36, T14N, R5W.	Noncontinuous	II	B
32.	Drainage Area – Trempealeau River (Whitehall)	Drainage area from Whitehall STP to Trempealeau River	Wetland	II	B
33.	Tributary–Eau Galle River (Woodville)	Tributary from Woodville STP downstream to Eau Galle River	Noncontinuous	II	B
		Eau Galle River downstream to CTH N	Noncontinuous	II	NA

(1) Criteria I requires the maintenance of surface water criteria specified in NR 104.02 (3) (a)2.
Criteria II requires the maintenance of surface water criteria specified in NR 104.02 (3) (b)2.

(2) Effluent limitation A requires those limits specified in NR104.02 (3) (a)3.
Effluent limitation B requires those limits specified in NR104.02 (3) (b)3.
NA – Not applicable.

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76; am. table 6, Register, December, 1977, No. 264, eff. 1–1–78; r. (2) table 7, entry 28, Register, September, 1981, No. 309, eff. 10–1–81.

NR 104.10 Variances and additions applicable in the northwest district. Subject to the provisions of s. NR 104.04, intrastate waters in the northwest district counties of Ashland, Bayfield, Burnett, Douglas, Iron, Price, Rusk, Sawyer, Taylor and Washburn shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows:

(1) ADDITION. The public water supply standard shall be met in the following surface waters:

(a) Lake Lavina in Iron county.

(b) Little Rib lake in Taylor county.

(2) VARIANCE. Surface waters in the northwest district subject to a variance under s. NR 104.02 (3) are listed in table 8.

TABLE 8
NORTHWEST DISTRICT

	Surface Water (Facility Affected)	Reach Description	Hydrologic Classification	Applicable Criteria (1)	Effluent Limitations (2)
1.	Drainage to Amnicon River (Camp Amnicon)	Drainageway from the Camp Amnicon lagoon to the Amnicon River	Diffused surface water	II	B
2.	Ditch & Seepage Area (Clam Lake Field Sta.)	Channel receiving Clam Lake Field Station polishing pond effluent	Effluent ditch	II	B
3.	Bear Creek (Douglas Co. Health Care Facility)	Bear Creek from the Douglas Co. Health Care Facility STP to Allouez Bay	Noncontinuous	I	A
4.	Drainage to Hackett Creek (Flambeau State Camp)	Drainage from Flambeau State Camp lagoon to Hackett Creek	Wetland	II	B
5.	Drainage to Yellow River (Gilman)	Drainage area from Gilman lagoon to Yellow River	Diffused surface water	II	B
6.	Tributary – Deertail Creek (Glen Flora Sch.)	Channel from Glen Flora School polishing pond to Deertail Creek	Effluent ditch	II	Effluent limits to be determined
7.	South Fork Main Creek (Hawkins)	South Fork Main Creek from Hawkins Millpond Dam downstream to CTH M	Continuous	I	A
8.	Bradley Brook (Hayward)	From Hayward STP outfall to the confluence with Namekagon River	Continuous	I	A
9.	Tributary – Cemetery Creek (Iron Belt)	Channel from the Iron Belt STP outfall to Cemetery Creek	Effluent ditch	II	Effluent limits to be determined
10.	Wetland near Frog Creek (Minong)	Wetland receiving Minong STP effluent	Wetland	II	B
11.	Tributary & Bardon Creek (Northwestern	From the school polishing pond to Bardon Creek	Noncontinuous	II	B
	Junior–Senior High School)	Bardon Creek	Noncontinuous	I	NA
12.	Wetland near Holmes Creek (Ogema)	Wetland receiving Ogema lagoon effluent	Wetland	II	B
13.	Drainageway and Tributary to a Tributary of Whittlesey Creek	Drainageway from Ondossagon School polishing pond to a noncontinuous tributary to an unnamed tributary to Whittlesey Creek	Diffused surface water	II	Effluent limits to be determined
	(Ondossagon School)	Noncontinuous tributary to an unnamed tributary to Whittlesey Creek	Noncontinuous	I	
14.	Drainage to the Black River (Pattison State Park)	Drainageway from Pattison Park STP to the Black River	Diffused surface water	II	Effluent limits to be determined
15.	Drainage to Meads Creek (Pence)	Drainage Area from Pence STP to Meads Creek	Wetland	II	B
16.	Drainage to Lake Superior (Pureair)	Drainageway from the Pureair STP to Lake Superior	Diffused surface water	II	B
17.	Drainage Area – Couderay River (Radisson)	Wetland receiving Radisson STP effluent	Wetland	II	B
18.	Sheep Ranch Creek (Rib Lake)	Sheep Ranch Creek from Rib Lake STP downstream to first town road	Continuous	I	A
19.	Tributary – Sawyer Creek (Shell Lake)	Channel from the Shell Lake STP outfall to Sawyer Creek	Diffused surface water	II	Effluent limits to be determined
20.	Wetland (Siren)	Wetland receiving Siren STP effluent	Wetland	II	B
21.	Ditch & West Branch Big Eau Pleine River	Channel from the Stetsonville lagoon to the West Branch Big Eau Pleine River	Effluent ditch	II	Effluent limits to be determined
	(Stetsonville)	West Branch Big Eau Pleine River downstream to tributary in the NW1/4 , SW1/4, Sec. 29, T30N, R2E	Noncontinuous	I	
22.	Drainage to Pokegama River	Drainageway from Village of Superior lagoon to Pokegama River	Diffused surface water	II	B
	(Superior, Village of)	Pokegama River from above location to St. Louis Bay	Continuous	I	
23.	Drainage to	Channel from Tony lagoon to wetland	Effluent ditch	II	B
	Deertail Creek (Tony)	Drainage from effluent ditch to Town Line Rd.	Wetland	II	NA
		Tributary to Deertail Creek below Town Line Rd.	Noncontinuous	I	NA
24.	Tributary – Clam River (Webster)	Tributary from the Webster lagoon to the Clam River	Noncontinuous	II	B
25.	Tributary – Soft Maple Creek (Weyerhauser)	Drainage from Weyerhauser lagoon to tributary	Diffused surface water	II	B
		Tributary of Soft Maple Creek upstream from CTH "F"	Noncontinuous	II	NA
26.	Seepage Area near Brunet River (Winter)	Area receiving the Winter lagoon effluent	Diffused surface water	II	B
27.	Drainage from Village of Turtle Lake to Moon Creek (Turtle Lake)	Drainage area from effluent pipes to impoundment	Wetland	II	B

Impoundment formed by constructed dam in the SW1/4, SW1/4, sec. 32, T34N, R14W	Flowage	II	NA
Drainage from the dam to the south line of sec. 32, T34N, R14W	Noncontinuous	I	NA
Drainage area from the north line to the south line of sec. 5, T33N, R14W	Wetland	II	NA

(1) Criteria I requires the maintenance of surface water criteria specified in NR 104.02 (3) (a)2.
Criteria II requires the maintenance of surface water criteria specified in NR 104.02 (3) (b)2.

(2) Effluent limitation A requires those limits specified in NR104.02 (3) (a)3.
Effluent limitation B requires those limits specified in NR104.02 (3) (b)3.
NA – Not applicable

(3) OTHER VARIANCES. (a) The Flambeau river from the upper dam at Park Falls downstream to the Crowley dam shall meet the standards for fish and aquatic life and recreational use, except that the dissolved oxygen may not be lowered to less than 3.0 mg/L at any time. On June 30, 1984, this variance shall expire and after that date all portions of the Flambeau river shall meet the standards for fish and aquatic life and recreational use, including the dissolved oxygen standard of 5.0 mg/L.

(b) Newton creek in the city of Superior, from the headwaters to its mouth into Hog Island Inlet of Superior Bay shall be classified as a noncontinuous stream and shall also be classified for fish and aquatic life uses with the subcategory of limited forage fish communities. Hog Island Inlet and Superior Bay shall be classified for fish and other aquatic life uses with the subcategory of great lake communities.

History: Cr. Register, September, 1976, No. 249, eff. 10–1–76; am. table 8, Register, December, 1977, No. 264, eff. 1–1–78; cr. entry 27, table 8, Register, September, 1981, No. 309, eff. 10–1–81; am. (3) (a), Register, May, 1983, No. 329, eff. 6–1–83; am. (3) (b), Register, February, 1989, No. 398, eff. 3–1–89; am. (3) (b), Register, April, 1991, No. 424, eff. 5–1–91.

Subchapter II —Interstate Waters

NR 104.20 Wisconsin–Illinois waters. (1) The Des Plaines River, Pitscasaw Creek, Nippersink Creek and Turtle Creek upstream of the Rock–Walworth county line are used for wildlife and stock watering, waste assimilation, warm water fishery and recreation. Dutch Gap Canal and Trevor Creek have similar uses excepting waste assimilation. The main stems of these streams shall meet the requirements for recreational use and fish and aquatic life.

(2) The Fox River is used for recreation, waste assimilation, industrial supply, fishing and irrigation. Water quality in the Fox River shall meet the standards for recreational use and fish and aquatic life.

(3) Benet/Shangrila, Cross and Elizabeth Lakes are located on the Wisconsin–Illinois boundary and used for fishing and recreation. Their water quality shall meet the requirements for fish and aquatic life and recreational use.

(d) The Rock River and Sugar River are used for waste assimilation, recreation, fish and aquatic life, irrigation, stock and wildlife watering and hydropower. Their waters shall meet water quality standards for recreational use and fish and aquatic life.

(5) Turtle Creek below the Rock–Walworth county line, Raccoon Creek, East Fork Raccoon Creek, East Fork Galena River, Spafford Creek, Menominee River, Pecatonica River and Galena River are used for recreation, stock and wildlife watering, waste assimilation and fish and aquatic life. Richland Creek and East Branch Richland Creek, Apple River and West Fork Apple River, Sinsinawa River, Little Menominee River and a tributary of the East Fork Galena River have similar uses excepting waste assimilation. Water quality of these streams shall meet standards for recreational use and fish and aquatic life.

(6) Honey Creek is used for waste assimilation, stock and wildlife watering, recreation and fish and aquatic life. A section from the Wisconsin–Illinois state line upstream to the Clarno–Cadiz town line shall meet the requirements for recreational use and fish and aquatic life.

(7) The sector of Honey Creek above the Clarno–Cadiz town line shall meet the standards for fish and aquatic life except that the dissolved oxygen shall not be lowered to less than 2 mg/L at any time. The membrane filter fecal coliform count in this sector shall not exceed 1,000 per 100 ml as a monthly geometric mean based on not less than 5 samples per month, nor exceed 2,000 per ml in more than 10% of all samples during any month.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; renum. from NR 103.01, Register, July, 1991, No. 427, eff. 8–1–91.

NR 104.21 Wisconsin–Minnesota–Iowa–Illinois waters. The Mississippi River is used for commercial and recreational fishing, industrial and cooling water supply, boating, hunting, commercial shipping and waste assimilation. Water quality shall meet the standards and requirements for recreational use and fish and aquatic life.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; renum. from NR 103.02, Register, July, 1991, No. 427, eff. 8–1–91.

NR 104.22 Wisconsin–Minnesota waters. (1) The St. Croix River has high scenic and aesthetic value and is used for recreation, fishing, hydropower, commercial shipping, stock and wildlife water supply, and waste assimilation. An anticipated use involves industrial and cooling water supply. Its water quality shall meet the standards and requirements for recreational use and fish and aquatic life. The standards for public water supply shall be met downstream from the north line of Polk county.

(2) Upper Tamarack River, East Branch Hay Creek and West Branch Hay Creek are used for recreation, fishing, and stock and wildlife water supply. Their water quality shall meet the requirements for recreation and fish and aquatic life.

(3) The St. Louis River adjoining Wisconsin is used for recreation, fishing, waste assimilation and commercial shipping. It is anticipated that a future use in the Lower St. Louis River will include cooling and industrial water supply. The St. Louis River water quality shall meet standards for recreational use and fish and aquatic life.

(4) Black River and Black Lake, Nemadji River and South Fork Nemadji River, Mud Creek, Clear Creek, Pokegama River and Red River are used for fishing, stock and wildlife water supply and recreation. Water quality of these streams shall meet the standards and requirements for recreation and fish and aquatic life. A section of Black River is classified for trout.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; renum. from NR 103.03, Register, July, 1991, No. 427, eff. 8–1–91.

NR 104.23 Wisconsin–Minnesota–Michigan waters. Lake Superior is used for recreation, commercial and recreational fishing, shipping, municipal water supply, industrial and cooling water, and waste assimilation. Lake Superior open waters shall meet the criteria and requirements for public water supplies. All waters of Lake Superior shall meet the standards for recreational use and fish and aquatic life.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; renum. from NR 103.04, Register, July, 1991, No. 427, eff. 8–1–91.

NR 104.24 Wisconsin–Michigan waters. (1) The Montreal River is used for hydropower, recreation, wildlife and stock watering, waste assimilation and has aesthetic value. Its waters shall meet the standards and requirements for recreational use and fish and aquatic life.

(2) Several waters cross the Wisconsin–Michigan line including Wester Creek, Black River tributaries, McDonald Creek tributaries, Bena Lake Inlet, Harris Creek, Moraine Creek, Oxbow Lake Inlet, Unnamed Creek between Little Presque Isle Lake and Twin Island Lake, South and East Branch Presque Isle River, tributary to Palmer Lake, Johnson Springs Outlet, Lobischer Creek and Elvoy Creek and the following lakes:

(a)	Unnamed (T44N, R5E, Sec.18)	(j)	Big
		(k)	West Bay
(b)	Moraine	(L)	Mamie
(c)	Stateline	(m)	Big Bateau
(d)	Basin	(n)	Mill
(e)	Little Presque Isle	(o)	Crystal
(f)	Roach	(p)	Eleanor
(g)	Tenderfoot	(q)	Lac Vieux Desert
(h)	Plum	(r)	Nurwood
(i)	Crampton	(s)	Smoky

Uses of these waters include fishing, recreation, aesthetic, and stock and wildlife watering. Their water quality shall meet the requirements and standards for recreation and fish and aquatic life. The Black River tributaries and Elvoy Creek are classified as trout waters.

(3) The Brule and Menominee Rivers are used for hydropower production and the latter stream is used for waste assimilation and industrial water supply. Fishing, recreation, aesthetic values and stock,and wildlife watering are common to both. The Brule River is classified as a trout stream and it shall meet the requirements for recreation and the standards for trout waters. Waste quality requirements and standards on the Menominee River shall meet the standards for recreational use and fish and aquatic life.

(4) Green Bay is used for public water supply, recreation, commercial and recreational fishing, industrial and cooling water, and waste assimilation. The waters of Green Bay, except as provided below, shall meet the standards for fish and aquatic life and recreational use.

(5) Green Bay waters southeasterly from the navigation channel and southerly from the north line of Brown County shall from January 1 to April 1 annually meet the standards for recreational use and fish and aquatic life except that the dissolved oxygen shall not be lowered to less than 2 mg/L at any time.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; renum. from NR 103.05, Register, July, 1991, No. 427, eff. 8–1–91.

NR 104.25 Wisconsin–Michigan–Illinois–Indiana waters. Lake Michigan is used for recreation, commercial and recreational fishing, shipping, public water supply, waste assimilation, and industrial and cooling water. All Lake Michigan waters shall meet the standards for public water supplies and the standards for recreational use and fish and aquatic life, in addition to the thermal criteria contained in s. 102.04, Stats.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; reprinted to correct printing error, Register, February, 1987, No. 374; renum. from NR 103.06, Register, July, 1991, No. 427, eff. 8–1–91.

NR 104.26 Trout waters. Trout waters include the open waters of Lakes Superior and Michigan as well as those classified by the department of natural resources. They must be given special protection as required by the fish and aquatic life standards.

History: Cr. Register, September, 1973, no. 213, eff. 10–1–73; reprinted to correct printing error, Register, February, 1987, No. 374; renum. from NR 103.07, Register, July, 1991, No. 427, eff. 8–1–91.

NR 104.27 Fish reproduction. Standards adequate to maintain fish reproduction shall be maintained in the open waters of Lake Superior and Lake Michigan and in all other interstate waters which are designated by the department as of primary importance in the public interest for the maintenance of fish reproduction.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; renum. from NR 103.08, Register, July, 1991, No. 427, eff. 8–1–91.

NR 104.28 Revision of designated uses. Modification of the uses and designated standards established in this chapter may be initiated by the department, by petition of any interested person, or by the natural resources board, subject to the provisions of ch. 227, Stats.

History: Cr. Register, September, 1973, No. 213, eff. 10–1–73; renum. from NR 103.08, Register, July, 1991, No. 427, eff. 8–1–91.

Chapter NR 105

SURFACE WATER QUALITY CRITERIA AND SECONDARY VALUES FOR TOXIC SUBSTANCES

NR 105.01 Purpose. The purpose of this chapter is to establish water quality criteria, and methods for developing criteria and secondary values for toxic substances to protect public health and welfare, the present and prospective use of all surface waters for public and private water supplies, and the propagation of fish and aquatic life and wildlife. This chapter also establishes how bioaccumulation factors used in deriving water quality criteria and secondary values for toxic and organoleptic substances shall be determined. Water quality criteria are a component of surface water quality standards. This chapter and chs. NR 102 to 104 constitute quality standards for the surface waters of Wisconsin.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89.; am. Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.02 Applicability. The provisions of this chapter are applicable to surface waters of Wisconsin as specified in chs. NR 102 to 104 and in this chapter.

(1) SITE SPECIFIC CRITERIA AND SECONDARY VALUES. A criterion contained within this chapter or a secondary value calculated pursuant to this chapter may be modified for a particular surface water segment or body. A criterion or secondary value may be modified if specific information is provided which shows that the data used to derive the criterion or secondary value do not apply and if additional information is provided to derive a site–specific criterion or secondary value. Site–specific criteria are intended to be applicable to a specific surface water segment. Criteria may be modified for site–specific considerations according to the USEPA "Water Quality Standards Handbook" Second Edition, revised 1994. Any criterion modified for site–specific conditions shall be promulgated in ch. NR 104 before it can be applied on a site–specific basis. Site–specific modifications of criteria and secondary values shall be consistent with the procedures described in 40 CFR Part 132, Appendix F, Procedure 1: Site–specific modifications to criteria and values. 40 CFR Part 132, Appendix F, Procedure 1 as stated on September 1, 1997 is incorporated by reference.

Note: Copies of 40 CFR Part 132 Appendix F, Proc. 1 are available for inspection in the offices of the department of natural resources, secretary of state and the revisor of statutes, Madison, WI or may be purchased from the superintendent of documents, US government printing office, Washington, D.C. 20402.

(2) STATEWIDE CRITERIA. (a) The department may promulgate a less stringent criterion or remove a criterion from this chapter when the department determines that the previously promulgated criterion is more stringent than necessary, or unnecessary for the protection of humans, fish and other aquatic life or wildlife. The modification shall assure that the designated uses are protected and water quality standards continue to be attained.

(b) The department may promulgate a more stringent criterion in this chapter when the department determines that the previously promulgated criterion is inadequate for the protection of humans, fish and other aquatic life or wildlife.

(3) DETERMINATION OF SECONDARY VALUES FOR EFFLUENT LIMITATIONS. If a discharge contains a toxic substance, and if data to calculate a water quality criterion for that substance are not available, then, on a case–by–case basis, the department may calculate a secondary value as defined in this chapter and establish an effluent limitation for the toxic substance if the conditions contained in s. NR 106.05 (1) (b) are met.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; am. (1) and (2), cr. (3), Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.03 Definitions. (1) "Acute toxicity" means the ability of a substance to cause mortality or an adverse effect in an organism which results from a single or short–term exposure to the substance.

(2) "Acute toxicity criterion" or "ATC" means the maximum daily concentration of a substance which ensures adequate protection of sensitive species of aquatic life from the acute toxicity of that substance and will adequately protect the designated fish and aquatic life use of the surface water if not exceeded more than once every 3 years. If the available data indicate that one or more life stages of a particular species are more sensitive to a substance than other life stages of the same species, the ATC shall represent the acute toxicity of the most sensitive life stage.

(3) "Adequate protection" means a level of protection which ensures survival of a sufficient number of healthy individuals in a population of aquatic species to provide for the continuation of an unreduced population of these species.

(4) "Adverse effect" means any effect resulting in a functional impairment or a pathological lesion, or both, which may affect the performance of the whole organism, or which contributes to a reduced ability to respond to an additional challenge. Adverse effects include toxicant–induced mutagenic, teratogenic, or carcinogenic effects or impaired, developmental, immunological or reproductive effects.

(5) "Baseline BAF" means for organic chemicals, a bioaccumulation factor normalized to 100% lipid that is based on the concentration of a freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism. For inorganic chemicals, a bioaccumulation factor is based on the wet weight of the tissue.

(6) "Baseline BCF" means for organic chemicals, a bioconcentration factor normalized to 100% lipid that is based on the concentration of freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism. For inorganic chemicals, a bioconcentration factor is based on the wet weight of the tissue.

(7) "Bioaccumulation" means the net accumulation of a substance by an organism as a result of uptake from all environmental sources.

(8) "Bioaccumulation factor" or "BAF" means the ratio (in L/kg) of a substance's concentration in the tissue of an aquatic organism to its concentration in the ambient water, in situations where both the organism and its food are exposed to the substance and where the ratio does not change substantially over time.

(9) "Bioaccumulative chemical of concern" or "BCC" means any substance that has the potential to cause adverse effects which, upon entering the surface waters, accumulates in aquatic organisms by a human health or wildlife bioaccumulation factor greater than 1000.

(10) "Bioconcentration" means the net accumulation of a substance by an aquatic organism as a result of uptake directly from the ambient water through its gill membranes or other external body surfaces.

(11) "Bioconcentration factor" or "BCF" means the ratio (in L/kg) of a substance's concentration in the tissue of an aquatic organism to its concentration in the ambient water, in situations where the organism is exposed through the water only and where the ratio does not change substantially over time.

(12) "Biota–sediment accumulation factor" or "BSAF" means the ratio (in kg of organic carbon/kg of lipid) of a substance's lipid–normalized concentration in the tissue of an aquatic organism to its organic carbon–normalized concentration in surface sediment, in situations where the ratio does not change substantially over time, both the organism and its food are exposed, and where the surface sediment is representative of the average surface sediment in the vicinity of the organism.

(13) "Carcinogen" means any substance listed in Table 9 or a substance for which the induction of benign or malignant neoplasms has been demonstrated in:

(a) Humans; or

(b) Two mammalian species; or

(c) One mammalian species, independently reproduced; or

(d) One mammalian species, to an unusual degree with respect to increased incidence, shortened latency period, variety of site, tumor type, or decreased age at onset; or

(e) One mammalian species, supported by reproducible positive results in at least 3 different types of short–term tests which are indicative of potential oncogenic activity.

(14) "Chronic toxicity" means the ability of a substance to cause an adverse effect in an organism which results from exposure to the substance for a time period representing that substantial portion of the natural life expectancy of that organism.

(15) "Chronic toxicity criterion" or "CTC" means the maximum 4–day concentration of a substance which ensures adequate protection of sensitive species of aquatic life from the chronic toxicity of that substance and will adequately protect the designated fish and aquatic use of the surface water if not exceeded more than once every 3 years.

(16) "Depuration" means the loss of a substance from an organism as a result of any active or passive process.

(17) "EC_{50}" means a concentration of a toxic substance which causes an adverse effect including mortality in 50% of the exposed organisms in a given time period.

(18) "Food–chain multiplier" or "FCM" means the ratio of a BAF to an appropriate BCF.

(19) "LC_{50}" means a concentration of a toxic substance which is lethal to 50% of the exposed organisms in a given time period.

(20) "LD_{50}" means a dose of a toxic substance which is lethal to 50% of the exposed organisms in a given time period.

(21) "Lipid–soluble substance" means a substance which is soluble in nonpolar organic solvents and which tends to accumulate in the fatty tissues of an organism exposed to the substance.

(22) "Lowest observable adverse effect level" or "LOAEL" means the lowest tested concentration that caused an adverse effect in comparison with a control when all higher test concentrations caused the same effect.

(23) "No observable adverse effect level" or "NOAEL" means the highest tested concentration that did not cause an adverse effect in comparison with a control when no lower test concentration caused an adverse effect.

(24) "Octanol/water partition coefficient" or "K_{OW}" means the ratio of the concentration of a substance in the octanol phase to its concentration in the aqueous phase in an equilibrated 2–phase octanol–water system. For log K_{OW}, the log of the octanol–water partition coefficient is a base 10 logarithm.

(25) "Secondary value" means a temporary value that represents the concentration of a substance which ensures adequate protection of sensitive species of aquatic life, wildlife or human health from the toxicity of that substance and will adequately protect the designated use of the surface water until database requirements are fulfilled to calculate a water quality criterion.

(26) "Steady state" means that an equilibrium condition in the body burden of a substance in an organism has been achieved and is assumed when the rate of depuration of a substance matches its rate of uptake.

(27) "Toxic substance" means a substance or mixture of substances which through sufficient exposure, or ingestion, inhalation or assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will cause death, disease, behavioral or immunological abnormalities, cancer, genetic mutations, or developmental or physiological malfunctions, including malfunctions in reproduction or physical deformations, in such organisms or their offspring.

(28) "Trophic level" means a functional classification of taxa within a community that is based on feeding relationships (e.g., aquatic plants comprise the first trophic level, herbivores comprise the second, small fish comprise the third, predatory fish the fourth, etc.).

(29) "Uptake" means the acquisition of a substance from the environment by an organism as a result of any active or passive process.

(30) "Water quality parameter" means one of the indicators available for describing the distinctive quality of water including, but not limited to, hardness, pH, or temperature.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; renum. (5) to (19) to be (11), (13) to (15), (17), (19) to (24), (26), (27) and (30), cr. (5) to (7), (9), (10), (12), (16), (18), (25), (28) and (29) and am. (8), (11) and (24), Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.04 Determination of adverse effects. **(1)** Substances may not be present in surface waters at concentrations which adversely affect public health or welfare, present or prospective uses of surface waters for public or private water supplies, or the protection or propagation of fish or other aquatic life or wild or domestic animal life.

(2) A substance shall be deemed to have adverse effects on fish or other aquatic life if it exceeds any of the following more than once every 3 years:

(a) The acute toxicity criterion as specified in s. NR 105.05, or

(b) The chronic toxicity criterion as specified in s. NR 105.06.

(c) The acute and chronic toxicity criteria for ammonia nitrogen shall be determined on a case–by–case basis by the department for the appropriate aquatic life use category.

(3) A substance shall be deemed to have adverse effects on wildlife if it exceeds the wildlife criterion as specified in s. NR 105.07.

(4) A substance shall be deemed to have adverse effects on public health and welfare if it exceeds any of the following:

(a) The human threshold criterion as specified in s. NR 105.08; or

(b) The human cancer criterion as specified in s. NR 105.09; or

(c) The taste and odor criterion as specified in s. NR 102.14.

(5) A substance shall be deemed to have adverse effects or the reasonable potential to have adverse effects on aquatic life, wildlife or human health, if it exceeds a secondary value determined according to the procedures in ss. NR 105.05 to 105.08.

(6) The determination of the criteria or secondary values for substances as calculated under ss. NR 105.05 to 105.09 shall be based upon the available scientific data base. References to be used in obtaining scientific data may include, but are not limited to:

(a) "Water Quality Criteria 1972", EPA–R3–73–033, National Academy of Sciences, National Academy of Engineering, United States Government Printing Office, Washington, D.C., 1974.

(b) "Quality Criteria for Water", EPA–440/9–76–003, United States Environmental Protection Agency, Washington, D.C., 1976.

(c) October 1980 and January 1985 U.S. Environmental Protection Agency (EPA) ambient water quality criteria documents.

(d) "Public Health Related Groundwater Standards: Summary of Scientific Support Documentation for NR 140.10", Wisconsin Department of Health and Social Services, Division of Health, September 1985.

(e) "Public Health Related Groundwater Standards – 1986: Summary of Scientific Support Documentation for NR 140.10", Wisconsin Department of Health and Social Services, Division of Health, June 1986.

(f) Health advisories published on March 31, 1987 by EPA, Office of Drinking Water.

(g) Any other reports, documents or information published by EPA or any other federal agency.

(h) Any other reports, documents or information that the department, deems to be reliable.

(7) When reviewing any of the references in sub. (6) to determine the effect of a substance, the department:

(a) Shall use scientific studies on the toxicity of a substance to fish and other aquatic life and wild and domestic animals, indigenous to the state;

(b) May use scientific studies on the toxicity of a substance to fish or other aquatic life, plant, mammalian, avian, and reptilian species not indigenous to the state; and

(c) May consider biomonitoring information to determine the aquatic life toxicity of complex mixtures of toxic substances in addition to the chemical specific criteria specified in this chapter.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; am. (3), renum. (5) and (6) to be (7) and am. (6) (intro.) and (7) (intro.), cr. (5), Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.05 Acute toxicity criteria and secondary acute values for aquatic life. (1) MINIMUM DATABASE FOR ACUTE CRITERION DEVELOPMENT. (a) To derive an acute toxicity criterion for aquatic life, the minimum information required shall be the results of acceptable acute toxicity tests with one or more species of freshwater animal in at least 8 different families provided that of the 8 species:

1. At least one is a salmonid fish in the family Salmonidae in the class Osteichthyes,

2. At least one is a non–salmonid fish from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species,

3. At least one is a planktonic crustacean (e.g., cladoceran, copepod),

4. At least one is a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish),

5. At least one is an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge),

6. At least one is a fish or amphibian from a family in the phylum Chordata not already represented in one of the other subdivisions.

7. At least one is an organism from a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca), and

8. At least one is an organism from a family in any order of insect or any other phylum not already represented in subds. 1. to 7.

9. If all 8 of the families in subds. 1. to 8. are represented, an acute toxicity criterion may be developed for surface waters classified as cold water using information on all of those families. If an acute toxicity criterion is developed for surface waters classified as cold water, acute toxicity criteria may also be developed for any of the surface water classifications in s. NR 102.04 (3)(b) to (e) using the procedure in sub. (2) or (3) and data on families in subds. 1. to 8. which are representative of the aquatic life communities associated with those classifications. For each substance, in no case may the criterion for a lower quality fish and aquatic life subcategory as defined in s. NR 102.04 be less than the criterion for a higher quality fish and aquatic life subcategory.

10. For a substance, if all of the families in subds. 1. to 8. are not represented, an acute toxicity criterion may not be developed for that substance. Instead, any available data may be used to develop a secondary acute value (SAV) for that substance according to s. NR 105.02(3) and sub.(4).

(b) The acceptability of acute toxicity test results shall be judged according to the guidelines in section IV of the United States environmental protection agency's 1985 "Guidelines for Deriving National Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" or 40 CFR Part 132, Appendix A. II, IV and V, as stated on September 1, 1997, is incorporated by reference.

Note: Copies of 40 CFR Part 132, Appendix A Sections II, IV and V are available for inspection in the offices of the department of natural resources, secretary of state and the revisor of statutes, Madison, WI or may be purchased from the superintendent of documents, US government printing office, Washington, D.C. 20402.

(2) ACUTE TOXICITY CRITERIA FOR SUBSTANCES WITH TOXICITY UNRELATED TO WATER QUALITY PARAMETERS. If the acute toxicity of a substance has not been adequately shown to be related to a water quality parameter (i.e., hardness, pH, temperature, etc.), the acute toxicity criterion (ATC) is calculated using the procedures specified in this subsection.

(a) 1. For each species for which at least one acute value is available, the species mean acute value (SMAV) is calculated as the geometric mean of all acceptable acute toxicity tests using the guidelines in sub. (1)(b).

2. For each genus for which one or more SMAVs are available, the genus mean acute value (GMAV) is calculated as the geometric mean of the SMAVs available for the genus.

(b) The GMAVs are ordered from high to low.

(c) Ranks (R) are assigned to the GMAVs from 1 for the lowest to N for the highest. If 2 or more GMAVs are identical, successive ranks are arbitrarily assigned.

(d) The cumulative probability (P) is calculated for each GMAVs as $P=R/(N + 1)$.

(e) The 4 GMAVs are selected which have P closest to 0.05. If there are less than 59 GMAVs, these will always be the lowest GMAVs.

(f) Using the selected GMAVs and Ps, the ATC is calculated using the following:

1. Let EV = sum of the 4 ln GMAVs,
   EW = sum of the 4 squares of the ln GMAVs,
   EP = sum of the 4 P values,
   EPR = sum of the 4 square roots of P, and
   JR = square root of 0.05.
2. $S = ((EW - (EV)^2 /4)/(EP-(EPR)^2 /4))^{0.5.}$
3. $L = (EV - S(EPR))/4.$
4. $A = (JR)(S) + L.$
5. Final Acute Value (FAV)= e^A.
6. ATC = FAV/2.

(g) If, for a commercially, recreationally or ecologically important species, the geometric mean of the acute values from flow–through tests in which the concentration of test material was measured is lower than the calculated ATC [FAV], then that geometric mean is used as the ATC [FAV] instead of the calculated one.

(h) Table 1 contains the acute toxicity criteria for fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1) (a).

(3) ACUTE TOXICITY CRITERIA FOR SUBSTANCES WITH TOXICITY RELATED TO WATER QUALITY PARAMETERS. If data are available on a substance to show that acute toxicity to 2 or more species is similarly related to a water quality parameter (i.e., hardness, pH, temperature, etc.), the acute toxicity criterion (ATC) is calculated using the procedures specified in this subsection.

(a) For each species for which acceptable acute toxicity tests using the guidelines in sub. (1) (b) are available at 2 or more different values of the water quality parameter, a least squares regression of the acute toxicity values on the corresponding values of the water quality parameter is performed to obtain the slope of the curve that best describes the relationship. Because the most commonly documented relationship is that between hardness and acute toxicity of metals and a log–log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this subsection to illustrate this method. For relationships based on other water quality parameters, no transformation or a different transformation might fit the data better, and appropriate changes shall be made as necessary throughout this subsection.

(b) For each species, the geometric mean of the available acute values (W) is calculated and then each of those acute values is divided by the mean for that species. This normalizes the acute values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.

(c) For each species, the geometric mean of the available corresponding water quality parameter values (X) is calculated and then each of those water quality parameter values is divided by the mean for that species. This normalizes the water quality parameter values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.

(d) A least squares regression of all the normalized acute values on the corresponding normalized values of the water quality parameter is performed to obtain the pooled acute slope (V). If the coefficient of determination, or r value, calculated from that regression is found not to be significant based on a standard F–test at a 0.05 level, then the pooled acute slope shall be set equal to zero.

(e) For each species the logarithmic intercept (Y) is calculated using the equation: $Y = \ln W - V(\ln X)$.

(f) 1. For each species the species mean acute intercept (SMAI) is calculated as e^Y.

2. For each genus for which one or more SMAIs are available, the genus mean acute intercept (GMAI) is calculated as the geometric mean of the SMAIs available for the genus.

(g) The GMAIs are ordered from high to low.

(h) Ranks (R) are assigned to the GMAIs from 1 for the lowest to N for the highest. If 2 or more GMAIs are identical, successive ranks are arbitrarily assigned.

(i) The cumulative probability (P) is calculated for each GMAI as $P=R/(N+1)$.

(j) The 4 GMAIs are selected which have P closest to 0.05. If there are less than 59 GMAIs, these will always be the lowest GMAIs.

(k) Using the selected GMAIs and Ps, the ATC is calculated using the following:

1. Let EV = sum of the 4 ln GMAIs,
   EW = sum of the 4 squares of the ln GMAIs,
   EP = sum of the 4 P values,
   EPR = sum of the 4 square roots of P, and
   JR = square root of 0.05.
2. $S = ((EW - (EV)^2/4) / (EP - (EPR)^2 /4))^{0.5}$.
3. $L = (EV - S(EPR))/4$.
4. $A = (JR)(S) + L$.
5. Final Acute Intercept (FAI) = e^A.
6. Acute Criterion Intercept (ACI) = FAI/2.

(L) The acute toxicity equation (ATE) is written as:
$ATC = e^{(V \ln(\text{water quality parameter}) + \ln ACI)}$.

The ATE shall be applicable only over the range of water quality parameters equivalent to the mean plus or minus 2 standard deviations using the entire fresh water acute toxicity data base and the water quality parameter transformation employed in par. (a). If the value at a specific location is outside of that range, the endpoint of the range nearest to that value shall be used to determine the criterion. Additional information may be used to modify those ranges.

(m) If, for a commercially, recreationally or ecologically important species, the SMAI is lower than the calculated [ACI], then that SMAI is used as the [ACI] instead of the calculated one.

(n) Table 2 contains the acute toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1) (a). Table 2A contains the water quality parameter ranges calculated in par. (L).

(4) SECONDARY ACUTE VALUES. If all 8 minimum data requirements for calculating acute toxicity criteria in sub. (1) (a) are not met, secondary acute values (SAVs) shall be determined using the procedure in this subsection.

(a) In order to calculate a SAV, the database shall contain, at a minimum, a genus mean acute value (GMAV) for one of the following 3 genera in the family Daphnidae – *Ceriodaphnia sp.*, *Daphnia sp.*, or *Simocephalus sp.* To calculate a SAV, the lowest GMAV in the database is divided by the Secondary Acute Factor (SAF). The SAF is an adjustment factor corresponding to the number of satisfied minimum data requirements, listed in sub. (1)(a). SAFs are listed in Table 2B.

(b) Whenever appropriate, the effects of variable water quality parameters shall be considered when calculating a SAV, consistent with the procedures described in sub. (3).

(c) Whenever, for a commercially, recreationally or ecologically important species, the SMAV is lower than the calculated SAV, that SMAV shall be used as the SAV instead of the calculated SAV.

(5) ACUTE TOXICITY CRITERIA EXPRESSED IN THE DISSOLVED FORM. Acute water quality criteria may be expressed as a dissolved concentration. The conversion of an acute water quality criterion expressed as a total recoverable concentration, to an acute water quality criterion expressed as a dissolved concentration, the portion of the substance which will pass through a 0.45 um filter, shall be done using the equations in pars. (a) and (b). Substances which may have criteria expressed as a dissolved concentration are listed in par. (a) with corresponding conversion factors.

(a) The conversion of the water quality criterion expressed as total recoverable ($WQC_{Total\ R.}$) to the water quality criterion expressed as dissolved (WQC_D) shall be performed as follows:

$WQC_D = (CF)(WQC_{Total\ R.})$

Where: $WQC_{Total\ R.}$ = Criteria from NR 105, Table 1 or 2.
CF = Conversion factor for total recoverable to dissolved.

Conversion factors are as follows:

Arsenic	1.000
Cadmium	0.850
Chromium (III)	0.316
Chromium (VI)	0.982
Copper	0.960
Lead	0.875
Mercury	0.850
Nickel	0.998
Selenium	0.922
Silver	0.850
Zinc	0.978

(b) The translation of the WQC_D into the water quality criterion which accounts for site–specific conditions (WQC_{TRAN}) shall be performed as follows:

$WQC_{TRAN} = (Translator)(WQC_D)$

Where: Translator (unitless) = $((M_P)(TSS) + M_D)/M_D$

M_P = Particle–bound concentration of the pollutant (ug/g) in receiving water.

M_D = Dissolved concentration of the pollutant in receiving water (ug/L).

TSS = Total Suspended Solids (g/L) concentration in receiving water.

(c) The procedures in pars. (a) and (b) may also be used for the conversion of secondary values from total recoverable to dissolved.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; am. (1) (a) 1. to 5., (1) (b), (2) (a) to (f), (3) (a) and (f) to (L), r. and recr. (1) (a) 6., cr. (1) (a) 7. to 10., (4) and (5), Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.06 Chronic toxicity criteria and secondary chronic values for fish and aquatic life. **(1)** MINIMUM DATABASE FOR CHRONIC CRITERION DEVELOPMENT. (a) To derive a chronic toxicity criterion for aquatic life, the minimum information required shall be results of acceptable chronic toxicity tests with one or more species of freshwater animal in at least 8 different families provided that of the 8 species:

1. At least one is a salmonid fish, in the family Salmonidae in the class Osteichthyes,

2. At least one is a non–salmonid fish, from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species,

3. At least one is a planktonic crustacean (e.g., cladoceran, copepod),

4. At least one is a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish),

5. At least one is an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge),

6. At least one is a fish or amphibian from a family in the phylum Chordata not already represented in one of the other subdivisions,

7. At least one is an organism from a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca), and

8. At least one is an organism from a family in any order of insect or any other phylum not already represented in subds. 1. to 7.

9. If all 8 of the families in subds. 1. to 8. are represented, a chronic toxicity criterion may be developed for surface waters classified as cold water using information on all of those families. If a chronic toxicity criterion is developed for surface waters classified as cold water, chronic toxicity criteria may also be developed for any of the surface water classifications in s. NR 102.04 (3) (b) to (e) using the procedure in sub. (2) or (3) and data on families in subds. 1. to 8. which are representative of the aquatic life communities associated with those classifications. For each substance, in no case may the criterion for a lower quality fish and aquatic life subcategory as defined in s. NR 102.04 be less than the criterion for a higher quality fish and aquatic life subcategory.

10. For a substance, if all the families in subds. 1. to 8. are not represented, acute–chronic ratios as calculated in sub. (5) may be used to generate the chronic toxicity values necessary to calculate a chronic toxicity criterion.

11. For a substance, if all of the families in subds. 1. to 8. are not represented, a chronic toxicity criterion may not be developed for that substance except as provided in subd. 10. Instead, any available data may be used to develop a secondary acute value (SAV) for that substance according to sub. (4).

(b) The acceptability of chronic toxicity test results shall be judged according to the guidelines in section VI of the United States environmental protection agency's 1985 "Guidelines for Deriving National Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" or 40 CFR Part 132 Appendix A, sections VI and VII as stated on September 1, 1997, is incorporated by reference.

Note: Copies of 40 CFR Part 132, Appendix A, Sections VI and VII are available for inspection in the offices of the department of natural resources, secretary of state and the revisor of statutes, Madison, WI or may be purchased from the superintendent of documents, US government printing office, Washington, D.C. 20402.

(2) CALCULATION OF A CHRONIC CONCENTRATION. A chronic concentration is obtained by calculating the geometric mean of the chronic lowest observable adverse effect level and the chronic no observable adverse effect level.

(3) CHRONIC TOXICITY CRITERIA FOR SUBSTANCES WITH TOXICITY UNRELATED TO WATER QUALITY PARAMETERS. If the chronic toxicity of a substance has not been adequately shown to be related to a water quality parameter, i.e., hardness, pH, temperature, etc., the chronic toxicity criterion (CTC) is calculated using the procedures specified in this subsection.

(a) 1. For each species for which at least one chronic value is available, the species mean chronic value (SMCV) is calculated as the geometric mean of all acceptable chronic toxicity tests using the guidelines in sub. (1) (b).

2. For each genus for which one or more SMCVs are available, the genus mean chronic value (GMCV) is calculated as the geometric mean of the SMCVs available for the genus.

(b) The GMCVs are ordered from high to low.

(c) Ranks (R) are assigned to the GMCVs from 1 for the lowest to N for the highest. If 2 or more GMCVs are identical, successive ranks are arbitrarily assigned.

(d) The cumulative probability (P) is calculated for each GMCVs as $P=R/(N + 1)$.

(e) The 4 GMCVs are selected which have P closest to 0.05. If there are less than 59 GMCVs, these will always be the lowest GMCVs.

(f) Using the selected GMCVs and Ps, the final chronic value (FCV) is calculated using the following:

1. Let EV = sum of the 4 ln GMCVs,
EW = sum of the 4 squares of the ln GMCVs,
EP = sum of the 4 P values,
EPR = sum of the 4 square roots of P, and
JR = square root of 0.05.

2. $S = ((EW - (EV)^2 /4)/(EP-(EPR)^2/4))^{0.5}$

3. $L = (EV - S(EPR))/4$.

4. $A = (JR)(S) + L$.

5. $FCV = e^A$.

(g) If, for a commercially, recreationally or ecologically important species, the geometric mean of the chronic values is lower than the calculated FCV then that geometric mean is used as the FCV instead of the calculated one.

(h) The chronic toxicity criterion (CTC) equals the lower of the FCV and the final plant value calculated using the procedure in s. NR 105.11.

(i) Table 3 contains the chronic toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1).

(4) CHRONIC TOXICITY CRITERIA FOR SUBSTANCES WITH TOXICITY RELATED TO WATER QUALITY PARAMETERS. (a) If data are available on a substance to show that chronic toxicity to 2 or more species is similarly related to a water quality parameter (i.e., hardness, pH, temperature, etc.), the chronic toxicity criterion (CTC) is calculated using the procedures specified in this paragraph.

1. For each species for which acceptable chronic toxicity tests using the guidelines in sub. (1) (b) are available at 2 or more different values of the water quality parameter, a least squares regression of the chronic toxicity values on the corresponding values of the water quality parameter is performed to obtain the slope of the curve that best describes the relationship. Because the most commonly documented relationship is that between hardness and the chronic toxicity of metals and a log–log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this subsection to illustrate this method. For relationships based on other water quality parameters, no transformation or a different transformation might fit the data better, and appropriate changes shall be made as necessary throughout this subsection.

2. For each species, the geometric mean of the available chronic values (W) is calculated and then each of the chronic values is divided by the mean for that species. This normalizes the chronic values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.

3. For each species, the geometric mean of the available corresponding water quality parameter values (X) is calculated and then each of the water quality parameter values is divided by the mean for that species. This normalizes the water quality parameter values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.

4. A least squares regression of all the normalized chronic values on the corresponding normalized values of the water quality parameter is performed to obtain the pooled chronic slope (V). If the coefficient of determination, or r value, calculated from that regression is found not to be significant based on a standard F–test at a 0.05 level, then the pooled chronic slope shall be set equal to zero.

5. For each species the logarithmic intercept (Y) is calculated using the equation: $Y = \ln W - V(\ln X)$.

6. a. For each species the species mean chronic intercept (SMCI) is calculated as e^Y.

b. For each genus for which one or more SMCIs are available, the genus mean chronic intercept (GMCI) is calculated as the geometric mean of the SMCIs available for the genus.

7. The GMCIs are ordered from high to low.

8. Ranks (R) are assigned to the GMCIs from 1 for the lowest to N for the highest. If 2 or more GMCIs are identical, successive ranks are arbitrarily assigned.

9. The cumulative probability (P) is calculated for each GMCI as $P=R/(N + 1)$.

10. The 4 GMCIs are selected which have P closest to 0.05. If there are less than 59 GMCIs, these will always be the lowest GMCIs.

11. Using the selected GMCIs and Ps, the final chronic value (FCV) is calculated using the following:

a. Let EV = sum of the 4 ln GMCIs,
EW = sum of the 4 squares of the ln GMCIs,
EP = sum of the 4 P values,
EPR = sum of the 4 square roots of P, and
JR = square root of 0.05.

b. $S = ((EW-(EV)^2/4)/(EP-(EPR)^2/4))^{0.5}$

c. $L = (EV - S(EPR))/4$.

d. $A = (JR)(S) + L$.

e. Final Chronic Intercept (FCI) = e^A.

12. The final chronic equation (FCE) is written as:
FCV = $_e$(V ln(water quality parameter) + ln FCI).

The FCE shall be applicable only over the range of water quality parameters equivalent to the mean ± 2 standard deviations using the entire freshwater chronic toxicity data base and the water quality parameter transformation employed in subd. 1. If the value at a specific location is outside of that range, the endpoint of the range nearest to that value shall be used to determine the criterion. Additional information may be used to modify those ranges.

13. If, for a commercially, recreationally or ecologically important species, the SMCI is lower than the calculated FCI, then that SMCI is used as the FCI instead of the calculated one.

(b) At a value of the water quality parameter, the chronic toxicity criterion (CTC) equals the lower of the FCV and the final plant value calculated using the procedure in s. NR 105.11.

(c) Table 4 contains the chronic toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1). Table 4A contains the water quality parameter ranges calculated in par. (a) 1.

(5) ACUTE–CHRONIC RATIOS. (a) The acute–chronic ratio is used to estimate the chronic toxicity of a substance to fish or other aquatic species when the database of sub. (1) (a) is not satisfied.

(b) The acute–chronic ratio for a species equals the acute concentration from data considered under s. NR 105.05 (1) divided by the chronic concentration from data calculated under sub. (1), subject to the following conditions:

1. If the acute toxicity of a substance is related to any water quality parameter, the acute–chronic ratio shall be based on acute and chronic toxicity data obtained from organisms exposed to test water with similar, if not identical, values of those water quality parameters. Preference under this paragraph shall be given to data from acute and chronic tests done by the same author or reference in order to increase the likelihood of comparable test conditions.

2. If the acute and chronic toxicity data indicate that the acute–chronic ratio varies with changes in the values of the water quality parameters, the acute–chronic ratio used at specified values of the water quality parameters shall be based on the ratios at values closest to that specified.

3. If the acute toxicity of a substance is unrelated to water quality parameters, the acute–chronic ratio may be derived from any acute and chronic test on a species regardless of the similarity in values of those parameters. Preference under this paragraph shall be given to data from acute and chronic tests done by the same author or reference to increase the likelihood of comparable test conditions.

(c) A final chronic value shall be calculated for a substance under this subsection only if at least one acute–chronic ratio is available for at least one species of aquatic animal in at least 3 different families, provided that of the 3 species, one is a fish, one is an invertebrate, and the third is a relatively sensitive freshwater species on an acute toxicity basis. The other 2 may be saltwater species.

(d) The geometric mean acute–chronic ratio is calculated for each species using the available acute–chronic ratios for that species. That mean ratio shall be called the species mean acute–chronic ratio (SMACR).

(e) For a given substance, if the SMACR appears to increase or decrease as the species or genus mean acute values (SMAVs or GMAVs) calculated for that substance using the procedure described in s. NR 105.05 increase, the final acute–chronic ratio (FACR) shall be equal to the geometric mean of the SMACRs for species with SMAVs closest to the final acute value.

(f) For a given substance, if no trend is apparent regarding changes in SMACRs and GMAVs, the FACR shall be equal to the geometric mean of all SMACRs available for that substance.

(g) For a given substance, the final chronic value (FCV) shall be equal to the final acute value (FAV) divided by the final acute–chronic ratio (FACR). The chronic toxicity criterion shall be equal to the lower of the FCV and the final plant value as calculated using the procedure in s. NR 105.11, if available.

(h) Chronic toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using acute–chronic ratios are listed in Table 5 for substances with acute toxicity unrelated to water quality parameters and in Table 6 for substances with acute toxicity related to water quality parameters. Equations listed in Table 6 are applicable over the same range of water quality parameters as contained in Table 2A.

(6) SECONDARY CHRONIC VALUES. If all 8 minimum data requirements for calculating FCVs in sub. (1)(a) are not met for a substance, secondary chronic values (SCVs) shall be calculated for that substance using the procedure in this subsection.

(a) If any one of the combinations of information in subds. 1. to 3. is available, a SCV may be calculated. To calculate a SCV for a substance, the acute value from subds. 1. to 3. is divided by the applicable acute–chronic ratio in the same subdivision.

1. Calculate a FAV using the procedure in s. NR 105.05(2) and divide it by a secondary acute–chronic ratio (SACR) using the procedure in sub. (7).

2. Calculate a SAV using the procedure in s. NR 105.05 (4) and divide it by a final acute–chronic ratio (FACR) using the procedure in sub. (5).

3. Calculate a SAV using the procedure in s. NR 105.05 (4) and divide it by a SACR using the procedure in sub. (7).

(b) If appropriate, the SCV shall be made a function of a water quality characteristic in a manner similar to that described in sub. (4) (a).

(c) If, for a commercially, recreationally or ecologically important species, the SMCV is lower than the calculated SCV, that SMCV shall be used as the SCV instead of the calculated SCV.

(d) If there is an FPV available using the procedure in s. NR 105.11 which is lower than the calculated SCV, that FPV shall be used as the SCV instead of the calculated SCV.

(7) SECONDARY ACUTE–CHRONIC RATIOS. (a) If a FACR cannot be calculated using the procedure in sub. (5) because SMACRs are not available for a fish, an invertebrate or an acutely sensitive freshwater species, a secondary acute–chronic ratio (SACR) may be calculated using the procedure in this subsection.

(b) The SACR shall be equal to the geometric mean of 3 acute–chronic ratios. Those ratios consist of the SMACRs available for the species in sub. (5)(c). When SMACRs are not available for the species in par. (a), the default acute–chronic ratio to be used is 18. Use of a SACR will result in the calculation of a secondary chronic value.

(8) CHRONIC TOXICITY CRITERIA EXPRESSED IN THE DISSOLVED FORM. Chronic water quality criteria may be expressed as a dissolved concentration. The conversion of a chronic water quality criterion expressed as a total recoverable concentration to a chronic water quality criterion expressed as a dissolved concentration, the portion of the substance which will pass through a 0.45 um filter, shall be done using the equations in pars. (a) and (b). Substances which may have criteria expressed as a dissolved concentration are listed in par. (a) with corresponding conversion factors.

(a) The conversion of the water quality criterion expressed as total recoverable ($WQC_{Total\ R.}$) to the water quality criterion expressed as dissolved (WQC_D) shall be performed as follows:

$$WQC_D = (CF)(WQC_{Total\ R.})$$

Where: $WQC_{Total\ R.}$ = Criteria from NR 105, Table 5 or 6.

CF = Conversion factor for total recoverable to dissolved.

Conversion factors are as follows:

Arsenic	1.000
Cadmium	0.850
Chromium (III)	0.860
Chromium (VI)	0.962
Copper	0.960
Lead	0.792
Nickel	0.997
Selenium	0.922
Zinc	0.986

(b) The translation of the WQC_D into the water quality criterion which accounts for site–specific conditions (WQC_{TRAN}) shall be performed as follows:

$$WQC_{TRAN} = (Translator)(WQC_D)$$

Where: Translator (unitless) = $((M_P)(TSS) + M_D)/M_D$

M_P = Particle–bound concentration of the pollutant (ug/g) in receiving water.

M_D = Dissolved concentration of the pollutant in receiving water (ug/L).

TSS = Total Suspended Solids (g/L) concentration in receiving water.

(c) The procedures in pars. (a) and (b) may also be used for the conversion of secondary values from total recoverable to dissolved.

Table 1
Acute Toxicity Criteria for Substances With Toxicity Unrelated to Water Quality
(in ug/L except where indicated)

Substance	Cold Water	Warm Water Sportfish, Warm Water Forage, and Limited Forage Fish	Limited Aquatic Life
Arsenic (+3)*	339.8	339.8	339.8
Chromium (+6)*	16.02	16.02	16.02
Mercury (+2)*	0.83	0.83	0.83
Cyanide, free	22.4	45.8	45.8
Chlorine*	19.03	19.03	19.03
Gamma – BHC	0.96	0.96	0.96
Dieldrin	0.24	0.24	0.24
Endrin	0.086	0.086	0.12
Toxaphene	0.73	0.73	0.73
Chlorpyrifos	0.041	0.041	0.041
Parathion	0.057	0.057	0.057

Note: * – Criterion listed is applicable to the "total recoverable" form except for chlorine which is applicable to the "total residual" form.

Table 2
Acute Toxicity Criteria for Substances With Toxicity Related to Water Quality
(all in ug/L)

Water Quality Parameter: Hardness (in ppm as $CaCO_3$)

$ATC=e^{(V \text{ in hardness}) + \ln ACI)}$

Substance	V	ln ACI	ATC at Various Hardness (pm) Levels 50	100	200
Total Recoverable Cadmium:					
Cold Water	1.147	–3.8104	1.97	4.36	9.65
Warm Water Sportfish, Warm Water Forage and Limited Forage Fish	1.147	–2.9493	4.65	10.31	22.83
Limited Aquatic Life	1.147	–1.9195	13.03	28.87	63.92
Total Recoverable Chromium (+3):					
All Surface Waters	0.819	3.7256	1022	1803	3181
Total Recoverable Copper:					
All Surface Waters	0.8561	–1.1199	9.29	16.82	30.45
Total Recoverable Lead:					
All Surface Waters	0.9662	0.2226	54.73	106.92	208.90
Total Recoverable Nickel:					
All Surface Waters	1.083	2.2289	642.7	1361	2434
Total Recoverable Zinc:					
All Surface Waters	0.8745	0.7634	65.66	120.4	220.7

Water Quality Parameter: pH

$ATC = e^{(V(pH) + \ln ACI)}$

Substance	V	ln ACI	506.5	7.8	8.8
Pentachlorophenol:					
All Surface Waters	1.0054	–4.877	5.25	19.40	53.01

Table 2A

Water Quality Parameter Ranges for Substances With Acute Toxicity Related to Water Quality

Substance	Parameter	Applicable Range
Cadmium	Hardness (ppm)	6 – 457
Chromium (+3)	Hardness (ppm)	13 – 301
Copper	Hardness (ppm)	14 – 427
Lead	Hardness (ppm)	12 – 356
Nickel	Hardness (ppm)	19 – 157
Zinc	Hardness (ppm)	12 – 333
Pentachlorophenol	pH (s.u.)	6.6 – 8.8

Table 2B

Secondary Acute Factors

Number of minimum data requirements satisfied	Adjustment factor
1	21.9
2	13.0
3	8.0
4	7.0
5	6.1
6	5.2
7	4.3

Table 3

Chronic Toxicity Criteria for Substances With Toxicity Unrelated to Water Quality(all in ug/L)

Substance	Cold Water	Warm Water Sportfish, Warm Water Forage and Limited Forage Fish	Limited Aquatic Life
		(Reserved)	

Note: This table is reserved for criteria that USEPA has indicated may be available in the near future.

Table 4

Chronic Toxicity Criteria for Substances With Toxicity Unrelated to Water Quality (all in ug/L)

Water Quality Parameter: Hardness (in ppm as $CaCO_3$

$CTC=e^{(V \ln(hardness) + \ln CCI)}$

Substance	V	ln CCI	CTC at Various Hardness (ppm) Levels 50	100	175
Total Recoverable Cadmium:					
All Surface Waters	0.7852	–2.7150	1.43	2.46	3.82

Table 4A

Water Quality Parameter Ranges for Substances With Chronic Toxicity Related to Water Quality

Substance	Parameter	Applicable Range
Cadmium	Hardness (ppm)	18–175

Table 5

Chronic Toxcity Criteria Using Acute–Chronic Ratios for Substances with Toxicity Unrelated to Water Quality (all in ug/L)

Substance	Cold Water	Warm Water Sportfish, Warm Water Forage and Limited Forage Fish	Limited Aquatic Life
Arsenic (+3)*	148	152.2	152.2
Chromium (+6)*	10.98	10.98	10.98
Mercury (+2)*	0.44	0.44	0.44
Cyanide, free	5.22	11.47	11.47
Chlorine*	7.28	7.28	7.28
Dieldrin	0.055	0.077	0.077
Endrin	0.072	0.072	0.10
Parathion	0.011	0.011	0.011

Note: * Criterion listed is applicable to the "total recoverable" form except for chlorine which is applicable to the "total residual" form.

Table 6

Chronic Toxicity Criteria Using Acute–Chronic Ratios for Substances With Toxicity Related to Water Quality (all in ug/L)

Water Quality Parameter: Hardness (in ppm as $CaCO_3$)

$CTC=e^{(V\ \ln(hardness) + \ln CCI)}$

Substance	V	ln CCI	CTC at Various Hardness (ppm) Levels 50	100	200
Total Recoverable Chromium (+3):					
Cold Water	0.819	0.6851	48.86	86.21	152.1
Warm Water Sportfish	0.819	1.112	74.88	132.1	233.1
All others	0.819	1.112	74.88	132.1	233.1
Total Recoverable Copper:					
All Surface Waters	0.8561	−1.4647	6.58	11.91	21.57
Total Recoverable Lead:					
All Surface Waters	0.9662	−1.1171	14.33	28.01	54.71
Total Recoverable Nickel:					
All Surface Waters	1.083	0.033	71.50	151.5	270.8
Total Recoverable Zinc					
All Surface Waters	0.8745	0.7634	65.66	120.4	220.7

Water Quality Parameter: pH

$CTC=e^{(V(pH) + \ln CCI)}$

Substance	V	ln CCI	CTC at Various pH (s.u.) Levels 6.5	7.8	8.8
Pentachlorophenol:					
Cold Water	1.0054	−5.1468	4.43	14.81	40.48
All Other Surface Waters	1.0054	−4.9617	5.33	12.82	48.70

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; am. (5) (f) and Tables 2, 2a, 4, 4a and 6, Register, July, 1995, No. 475, eff. 8–1–95; am. (1) (a) 1., 2., 4., and 5., (1) (b), (3) (intro.), (a) to (g), (4) (a) 1., 7. to 13., (5) (c), renum. (1) (a) 6. to be (1) (a) 10., (3) (h) to be (3) (i) and am. (1) (a) 10, (4) (a) 6. to be (4) (a) 6. a., (4) (b) to be (4) (c), (5) (e) to (i) to be (5) (d) to (h) and am. (5) (e) to (g), cr. (3) (h), (4) (a) 6. b., (4) (b), (5) (b) 3., (6) to (8), r. and recr., Tables 1 to 2a, 3 to 6, r. (5) (d).

NR 105.07 Wildlife criteria. (1) The wildlife criterion is the concentration of a substance which if not exceeded protects Wisconsin's wildlife from adverse effects resulting from ingestion of surface waters of the state and from ingestion of aquatic organisms taken from surface waters of the state.

(a) For any substance not shown in Table 7, the wildlife criterion (WC) is the lower of the available mammalian or avian wildlife values (WVs) calculated pursuant to sub. (2). A wildlife criterion protective of Wisconsin's reptile fauna may be calculated pursuant to sub. (2) whenever data specific to reptiles are available.

(b) Table 7 contains the wildlife criteria calculated according to the procedures of this chapter.

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Table 7

Wildlife Criteria

Substance	Criteria (in ng/L, except where indicated)
DDT & Metabolites	0.011
Mercury	1.3
Polychlorinated Biphenyls	0.12
2,3,7,8 – TCDD	0.003 (pg/L)

(2) (a) Mammalian and avian wildlife values shall be calculated as follows using information available from scientifically acceptable studies of animal species exposed repeatedly to the substance via oral routes including gavage:

$$WV = \frac{NOAEL \times Wt_A \times SSF}{W + \Sigma[F_{TLi} \times BAF_{TLi}]}$$

Where:

WV= Wildlife value in milligrams per liter (mg/L).

NOAEL= No observed adverse effect level in milligrams of substance per kilogram of body weight per day (mg/kg–d) as derived from subchronic or chronic mammalian or avian studies or as specified in subs. (3) to (5).

Wt= Average weight in kilograms (kg) of the representative species.

W= Average daily volume of water in liters consumed per day (L/d) by the representative species or as specified in sub. (6).

SSF= Species sensitivity factor, ranging between 0.01 and 1 to account for interspecies differences in sensitivity.

F_{TLJ}= Average daily amount of food consumed from trophic level i by the representative species in kilograms per day (kg/d) or as specified in sub. (6).

BAF_{TLJ}= Bioaccumulation factor for wildlife food in trophic level i with units of liter per kilogram (L/kg) as derived in s. NR 105.10. For consumption of piscivorous birds by other birds (e.g., herring gull by eagles), the BAF is derived by multiplying the trophic level 3 BAF for fish by a biomagnification factor to account for the biomagnification from fish to the consumed birds.

(b) The selection of the species sensitivity factor (SSF) shall be based on the available toxicological data base and available physicochemical and toxicokinetic properties of the substance and the amount and quality of available data.

(c) The bald eagle, kingfisher, herring gull, mink and otter are representative of avian and mammalian species to be protected by wildlife criteria. A NOAEL specific to each taxonomic class is used to calculate WVs for each of the 5 representative species. The avian WV is the geometric mean of the WVs calculated for the 3 representative avian species. The mammalian WV is the geometric mean of the WVs calculated for the 2 representative mammalian species.

(d) In those cases in which more than one NOAEL is available, the following shall apply:

1. If more than one NOAEL is available within a taxonomic class, based on the same endpoint of toxicity, the NOAEL from the most sensitive species shall be used.

2. If more than one NOAEL is available for a given species, based on the same enpoint of toxicity, the NOAEL for that species shall be calculated using the geometric mean of those NOAELs.

(e) Because wildlife consume fish from both trophic levels 3 and 4, baseline BAFs shall be available for both trophic levels 3 and 4 to calculate either a criterion or secondary value for a chemical. When appropriate, ingestion through consumption of invertebrates, plants, mammals and birds in the diet of wildlife species to be protected shall be included.

(3) In those cases in which a no observed adverse effect level (NOAEL) is available from studies of mammalian or avian species exposed repeatedly to the substance via oral routes including gavage, but is available in units other than mg/kg–d as specified in sub. (2), the following procedures shall be used to express the NOAEL prior to calculating the wildlife value:

(a) If the NOAEL is given in milligrams of toxicant per liter of water consumed (mg/L), the NOAEL shall be multiplied by the daily average volume of water consumed by the test animals in liters per day (L/d) and divided by the average weight of the test animals in kilograms (kg).

(b) If the NOAEL is given in milligrams of toxicant per kilogram of food consumed (mg/kg), the NOAEL shall be multiplied by the average amount of food in kilograms consumed daily by the test animals (kg/d) and divided by the average weight of the test animals in kilograms (kg).

(4) In those cases in which a NOAEL is unavailable and a lowest observed adverse effect level (LOAEL) is available from studies of animal species exposed repeatedly to the substance via oral routes including gavage, the LOAEL may be substituted with proper adjustment to estimate the NOAEL. An uncertainty factor of between one and 10 may be applied to the LOAEL, depending on the sensitivity of the adverse effect, to reduce the LOAEL into the range of a NOAEL. If the LOAEL is available in units other than mg/kg–d, the LOAEL shall be expressed in the same manner as that specified for the NOAEL in sub. (3).

(5) In instances where a NOAEL is based on subchronic data, an uncertainty factor may be applied to extrapolate from subchronic to chronic levels. The value of the uncertainty factor may not be less than 0.1 and may not exceed 1.0. This factor is to be used when assessing highly bioaccumulative substances where toxicokinetic considerations suggest that a bioassay of limited length underestimates chronic effects.

(6) If drinking or feeding rates are not available for representative species, drinking (W) and feeding rates (F_{TLi}) shall be calculated for representative mammalian or avian species by using the allometric equations given in pars. (a) and (b).

(a) For mammalian species the allometric equations are as follows:

1. $F_{TLi} = 0.0687 \times (Wt)^{0.82}$

Where: F_{TLi} = Feeding rate of mammalian species in kilograms per day (kg/d).

Wt = Average weight in kilograms (kg) of the test animals.

2. $W = 0.099 \times (Wt)^{0.90}$

Where: W = Drinking rate of mammalian species in liters per day (L/d).

Wt = Average weight in kilograms (kg) of the test animals.

(b) For avian species the allometric equations are as follows:

1. $F_{TLi} = 0.0582\ (Wt)^{0.65}$

Where: F_{TLi} = Feeding rate of avian species in kilograms per day (kg/d).

Wt = Average weight in kilograms (kg) of the test animals.

2. $W = 0.059 \times (Wt)^{0.67}$

Where: W = Drinking rate of avian species in liters per day (L/d).

Wt = Average weight in kilograms (kg) of the test animals.

Note: Criteria to protect domestic animals will be considered on an as needed basis using a model that accounts for domestic animal exposure through drinking water. Because domestic animals do not regularly consume aquatic organisms, the wildlife exposure model is not appropriate.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; am. table 7, Register, July, 1991, No. 427, eff. 8–1–91; am. (1), (2) (a), (b), (3) (intro.), (6) (intro.), r. and recr. (2) (c), (5), cr. (2) (d), (e), r. (6) (a), renum. (6) (b) and (c) to be (6) (a) and (b) and am., Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.08 Human threshold criteria. (1) The human threshold criterion (HTC) is the maximum concentration of a substance established to protect humans from adverse effects resulting from contact with or ingestion of surface waters of the state and from ingestion of aquatic organisms taken from surface waters of the state. Human threshold criteria are derived for those toxic substances for which a threshold dosage or concentration can be estimated below which no adverse effect or response is likely to occur.

(2) For noncarcinogenic components of mixtures in effluents, interactions among substances may be additive, antagonistic or synergistic and may be accounted for by a model that is supported by credible scientific evidence. The risks are assumed to be additive when substances are members of the same structural class and cause potential adverse effects via the same mechanism of action, influencing the same kind of endpoint, and shall be accounted for by a model that is supported by credible scientific evidence.

(3) Human threshold criteria are listed in Table 8. Criteria for the same substance may be different depending on the surface water classification, due to the lipid value of representative fish, a component of the BAF, and whether or not the water may be a source of drinking water. Further application of these criteria to protect drinking water and downstream uses in the Great Lakes system shall be according to s. NR 106.06 (1)

(4) To derive human threshold criteria for substances not included in Table 8 the following methods shall be used:

(a) The human threshold criterion shall be calculated as follows:

$$HTC = \frac{ADE \times 70\ kg \times RSC}{W_H + (F_H \times BAF)}$$

Where: HTC = Human threshold criterion in milligrams per liter (mg/L).

ADE = Acceptable daily exposure in milligrams toxicant per kilogram body weight per day (mg/kg–d) as specified in sub. (5).

70 kg = Average weight of an adult male in kilograms (kg).

RSC = Relative source contribution factor used to account for routes of exposure other than consumption of contaminated water and aquatic organisms. In the absence of sufficient data on alternate sources of exposure, including but not limited to non–fish diet and inhalation, the relative source contribution factor shall be set equal to 0.8.

W_H = Average per capita daily water consumption of 2 liters per day (L/d) for surface waters classified as public water supplies or, for all other surface waters, 0.01 liters per day (L/d) for exposure through body contact or ingestion of small volumes of water during swimming or other recreational activities.

F_H = Average per capita daily consumption of sport–caught fish by Wisconsin anglers equal to 0.02 kilograms per day (kg/d).

BAF = Aquatic organism bioaccumulation factor with units of liter per kilogram (L/kg) as derived in s. NR 105.10.

Table 8
Human Threshold Criteria
(ug/L unless specified otherwise)

Substance	Public Water Supply: Warm Water Sport Fish Communities	Public Water Supply: Cold Water[4] Communities	Non–public Water Supply: Warm Water Forage, Limited Forage, and Warm Water Sport Fish Communities	Non–public Water Supply: Cold Water Communities	Non–public Water Supply: Limited Aquatic Life
Acrolein	7.2	3.4	15	4.4	2800
Antimony[2]	10	10	2200	2200	2200
Benzene[2]	5	5	610	260	4000
Bis(2–chloroisopropyl) ether	1100	1100	55000	34000	220000
Cadmium[2]	10	10	1200	1200	2800
*Chlordane (ng/L)	2.4	0.70	2.4	0.70	310000
Chlorobenzene[2]	100	100	4900	1600	110000
Chromium (+3)	28000	28000	2500000	2500000	5600000
Chromium (+6)	140	140	13000	13000	28000
Cyanide, Total[2]	200	200	40000	40000	120000
*4,4'–DDT (ng/L)	3.0	0.88	3.0	0.88	2800000
1,2–Dichlorobenzene[2]	600	600	6400	1900	500000
1,3–Dichlorobenzene	1400	710	3300	1000	500000
cis–1,2–Dichloroethene[2]	70	70	14000	9000	56000
trans–1,2–Dichloroethene[2]	100	100	24000	13000	110000
Dichloromethane[2] (methylene chloride)	5	5	95000	72000	328000
2,4–Dichlorophenol	74	58	580	180	17000
Dichloropropenes[3] (1,3–Dichloropropene)	8.3	8.2	420	260	1700
*Dieldrin (ng/L)	0.59	0.17	0.59	0.17	280000
2,4–Dimethylphenol	450	430	11000	4500	94000
Diethyl phthalate[2]	5000	5000	68000	21000	4500000
Dimethyl phthalate (mg/L)	241	184	1680	530	56000
4,6–Dinitro–o–cresol	100	96	1800	640	22000
Dinitrophenols[3] (2,4–Dinitrophenol)	55	55	2800	1800	11000
2,4–Dinitrotoluene	0.51	0.48	13	5.3	110
Endosulfan	87	41	181	54	33600
Ethylbenzene[2]	700	700	12000	3700	560000
Fluoranthene	890	610	4300	1300	220000
*Hexachlorobenzene	0.075	0.022	0.075	0.022	4500
Hexachlorocyclopentadiene	50	50	980	310	39000
Hexachloroethane	8.7	3.3	13	3.7	5600
*gamma–BHC (lindane)	0.20	0.20	0.84	0.25	1900
Isophorone	5500	5300	180000	80000	1100000
Lead	10	10	140	140	2240
*Mercury[5]	0.0015	0.0015	0.0015	0.0015	336
Nickel[2]	100	100	43000	43000	110000
*Pentachlorobenzene	0.46	0.14	0.47	0.14	4500
Selenium[2]	50	50	2600	2600	28000
Silver	140	140	28000	28000	28000
*2,3,7,8–TCDD (pg/L)	0.11	0.032	0.11	0.032	7300
*1,2,4,5–Tetrachlorobenzene	0.54	0.17	0.58	0.17	1700
Tetrachloroethene	5.8	4.6	46	15	1300
Toluene[2]	1000	1000	760100	26000	1200000
1,1,1–Trichloroethane[2]	200	200	270000	110000	2000000
2,4,5–Trichlorophenol	1600	830	3900	1200	560000

* Indicates substances that are BCCs.

[1] A human threshold criterion expressed in micrograms per liter (ug/L) can be converted to milligrams per liter (mg/L) by dividing the criterion by 1000.

[2] For this substance the human threshold criteria for public water supply receiving water classifications equal the maximum contaminant level pursuant to s. NR 105.08 (3) (b).

[3] The human threshold criteria for this chemical class are applicable to each isomer.

4 For BCCs, these criteria apply to all water of the Great Lakes system.

[5] The mercury criteria were calculated using 20 g/day fish consumption and the human non–cancer criteria derivation procedure in 40 CFR Part 132, Appendix C. For these criteria, 40 CFR Part 132, Appendix C as stated on September 1, 1997 is incorporated by reference.

(b) For surface waters classified as public water supplies, if the human threshold criterion for a toxic substance as calculated in par. (a) exceeds the maximum contaminant level (MCL) for that substance as specified in ch. NR 809 or the July 8, 1987 Federal Register (52 FR 25690), the MCL shall be used as the human threshold criterion.

(5) The acceptable daily exposure (ADE) referenced in sub. (4) represents the maximum amount of a substance which if ingested daily for a lifetime results in no adverse effects to humans. Paragraphs (a) to (c) list methods for determining the acceptable daily exposure.

(a) The department shall review available references for acceptable daily exposure or equivalent values, such as a reference dose (RfD) as used by the U.S. environmental protection agency, and for human or animal toxicological data from which an acceptable daily exposure can be derived. Suitable references for review include, but are not limited to, those presented in s. NR 105.04 (5).

(b) When human or animal toxicological data are available, the department may derive an acceptable daily exposure by using as guidance procedures presented by the U.S. environmental protection agency in "Water Quality Criteria Documents; Availability" (45 FR 79318, November 28, 1986). Additional guidance for deriving acceptable daily exposures from toxicological data are given in subds. 1 to 4. Alternate procedures may be used if supported by credible scientific evidence.

1. No observable adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) from studies of humans or mammalian test species shall be divided by an uncertainty factor to derive an acceptable daily exposure. Uncertainty factors reflect uncertainties in predicting acceptable exposure levels for the general human population based upon experimental animal data or limited human data. Factors to be considered when selecting an uncertainty factor include, but are not limited to, interspecies and individual variations in response and susceptibility to a toxicant, and the quality and quantity of the available data. The following guidelines shall be considered when selecting an uncertainty factor:

a. Use an uncertainty factor of 10 when extrapolating from valid experimental results from studies on prolonged ingestion by humans. This 10–fold factor protects sensitive members of the human population.

b. Use an uncertainty factor of 100 when extrapolating from valid results of long–term feeding studies on experimental animals with results of studies of human ingestion not available or insufficient (e.g., acute exposure only). This represents an additional 10–fold uncertainty factor in extrapolating data from the average animal to the average human.

c. Use an uncertainty factor of 1000 when extrapolating from less than chronic results on experimental animals with no useful long–term or acute human data. This represents an additional 10–fold uncertainty factor in extrapolating from less than chronic to chronic exposures.

d. Use an additional uncertainty factor of between 1 and 10 depending on the severity of the adverse effect when deriving an acceptable daily exposure from a lowest observable adverse effect level (LOAEL). This uncertainty factor reduces the LOAEL into the range of a no observable adverse effect level (NOAEL).

e. Use an additional uncertainty factor of 10 when deriving an acceptable daily exposure for a substance which the U.S environmental protection agency classifies as a "group C" carcinogen, but which is not defined as a carcinogen in s. NR 105.03 (13).

2. Results from studies of humans or mammalian test species used to derive acceptable daily exposures shall have units of milligrams of toxicant per kilogram of body weight per day (mg/kg–d). When converting study results to the required units, a water consumption of 2 liters per day (L/d) and a body weight of 70 kilograms (kg) is assumed for humans. The following examples and procedures illustrate the conversion of units:

a. Results from human studies which are expressed in milligrams of toxicant per liter of water consumed (mg/L) are converted to mg/kg–d by multiplying the results by 2 L/d and dividing by 70 kg.

b. Results from animal studies which are expressed in milligrams of toxicant per liter of water consumed (mg/L) are converted to mg/kg–d by multiplying the results by the daily average volume of water consumed by the test animals in liters per day (L/d) and dividing by the average weight of the test animals in kilograms (kg).

c. Results from animal studies which are expressed in milligrams of toxicant per kilogram of food consumed (mg/kg) are converted to mg/kg–d by multiplying the results by the average amount of food consumed daily by the test animals in kilograms per day (kg/d) and dividing by the average weight of the test animals in kilograms (kg).

d. If a study does not specify water or food consumption rates, or body weight of the test animals, standard values taken from appropriate references, such as the National Institute of Occupational Safety and Health, 1980, Registry of Toxic Effects of Chemical Substances, may be used to convert units.

e. Results from animal studies in which test animals were not exposed to the toxicant each day of the test period shall be multiplied by the ratio of days that the test animals were dosed to the total days of the test period. For the purposes of this adjustment, the test period is defined as the interval beginning with the administration of the first dose and ending with the administration of the last dose, inclusive.

3. When assessing the acceptability and quality of human or animal toxicological data from which an acceptable daily exposure can be derived, the department may use the following documents as guidance:

a. "Guidelines for Mutagenicity Risk Assessment", (51 FR 34006, September 24, 1986).

b. "Guidelines for the Health Risk Assessment of Chemical Mixtures", (51 FR 34014, September 24, 1986).

c. "Guidelines for the Health Assessment of Suspect Development Toxicants", (51 FR 34028, September 24, 1986).

d. "Guidelines for Exposure Assessment", (51 FR 34042, September 24, 1986).

e. Any other documents that the department deems reliable.

4. When the available human or animal toxicological data contains conflicting information, the department may consult with experts outside of the department for guidance in the selection of the appropriate data.

(c) Using sound scientific judgment, the department shall select an acceptable daily exposure as derived in pars. (a) and (b) for calculation of the human threshold criterion. When selecting an acceptable daily exposure, the department shall adhere to the following guidelines unless a more appropriate procedure is supported by credible scientific evidence:

1. Acceptable daily exposures based on human studies are given preference to those based on animal studies.

2. When deriving an acceptable daily exposure from animal studies preference is given to chronic studies involving oral routes of exposure, including gavage, over a significant portion of the animals' life span. If acceptable studies using oral exposure routes are not available, acceptable daily exposures derived from studies using alternate exposure routes, such as inhalation, may be used.

3. When 2 or more acceptable daily exposure values are available and have been derived from studies having equal preference as defined in subds. 1. and 2., the lowest acceptable daily exposure is generally selected. If the acceptable daily exposure values differ significantly, the department may consult with experts outside of

the department for guidance in the selection of the more appropriate acceptable daily exposure.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; correction in (3) (b) made under s. 13.93 (2m) (b) 7., Stats., Register, September, 1995, No. 477; renum. (2) to (4) to be (3) to (5) and am., cr. (2), r. and recr. Table 8, am. (5) (intro.), 1. (intro.), d., e., 2 (intro.) and (c) and am., Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.09 Human cancer criteria. (1) The human cancer criterion (HCC) is the maximum concentration of a substance or mixture of substances established to protect humans from an unreasonable incremental risk of cancer resulting from contact with or ingestion of surface waters of the state and from ingestion of aquatic organisms taken from surface waters of the state. Human cancer criteria are derived for those toxic substances which are carcinogens as defined in s. NR 105.03 (13).

(2) For any single carcinogen or any mixture of carcinogens the incremental cancer risk from exposure to surface waters and aquatic organisms taken from surface waters may not exceed one in 100,000. The combined cancer risk of individual carcinogens in a mixture is assumed to be additive unless an alternate model is supported by credible scientific evidence.

(3) Human cancer criteria are listed in Table 9. Criteria for the same substance may be different depending on the surface water classification, due to the lipid value of representative fish, a component of the BAF, and whether or not the water may be a source of drinking water. Further application of these criteria to protect drinking water and downstream uses in the Great Lakes system shall be according to s. NR 106.06 (1).

Table 9
Human Cancer Criteria
(ug/L unless specified otherwise[1])

	Public Water Supply		Non–public Water Supply		
Substance	Warm Water Sport Fish Communities	Cold Water[4] Communities	Warm Water Forage, Limited Forage, and Warm Water Sport Fish Communities	Cold Water Communities	Limited Aquatic Life
Acrylonitrile	0.57	0.45	4.6	1.5	130
Arsenic[2]	0.185	0.185	50	50	50
*alpha–BHC	0.012	0.0037	0.013	0.0039	11
*gamma–BHC (lindane)	0.052	0.018	0.064	0.019	54
*BHC, technical grade	0.038	0.013	0.047	0.014	39
Benzene[2]	5	5	140	45	1300
Benzidine (ng/L)	1.5	1.5	81	55	300
Beryllium	0.054	0.054	0.33	0.33	16
Bis(2–chloroethyl) ether	0.31	0.29	7.6	3.0	64
Bis(chloromethyl) ether (ng/L)	1.6	1.6	96	79	320
Carbon tetrachloride	2.5	2.1	29	9.5	540
*Chlordane (ng/L)	0.41	0.12	0.41	0.12	54000
Chloroethene (vinyl chloride)	0.18	0.18	10	6.8	37
Chloroform (trichloromethane)	55	53	1960	922	11200
*4,4[1]–DDT (ng/L)	0.22	0.065	0.22	0.065	206000
1,4–Dichlorobenzene	14	12	163	54	2940
3,3[1]–Dichlorobenzidine	0.51	0.29	1.5	0.46	154
1,2–Dichloroethane	3.8	3.8	217	159	770
Dichloromethane[2] (methylene chloride)	5	5	2700	2100	9600
*Dieldrin (ng/L)	0.0091	0.0027	0.0091	0.0027	4400
2,4–Dinitrotoluene	0.51	0.48	13	5.3	110
1,2–Diphenylhydrazine	0.38	0.31	3.3	1.04	88
Halomethanes[3]	55	53	1960	922	11200
*Hexachlorobenzene (ng/L)	0.73	0.22	0.73	0.22	44000
*Hexachlorobutadiene	0.59	0.19	0.69	0.2	910
Hexachloroethane	7.7	2.9	11	3.3	5000
N–Nitrosodiethylamine (ng/L)	2.3	2.3	150	140	460
N–Nitrosodimethylamine	0.0068	0.0068	0.46	0.46	1.4
N–Nitrosodi–n–butylamine	0.063	0.062	2.5	1.3	13
N–Nitrosodiphenylamine	44	23	116	34	13
N–Nitrosopyrrolidine	0.17	0.17	11	11	34
*Polychlorinated biphenyls (ng/L)	0.01	0.003	0.01	0.003	9100
*2,3,7,8–Tetrachlorodibenzo–p–dioxin (pg/L)	0.014	0.0041	0.014	0.0041	930
1,1,2,2–Tetrachloroethane	1.7	1.6	52	22	350
Tetrachloroethene	5.8	4.6	46	15	1300
*Toxaphene (ng/L)	0.11	0.034	0.14	0.034	63600
1,1,2–Trichloroethane[2]	6.0	6.0	195	87	1200
Trichloroethene[2]	5	5	539	194	6400
2,4,6–Trichlorophenol	29	24	30	97	6400

* Indicates substances that are BCCs.

1 A human cancer criterion expressed in micrograms per liter (ug/L), nanograms per liter (ng/L) or picograms per liter (pg/L) can be converted to milligrams per liter (mg/L) by dividing the criterion by 1000, 1,000,000 or 1,000,000,000, respectively.

2 For this substance the human cancer criteria for public water supply receiving water classifications equal the maximum contaminant level pursuant to s. NR 105.09 (4) (b).

3 Human cancer criteria for halomethanes are applicable to any combination of the following chemicals: bromomethane (methyl bromide), chloromethane (methyl chloride), tribromomethane (bromoform), bromodichloromethane (dichloromethyl bromide), dichlorodifluoromethane (fluorocarbon 12) and trichlorofluoromethane (fluorocarbon 11).

4 For BCCs, these criteria apply to all waters of the Great Lakes system.

(4) To derive human cancer criteria for substances not included in Table 9 the following methods shall be used:

(a) The human cancer criterion shall be calculated as follows:

$$HCC = \frac{RAD \times 70\ kg}{W_H + (F_H \times BAF)}$$

Where:

HCC = Human cancer criterion in milligrams per liter (mg/L).

RAD = Risk associated dose in milligrams toxicant per kilogram body weight per day (mg/kg–d) that is associated with a lifetime incremental cancer risk equal to one in 100,000 as derived in sub. (5).

70 kg = Average weight of an adult male in kilograms (kg).

W_H = Average per capita daily water consumption of 2 liters per day (L/d) for surface waters classified as public water supplies or, for other surface waters, 0.01 liters per day (L/d) for exposure through contact or ingestion of small volumes of water during swimming or during other recreational activities.

F_H = Average per capita daily consumption of sport–caught fish by Wisconsin anglers equal to 0.02 kilograms per day (kg/d).

BAF = Aquatic life bioaccumulation factor with units of liter per kilogram (L/kg) as derived in s. NR 105.10.

(b) For surface waters classified as public water supplies, if the human cancer criterion for a toxic substance as calculated in par. (a) exceeds the maximum contaminant level (MCL) for that substance as specified in ch. NR 809 or the July 8, 1987 Federal Register (52 FR 25690), the MCL shall be used as the human cancer criterion.

(5) The risk associated dose (RAD) referenced in sub. (4) represents the maximum amount of a substance which if ingested daily for a lifetime of 70 years has an incremental cancer risk equal to one case of human cancer in a population of 100,000. Methods for deriving the risk associated dose are specified in pars. (a) to (d).

(a) The department shall review available references for acceptable human and animal studies from which the risk associated dose can be derived. The department shall use sound scientific judgment when determining the acceptability of a study and may use the U.S. environmental protection agency's "Guidelines for Carcinogen Risk Assessment" (FR 51 33992, September 24, 1986) as guidance for judging acceptability. Suitable references for review include, but are not limited to, those presented in s. NR 105.04 (5).

(b) If an acceptable human epidemiologic study is available, contains usable exposure data, and indicates a carcinogenic effect, the risk associated dose shall be set equal to the lifetime average exposure which would produce an incremental cancer risk of one in 100,000 based on the exposure information from the study and assuming the excess cancer risk is proportional to the lifetime average exposure. If more than one human epidemiologic study is judged to be acceptable, the most protective risk associated dose derived from the studies is generally used to calculate the human cancer criterion. If the risk associated dose values differ significantly, the department may consult with experts outside of the department for guidance in the selection of the more appropriate value.

(c) In the absence of an acceptable human epidemiologic study, the risk associated dose shall be derived from available studies which use mammalian test species and which are judged acceptable. Methods for deriving the risk associated dose are specified in subds. 1. to 4.

1. A linear, non–threshold dose–response relationship as applied by the U.S. environmental protection agency in "Water Quality Criteria Documents; Availability" (45 FR 79318, November 28, 1980) shall be assumed unless a more appropriate dose–response relationship or extrapolation model is supported by credible scientific evidence.

Note: The linear non–threshold dose–response model used by the U.S. environmental protection agency provides an upper–bound estimate (i.e., the one–sided 95% upper confidence limit) of incremental cancer risk. The true cancer risk is unknown. While the true cancer risk is not likely to be greater than the upper bound estimate, it may be lower.

2. When a linear, non–threshold dose–response relationship is assumed, the risk associated dose shall be calculated using the following equation:

$$RAD = \frac{1}{q_1^*} \times 0.00001$$

Where:

RAD = Risk associated dose in milligrams toxicant per kilogram body weight per day (mg/kg–d).

0.00001 = Incremental risk of human cancer equal to one in 100,000.

q_1^* = Upper 95% confidence limit (one–sided) of the carcinogenic potency factor in days per milligram toxicant per kilogram body weight (d–kg/mg) as derived from the procedures referenced in subd. 1. and the guidance presented in subd. 3.

3. The department shall adhere to the following guidance for deriving carcinogenic potency factors, or corresponding values if an alternate dose–response relationship or extrapolation model is used, unless more appropriate procedures are supported by credible scientific evidence:

a. If 2 or more mammalian studies are judged acceptable, but vary in either species, strain or sex of the test animals, or in tumor type or site, the study giving the greatest carcinogenic potency factor shall be used. Studies which produce a spuriously high carcinogenic potency factor due to the use of a small number of test animals may be excluded.

b. If 2 or more mammalian studies are judged acceptable, are comparable in size and are identical in regard to species, strain and sex of the test animals and to tumor sites, the geometric mean of the carcinogenic potency factors derived from each study shall be used.

c. If in an acceptable study, tumors were induced at more than one site, the number of animals with tumors at one or more of the sites shall be used as incidence data when deriving the cancer potency factor.

d. The combination of benign and malignant tumors shall be used as incidence data when deriving the cancer potency factor.

e. Calculation of an equivalent dose between animal species and humans using a surface area conversion, and conversion of units of exposure to milligrams of toxicant per day (mg/d) shall be performed as specified by the U.S. environmental protection agency in "Water Quality Criteria Documents; Availability" (45 FR 79318, November 28, 1980).

f. If the duration of the mammalian study (D) is less than the natural life span of the test animal (LS), the carcinogenicity potency factor is multiplied by the factor (D/LS)3.

4. When available mammalian studies contain conflicting information, the department shall consult with the department of health and social services and may consult with experts outside of the department for guidance in the selection of the appropriate study.

(d) If both a human epidemiologic study and a study of mammalian test species are judged reliable but only the animal study indicates a carcinogenic effect, it is assumed that a risk of cancer to humans exists but that it is less than could have been detected in the epidemiologic study. An upper limit of cancer incidence may be calculated assuming that the true incidence is just below the level of detection in the cohort of the epidemiologic study. The department may consult with experts outside of the department for guidance in the selection of the appropriate study.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; am. table 9 and (6), Register, July, 1991, No. 427, eff. 8–1–91; correction in (4) (b) made under s. 13.93 (2m) (b) 7., Stats., Register, September, 1995, No. 477; am. (1), (3), r. and recr. Table 9, am. (4) (a), (b), (5) (intro.), (a) (b), (c) (intro.) and 2., r. (6), Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.10 Bioaccumulation factor. (1) The bioaccumulation factor used to derive wildlife, human threshold, human cancer and taste and odor criteria or secondary values is determined from a baseline BAF using the methodology provided in Appendix B to 40 CFR part 132. 40 CFR part 132, Appendix B as stated on September 1, 1997, is incorporated by reference. BAFs shall be used to calculate criteria and secondary values for human health and wildlife. Use of a BAF greater than 1000, as determined from either of the methods referred to in sub. (2)(c) or (d) for organic substances, will result in the calculation of a secondary value. The baseline BAF is based on the concentration of freely dissolved substances in the ambient water to facilitate extrapolation from one water to another.

(2) Baseline BAFs shall be derived using one of the following 4 methods, which are listed from most preferred to least preferred.

(a) A measured baseline BAF for an organic or inorganic substance derived from a field study of acceptable quality;

(b) A predicted baseline BAF for an organic substance derived using field–measured BSAFs of acceptable quality;

(c) A predicted baseline BAF for an organic or inorganic substance derived from a BCF measured in a laboratory study of acceptable quality and a food–chain multiplier. Food–chain multipliers are provided in 40 CFR part 132, Appendix B; or

(d) A predicted baseline BAF for an organic substance derived from a K_{OW} of acceptable quality and a food–chain multiplier.

(3) REVIEW AND SELECTION OF DATA. Measured BAFs, BSAFs and BCFs shall meet the quality assurance requirements provided in 40 CFR part 132, Appendix B and shall be obtained from available sources including the following:

(a) EPA Ambient Water Quality Criteria documents issued after January 1, 1980.

(b) Published scientific literature.

(c) Reports issued by EPA or other reliable sources.

(d) Unpublished data.

(4) HUMAN HEALTH AND WILDLIFE BAFS FOR ORGANIC SUBSTANCES. (a) To calculate human health and wildlife BAFs for organic substances, the K_{OW} of the substance shall be used with a POC concentration of 0.00000004 kg/L and a DOC concentration of 0.000002 kg/L to yield the fraction freely dissolved:

$$f_{fd} = \frac{1}{1 + \frac{(DOC)(K_{ow})}{10} + (POC)(Kow)}$$

$$= \frac{1}{1 + \frac{(0.000002\ kg/L)(K_{ow})}{10} + (0.00000004\ kg/L)(Kow)}$$

$$= \frac{1}{1 + (0.00000024\ kg/L)(K_{ow})}$$

Where:

DOC = concentration of dissolved organic carbon, kg of dissolved organic carbon/L of water.

POC = concentration of particulate organic carbon, kg of particulate organic carbon/L of water.

(b) The human health BAFs for an organic substance shall be calculated using the following equations:

For warm water communities:

Human Health BAF = [(baseline BAF)(0.013)+ 1](f_{fd})

For cold water communities:

Human Health BAF = [(baseline BAF)(0.044)+ 1](f_{fd})

Where: 0.013 and 0.044 are the fraction lipid values for warm and cold water fish and aquatic life communities, respectively, that are required to derive human health criteria and secondary values.

baseline BAF = the baseline BAF calculated according to 40 CFR part 132, Appendix B.

(c) The wildlife BAFs for an organic substance shall be calculated using the following equations:

1. For trophic level 3:
Wildlife BAF = [(baseline BAF)(0.0646)+ 1](f_{fd})

2. For trophic level 4:
Wildlife BAF = [(baseline BAF)(0.1031)+ 1](f_{fd})

Where: 0.0646 and 0.1031 are the standardized fraction lipid values for dietary consumption from trophic level 3 and 4 fish taxa, respectively, that are required to derive wildlife criteria and secondary values.

baseline BAF = the baseline BAF calculated according to 40 CFR part 132, Appendix B.

(5) HUMAN HEALTH AND WILDLIFE BAFS FOR INORGANIC SUBSTANCES. (a) *Human health.* 1. Measured BAFs and BCFs used to determine human health BAFs for inorganic substances shall be based on edible tissue (e.g., muscle) of freshwater fish. If it is demonstrated that whole–body BAFs or BCFs are similar to edible–tissue BAFs or BCFs, then these data are acceptable. BCFs and BAFs based on measurements of aquatic plants and invertebrates may not be used in the derivation of human health criteria and values.

2. If one or more field–measured baseline BAFs for an inorganic substance are available from studies conducted in the Great Lakes system with the muscle of fish, the geometric mean of the species mean baseline BAFs shall be used as the human health BAF for that substance.

3. If an acceptable measured baseline BAF is not available for an inorganic substance and one or more acceptable edible–portion BCFs are available for the substance, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a FCM. The FCM will be 1.0 unless chemical–specific biomagnification data support using a multiplier other than 1.0. The predicted baseline BAF shall be used as the human health BAF for that substance.

(b) *Wildlife.* 1. Measured BAFs and BCFs used to determine wildlife BAFs for inorganic substances shall be based on whole–body freshwater fish and invertebrate data. If it is demonstrated that edible–tissue BAFs or BCFs are similar to whole–body BAFs or BCFs, then these data are acceptable.

2. If one or more field–measured baseline BAFs for an inorganic substance is available from studies conducted in the Great Lakes system with whole body of fish or invertebrates, then the following apply:

a. For each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one measured BAF is available for a given species.

b. For each trophic level, the geometric mean of the species mean measured baseline BAFs shall be used as the wildlife BAF for that substance.

3. If an acceptable measured baseline BAF is not available for an inorganic substance and one or more acceptable whole–body BCFs are available for the substance, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a FCM. The FCM shall be 1.0 unless chemical–specific biomagnification data support using a multiplier other than 1.0. The predicted baseline BAF shall be used as the wildlife BAF for that substance.

Note: Copies of 40 CFR Part 132, Appendix B are available for inspection in the offices of the department of natural resources, secretary of state and the revisor of statutes, Madison, WI or may be purchased from the superintendent of documents, US government printing office, Washington, D.C. 20402.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; r. and recr., Register, August, 1997, No. 500, eff. 9–1–97.

NR 105.11 Final plant values. **(1)** A Final Plant Value (FPV) is the lowest plant value that was obtained with an important aquatic plant species in an acceptable toxicity test for which the concentrations of the test substance were measured and the adverse effect was biologically important. Appropriate measures of the toxicity of the substance to aquatic plants are used to compare the relative sensitivities of aquatic plants and animals.

(2) A plant value is the result of a 96–hour test conducted with an algae or a chronic test conducted with an aquatic vascular plant. A test of the toxicity of a metal to a plant may not be used if the medium contained an excessive amount of a complexing agent, such as EDTA, that might affect the toxicity of the metal. Concentrations of EDTA above 200 μg/L should be considered excessive.

(3) The FPV shall be established by selecting the lowest result from a test with an important aquatic plant species in which the concentrations of test material are measured and the endpoint is biologically important.

Note: Although procedures for conducting and interpreting the results of toxicity tests with plants are not well advanced, results of tests with plants usually indicate that criteria which adequately protect aquatic animals and their uses will, in most cases, also protect aquatic plants and their uses.

History: Cr. Register, August, 1997, No. 500, eff. 9–1–97.

Chapter NR 216

STORM WATER DISCHARGE PERMITS

Note: Corrections made under s. 13.93 (2m) (b) 7., Stats., Register, August, 1997, No. 500.

NR 216.001 Purpose. The purpose of this chapter is to establish criteria defining those storm water discharges needing WPDES storm water discharge permits, as required by s. 283.33, Stats. The goal of this chapter is to eliminate to the maximum extent practicable the discharge of pollutants carried by storm water runoff into waters of the state from certain industrial facilities as identified in this chapter, construction sites over 5 acres and municipal storm water runoff as identified in this chapter.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.002 Definitions. For the purposes of this chapter the following definitions are applicable:

(1) "Best management practices" or "BMPs" means schedules of activities, prohibitions of practices, maintenance procedures, structural controls, source area controls, treatment requirements, operating procedures, outdoor storage containment and other management practices to prevent or reduce pollutants in runoff entering waters of the state.

(2) "Construction site" means a site upon which land disturbing activities affecting 5 or more acres of land are occurring, including areas that are part of a larger common plan of development or sale where multiple separate and distinct construction activities may be taking place at different times on different schedules but under one plan such that the total disturbed area is 5 or more acres.

(3) "Contaminated storm water" means storm water that comes into contact with material handling equipment or activities, raw materials, intermediate products, final products, waste materials, byproducts, or industrial machinery in the source areas listed in s. NR 216.27 (3) (e).

(4) "Department" means the department of natural resources.

(5) "Discharge" means the discharge of any pollutant into the waters of the state from any point source.

(6) "Erosion" means the detachment and movement of soil, sediment or rock fragments by water, wind, ice or gravity.

(7) "Event mean concentration" means the flow–weighted concentration over the duration of a single runoff event.

(8) "Final stabilization" means that all soil disturbing activities at the site have been completed and that a uniform perennial vegetative cover has been established with a density of 70% of the cover for the unpaved areas and areas not covered by permanent structures or that employ equivalent permanent stabilization measures.

(9) "General WPDES permit" means a permit for the discharge of pollutants issued by the department under s. 283.35, Stats.

(10) "Illicit discharge" means any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges with a WPDES permit or other discharges allowed locally.

(11) "Infiltration system" means a device or practice that encourages surface water to percolate or penetrate into underlying soil, including but not limited to infiltration trenches, grassed waterways and infiltration basins.

(12) "Land disturbing construction activity" means any man–made change of the land surface resulting in a change in the topography, existing vegetative and non–vegetative soil cover or the existing soil topography which may result in storm water runoff and lead to increased soil erosion and movement of sediment into waters of the state. Land disturbing construction activities include, but are not limited to clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities, but does not include agricultural land uses.

(13) "Landowner" means any person holding fee title, an easement or other interest in property which allows the person to undertake land disturbing construction activity on the property.

(14) "Municipal separate storm sewer" 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 the following criteria:

(a) Owned or operated by a municipality.

(b) Designed or used for collecting or conveying storm water.

(c) Which is not a combined sewer conveying both sanitary and storm water.

(d) Which is not part of a publicly owned wastewater treatment works which provides secondary or more stringent treatment.

(15) "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.

(16) "Outfall" means the point at which storm water is discharged to waters of the state or to a storm sewer.

(17) "Person" means an individual, owner, operator, corporation, partnership, association, municipality, interstate agency, state agency or federal agency.

(18) "Phase one municipality" means the cities of Madison and Milwaukee.

(19) "Point source" means a discernible, confined and discrete conveyance of storm water for which a permit is required under s. 283.33, Stats.

(20) "Pollutant" means any dredged spoil, solid waste, incinerator residue, sewage, garbage, refuse, oil, sewage sludge, munitions, chemical wastes, biological materials, radioactive substance, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal and agricultural waste discharged into water.

(21) "Pollution" means man-made or man-induced alteration of the chemical, physical, biological or radiological integrity of water.

(22) "Runoff coefficient" means the fraction of total precipitation that will leave a site as storm water runoff based on land use, soil and drainage characteristics.

(23) "Section 313 water priority chemical" means a chemical or chemical categories which:

(a) Is listed at 40 CFR 372.65 pursuant to 42 USC 11023;

Note: 42 USC 1023 is also known as the emergency planning and community right-to-know act (EPCRA), or as Section 313 of title III of the superfund amendments and reauthorization act (SARA) of 1986.

(b) Is present at or above threshold levels at a facility subject to EPCRA s. 313 reporting requirements; and

(c) Is listed in appendix D of 40 CFR 122 on either table II, table III or table V or is listed as a hazardous substance pursuant to 33 USC 1321 (b) (2) (A) of the clean water act at 40 CFR 116.4.

(24) "SIC" means standard industrial classification. SIC codes cited in this chapter are from the 1987 edition of the *Standard Industrial Classification Manual.*

(25) "Significant contributor" means a person who discharges to waters of the state pollutants which contribute to or have the reasonable potential to contribute to an exceedence of a water quality standard.

(26) "Significant materials" means materials related to industrial activity that may contaminate storm water, including, but not limited to: raw materials; fuels; materials such as solvents, detergents and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under 42 USC 9601 to 9675; any chemical the facility is required to report pursuant to 42 USC 11023; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with storm water discharges.

Note: 42 USC 9601 to 9675 is also known as the comprehensive environmental response, compensation and liability act (CERCLA). 42 USC 11023 is also known as the emergency planning and community right-to-know act (EPCRA), or as Section 313 of title III of the superfund amendments and reauthorization act (SARA) of 1986.

(27) "Source area control BMP" means best management practices intended to prevent storm water runoff from contacting materials that can potentially contaminate it.

(28) "Stabilize" means the process of making a site steadfast or firm, minimizing soil movement by the use of such practices as mulching and seeding, sodding, landscaping, paving, graveling or other appropriate measures.

(29) "Storm water" means storm water runoff, snow or ice melt runoff, and surface runoff and drainage.

(30) "Storm water outfall" means the point where a municipal separate storm sewer discharges to waters of the state, or leaves one municipality and enters another.

(31) "SWPPP" means storm water pollution prevention plan.

(32) "Treatment BMP" means a storm water treatment system, works, or practice that is designed to reduce or remove pollutants from contaminated storm water.

(33) "Urban storm water planning area" means the boundary defined by a phase one municipality, great lakes area of concern municipality, or a municipality over 50,000 in a priority watershed which serves as the appropriate planning area for the abatement of storm water runoff pollution into waters of the state.

(34) "Waters of the state" means those portions of Lake Michigan and Lake Superior within the boundaries of Wisconsin, all lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, marshes, water courses, drainage systems and other surface water or groundwater, natural or artificial, public or private within the state or under its jurisdiction, except those waters which are entirely confined and retained completely upon the property of a person.

(35) "WPDES" means Wisconsin pollutant discharge elimination system.

(36) "Working day" means any day except Saturday and Sunday and holidays designated in s. 230.35 (4) (a), Stats.

History: Cr. Register, October, 1994, No. 466, eff. 11-1-94.

NR 216.003 General permit conditions. In addition to the terms and conditions listed under this chapter, if a general permit is issued, it may require compliance with the terms and conditions identified in s. NR 205.08. The term of the permit shall be the maximum period of time provided by federal law.

History: Cr. Register, October, 1994, No. 466, eff. 11-1-94.

NR 216.004 Noncompliance. (1) Any act of noncompliance with the provisions of any storm water permit issued under this chapter is a violation of the permit and is grounds for enforcement action or denial of continued coverage under a general permit.

(2) Permittees shall submit reports of noncompliance with requirements contained in a compliance schedule of the permit in writing within 14 days after the compliance schedule deadline. Reports of noncompliance shall include: a description of the noncompliance; its cause; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and the effect of the noncompliance on the permittee's ability to meet remaining deadlines.

(3) The permittee shall immediately notify the department or the designated statewide 24-hour emergency number provided by the division of emergency government in accordance with ch. NR 706, in the event that a spill or accidental release of any hazardous material or substance results in the discharge of pollutants to waters of the state or creates a condition that may contaminate storm water discharged to waters of the state.

(4) The permittee shall take all reasonable steps to minimize or prevent any adverse impacts on the waters of the state resulting from noncompliance with a storm water permit.

History: Cr. Register, October, 1994, No. 466, eff. 11-1-94.

Subchapter I — Municipal Storm Water Discharge Permits

NR 216.01 Purpose. The purpose of this subchapter is to establish the requirements for municipal storm water discharge permits, as required by s. 283.33, Stats. The goal of this subchapter is to eliminate to the maximum extent practicable the discharge of pollutants into waters of the state from municipal storm water runoff from municipalities identified in s. NR 216.02. The department shall consider the other environmental problems facing municipalities and emphasize cost effective pollution prevention solutions when determining what is practicable.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.02 Applicability. The following municipal storm water dischargers shall obtain a WPDES storm water discharge permit under this subchapter because of water quality concerns associated with urban runoff:

(1) PHASE ONE MUNICIPALITIES. Municipal separate storm sewer systems serving incorporated areas with a population of 100,000 or more shall obtain a permit.

Note: The phase one municipalities are the cities of Madison and Milwaukee. They have already completed the permit application process in accordance with the EPA regulations in 40 CFR part 122.26 (d), prior to the promulgation of ch. NR 216.

(2) GREAT LAKES AREAS OF CONCERN. Municipalities in the great lakes areas of concern shall obtain a permit.

Note: There are 5 great lakes areas of concern in Wisconsin. Areas of concern have persistent water quality problems impairing beneficial uses. Remedial action plans for reacting to the pollutants are being developed for the areas of concern. The department is designating the great lakes areas of concern for storm water permitting because of the significance of storm water runoff as a pollutant source. Municipalities in remedial action plans, except for the city of Milwaukee which is required to apply under s. NR 216.02 (1), include the following:

Area of Concern	Municipality
Lower Green Bay and Fox River	Green Bay, Allouez, Ashwaubenon, DePere
Menominee River	Marinette
Sheboygan River	Sheboygan
St. Louis River and Duluth–Superior Harbor	Superior

(3) PRIORITY WATERSHEDS. Municipalities in priority watersheds with a population of 50,000 or more, based on the most recent census data for the incorporated area, shall obtain a permit.

Note: Priority watersheds associated with municipalities with a population of 50,000 or more, except for municipalities required to apply under s. NR 216.02 (1) or (2), are listed below. Clean–up and protection of water resources through control of runoff sources of pollution are needed to improve water quality in priority watersheds. The department is designating these priority watersheds for storm water permitting because of the significance of storm water runoff as a pollutant source. Municipalities in these priority watersheds include the following:

Priority Watershed	Municipality
Duncan Creek and Lowes Creek	Eau Claire
Root River	Racine
Menomonee and Kinnickinnic Rivers	West Allis
Upper Fox River (Illinois)	Waukesha

(4) DESIGNATED MUNICIPALITIES. Discharges from a municipal separate storm sewer system which either contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the state shall obtain a permit. All designations shall be guided by consistent statewide application of technical criteria. The department may designate discharges from municipal separate storm sewer systems on a system wide, jurisdiction wide or watershed basis. A designation for storm water permitting may be initiated by the following:

(a) The department may identify a municipality for permitting. To assist in making this determination, the department may request information from the municipality. The department shall consider the following factors when making a designation:

1. Physical interconnections between the municipal separate storm sewers of a permitted municipality and a designated municipality.

2. Location of the discharge from a designated municipality relative to a permitted municipal separate storm sewer system.

3. The quantity and nature of pollutants discharged to waters of the state.

4. The nature of the receiving water.

5. Protection of the watershed or basin drainage area receiving the municipal discharge.

6. Population of the municipality.

7. Other relevant factors.

(b) Phase one municipalities, great lakes areas of concern municipalities, priority watershed municipalities with a population of 50,000 or more, and the public may petition the department to designate additional municipalities for permitting. The petition shall contain information to assist the department in making a determination in accordance with the factors outlined in s. NR 216.02 (4) (a).

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.03 Method of application. The owner or operator of a discharge from a municipal separate storm sewer system may either apply individually or as a co–applicant. Permit applications may be made by the following methods:

(1) GROUP APPLICATION. Municipalities may be co–applicants and submit a group application with one or more other owners or operators of discharges from municipal separate storm sewer systems.

(2) REGIONAL AUTHORITY. A regional authority, which would administer the co–applicants for an entire urban storm water planning area, may submit a permit application.

(3) INDIVIDUAL APPLICATION. A municipality may submit an individual permit application which only covers discharges from the municipal separate storm sewer system it is responsible for.

Note: The department encourages the filing of group or regional authority applications because of the possible benefits, including: economy of size, an additional 12 months to prepare the permit application, reduced permit fees, and enhanced cooperation between municipalities to achieve the same water quality goals. During the preapplication period municipalities can pursue forming groups or regional authorities. Formation of a storm water utility district may be a mechanism for applying as a group or regional authority, and could be a source for funding.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.04 Issuance of permits. (1) TYPES OF PERMITS. The department may issue a permit to a group of co–applicants, a permit to a regional authority, or individual permits. Permits will be issued by the department for the type of application made. The department may exclude co–applicants from coverage under a group or regional authority permit, and instead issue an individual permit to each excluded co–applicant if coverage is necessary to ensure compliance with this subchapter.

(2) CO–PERMITTEES. A co–permittee is only responsible for permit conditions relating to discharges from the municipal separate storm sewers for which it is the owner or operator.

(3) CONDITIONS. Permits may specify different conditions for different discharges covered by a permit, including distinctive management programs for different storm water drainage areas.

(4) PRIORITIES. The following criteria shall be used by the department to determine the order of permitting municipalities:

(a) Phase one municipalities. These permits shall be issued beginning August 1, 1994.

(b) Municipalities designated by phase one municipalities and approved by the department. Beginning July 1, 1995, the department shall notify these municipalities they are required to apply for a storm water permit.

(c) Municipalities in great lakes areas of concern. Beginning July 1, 1996, the department shall notify these municipalities they are required to apply for a storm water permit.

(d) Municipalities in priority watersheds with a population of 50,000 or more. Beginning July 1, 1997, the department shall notify these municipalities they are required to apply for a storm water permit.

(e) Other municipalities designated under s. NR 216.02 (4).

(5) PREAPPLICATION DEADLINES. The following time frames apply:

(a) The department shall notify a municipality when application for a storm water permit is required. Preapplication information as described in s. NR 216.05 shall be submitted by the notified municipality within 6 months of this notification.

(b) The department shall review the urban storm water planning area required in s. NR 216.05 (3), and any petition to designate other municipalities for permitting in accordance with s. NR 216.05 (4). If the department intends to designate any municipalities in the watersheds of an applicant, according to s. NR 216.02 (4), it shall do so in the process of approving the preapplication. The following time frame applies to the petition and designation process.

1. The department shall notify municipalities named in a petition, or which the department designates under s. NR 216.02 (4), within 30 days of receipt.

2. The department shall notify municipalities within 90 days of the department's ruling on the petition.

3. A municipality can appeal the department's designation decision by demonstrating why they are not [a] contributor to a violation of a water quality standard or a significant contributor of pollutants to waters of the state for either all or a portion of their jurisdiction. Municipalities shall appeal the department's decision within 90 days.

4. The department shall rule on an appeal within 90 days.

5. If there is no appeal of the department's designation decision, approval of the preapplication shall occur when the department issues its ruling under subd. 2. If there is an appeal of the department's designation decision, approval of the preapplication shall occur when the department issues its ruling on the appeal under subd. 4.

(6) APPLICATION DEADLINES. Permit applications shall be submitted according to the following time frames after the preapplication is approved by the department:

(a) Within 24 months for an individual applicant.

(b) Within 36 months for a group or regional authority applicant.

Note: The department's goal is to issue a permit within 12 months after receipt of a substantially complete application.

History: Cr. Register, October, 1994, No. 466, eff. 11-1-94.

NR 216.05 Preapplication requirements. The following information shall be submitted to the department prior to applying for a municipal storm water permit:

(1) GENERAL INFORMATION. The applicant's name, address, telephone number of contact person, ownership status and status as a government entity. For the purpose of establishing the responsibilities of each municipality in a group or regional authority application, co-applicants shall provide an intermunicipal agreement or a proposed agreement with a schedule for execution of the agreement.

(2) LEGAL AUTHORITY. A description of existing local ordinances to control discharges to the municipal separate storm sewer system. When existing legal authority is not sufficient to meet the criteria in s. NR 216.06 (1), the description shall list additional authorities necessary to meet the criteria, and shall include a commitment and schedule to obtain additional authority.

(3) URBAN STORM WATER PLANNING AREA. A map showing the urban storm water planning area boundary, which shall take into consideration the storm water drainage basin and affected watersheds, the sewer service area and urban development area.

(4) DESIGNATED MUNICIPALITIES. A petition in accordance with s. NR 216.02 (4), to designate for storm water permitting any surrounding municipalities within the urban storm water planning area.

(5) FISCAL RESOURCES. A description of the financial resources currently available to the municipality to complete a permit application, the budget for existing storm water management programs, and sources of funds for storm water management programs.

History: Cr. Register, October, 1994, No. 466, eff. 11-1-94.

NR 216.06 Application requirements. Municipalities subject to the requirements of this subchapter shall apply for a storm water permit by submitting the necessary application information to the department. The municipal storm water permit application shall consist of:

(1) ADEQUATE LEGAL AUTHORITY. A demonstration that the applicant has legal authority established by statute, ordinance or series of contracts to, at a minimum:

(a) Control the contribution of pollutants to the municipal separate storm sewer system from storm water discharges associated with industrial activity.

(b) Prohibit illicit discharges to the municipal separate storm sewer system.

(c) Control the discharge of spills, dumping or disposal of materials other than storm water to the municipal separate storm sewer system.

(d) Control through intermunicipal agreements among co-applicants the contribution of pollutants from one municipal separate storm sewer system to another.

(e) Require compliance with conditions in ordinances, permits, contracts or orders.

(f) Carry out all inspections, surveillance and monitoring procedures necessary to determine compliance and noncompliance with permit conditions including the prohibition on illicit discharges to the municipal separate storm sewer system.

(2) STORM SEWER SYSTEM MAP. A compilation of data on the municipal separate storm sewer system and identification of potential sources of pollutants. Provide on a sufficiently sized and detailed map, such as a U.S. geological survey 7.5 minute topographic map or equivalent map with a scale suited for the level of detail, the following information:

(a) Identification and outline of the storm water drainage basins, the watersheds and municipal separate storm sewer systems. Other major municipal storm water conveyance systems lying within, but not owned or operated by the permittee shall also be identified.

(b) A boundary defining the final urban storm water planning area as determined during the preapplication and all municipal borders in the area.

(c) A list and location of all known municipal storm sewer system outfalls discharging to waters of the state. Indicate the pipe size and identify those outfalls which are considered major. A major outfall means a municipal separate storm sewer outfall which meets one of the following criteria:

1. A single pipe with an inside diameter of 36 inches or more, or from an equivalent conveyance (cross sectional area of 1,018 $inch^2$) which is associated with a drainage area of more than 50 acres.

2. A municipal separate storm sewer that receives storm water runoff from land zoned for industrial activity and discharges from a single pipe with an inside diameter of 12 inches or more, or from an equivalent conveyance (cross sectional area of 113$inch^2$) which is associated with a drainage area of more than 2 acres.

(d) The location and a description of each currently operating or closed municipal landfill or other treatment, disposal or storage facility for municipal waste.

(e) The location and permit number of any known discharge to the municipal separate storm sewer system that has been issued a WPDES permit, or has filed a permit application with the department.

(f) The location of major structural controls for storm water discharges including retention basins, detention basins and major infiltration devices.

(g) Identification of publicly owned parks, recreational areas and other open lands.

(3) EXISTING MANAGEMENT PROGRAMS. Identification of existing management programs to control pollutants from municipal separate storm sewer systems. Provide the following information:

(a) A description of any existing source area controls and structural best management practices, including operation and maintenance measures. Programs may include construction site erosion control practices, floodplain management controls, wetland protection measures, roadway management, emergency spill response, best management practices for new developments and recommendations in regional water quality management plans.

(b) A description of any existing programs to identify illicit connections to the municipal separate storm sewer system. Include inspection procedures, methods for detecting and preventing illicit discharges, areas where this program has been implemented and a summary of results.

Note: Existing management programs that affect storm water quality may be a starting point for improving and expanding a storm water management program.

(4) INDUSTRIAL SOURCE IDENTIFICATION. An inventory, organized by watershed, of industrial facilities which are likely to discharge storm water runoff to the municipal separate storm sewer system. Include the name and address of each industrial facility, and a description such as a standard industrial classification which best reflects the principal products or services provided by the industry.

Note: The department can assist in obtaining information on industrial facilities.

(5) DISCHARGE CHARACTERIZATION. A characterization of the quality and quantity of storm water runoff and effects of this runoff on receiving water bodies. This information shall be used to estimate potential storm water flows and to evaluate water quality. Using existing data and conditions, provide the following information:

(a) Monthly mean rain and snow fall estimates, or summary of weather bureau data, and the monthly average number of storm events.

(b) The location and description of land use activities, with divisions indicating undeveloped, residential, commercial, agricultural and industrial uses. For each land use type, estimate the average runoff coefficient. Estimate population densities and projected growth for a 10 year period within the drainage area served by a municipal separate storm sewer system.

(c) If available, quantitative data describing the volume and quality of discharges from the municipal separate storm sewer system, including a description of the outfalls sampled, sampling procedures, and analytical methods used.

(d) A list of water bodies that receive discharges from the municipal separate storm sewer system and the locations in these water bodies, where pollutants from storm water discharges may accumulate and cause water quality degradation. Briefly describe known water quality impacts, by providing the following information on whether the water bodies have been:

1. Assessed and reported in a water quality inventory report, required under 33 USC 1315 (b). Applicants shall reference the report as to the designated use of the water body, attainment of the goals of 33 USC 1251 to 1376, and causes of pollution which prevent attainment of goals.

2. Listed in an individual control strategies toxic pollutant report, required under 33 USC 1314 (l), as a water body that is not expected to meet water quality standards or water quality goals due to toxic pollutants.

3. Listed in a nonpoint source assessment required under 33 USC 1329 (a), indicating that without additional action to control nonpoint sources of pollution, the water body cannot reasonably be expected to meet water quality standards due to significantly polluted storm water runoff.

4. Listed as a publicly owned lake and classified according to the level of eutrophication, required under 33 USC 1324 (a).

5. Recognized as a highly valued or sensitive water, classified as an exceptional or outstanding resource water by the department in ch. NR 102, or included in a priority watershed.

6. Defined by the department or U.S. fish and wildlife service's national wetlands inventory as wetlands.

7. Found to have pollutants in bottom sediments, fish tissue or biosurvey data.

8. Identified as contaminated groundwater, because of impacts from storm water infiltration on groundwater quality, especially drinking water supplies.

Note: The department can assist in obtaining some of the water resources information.

(6) POLLUTANT LOADINGS. A proposed schedule to provide pollutant loadings to receiving water bodies and the event mean concentrations, in accordance with s. NR 216.07 (4).

(7) PROPOSED MONITORING PROGRAM. A proposed monitoring program for data collection for the term of the permit, in accordance with s. NR 216.07 (5).

(8) PROPOSED MANAGEMENT PROGRAM. A schedule to provide a proposed storm water management program that shall be developed and initiated during the term of the permit, in accordance with s. NR 216.07 (7).

(9) FISCAL ANALYSIS. For each fiscal year to be covered by the permit, a fiscal analysis of the estimated capital and operation and maintenance expenditures necessary to implement the proposed management programs. The analysis shall include a description of the source of funds, including any restrictions on the use of the funds.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.07 Permit requirements. The department shall issue permits using the information provided by the applicant and other pertinent information when developing permit conditions. Permits shall include, but are not limited to, the following requirements (subject to the exemptions in s. NR 216.08):

(1) APPLICATION DEFICIENCIES. Orders to assure compliance with the permit application requirements in s. NR 216.06, if an incomplete application was submitted.

(2) SCHEDULE OF COMPLIANCE. A compliance schedule for the development and implementation of the storm water management program and any other requirements specified in the permit.

(3) FIELD SCREENING. A field screening analysis for illicit connections and illegal dumping at all major outfalls identified in the permit application, plus any additional selected field screening point designated by the municipality or the department. At a minimum, a screening analysis shall include a narrative description of visual observations made during dry weather periods. If any flow is observed, 2 grab samples shall be collected during a 24 hour period with a minimum period of 4 hours between samples. For all samples, provide a narrative description of the color, odor, turbidity and the presence of an oil sheen or surface scum as well as any other relevant observations regarding the potential presence of non–storm water discharges or illegal dumping. In addition, summarize the field analysis results for pH, total chlorine, total copper, total phenol, and detergents or surfactants, along with a description of the flow rate. Additional field analysis may be conducted using other parameters, like ammonia, to enhance the detection of illicit discharges. Where the field analysis does not involve analytical methods approved under 40 CFR 136 or by the department, the applicant shall provide a description of the method used including the name of the manufacturer of the test method along with the detection levels and accuracy of the test. The field screening points shall be established using the following guidelines:

(a) Field screening points shall, where possible, be located downstream of any sources of suspected illegal or illicit activity.

(b) 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.

(c) 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.

(4) POLLUTANT LOADING. A calculation of the event mean concentration, and the annual and seasonal pollutant loadings from each major outfall and the cumulative discharges from all known municipal separate storm sewer system outfalls to waters of the state. This information will be used to monitor trends in pollutant loadings. Calculations shall be provided for the following pollutants: BOD, COD, total suspended solids, total dissolved solids, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, ammonia nitrogen, total phosphorus, dissolved phosphorus, cadmium, copper, lead, zinc, and any other pollutant of significance detected in the storm water characterization. Provide a description of the procedures for calculating pollutant concentrations and loadings, including any modelling analysis with this calculation.

(5) MONITORING PROGRAM. A storm water monitoring program that considers the program proposed in the application, and may include changes required by the department. The program shall include information on the purpose and goals of the monitoring, the location of outfalls or field screening points for sampling, why the location is representative, the frequency of sampling, parameters to be sampled, and type of sampling equipment. The monitoring program may consider 3 components:

(a) Characterization of storm water by monitoring the pollutants identified in sub. (6) (f), from locations representative of various land uses and water quality concerns. This information shall be used to calculate pollutant loadings and event mean concentrations.

(b) Program assessment using water quality analysis and instream monitoring of the biological community and habitat conditions in the receiving water, to determine the effectiveness and adequacy of best management practices.

(c) Wet weather screening of storm water quality to identify areas that may be significant contributors of pollutants to the municipal separate storm sewer system.

(6) SAMPLING PROCEDURES. Procedures for storm water sampling. When characterization data as described in sub. (5) (a) is required by the permit, sampling is subject to the following procedures:

(a) Outfalls monitored shall be representative of the commercial, residential, and industrial land use activities in the drainage area contributing to the municipal separate storm sewer system. The number and location of outfalls monitored shall be designated by the applicant in the proposed monitoring program. No more than 5 outfalls per municipality need to be monitored.

(b) Samples shall be collected from storms which are preferably at least 50% of the average rainfall amount, but no less than 0.1 inch. The runoff event sampled shall be at least 72 hours after any previous measurable storm greater than 0.1 inch rainfall. Runoff events sampled shall be at least 4 weeks apart whenever possible. The entire runoff event shall be sampled whenever possible, or at least the first 3 hours of a lengthy runoff. There is no minimum time criteria for the duration of the runoff.

(c) Samples collected shall be flow weighted composite samples using a continuous auto sampler, or using a combination of a minimum of 3 sample portions taken manually each hour of the runoff with each sample portion separated by a minimum period of 15 minutes. A grab sample shall be collected within the first 30 minutes of the runoff for those parameters being analyzed that require a grab sample, which include: pH, cyanide, total phenols, oil and grease, fecal coliform, fecal streptococcus and volatile organic compounds.

(d) A narrative description shall be provided of each storm event which is sampled, including the date and duration of the storm, rainfall amount and the interval between the storm sampled and the end of the previous measurable storm of greater than 0.1 inch rainfall.

(e) Approved analytical methods shall be used, in accordance with ch. NR 219. When no analytical method is approved, a suitable method may be used provided a description of the method is submitted to the department for concurrence prior to sampling.

(f) Quantitative data shall be provided for the pollutants listed in the following table, plus the organic priority pollutants listed in Table II (organic, toxic pollutants) and the toxic metals, cyanide and total phenols listed in table III (metals, cyanide and total phenols) of appendix D of 40 CFR 122. The number of pollutants to be analyzed may be reduced if there is reason to believe some pollutants are unlikely to be present, or if initial analysis shows some pollutants were not detected at a level of concern.

Total Suspended Solids	Total Kjeldahl Nitrogen
Total Dissolved Solids	Nitrate plus Nitrite
COD	Ammonia Nitrogen
BOD_5	Dissolved Phosphorus
Oil and Grease	Total Phosphorus
Fecal Coliform	Alkalinity
Fecal Streptococcus	Chloride
pH	Color
Hardness	Odor

(g) The department may require that quantitative data be provided for additional parameters on a case–by–case basis, and may establish sampling conditions such as the location, season of sample collection, form of runoff such as snow melt, rainfall amount and other conditions necessary to insure a representative sample.

(7) STORM WATER MANAGEMENT PROGRAM. A storm water management program that considers the program proposed in the application, and may include changes required by the department. The program shall include a comprehensive planning process which involves public participation and, where necessary, intergovernmental coordination and a description of staff and equipment available, and priorities for implementation. The discharge of pollutants shall be reduced to the maximum extent practicable using appropriate best management practices. The program shall be consistent with the recommendations in regional water quality management plans. Separate proposed programs may be submitted by each co–applicant. Proposed programs may impose controls on a system wide basis, a watershed basis, a jurisdiction basis, or on individual outfalls. Management programs may include the following requirements:

(a) Source area controls and structural best management practices to reduce pollutants in runoff from commercial and residential areas that discharge into the municipal separate storm sewer system. An estimate of the expected reduction of pollutant loading and schedule for implementation shall be provided. The controls shall include:

1. Maintenance activities and a maintenance schedule for source area controls and structural best management practices.

2. Planning procedures including a comprehensive master plan to develop, implement and enforce controls on discharges from areas of new development and significant redevelopment, after construction is completed.

3. Practices for operating and maintaining roadways including deicing activities.

4. Procedures to assure that flood management projects assess impacts on the water quality, and that existing structural flood control devices have been evaluated to determine the feasibility of a retrofit device to provide pollutant removal from storm water.

5. A program to reduce pollutants associated with the application of pesticides, herbicides and fertilizer. The program may include educational activities, permits, certification of commercial applicators and distributors, and controls for application in public right–of–ways and at municipal facilities.

6. A program to promote the management of stream banks and shorelines by riparian land owners to minimize erosion, and restore or enhance the ecological values of the waterway.

(b) A program to detect and remove illicit discharges and improper disposal of wastes into the municipal separate storm sewer system, or require the discharger to obtain a separate WPDES permit. The program shall include:

1. A schedule to implement and enforce an ordinance, orders or similar means to prevent illicit discharges.

2. A strategy to address all types of illicit discharges. The following non–storm water discharges or flows are not considered illicit discharges: 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, dechlorinated swimming pool water, street wash water and fire fighting. However, these discharges need to be included in the strategy when identified by the municipality as significant sources of pollutants to waters of the state.

3. Procedures to conduct on–going field screening activities during the term of the permit, including areas or locations of storm sewers that will be evaluated.

4. Procedures to be followed to investigate portions of the municipal separate storm sewer system 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. Procedures may include sampling for the field screening parameters identified in sub. (3), testing with fluorometric dyes or conducting inspections inside storm sewers where safety and other considerations allow.

5. Procedures to prevent, contain and respond to spills that may discharge into the municipal separate storm sewer system.

6. A program to promote public reporting of the presence of illicit discharges or water quality impacts associated with discharges from municipal separate storm sewers.

7. Information and education programs to facilitate the proper management of materials and behaviors that may pollute storm water, including: used oil, toxic materials, yard waste, lawn care and car washing.

8. Controls to limit infiltration of leakage from municipal sanitary sewers into municipal separate storm sewer systems.

(c) A program to monitor and control pollutants in industrial and high risk runoff discharges to municipal separate storm sewer systems. These sources include landfills; hazardous waste treatment, disposal, storage and recovery facilities; industrial facilities subject to 42 USC 11023; and industrial facilities that the municipal permit applicant determines are contributing a substantial pollutant loading to the municipal separate storm sewer system. The program shall include:

1. Priorities and procedures for inspections and implementing control measures.

2. A monitoring program for storm water discharges associated with the industrial facilities and high risk runoff, to be implemented during the term of the permit. Monitoring may include the submission of quantitative data on the following constituents: any pollutants limited in effluent guideline subcategories where applicable, any pollutant listed in an existing WPDES permit for a facility, oil and grease, COD, pH, BOD, total suspended solids, total phosphorus, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, and any other pollutant known or believed to be present. This monitoring program can be done in conjunction with the wet weather screening described in sub. (5) (c).

Note: If the industrial facility has a WPDES permit, storm water monitoring data may be available from the department.

(d) A program to implement and maintain source area controls and structural best management practices to reduce pollutants in storm water runoff from construction sites to the municipal separate storm sewer system. The program shall include:

1. Procedures for site planning which incorporate consideration of potential water quality impacts.

2. Requirements for source area controls and structural best management practices.

3. Procedures for identifying priorities for inspecting sites and enforcing control measures which consider the nature of the construction activity, topography, the characteristics of soil and receiving water quality.

4. Information and education programs for construction site operators.

(8) ASSESSMENT OF CONTROLS. An assessment of the storm water management program and the effectiveness and adequacy of the best management practices implemented shall be reviewed annually. The assessment shall include the following:

(a) Review the results of the monitoring program.

(b) Estimate expected reductions in pollutant loadings discharged from the municipal separate storm sewer system.

(c) Identify known impacts of storm water controls on both surface water and groundwater.

(d) Propose modifications to the storm water management program to correct deficiencies and to improve the program.

(9) ANNUAL REPORT. An annual report for the preceding calendar year shall be submitted by March 31 of the next year. The municipal governing body, interest groups, and the general public shall be encouraged to review and comment on the annual report. Permittees shall consider the comments in the storm water management program. The annual report shall include the following information:

(a) The status of implementing the storm water management program and compliance with permit schedules.

(b) A summary of the monitoring data accumulated through the reporting year.

(c) A summary of the assessment of controls.

(d) Proposed modifications to the storm water management program in response to the assessment of controls.

(e) A fiscal analysis which includes the annual expenditures and budget for the reporting year, and the budget for the next year.

(f) A summary of the number and nature of enforcement actions, inspections, and public information and education programs.

(g) Identification of water quality improvements or degradation.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.08 Exemptions. The department shall have flexibility in determining application and permit requirements. When an applicant demonstrates a requirement will take more time to complete, is not practicable or applicable, or the information is not necessary for the permit, the department may give an exemption to exclude or modify the following:

(1) DESIGNATED MUNICIPALITIES. A petition designating additional municipalities for permitting required under s. NR 216.05 (4).

(2) INDUSTRIAL INVENTORY. An inventory of each industrial discharger required under s. NR 216.06 (4).

(3) DISCHARGE CHARACTERIZATION. Characterization data required under s. NR 216.06 (5).

(4) POLLUTANT LOADINGS. Calculation of event mean concentrations and pollutant loadings required under s. NR 216.07 (4).

(5) MONITORING. Monitoring programs for storm water data collection under s. NR 216.07 (5).

(6) SAMPLING. Sampling procedures for storm water characterization under s. NR 216.07 (6).

(7) STORM WATER MANAGEMENT PROGRAM. Management programs required under s. NR 216.07 (7).

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.09 Permit fees. A storm water permit fee shall be paid annually by each permittee under this subchapter, or by permittees whose WPDES permit incorporates storm water management requirements under this subchapter. Permit fees are due by June 30th each year. The fees shall be assessed according to the following schedule:

(1) $10,000 for permits serving populations of 100,000 or more.

(2) $5,000 for permits serving populations less than 100,000.

(3) $1,000 for state and federal permits.

Note: The permit fee for a group permit or regional authority permit can be shared between the co–permittees by a method determined to be equitable by the co–permittees. For example, a group permit representing 10 co–permittees with a total population of 200,000, could divide the $10,000 fee 10 ways proportionally based on the ratio of each co–permittee's population to the total population.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.10 Permit reissuance. Permits shall be issued for a term of no more than 5 years. Application for reissuance of a permit shall be filed at least 180 days prior to the expiration date of the permit. If the permit is not reissued by the time the existing permit expires, the existing permit remains in effect. The following information shall be submitted as the reissuance application:

(1) APPLICABILITY. Proposed modifications to permit applicability including the permitted area, co–permittees and storm sewer system map.

(2) MONITORING PROGRAM. Proposed modifications to the storm water monitoring program for the term of the next permit.

(3) MANAGEMENT PROGRAM. Proposed modifications to the storm water management program for the term of the next permit.

(4) OTHER. Any other information pertinent to permit reissuance to update the permit.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.11 Trading. If watershed planning occurs in Wisconsin which allows the trading of pollutant discharge loadings, this trading process can be used to meet the substantive requirements of the storm water discharge permit program. Municipalities shall be allowed to demonstrate compliance with the requirements of this subchapter by meeting the requirements of an enforceable watershed management plan approved by the department. Municipalities may be allowed to discharge a quantity or quality of storm water which, taken alone, does not assure attainment and maintenance of water quality standards, if the receiving water is part of a watershed management unit for which an enforceable management plan has been approved by the department. Implementation of storm water management practices recommended in department approved watershed plans may constitute compliance with this chapter and issuance of a storm water permit may be unnecessary.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

Subchapter II — Industrial Storm Water Discharge Permits

NR 216.20 Purpose. The purpose of this subchapter is to:

(1) PERMITTING CRITERIA. Establish the criteria for identifying non–construction related storm water discharges associated with industrial activity for which permits are required under s. 283.33 (1) (a) and (d), Stats.;

(2) APPLICATION REQUIREMENTS. Establish the requirements for filing applications for storm water discharge permits for non–construction related activities defined in s. 283.33 (1) (a) and (d), Stats.;

(3) PERMITS. Establish the requirements and conditions for storm water individual and general permits for discharges associated with industrial activity; and

(4) PRIORITY. Establish a system for prioritizing the issuance of permits based on the relative impact of the discharges on water quality.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.21 Applicability and exclusions. (1) POINT SOURCES. This subchapter is applicable to point sources which discharge storm water associated with industrial activity to the waters of the state, either directly or via a separate storm sewer system.

(2) CATEGORIES. This subchapter is applicable to discharges originating from the industrial facilities belonging to categories identified in pars. (a) to (c).

(a) Tier 1 categories:

1. Heavy manufacturers defined by their primary Standard Industrial Classification (SIC) Code, which represents the primary income–producing activity at the facility, listed in Table 1:

Table 1
Tier 1 Heavy Manufacturers

SIC	Description
–24	Lumber & Wood Products
–26	Paper & Allied Products
–28	Chemicals & Allied Products
–29	Petroleum Refining & Related Industries
–311	Leather Tanning & Finishing
–32	Stone, Clay, Glass & Concrete Products
–33	Primary Metal Industries
–3441	Fabricated Structural Metal
–373	Ship & Boat Bldg. & Repair

Note: Facilities in SIC Codes 2434, 265, 267, 283, 285, 2951, 323, 3271, 3272 and 3273 are included in s. NR 216.21 (2) (b).

2. Facilities involved in the recycling of materials such as metal scrap yards, battery reclaimers, salvage yards and automobile junk yards, including but not limited to those classified in SIC Codes 5015 and 5093.

3. Facilities with bulk storage piles for coal, metallic and non–metallic minerals and ores, and scrap not otherwise covered under this subchapter, such as those associated with freight transportation, SIC Code 44, and wholesale trade, SIC Code 5052.

(b) Tier 2 categories:

1. Manufacturing facilities defined by Table 2, not to include their access roads and rail lines, but only if contaminated storm water results from the operation of these facilities:

Table 2
Tier 2 Light Manufacturers

SIC	Description
–20	Food & Kindred Products
–21	Tobacco Products
–22	Textile Mill Products
–23	Apparel & Other Textile Products
–2434	Wood Kitchen Cabinets
–25	Furniture & Fixtures
–265	Paperboard Containers & Boxes
–267	Misc. Converted Paper Products
–27	Printing, Publishing, & Allied Industries
–283	Drugs
–285	Paints & Allied Products
–30	Rubber & Misc. Plastics Products
–31	Leather & Leather Products
–323	Products of Purchased Glass
–34	Fabricated Metal Products
–35	Industrial & Commercial Machinery & Computer Equipment
–36	Electronic & Other Electrical Equipment & Components
–37	Transportation Equipment
–38	Instruments & Related Products
–39	Misc. Manufacturing Industries
–4221	Farm Product Warehousing & Storage
–4222	Refrigerated Warehousing & Storage
–4225	General Warehousing & Storage

Note: Facilities in SIC Codes 311, 3441 and 373 are included in s. NR 216.21 (2) (a) 1.

2. Transportation facilities defined by Table 3 that have vehicle maintenance shops, equipment cleaning operations or airport de–icing operations. This subchapter only applies to those portions of these facilities that are either involved in vehicle maintenance including rehabilitation, mechanical repairs, painting, fueling, lubrication and associated parking areas, or involved in cleaning operations or de–icing operations, or that are listed as source areas under s. NR 216.27 (3) (e):

Table 3
Tier 2 Transportation Facilities

SIC	Description
–40	Railroad Transportation
–41	Local & Interurban Passenger Transit
–42	Trucking & Warehousing
–43	U.S. Postal Service
–44	Water Transportation
–45	Transportation By Air
–5171	Petroleum Bulk Stations & Terminals

Note: Facilities in SIC Codes 4221–4225 are included in s. NR 216.21 (2) (b) 1.

3. Facilities defined by Table 4, including active and inactive mining operations and oil and gas exploration, production, processing or treatment operations or transmission facilities. This subchapter only applies where storm water runoff has come into contact with any overburden, raw material, intermediate product, finished product, by–product or waste material.

Table 4
Tier 2 Mining, Oil and Gas Operations

SIC	Description
–10	Metal Mining
–12	Coal Mining
–13	Oil & Gas Extraction
–14	Non–metallic Minerals, except fuels

This subchapter does not apply to non–coal mining operations which have been released from applicable state or federal reclamation requirements after December 17, 1990; nor to coal mining operations released from the performance bond issued to the facility by the appropriate surface mining control and reclamation act authority under 30 USC 1201 et seq. and 16 USC 470 et seq. Production, processing or treatment operations or transmission facilities associated with oil and gas extraction are included only if there has been a discharge of storm water after November 16, 1987 containing a quantity of a pollutant reportable pursuant to 40 CFR 110.64, CFR 117.21 or 40 CFR 302.6, or if a storm water discharge contributed to a violation of a water quality standard.

4. Facilities subject to storm water effluent limitation guidelines, new or existing source performance standards or toxic pollutant effluent standards under 33 USC 1251, 1311, 1314 (b) and (c), 1316 (b) and (c), 1317 (b) and (c), 1326 (c), except Table 2 facilities, in this subparagraph, that do not discharge contaminated storm water.

5. Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage, treatment, recycling and reclamation of municipal or domestic sewage, including lands dedicated to the disposal of sewage sludge that are located within the confines of the facility, with a design flow of one million gallons per day or more, or required to have an approved pretreatment program. Not included are farm lands, domestic gardens or lands used for sludge management where sludge is beneficially reused and which are not physically located in the confines of the facility, or areas that are in compliance with 33 USC 1345.

6. Hazardous waste treatment, storage and disposal facilities, including those operating under interim status or a permit under subtitle C of the resource conservation and recovery act (RCRA) under 42 USC 6921 et seq.

7. Landfills, land application sites, and open dumps that receive or have received any industrial waste from any of the facilities identified in this section, including those subject to regulation under subtitle D of RCRA, under 42 USC 6901 et seq.

8. All steam electric power generating facilities, including coal handling sites but not including off–site transformer or electric substations.

9. Facilities described in SIC code 2951 for asphalt paving mixes and block, and facilities described in SIC codes 3271, 3272 and 3273 for cement products.

10. Facilities previously classified as tier one dischargers which are subsequently classified as tier 2 under s. NR 216.23 (6).

11. Discharges determined by the department to be significant contributors of pollutants to waters of the state.

(c) Tier 3 categories shall include facilities that have certified to the department that they have no discharges of contaminated storm water and for which the department has concurred with the certification.

(3) OTHER ENVIRONMENTAL PROGRAMS. If one of the following conditions is met, the department may deem that a facility is in compliance with coverage required under s. 283.33, Stats., and will not be required to hold a separate permit under s. 283.33, Stats.:

(a) The storm water discharge is in compliance with a department permit or approval which includes storm water control requirements that are at least as stringent as regulations under this subchapter; or

(b) The storm water discharge is in compliance with a memorandum of understanding with another agency of the state that implements regulations including storm water control requirements that are at least as stringent as regulations under this subchapter.

(4) EXCLUSIONS. This subchapter does not apply to any of the following:

(a) Diffused surface drainage or agricultural storm water discharges.

(b) Non–storm water discharges to the outfall covered under an individual or general WPDES permit, including contact cooling water, non–contact cooling water, other process wastewaters, sewage, spills or leaks.

(c) Non–storm water discharges to the outfall for which coverage under an individual or general WPDES permit is not necessary, including 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, dechlorinated swimming pool water, street wash water, and fire fighting.

(d) Inactive, closed or capped landfills which have no potential for contamination of storm water. The department shall make a determination of contamination potential on a case–by–case basis.

(e) Remedial action discharges or discharges authorized by a general permit for discharging contaminated or uncontaminated groundwater.

(f) Discharges of hazardous materials that are required to be reported under ch. NR 706.

(g) Areas located on plant lands which are segregated from the industrial activities of the plant, such as office buildings and accompanying parking lots, if the drainage from the segregated areas is not mixed with contaminated storm water drainage.

(h) Storm water discharges from industrial activities owned or operated by municipalities which are not required to apply for a municipal storm water discharge permit, not including airports, power plants or uncontrolled sanitary landfills.

(i) Storm water discharges into a municipal combined sewer system.

(5) EXEMPTION. Storm water discharges at facilities that are regulated by permits containing storm water effluent limitations may be exempt from the need for coverage under a general storm water permit.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.22 Certification program. (1) VOLUNTARY. The department may establish or approve a voluntary certification program.

(2) PURPOSE. The purpose of the program is to provide storm water pollution prevention training for persons designated by permitted facilities to act as the storm water pollution prevention managers. Certification is intended to provide storm water pollution prevention managers with a minimum level of competence. The department may not require facilities to have certified storm water pollution prevention managers.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.23 Permit coverage. (1) STATEWIDE TIER ONE TYPE GENERAL PERMIT. The department may issue a statewide general permit to cover all tier one type storm water discharges where the discharges are not covered by an industry–specific general permit issued pursuant to s. NR 216.24, or by an individual permit issued pursuant to s. 283.31 or 283.33, Stats.

(2) STATEWIDE TIER 2 TYPE GENERAL PERMIT. The department may issue a statewide general permit to cover all tier 2 type storm water discharges where the discharges are not covered by an industry–specific general permit issued pursuant to s. NR 216.24, or by an individual permit issued pursuant to s. 283.31 or 283.33, Stats.

(3) STATEWIDE TIER 3 TYPE GENERAL PERMIT. The department may issue a statewide general permit to cover all tier 3 type storm water discharges where the discharges are not covered by an industry–specific general permit issued pursuant to s. NR 216.24, or by an individual permit issued pursuant to s. 283.31 or 283.33, Stats.

(4) APPLICABILITY OF PERMIT COVERAGE. Conditions of an individual permit issued under s. 283.31 or 283.33, Stats., may not be more stringent than similar conditions in general storm water permits and, specifically, individual permittees shall have the right to develop and implement their own SWPPP and BMPs in accordance with s. NR 216.27.

(5) MONITORING AND REPORTING REQUIREMENTS. The owner or operator of a facility subject to a:

(a) Tier one general permit issued under this subchapter or an individual permit issued under s. 283.31, Stats., containing tier one general permit requirements, or individual storm water permits issued under s. 283.33 (1) (a) and (d), Stats., shall be required to submit to the department annual chemical specific monitoring results for the first 2 years following SWPPP implementation and annual facility site compliance inspection (AFSCI) reports under s. NR 216.28 (2).

(b) Tier 2 general permit or an individual permit issued under s. 283.31 or 283.33, Stats., containing tier 2 general permit requirements shall be required by the general or individual permit to maintain the annual facility site compliance inspection reports on the site of the discharge. Facilities subject to this paragraph may be subject to fewer conditions and requirements than facilities covered by a tier one general permit and may not be required by the general permit to undertake chemical specific monitoring.

(c) Tier 3 general permit shall be required by the general permit to maintain the annual reports required under s. NR 216.28 (6) on the site of the discharge. Facilities subject to this paragraph are not required to develop or implement a SWPPP, conduct chemical specific monitoring or conduct annual site compliance and quarterly inspections.

(6) CHANGING COVERAGE TO TIER 2. A permittee covered by a tier one general permit issued under this section, or a permit issued under s. NR 216.24, may request that the department consider converting its coverage to a tier 2 category general storm water permit if all of the following occur:

(a) The process or operation has changed so that no storm water is contaminated with any of the pollutants identified in s. NR 216.27 (3) (i);

(b) The permittee certifies that there is no unpermitted non–storm water discharge in the outfall; and

(c) The permittee has completed a minimum of 3 years of industrial activity under a SWPPP, with no confirmed problems identified by public complaint or the AFSCI reports required under s. NR 216.28 (2).

(7) CHANGING COVERAGE TO TIER 3. A facility covered by a tier one or 2 general permit or a general permit issued under s. NR 216.24 may request at the time of permit reissuance that the department convert its coverage to a tier 3 general permit under s. NR 216.21 (2) (c).

(8) EFFLUENT LIMITATIONS. A facility covered by an individual storm water permit under s. 283.33 (1) (d), Stats. may be subject to an effluent limitation for a point source discharge, as defined in s. 283.01 (6), Stats., for storm water discharge.

(9) MOVEMENT TO TIER 2. The department may make the determination that a facility or an industrial activity defined under s. NR 216.21 (2) (a) has no significant exposure of pollutants listed under s. NR 216.27 (3) (i) and is more appropriately covered by a tier 2 general permit.

(10) MOVEMENT TO TIER ONE. In the event that the department makes the determination that a facility or an industrial activity, defined by the 4 digit SIC code, covered under a tier 2 permit may be discharging storm water contaminated with pollutants listed in s. NR 216.27 (3) (i), the department may determine that the facility or activity is more appropriately covered by a tier one general permit.

(11) DISCONTINUING TIER 3 COVERAGE. The department may revoke coverage of a tier 3 permitted facility if the department determines that the facility is not in compliance with s. NR 216.21 (2) (c). In this case, the permittee shall reapply for tier one or tier 2 general permit coverage.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.24 Industry–specific general permits. **(1)** INDUSTRY SPECIFIC PERMITS. In addition to statewide general permits issued under s. NR 216.23 (1) to (3), the department may issue industry–specific general permits to one or more categories of industries identified in s. NR 216.21 (2).

(2) REQUIREMENTS. Industry–specific storm water general permits shall differ from the statewide storm water general permits by factoring in characteristics common to the industry. The primary distinguishing characteristic shall be the requirements of the SWPPPs. Industry– specific storm water permits may contain all of the requirements of a statewide tier one general permit.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.25 Movement out of a storm water general permit. **(1)** APPLICABILITY. The department may make the determination that a facility covered under a tier 2 or tier 3 general permit no longer needs to be covered under a storm water general permit if all of the following conditions are met:

(a) The industry is described in s. NR 216.21 (2) (b) 1.; and

(b) There are no discharges of storm water that has come into contact with material handling equipment or activities, raw materials, intermediate products, final products, waste materials, byproducts or industrial machinery in any of the source areas listed in s. NR 216.27 (3) (e); and

(c) The permit holder certifies that there are no unpermitted non–storm discharges in the outfall.

(2) RENEWED COVERAGE. Any facility described in s. NR 216.21 (2) (b) 1. that has been dropped from general permit coverage by the department shall reapply for a storm water general permit whenever there are changes in activities or site drainage patterns which could result in contamination of storm water.

(3) INDIVIDUAL PERMIT COVERAGE. If one or more of the following conditions are met, the department may make the determination that a storm water general permit holder is more appropriately covered by an individual WPDES permit under s. 283.31 or 283.33, Stats.:

(a) The storm water discharge is a significant source of pollution and more appropriately regulated by an individual WPDES storm water discharge permit; or

(b) The storm water discharger is not in compliance with the terms and conditions of this chapter, or the general storm water permit issued under this subchapter; or

(c) Effluent limitations or standards are promulgated for a storm water discharge.

(4) PETITION. Any person may submit a written request to the department that it take action under this section.

(5) REVOCATION OF GENERAL PERMIT. If the department determines that a general permit holder is more appropriately covered by an individual WPDES permit, the department shall explain its decision in writing to the permittee prior to revoking the general permit and issuing an individual WPDES permit.

(6) NON–STORM WATER DISCHARGES. If a permittee identifies an unpermitted non–storm water discharge into their outfall and is unable to remove the discharge, the permittee shall notify the department and apply for a permit, under s. 283.31 or 283.35, Stats.

(7) NOTICE OF TERMINATION. If a facility no longer claims coverage under any general or individual permit for the discharge of storm water from industrial activity under this subchapter, the permittee shall submit a signed notice of termination to the department.

(a) A notice of termination shall be submitted on forms supplied by the department. Data submitted in the notice of termination forms shall be used as [a] basis for terminating coverage under this subchapter.

(b) Notice of termination forms may be obtained from the district offices of the department or by writing to the Department of Natural Resources, WPDES Permit Section, Box 7921, Madison, WI 53707–7921.

(c) Notice of termination forms shall be filed with the Department of Natural Resources, WPDES Permit Section, Box 7921, Madison, WI 53707–7921.

(d) The notice of termination form shall be signed in accordance with the signature requirements in s. NR 216.26 (7).

(e) Termination of coverage under this subchapter shall be effective upon submittal of written confirmation by the department to the permittee.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.26 Application requirements. **(1)** APPLICABILITY. Facility types listed in s. NR 216.21 (2), except for Table 2 facilities that discharge no contaminated storm water, shall apply for a storm water discharge permit. Application for a storm water discharge permit shall be made within the time frames specified in sub. (2), using department forms specified in sub. (3).

(2) DATE OF APPLICATION. Persons proposing to discharge storm water within 6 months after November 1, 1994 shall submit to the department a completed storm water permit application at least 30 days prior to the commencement of activities at the site. Persons proposing to discharge storm water after 6 months from November 1, 1994, or later, shall submit to the department a completed storm water permit application at least 6 months prior to the commencement of activities at the site.

(3) FORMS. Applications forms can be obtained from the following address: Department of Natural Resources, WPDES Permit Section, Box 7921, Madison, WI 53707–7921. The following application forms are acceptable:

(a) Prior to November 1, 1994;

1. Group storm water permit application which has been submitted to the United States environmental protection agency and a duplicate copy sent to the department.

2. DNR Form 3400–151, DNR Form 3400–152 or DNR Form 3400–163 which the applicant has completed and submitted to the department for consideration. The applicant shall also submit a copy of this completed form to the owner of any separate municipal storm sewer receiving the facility's storm water discharge if the municipal separate storm sewer serves an area for which a WPDES municipal storm water discharge permit is required.

(b) Following November 1, 1994, DNR Form 3400–151 and DNR Form 3400–152 may not be used as application for a permit to discharge storm water associated with industrial activity.

(4) PERMIT TYPE CRITERIA. The department shall evaluate the information submitted on the application form to determine whether a facility is covered under a storm water general permit or an individual permit under s. 283.31 or 283.33, Stats.; or whether coverage under a permit should be denied. The criteria for the department's determination of coverage under a storm water general permit, coverage under an individual WPDES permit, or denial of coverage, are specified in pars. (a), (b) and (c), respectively. The criteria for determination of tier type are specified in par. (d). All permit issuances shall be accompanied by a cover letter justifying the permit type or reason for denial of coverage. The cover letter shall also indicate the date upon which coverage under the permit becomes effective at the facility.

(a) The basis for determining coverage under a storm water general permit shall be a comparison of application information on SIC code, industrial activity and the discharge of contaminated storm water, to the categories identified in s. NR 216.21 (2).

(b) If a facility has an existing WPDES permit, the department may choose to regulate storm water discharges under that permit.

(c) If the SIC code or description of industrial activity stated on the application is any of the categories defined in Table 2 of s. NR 216.21 (2), and the application states that the facility discharges no contaminated storm water, the department shall determine that no permit coverage is required under this subchapter.

(d) The basis for determining the tier type of general permit shall be a comparison of application information on SIC code, industrial activity and the discharge of contaminated storm water, to the descriptions or categories identified in s. NR 216.21 (2) (a) to (c).

(5) ADDITIONAL INFORMATION. The department may require more information than what is provided in the completed application in order to make a determination if coverage under a general permit is appropriate. The applicant shall provide the additional information requested by the department within 30 days from receipt of notification by the department.

(6) FORMS. Permit application forms shall be filed with the Department of Natural Resources, WPDES Permit Section, Box 7921, Madison, WI 53707–7921.

(7) SIGNATURE. The permit application form shall be signed as follows:

(a) In the case of a corporation, by a principal executive officer of at least the level of vice–president, or by an authorized representative responsible for the overall operation of the site for which a permit is sought;

(b) In the case of a partnership, by a general partner;

(c) In the case of a sole proprietorship, by the proprietor.

(8) DEFICIENT APPLICATION. The department may require an applicant to submit data necessary to complete any deficient permit application or may require the applicant to submit a complete new permit application where the deficiencies are extensive or the appropriate form has not been used. The department may take enforcement action against anyone who fails to submit a timely application or to provide requested information in a timely manner.

(9) REAPPLICATION. At such time that a storm water general permit is reissued, the department may require a covered facility to submit a complete new permit application in order to determine continued applicability of the permit.

(10) LATE APPLICATION. An operator of a storm water discharge associated with industrial activity is not precluded from submitting an application for an existing facility after October 1, 1992. In such instance, the department may bring appropriate enforcement actions.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.27 Storm water pollution prevention plan.

(1) APPLICABILITY. Any person covered by a storm water general or individual permit, excluding coverage described in s. NR 216.21 (2) (c), shall prepare and implement a SWPPP.

(2) INCORPORATION BY REFERENCE. When plans, the permit application or activities developed and conducted in compliance with this chapter or other federal, state or local regulatory programs meet the requirements of this section, the plans or activities may be incorporated into the SWPPP by reference to avoid unnecessary duplication of regulatory requirements.

(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 that has responsibility for all aspects of SWPPP development and implementation. The individual acting in that job title shall have the responsibility to develop, evaluate, maintain and revise the SWPPP; carry out the specific management actions identified in the SWPPP, including maintenance practices; conduct or provide for monitoring activities; prepare and submit reports; and serve 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 how storm water drains on, through and from the facility to either groundwater, surface water or wetlands. The drainage base map shall show the facility property; a depiction of the storm drainage collection and disposal system including all known surface and subsurface conveyances, with the conveyances named; any secondary containment structures; the location of all outfalls, including outfalls recognized as permitted outfalls under another WPDES permit, numbered for reference, that discharge channelized flow to surface water, ground water or wetlands; the drainage area boundary for each outfall; 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; existing structural storm water controls; the name and location of receiving waters. The location of activities and materials that have the potential to contaminate storm water shall also be depicted on the drainage base map.

(d) The SWPPP shall summarize any results of available storm water sampling data or other observations that could be useful in characterizing 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 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 but not limited to:

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 (storage, loading, unloading, transportation, or conveyance of any raw material, finished product, intermediate product, by–product or waste);
7. Storage areas (including tank farms) for raw materials, finished and intermediate products;
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. Shipping and receiving areas;
14. Manufacturing buildings;
15. Residual treatment, storage and disposal sites; and

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

(f) The SWPPP shall identify any significant polluting materials or activities associated with the storm water contamination from source areas identified in par. (e). When possible, specific pollutants likely to be present in storm water as a result of contact with specific materials shall also be listed.

(g) The SWPPP shall identify all known 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 house–keeping measures, preventive maintenance measures, visual inspections, spill prevention and response measures and employe 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 identify storm water 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, 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 discharge 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 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 which might be present in significant concentrations: oil and grease; pH; total suspended solids; 5–day biological oxygen demand; chemical oxygen demand.

(j) 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 a separate individual or general 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 sedimentation type practices.

(k) 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 discharge monitoring; storm water discharge quality inspections; or chemical pollutant monitoring for facilities covered under a tier one permit. The following are requirements for facilities covered under a tier one 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. (i), or an explanation of why the pollutant should not be included in the chemical testing.

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

(m) The SWPPP shall be signed in accordance with s. NR 216.26 (7) prior to submittal to the department.

(4) PLAN AMENDMENT. A permittee shall amend a 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 permit issued to the facility.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

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. 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) Either of the following monitoring procedures are acceptable:

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) Tier one and tier 2 facilities shall include the results of the non–storm water evaluations in their SWPPP. Tier 3 facilities shall maintain the results of their non–storm water evaluations on site. Information reported shall include: date of testing, test method, outfall location, testing results and potential significant sources of non–storm water discovered through testing. The department may provide a standard form for recording the information.

(d) Any permittee, excluding tier 3 permittees, 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. In this case, the entire SWPPP shall be submitted to the department.

(e) Any tier 3 permittee unable to evaluate outfalls for non–storm water discharges shall sign a statement certifying that this requirement could not be complied with, and shall submit the statement to the department.

(2) ANNUAL SITE INSPECTION. Facilities, except facilities covered under a tier 3 general permit, shall perform and document the results of an annual facility site compliance inspection (AFSCI). 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, are being properly operated and are being 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. Facilities, except facilities covered under a tier 3 general permit, 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 to 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 reported shall include: the inspection date, inspection personnel, visual quality of the storm water discharge and probable sources of any observed storm water contamination.

(4) STORM WATER SAMPLING AND ANALYSIS. Unless an alternative monitoring plan is required as part of the SWPPP, facilities covered under a tier one permit shall perform annual chemical storm water sampling at each outfall for those residual pollutants listed in the permittee's SWPPP as required by s. NR 216.27 (3) (i). The following are specific requirements for chemical storm water monitoring:

(a) The list of pollutants to be tested in the outfall shall be identified in the facility monitoring plan portion of the SWPPP.

(b) When a facility has more than one outfall which have storm water discharges substantially similar based on consideration of industrial activity, significant materials, and management, one outfall may be selected to represent the group of similar outfalls provided that this strategy has been clearly stated in the facility monitoring plan and that the representative outfall is clearly identified as such on the drainage base map. No more than 5 outfalls with discharges representative of storm water discharged from the facility need to be sampled. A permittee may voluntarily collect and analyze additional samples, and may at the permittee's discretion submit this information to the department.

(c) After review of the facility monitoring plan portion of the SWPPP, the department may add additional pollutants to the monitoring list if it has cause to do so based on a reasonable probability that the pollutants will be present in storm water discharges from the facility. The department may also remove pollutants from the monitoring list if it determines that continued monitoring for the pollutant serves no further purpose. Chemical monitoring may be discontinued after submitting the second annual facility site compliance inspection report.

(d) Storm water samples shall be collected during the period of March through November from rainfall events that produce greater than 0.1 inch of rainfall and occur at least 72 hours after a previous rainfall of 0.1 inch or greater.

(e) Storm water samples shall be representative of either:

1. The "first flush" of storm water runoff from the outfall. Composite samples are required for all pollutants except those for which analytic techniques require grab samples. The composite sample shall be collected during the first 30 minutes of runoff. At least 3 separate samples shall be collected for compositing, and the collection of samples shall be evenly spaced throughout the sampling period, or

2. The storm water discharged from a detention pond that has greater than a 24 hour holding time for a representative storm. A grab sample is required for all pollutants. The grab sample shall be representative of the storm water discharge from the pond outfall.

(f) Monitoring samples shall be representative of the volume and nature of the monitored discharge. Analytic testing shall be in conformance with ch. NR 219, unless an alternate procedure is approved by the department prior to the initiation of sampling.

(g) For each storm water measurement or sample taken, the permittee shall record and submit the following information to the department. This information shall be included in the annual facility site compliance inspection reports described in s. NR 216.29 (2):

1. The date, exact place, method and time of sampling or measurements;

2. The individual who performed the sampling or measurements;

3. The date the analysis was performed;

4. The name of the certified laboratory which performed the analysis;

5. The analytical techniques or methods used;

6. The results of the analysis;

7. The estimated duration of the rainfall event, in hours, and the estimated total amount of precipitation falling during the rainfall event, in inches.

(5) SAMPLING EXCEPTIONS. The department may waive specific monitoring requirements for the following reasons:

(a) The permittee indicates that either an employe could not reasonably be present at the facility at the time of the snow–melt or runoff event, or that attempts to meet the monitoring requirement would endanger employe safety or well–being.

(b) The permittee indicates that there were no snow melt or runoff events large enough to conduct a quarterly visual inspection at an outfall.

(c) The facility is inactive or remote, such as inactive mining operations where monitoring and inspection activities are impractical or unnecessary. At a minimum, the department shall establish an alternative requirement that the facilities make site inspections by a qualified individual at least once in every 3 year period.

(d) The permittee can demonstrate to the department's satisfaction that the sources of storm water contamination are outside of the facility's property boundary and are not associated with the facility's activities. The demonstration shall be presented in the SWPPP and submitted to the department for evaluation.

(6) TIER 3 INSPECTION. Tier 3 facilities shall perform and maintain for 3 years the results of an annual facility source exposure inspection (FSEI). The inspection shall be adequate to verify that storm water discharged from the facility is not contaminated by industrial activity in the source areas identified in s. NR 216.27 (3) (e).

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.29 Compliance and reporting requirements. (1) REQUIREMENTS. Facilities covered under s. NR 216.23 (1) and (2) shall be subject to the following requirements:

(a) Existing facilities shall develop a SWPPP and submit a SWPPP summary to the department within 12 months from the effective date of coverage under the storm water general permit.

(b) Facilities constructed on or after November 1, 1994 shall develop a SWPPP and submit a SWPPP summary to the department prior to initiating construction.

(c) The SWPPP shall conform to the requirements specified in s. NR 216.27 (3).

(d) The SWPPP shall be kept at the facility and made available to the department upon request.

(e) The SWPPP summary shall be submitted on a standardized department form, which the department shall provide with the permit.

(f) If a SWPPP summary is incomplete, the department shall notify the permittee, and may request to review the complete SWPPP.

(g) The SWPPP summary shall include the results of the non–storm water discharge testing, under s. NR 216.28 (1), and shall indicate whether the SWPPP includes a storm water treatment practice. If a SWPPP includes a storm water treatment practice, the department may require the submittal of plans and specifications for review and approval pursuant to s. 281.41 (1), Stats.

(2) FIRST ANNUAL SITE INSPECTION. The first annual facility site compliance inspection shall be conducted by the permittee within 24 months of the effective date of coverage under the general permit. Facilities covered under a tier one permit shall submit their first inspection report to the department within 30 months of the effective date of coverage under the permit. The report shall be written on department forms, and shall contain information from the inspection, the quarterly visual inspection and the annual chemical monitoring. Facilities covered under the tier 2 permit shall keep the results of their AFSCI and quarterly visual inspections on site for department inspection. Facilities covered under a tier one permit are not required to submit inspection reports after submittal of the second inspection report, unless so directed by the department. However, these inspections and quarterly visual inspections shall still be conducted; and results shall be kept on site for department inspection.

(3) INSPECTION DATES. The first quarterly visual inspection of storm water discharge quality shall be conducted within 24 months of the effective date of coverage under the permit.

(4) SAMPLING DATES. Facilities covered under the tier one permit shall submit their first annual chemical monitoring results with their first inspection report. The monitoring results shall include all of the information specified in s. NR 216.28 (4) (g).

(5) BMP IMPLEMENTATION. Unless an alternate implementation schedule is required as part of the SWPPP, the BMPs identified in the SWPPP shall be implemented within 24 months of the effective date of coverage under the permit. Facilities constructed on or after November 1, 1994 shall implement the BMPs identified in the SWPPP within 12 months of the effective date of coverage under the permit, unless an alternate implementation schedule is required as part of the SWPPP.

(6) SWPPP AMENDMENTS. The permittee shall keep the SWPPP current to correct deficiencies in the original SWPPP. The permittee shall amend the SWPPP and notify the department in the event of any facility operational changes that could result in additional significant storm water contamination.

(7) RECORD RETENTION. Records required under this subchapter shall be retained for 5 years beyond the date of the cover letter notifying a facility of coverage under a storm water permit, and shall be made available to the department upon request.

(8) SIGNATURE. Reports required under this subchapter shall be signed in accordance with s. NR 216.26 (7).

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.30 Industrial storm water discharge permit fees. A storm water discharge permit fee shall be paid annually by each industry holding a permit under this chapter or a wastewater discharge permit that incorporates storm water management requirements under this chapter. Permit fees are due June 30 of each year. However, for 1994, the permit fees are due 60 days after November 1, 1994. The fee shall be:

(a) $200 for a tier 1 industrial general permit under s. NR 216.21 (2) (a), an industry–specific general permit under s. NR 216.24 with tier 1 requirements, or an individual WPDES permit under s. 283.31, Stats., with tier 1 requirements; or

(b) $100 for a tier 2 industrial general permit under s. NR 216.21 (2) (b), an industry–specific general permit under s. NR 216.24 or an individual WPDES under s. 283.31, Stats., with tier 2 requirements; or

(c) $0 for a tier 3 industrial general permit under s. NR 216.21 (2) (c); or

(d) $500 for an individual WPDES permit issued under s. 283.33 (1), Stats.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

Subchapter III — Construction Site Storm Water Discharge Permits

NR 216.41 Purpose. The purpose of this subchapter is to establish criteria defining those construction site activities that constitute discharges needing a WPDES storm water discharge permit, and the requirements for filing applications for WPDES storm water discharge permits for construction site activities, as required by s. 283.33, Stats.; to prescribe the form of the applications pursuant to s. 283.37, Stats.; and to specify the number of working days within which the department will indicate its intended action on a WPDES permit application or request for modification, pursuant to s. 227.116 (1), Stats.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.42 Applicability. (1) CONSTRUCTION SITES. Except as provided in subs. (2) to (4), a notice of intent shall be filed by any landowner who intends to create a point source discharge of storm water associated with a construction site activity to the waters of the state.

(2) AGRICULTURE. Storm water discharges from agricultural land uses, including use of land for planting, growing, cultivating and harvesting of crops for human or livestock consumption and pasturing or yarding of livestock, including sod farms and tree nurseries are not covered by this subchapter.

(3) COMMERCIAL BUILDINGS. Storm water discharges from commercial building sites regulated by chs. ILHR 50 through 64 in a manner which is in compliance with this chapter shall be deemed to hold a WPDES permit and shall be in compliance with this chapter. The department of commerce shall notify the department of projects covered under this subsection which shall constitute the notice of intent for these projects. Storm water discharges which occur after November 1, 1994 from commercial building sites prior to the adoption of the erosion control requirements in chs. ILHR 50 through 64 shall require coverage under a permit issued pursuant to this chapter.

(4) DEPARTMENT OF TRANSPORTATION PROJECTS. Storm water discharges from projects administered by the department of transportation, regulated by ch. Trans 401, and subject to the department of transportation and department of natural resources liaison cooperative agreement, if in compliance with ch. Trans 401 and the liaison cooperative agreement shall be deemed to be in compliance with s. 283.33, Stats., and the requirements of this chapter. The department of transportation shall notify the department of projects covered under this subsection which shall constitute the notice of intent for these projects.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.43 Notice of intent requirements. (1) FORMS. A notice of intent shall be submitted on forms supplied by the department. Data submitted in the notice of intent forms shall be used as [a] basis for issuing storm water discharge permits. Different notice of intent forms are used to provide information from different sources of storm water discharge.

(2) OBTAINING FORMS. Notice of intent forms may be obtained from the district offices of the department or by writing to the Department of Natural Resources, WPDES Permit Section, Box 7921, Madison, WI 53707–7921.

(3) REQUIRED INFORMATION. The notice of intent shall include at a minimum the following information:

(a) The name and mailing address of the construction site landowner;

(b) The name and telephone number of the contact person;

(c) The mailing address and location of the construction site for which the notification is submitted;

(d) When known, the name, address and telephone number of the general contractor;

(e) Proposed start and end dates for construction; and

(f) The following certification: "I certify under penalty of law that this document and attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person, or persons, who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition, I certify that the provisions of the permit, including development and implementation of the construction site erosion control and storm water management plans, will be complied with."

(4) APPLICATION FEE. (a) A storm water construction site application fee of $200 shall be paid to the department with the notice of intent, excluding notices filed under s. NR 216.42 (3), (4) or this subsection.

(b) Construction sites receiving erosion control plan review and inspection by a county, city, village or town with an ordinance in effect prior to January 1, 1994 that establishes standards for erosion control at commercial building sites are exempt from the permit application fee.

(6) FILING. Notice of intent forms shall be filed with the Department of Natural Resources, WPDES Permit Section, Box 7921, Madison, WI 53707–7921.

Note: It is intended that when these forms are changed, input from affected individuals and parties will be sought.

(7) SIGNATURE REQUIREMENTS. The notice of intent form shall be signed as follows:

(a) In the case of a corporation, by a principal executive officer of at least the level of vice–president, or by his or her authorized representative responsible for the overall operation of the site for which a permit is sought;

(b) In the case of a partnership, by a general partner;

(c) In the case of a sole proprietorship, by the proprietor.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.44 Notice of intent deadlines. Persons required to obtain coverage for storm water discharge associated with land disturbing construction activity under a general WPDES permit shall submit a completed notice of intent, via certified or registered mail, in accordance with the requirements of this chapter prior to commencing any land disturbing construction activities. Unless notified by the department to the contrary, applicants who submit a notice of intent in accordance with the provisions of this subchapter are authorized to discharge storm water from construction sites under the terms and conditions of the general WPDES permit 14 working days after the date that the department receives the notice of intent. The department may require the landowner to submit plans and specifications for approval of storm water treatment practices, pursuant to s. 281.41, Stats.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.45 Incomplete notice of intent. Within 14 working days after the date the department receives the notice of intent, the department may require an applicant to submit data the department has identified as being necessary to complete any deficient notice of intent or may require the applicant to submit a complete new notice of intent when the deficiencies are extensive or the appropriate form has not been used.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.46 Erosion control plan requirements. (1) SITE SPECIFIC PLAN. The permittee shall develop a construction site erosion control plan for each site covered by this subchapter and shall perform all activities required by the plan and shall maintain compliance with the plan thereafter. The construction site erosion control plan shall address pollution caused by soil erosion and sedimentation during construction, and up to final stabilization of the site. The construction site erosion control plan shall be 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) HANDBOOK. The *Wisconsin Construction Site Best Management Practice Handbook* (WDNR Pub. WR–222 November 1993 Revision) contains limitations on suitable conditions where best management practices can be applied. Tributary area limitations on the use of practices for trapping sediment in channelized flow conflict with the practices suggested in the January 7, 1987 version of the State Model Construction Site Erosion Control Ordinance. Where this occurs, the specifications contained in the *Wisconsin Construction Site Best Management Practice Handbook* shall take precedence over erosion and other pollutant control requirements contained in the State Model Construction Site Erosion Control Ordinance.

Note: The *Wisconsin Construction Site Best Management Practice Handbook* is available through WI Department of Administration, Document Sales, 202 S. Thornton Ave., Madison, WI 53707.

(3) PLAN COMPLETION. The plan shall be completed prior to the submittal of a notice of intent to be covered by a permit and shall be updated as appropriate pursuant to s. NR 216.50.

(4) REQUIRED INFORMATION. The construction site erosion control plan shall include, at a minimum, the following items:

(a) Description of the site and the nature of the construction activity.

(b) Description of the intended sequence of major activities which disturb soils for major portions of the site, such as grubbing, excavation or grading;

(c) Estimates of the total area of the site and the total area of the site that is expected to be disturbed by construction activities;

(d) Estimates, including calculations, if any, of the runoff coefficient of the site before and after construction activities are completed;

(e) Existing data describing the surface soil as well as subsoils;

(f) Depth to groundwater, as indicated by soil conservation service soil information where available, except when permanent infiltration systems are used, the depth to groundwater shall be identified as outlined in sub. (5); and

(g) Name of immediate named receiving water from the United States geological service 7.5 minute series topographic maps or other appropriate source.

(5) GROUNDWATER LIMITATIONS. When permanent infiltration systems are used, appropriate on–site testing shall be conducted to determine if seasonal high water is within 5 feet of the bottom of the proposed practice. If permanent infiltration structures are to be used and there is a municipal well within 400 feet or a non–public well within 100 feet, the groundwater flow shall be identified in accordance with the provisions specified in either ch. NR 110 or 214.

(6) SITE MAP REQUIREMENTS. Each site map shall include a map showing the following items:

(a) Existing topography and drainage patterns, roads and surface waters;

(b) Boundaries of the construction site;

(c) Drainage patterns and approximate slopes anticipated after major grading activities;

(d) Areas of soil disturbance;

(e) Location of major structural and non–structural controls identified in the plan;

(f) Location of areas where stabilization practices will be employed.

(g) Areas which will be vegetated following construction; and

(h) Wetlands, area extent of wetland acreage on the site and locations where storm water is discharged to a surface water or wetland.

(7) CONTROL MEASURES. Each 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 identified in the notice of intent 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:

(a) Description of interim and permanent stabilization practices, including a schedule for implementing the practices. Site plans shall ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized;

(b) 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, structural measures shall be installed on upland soils;

(c) Management of overland flow at all sites, unless otherwise controlled by outfall controls;

(d) Trapping of sediment in channelized flow;

(e) Staging construction to limit bare areas subject to erosion;

(f) Protection of downslope drainage inlets where they occur;

(g) Minimization of tracking at all sites;

(h) Clean up of off–site sediment deposits;

(i) Proper disposal of building and waste material at all sites;

(j) Stabilization of drainage ways;

(k) Installation of permanent stabilization practices as soon as possible after final grading; and

(L) Minimization of dust to the maximum extent practicable.

(8) No solid materials, including building materials, may be discharged in violation of chs. 30 and 31, Stats., or U.S. army corps of engineers section 404 permit requirements.

(9) PROHIBITED DISCHARGES. Velocity dissipation devices shall 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.

(10) PROOF OF PERMIT COVERAGE. A copy of the notice of intent or other indication that storm water discharges from the site are covered under a general WPDES permit shall be kept with building plans on the construction site and with the landowner. Where appropriate, notification under ch. ILHR 50 or Trans 401 or a county, city, village or town ordinance in effect prior to January 1, 1994 that establishes standards for erosion control at commercial building sites may be used in lieu of the department's notice of intent.

(11) PERMIT MODIFICATION. The department may, upon request of a permittee or upon finding of just cause, grant modifications to the compliance and reporting schedules or any requirements of a storm water discharge permit.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.47 Storm water management plan requirements. Pollution caused by storm water discharges from the site after construction is completed, including, but not limited to, rooftops, parking lots, roadways and the maintenance of grassed areas shall be addressed by a storm water management plan. Inclusion in the plan of post construction management may not bind either future owners of the property nor any municipalities to implement the management practices. A storm water management plan is not required for projects that do not alter runoff volumes or runoff quality from existing conditions and that do not include new development or redevelopment.

Note: Projects that may be excluded from the storm water management plan primarily involve highway maintenance projects related to ditching.

(1) PRACTICES DURING CONSTRUCTION. The plan shall include a description of the management practices that will be installed during the construction process to control peak flow, pollutants and runoff volume that will occur after construction operations have been completed. Storm water management practices shall be in accordance with applicable state and local regulations. To the extent feasible, the plan shall consider efforts to increase on–site infiltration through conveyance, depression storage and reduction of impervious area, consistent with any site or local development standards.

(2) LONG TERM PRACTICES. For any permanent structures, provisions shall be made for long–term maintenance. Long term maintenance provisions for storm water management structures should be made with the local municipality. If the local municipality agrees to take over long term maintenance responsibilities, a copy of the agreement shall be attached to the notice of termination. If the local municipality will not make such an agreement, alternative provisions that will be made for long–term maintenance of storm water management structures shall be identified, and a copy of the document mechanism by which it shall be enacted attached to the notice of termination.

Note: These are interim measures only. In the future, the department will be working to address this issue more fully.

(3) MANAGEMENT PRACTICES. Storm water management practices to control impacts from runoff volume and pollutants may include, but are not limited to: infiltration systems, flow attenuation, constructed wetlands, temporary or permanent ponds, combinations of these practices, or other methods which do not cause significant adverse impact on the receiving surface water or groundwater. The plan shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.48 Reporting and monitoring requirements. **(1)** RECORDS. The permittee shall retain records of all monitoring information, copies of all reports and plans required by the permit, and records of all data used to obtain coverage under the permit. Minimum periods of retention are as follows:

(a) The construction site erosion control and storm water management plan, and amendments to the construction site erosion control and storm water management plan shall be retained at the site until construction is completed, the site has undergone final stabilization and permit coverage is terminated.

(b) All reports required by this subchapter or information submitted to obtain coverage under this subchapter, including the construction site erosion control and storm water management plan, amendments and background information used in their preparation, shall be kept by the permittee for a period of at least 3 years from the date of notice of termination.

(2) LOCAL APPROVALS. Persons operating a construction site under approved local sediment and erosion plans, grading plans or storm water management plans shall also submit signed copies of the notice of intent to the local agency approving the plans. If storm water from the construction site discharges to a separate storm sewer system that is operating pursuant to a general WPDES permit, then a signed copy of the notice of intent shall also be sent to the operator of the system.

(3) ADDITIONAL INFORMATION. Upon request by the department, the permittee shall provide a copy of the plan, and any additional data requested, within 5 working days to the department, to the operator of the storm sewer system which receives the discharge, and any local agency approving sediment and erosion plans, grading plans or storm water management plans. the additional information shall be submitted in accordance with s. NR 200.09. Additional information may be requested by the department for resource waters that require additional protection such as outstanding or exceptional resource waters, or other sensitive water resources.

(4) PERMITTEE RESPONSIBILITIES. For the purposes of monitoring, the permittee shall:

(a) Conduct the following inspections:

1. Weekly inspections of implemented erosion and sediment controls; and

2. Inspections of erosion and sediment controls within 24 hours after a precipitation event 0.5 inches or greater which results in runoff during active construction periods.

(b) Maintain weekly written reports of all inspections conducted by or for the permittee that include:

1. The date, time and exact place of the inspection;

2. The name of the individual who performed the inspection;

3. An assessment of the condition of erosion and sediment controls;

4. A description of any erosion and sediment control implementation and maintenance performed; and

5. A description of the present phase of construction at the site.

(5) SUBMITTAL OF INFORMATION. The information maintained in accordance with sub. (4) shall be submitted, upon request of the department.

Wisconsin Department of Natural Resources
Bureau of Watershed Management
101 South Webster P.O. Box 7921
Madison, WI 53707–7921

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.49 Conformance with other applicable plans. **(1)** LOCAL COMPLIANCE. The plan shall document other applicable county and local regulatory provisions, compliance with which will also meet the requirements of the permit. If these additional provisions are more stringent than those provisions appearing in a permit issued pursuant to this subchapter, the plan shall include a description of how it will comply with these provisions.

(2) SANITARY REGULATIONS. The plan shall ensure and demonstrate compliance with applicable state and local waste disposal, sanitary sewer or septic system regulations.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.50 Amendments. **(1)** APPLICABILITY. The permittee shall amend the plan if either 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; and

(b) The actions required by the plan fail to reduce the impacts of pollutants carried by construction site storm water runoff.

(2) DEPARTMENT NOTIFICATION. If the department notifies the permittee of changes needed in the plan, the permittee shall submit, within the date specified in the notice, the changes in the plan.

(3) SUBMITTAL REQUIREMENTS. For those projects for which there has been earlier department review of the project, if the permittee identifies changes needed in the plan, the permittee shall notify the department within 5 days of an intent to change the plan.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.51 Department actions. **(1)** INADEQUATE PLANS. The department may notify the permittee at any time that the plan does not meet one or more of the minimum requirements of this subchapter, or a permit issued pursuant to this subchapter, for reducing and preventing soil erosion. The notification shall identify those provisions which are not being met by the plan, and identify which provisions of the plan require modifications in order to meet the minimum requirements.

(2) REQUIRED PLAN REVISIONS. Within the time frame identified by the department in its notice, the permittee shall make the required changes to the plan, perform all actions required by the revised plan, and submit to the department a written certification that the requested changes have been made and implemented, and such other information as the department requires. Failure to comply shall terminate authorization to discharge pollutants under the general WPDES permit program.

(3) OTHER STORM WATER DISCHARGERS. The department may require the landowner of any storm water discharge to apply for and obtain a storm water permit if the storm water discharge is determined to be a significant contributor of pollution.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.52 Use of information. All information contained in the notice of intent other than that specified as confidential shall be available to the public for inspection and copying. All confidential information, so identified, shall be in separate documents. Effluent data is not confidential information. Confidential treatment will be considered only for that information identified as confidential in documents separate from nonconfidential information which meets the requirements of s. 283.55 (2) (c), Stats., and for which written application for confidentiality has been made pursuant to s. NR 2.19.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.53 Time periods for action on permit applications and modification requests. **(1)** EFFECTIVE DATE OF PERMIT. Unless notified by the department to the contrary, applicants who submit a notice of intent in accordance with the provisions of this subchapter are authorized to discharge storm water from construction sites under the terms and conditions of the general WPDES permit 14 working days after the date that the department receives the notice of intent. The department may require the landowner to submit plans and specifications for approval of storm water treatment practices, pursuant to s. 281.41, Stats.

(2) DENIAL OR REVOCATION OF GENERAL PERMIT. The department may deny or revoke coverage under a general WPDES permit and require submittal of an application for an individual WPDES storm water discharge permit based on a review of the completed notice of intent or other information.

(3) INDIVIDUAL PERMIT. The department may require the landowner of any storm water discharge covered by a general WPDES permit issued pursuant to this subchapter to apply for and obtain an individual WPDES storm water discharge permit if any of the following occur:

(a) The storm water discharge is determined to be a significant source of pollution and more appropriately regulated by an individual WPDES storm water discharge permit;

(b) The storm water discharge is not in compliance with the terms and conditions of this chapter, or of a general WPDES permit issued pursuant to this chapter;

(c) A change occurs in the availability of demonstrated technology or practices for the control or abatement of pollutants from the storm water discharge; or

(d) Effluent limitations or standards are promulgated for a storm water discharge that are different than the conditions contained in this chapter.

(4) PETITION. Any person may submit a written request to the department that it take action under sub. (3).

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.54 Transfers. A person who has submitted a completed notice of intent and does not intend to control the permitted activities on the site may transfer authorization under a general WPDES permit to the person who will control the permitted activities. The transfer shall occur upon written notification, signed by both the transferor and transferee and sent via certified or registered mail to the department. Unless the permittee is notified to the contrary by the department, the department will recognize this permit coverage transfer upon receipt of written notification. The department may require additional information to be filed prior to granting coverage under the general WPDES permit. The department may, if appropriate, require an application for an individual WPDES storm water discharge permit to be submitted.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

NR 216.55 Notice of termination. When a site has undergone final stabilization and all storm water discharges associated with construction site activities that were required to have a general WPDES permit under this subchapter have ceased, the permittee shall submit a signed notice of termination to the department.

(1) FORMS. A notice of termination shall be submitted on forms supplied by the department. Data submitted in the notice of termination forms shall be used as [a] basis for terminating coverage of a storm water discharge permit. Different notice of termination forms are used to provide information from different sources of storm water discharge.

(2) OBTAINING FORMS. Notice of termination forms may be obtained from the district offices of the department or by writing to the Department of Natural Resources, WPDES Permit Section, Box 7921, Madison, WI 53707–7921.

(3) FILING. Notice of termination forms shall be filed with the Department of Natural Resources, WPDES Permit Section, Box 7921, Madison, WI 53707–7921.

Note: It is intended that when these forms are changed, input from affected individuals and parties will be sought.

(4) SIGNATURE REQUIREMENTS. The notice of termination form shall be signed as follows:

(a) In the case of a corporation, by a principal executive officer of at least the level of vice–president, or by his or her authorized representative responsible for the overall operation of the site for which a permit is sought;

(b) In the case of a partnership, by a general partner; or

(c) In the case of a sole proprietorship, by the proprietor.

(5) REQUIRED INFORMATION. The notice of termination shall include the following information:

(a) The mailing address and location of the construction site for which the notification is submitted.

(b) The name, address, telephone number of the current permittee, as well as any transferee;

(c) The name, address and telephone number of the general contractor; and

(d) The following signed certification:

"I certify under penalty of law that disturbed soils at the identified site have undergone final stabilization and temporary erosion and sediment control measures have been removed or that all storm water discharges associated with construction activity that are authorized by a general WPDES permit have otherwise been eliminated. I understand that by submitting this notice of termination, I am no longer authorized to discharge storm water associated with construction activity by the general WPDES permit, and that discharging pollutants in storm water associated with construction activity to waters of Wisconsin is unlawful where the discharge is not authorized by a general WPDES permit."

(6) EFFECTIVE DATE. Termination of coverage under the permit shall be effective upon submittal of written confirmation of final stabilization by the department to the permittee.

History: Cr. Register, October, 1994, No. 466, eff. 11–1–94.

Watershed Protection

Techniques

SPECIAL EXPANDED ISSUE
EROSION AND SEDIMENT CONTROL

A Periodic Bulletin on Urban Watershed Restoration and Protection Tools — Vol. 2, No. 3 — February 1997

Feature Articles

Open Forum

Technical Notes

A Publication of the

CENTER FOR WATERSHED PROTECTION

critique of erosion and sediment control plans

Muddy Water In - Muddy Water Out?

'hitney E. Brown and Deborah S. Caraco, Center for Watershed Protection

Construction is considered the most damaging phase of the development cycle for streams and other aquatic resources. Many communities have responded to the many impacts caused during construction by enacting erosion and sediment control (ESC) ordinances. Typically, the ordinances require developers to submit a plan that contains measures to reduce soil erosion (erosion prevention) and practices to control sediments that have already eroded (sediment controls). In addition, plans may restrict or require phasing of the clearing or grading needed to prepare a development site. Once an ESC plan is reviewed and approved by the local or state authority, the ordinance then requires the developer or contractor to install and maintain specified measures and practices throughout the construction phase. A construction site may be inspected for compliance, and if found lacking, an inspector may issue a permit violation, stop-work order, fine, or take other measures to compel action.

Theory Collides With Reality

How well do these ESC programs work in the real world? Not very well, according to six recent surveys of local and state ESC experts and administrators. Consider these statistics:

- Paterson's (1994) investigation of 128 North Carolina construction sites revealed that 16% of the ESC practices prescribed in the plan were never installed. Of the ESC practices that were actually installed, 16 % percent were not installed correctly and failed to perform. An additional 18% of ESC practices failed because of a lack of maintenance. Combining these three sources of failure together, Paterson found that half of all practices specified in the ESC plans were not implemented properly.
- Mitchell (1993) surveyed state highway erosion control experts finding that 30% of respondents reported that at least half of the ESC practices specified in highway ESC plans were never actually installed. While 83% of the respondents indicated that they required a preconstruction meeting with the contractor to discuss ESC plan implementation, only 29% scheduled a pre-wintering meeting. The state highway ESC experts cited five major problems in achieving better highway ESC control: lack of inspectors, weather, lack of contractor cooperation, lack of state leadership, and contractor ignorance (in rank order).
- North Carolina ESC surveys by Patterson et al. (1993) found that contractors actually spent only half the estimated cost to install the ESC controls outlined in their plan. In addition, local governments expended three to six times more effort reviewing plans than actually inspecting them. Despite the fact that a majority of ESC staff spent time in the office, they received very little training nor did they train contractors. Training comprised only one-tenth of one percent of local ESC program budgets.

> Half of all ESC practices in a North Carolina study were not properly implemented.

- According to a survey of 24 ESC local programs in Northeastern Illinois conducted by Dreher and Mertz-Erwin (1991), less than 45% of ESC plan reviewers had received formal training in ESC techniques. In addition, while a slightly higher number of inspectors were trained in ESC techniques (55%), most training consisted of informal field monitoring by more experienced staff. The researchers also reported a wide range of inspection frequency. For example, 25% of communities only conducted inspections in response to citizen complaints, and 10% inspected construction sites less frequently than one time a month. More positively, half the Ilinois programs reported construction site inspections were done weekly or on a more frequent basis.
- Corish's 1995 national survey of 40 local ESC programs documented poor plan implementation. For example, 67% of survey respondents indicated that ESC controls were inadequately maintained. Soils were not adequately stabilized within the prescribed time limit in 44% of ESC programs, and 56% of programs encountered chronic problems with inadequate temporary soil stabilization (grass or mulch cover).

Nearly half of the local program respondents noted that sensitive areas adjacent or within construction sites, such as stream buffers and wetlands, were inadequately protected from sediment or were actually cleared. Trees and forest areas "protected" under the plan were not in fact, according to 57% of respondents. Another 24% reported clearing frequently occurred well beyond the disturbed area specified in the plan. Lastly, 36% of the respondents to Corish's survey observed that steep slopes were improperly cleared or were inadequately stabilized.

- A national survey of over 80 local ESC programs conducted by Brown and Caraco (1996) discovered that 10% of local ESC programs appear to exist only on paper, as they allocated no staff for either plan review or inspection. Staffing was a major constraint even for the established ESC programs in larger communities that processed in excess of 100 ESC permits each year. Over half of these larger ESC programs had less than two plan reviewers and three inspectors to administer their program, and these staff were often asked to perform other duties.

Many ESC plans are poorly integrated with other stream protection efforts.

The lack of manpower reflects a chronic funding problem for many local ESC programs, as 75% reported complete dependence on unreliable revenue streams such as application fees or local operating budgets. Brown and Caraco (1996) further noted that a third of all programs surveyed did not require engineering plans, and one-fourth considered themselves a "non-regulatory" program.

Several surveys found that ESC practices rated by experts as "most effective" were seldom applied. Conversely, a number of ESC practices rated as "ineffective" still enjoy widespread use (Patterson 1994; Brown and Caraco 1996). The four most popular practices cited in a national survey were silt fences, stabilized construction entrances, storm drain inlet protection and temporary vegetative stabilization—all of which rank high in terms of installation and maintenance problems.

The actual sediment removal capability of many ESC practices appears to be fairly limited, with most practices achieving 50 to 85% total suspended solids (TSS) removal rates, according to recent field research profiled in this issue of *Techniques*. By contrast, sediment removal rates on the order of 95 to 99% are needed to achieve anything resembling a "clear water" discharge.

ESC practices are increasing the cost of development, with several sources estimating they now comprise three to six percent of total development costs. While this investment would have been unthinkable a few decades ago, it is evident from the foregoing statistics that much of this money is not being well spent—practices are poorly or inappropriately installed, and very little is spent on maintaining them. It is therefore unsurprising that many in the development industry view ESC plans as "muddy water in – muddy water out and a lot of money in between."

Taken together, the information presented here confirms that both the quality and the implementation of ESC plans need to be greatly strengthened. In the remainder of this article, we explore practical factors that lead to poor design and implementation of ESC plans based on surveys and expert opinion of ESC professionals. Next, ten elements that can improve performance are outlined in order to assist in increasing plan effectiveness. Finally, some practical recommendations are made to improve the capability of local ESC programs to produce better results in the field, given the reality that resources will always be scarce for most communities.

Why Erosion and Sediment Control Plans Fail to Perform

Before ESC plans can be improved, it is important to understand the underlying reasons why they fail. In general, poor performance can be explained by two reasons. First, many ESC plans are not well integrated with other stream protection efforts occurring during construction. Construction is potentially the most destructive stage in the entire development process—trees and topsoil are removed, soils are exposed to erosion, steep slopes are cut, natural topography and drainage are altered, wetlands filled, and riparian areas are disturbed. Consequently, an ESC plan is about more than preventing sediment from leaving the site. It also sets forth how a stream will be protected during this critical stage of development. The plan should clearly outline where and how other stream protection measures are employed, such as wetland protection, forest conservation, stream buffers, and stormwater best management practices, (BMPs). It is worth emphasizing that grading and ESC plans are usually the only plans that are routinely read by earthmoving contractors at a construction site. Consequently, any stream protection measure that is dependent or influenced by earthmoving activities, and most are, should be clearly marked on the plan.

Many communities fail to make this important link. As a result, their ESC programs are not integrated into an overall stream protection strategy. For example, only 35% of the local ESC programs considered wetland protection in the ESC plan approval process. An even smaller number (20%) reviewed ESC plans within a watershed or special protection framework (Ohrel 1996). All too often, ESC plans tend to be developed in isolation from other stream protection plans prepared for the site— someone else designs the stormwater management practices, somebody else does the grading plan, while others assemble any wetland protection, forest conservation, stream buffer or other sensitive area requirements. Because these plans are usually submitted to different agencies and undergo separate approval processes, there is no apparent need to integrate them.

A quick glance through many state and local ESC manuals reveals a second major reason for poor ESC plans—they are based on "cookie cutter" manuals. Most ESC manuals consist of little more than a collection of a few dozen detailed standards and specifications for individual ESC practices. Very little guidance is given on how to combine ESC practices together into an effective plan. In particular, most ESC manuals provide very skimpy coverage about erosion prevention techniques, such as clearing restrictions, protecting the limits of disturbance, and construction phasing. Many of the standard details for ESC practices are outdated or lack specific guidance on where and when a particular practice is appropriate. For example, Mitchell (1993) reviewed the contents of 49 state highway ESC manuals and found that 50% did not have detailed standards and specifications for 25 of the more common ESC practices. Few practices ever seem to be dropped from ESC manuals, even if monitoring data or maintenance experience prove them to be inadequate. At the same time, design enhancements that can sharply increase the effectiveness of an ESC practice are often recommended but not required. Faced with this choice, cost-conscious designers and contractors will generally only chose to install that which is absolutely required.

With ESC manuals offering relatively little practical guidance, the responsibility for developing a quality plan falls to the design engineer. ESC plans, however, are often among the last elements of a construction plan to be completed, and are usually delegated to junior engineers who possess little hands-on ESC experience or training. Often, the only resources available to them are the grading plan for the site, a few sample ESC plans and the local ESC manual. Given a tight timetable, a designer rarely has time to become familiar with construction site conditions. Thus, it is not surprising that many ESC plans submitted to local agencies for review are of poor quality.

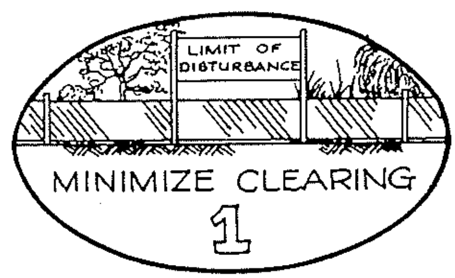
Local plan reviewers, in turn, often lack the time to fix mistakes, or may not have the field experience or specialized training needed to catch them. This leaves it up to the inspector to correct the mistakes at the construction site. At this point, the contractor who based the ESC cost estimate on the original plan, is extremely reluctant to make any changes that will increase costs.

Ten Elements of an Effective Plan

How can the implementation of ESC plans be improved? To start, designers and plan reviewers should check their ESC plan to determine if it includes the ten critical elements portrayed in Figure 1. These ten elements were drafted in consultation with local and state ESC experts. They present a comprehensive and integrated approach for achieving stream protection requirements during construction. As a result, only four elements of the ten actually involve better design and selection of ESC practices. Three ESC elements emphasize non-structural techniques for erosion prevention, while the last three involve management techniques to translate a plan into reality. The ten elements are:

> Only those areas actually needed for building construction access should ever be cleared.

1. Minimize Needless Clearing and Grading
2. Protect Waterways and Stabilize Drainage Ways
3. Phase Construction to Limit Soil Exposure
4. Stabilize Exposed Soils Immediately
5. Protect Steep Slopes and Cuts
6. Install Perimeter Controls to Filter Sediments
7. Employ Advanced Sediment Settling Controls
8. Certify Contractors on ESC Plan Implementation
9. Adjust ESC Plan at Construction Site
10. Assess ESC Practices After Storms



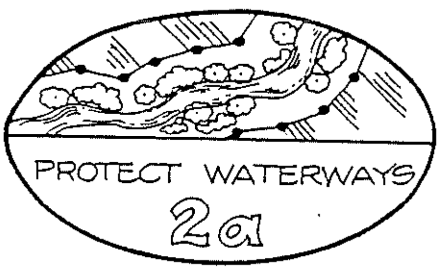
Clearing and grading should only be performed within the context of the overall stream protection strategy. Some portions of the development site should never be cleared and graded, or these activities should be sharply restricted. These include:

- stream buffers
- forest conservation areas
- wetlands, springs and seeps
- highly erodible soils
- steep slopes
- environmental features
- stormwater infiltration areas

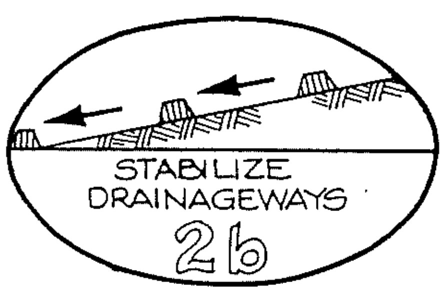
A site designer can go even further, however, and analyze the *entire* site to find other open spaces where clearing or grading can be avoided. Ideally, only those areas actually needed to build structures and provide access should be cleared. This technique, known as site fingerprinting, can sharply reduce earthwork and ESC control costs by as much as $5,000 per acre (Schueler 1995) and is critical for forest conservation. All "protected" areas should be delineated on construction drawings, and shown as the "limits of disturbance " or LOD.

Hydroseeding and mulching provide a 80 to 90 % reduction in sediment load.

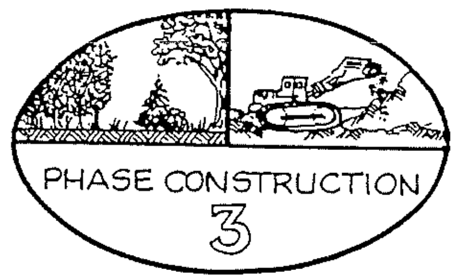
The LOD must be clearly visible in the field, and posted by signage, staking, flagging or most preferably, fences (i.e., silt fence or temporary safety/ snow fence). The limits and the purpose of the LOD should be clearly conveyed to site personnel and the construction foreman at a preconstruction meeting. In addition, paving and other subcontractors that will be working on the site during a later stage of construction should also be routinely notified about the LOD as they arrive.



Streams and waterways are particularly susceptible to sedimentation. A designer should always check to see if they are present at a site and whether construction activities will occur near them. If so, no clearing is permitted adjacent to the waterway. As a secondary form of protection, a line of silt fence or earthen dike should be installed along the perimeter of the waterway buffer. If work is planned across or within the waterway, special crossings and diversion techniques will be required (WRA 1986, is an excellent reference in this regard).



Of equal importance, a designer should carefully map the existing and future drainage patterns at the site, known as *drainage ways*. Not only are drainage ways the major route that eroded sediments take to reach streams and waterways, they also are prone to severe erosion due to the velocity of concentrated runoff that travels through them. Consequently, special ESC practices are applied to the drainage way, depending on their slope and length, and the disturbed area that drains to them. An ideal drainage way serves as a grassed waterway, which may require sod, erosion control blankets or jute netting to prevent erosion during storms. In addition, checkdams may often be needed along the drainage way, using riprap, earth, silt fence or straw bales. The storage provided behind checkdams can trap sediment and it also serves as a useful backup in cases where an upstream portion of the drainage way begins to erode into a gully.

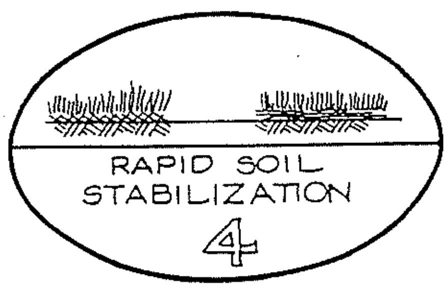


Mass grading of larger construction sites should be avoided because it maximizes both the time and area that disturbed soils are exposed to rainfall and therefore subject to soil erosion. As an alternative, designers should consider "construction phasing" whereby only a portion of a construction site is disturbed at any one time to complete the needed building in that phase. Other portions of the construction site are not cleared and graded until the construction of the earlier phase is nearly completed and its exposed soils have been stabilized.

Construction phasing is similar to "just-in-time manufacturing" in that earthmoving occurs only when it is absolutely needed. By breaking the construction site into smaller units, the disturbed area is sharply reduced. This is particularly critical for larger residential and commercial projects that may take one, two or even three years to finish. The potential reduction in sediment load from construction phasing can be very impressive. Claytor computes a 42% reduction in off-site sediment loads in a typical subdivision development scenario (Technical Note 80).

Phased construction requires careful planning. For example, the phase must be planned so that earthwork is balanced within a phase, i.e., the "cut" soil from one area matches the "fill" requirement elsewhere. Other key elements of construction phasing are described in Technical Note 80, and include provisions for temporary stockpiling and construction access, and performance criteria for triggering a new phase. In addition, the phases should correspond to existing or future drainage boundaries wherever possible. In general, construction phasing is most appropriate for larger construction sites of 25 acres or more.

Lastly, it is important to note that construction *phasing* should not be confused with the construction *sequence*, which outlines the specific order of construction that the contractor must follow to complete a single phase. The construction sequence can also be a critical element of an ESC plan. For example, the construction sequence should clearly state that the first step of construction is a preconstruction meeting, that ESC controls must be installed prior to any clearing or grading, and that disturbed areas must be stabilized within a prescribed time limit. In addition, the ESC designer should carefully evaluate the entire construction sequence to determine if additional ESC practices are needed. For example, the location of drainage ways are often altered as the construction sequence progresses, particularly after storm drains are installed. Consequently, additional ESC practices may be needed to accommodate the greater runoff and new discharge points that occur in later development stages.

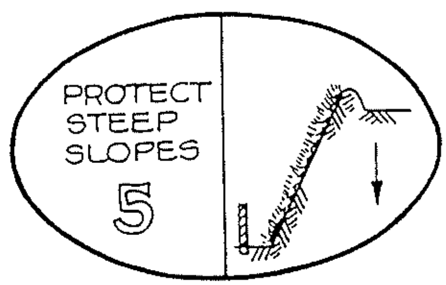


The objective at every construction site is to establish a grass or mulch cover within a minimum of two weeks after the soils are exposed. Given the germination time for grass, this means that hydroseeding must occur within two to five days after grading. In northern climates, a straw, bark or fiber mulch is needed to stabilize the soil during the winter months when grass does not grow, or grows poorly.

The value of soil stabilization cannot be overemphasized; research in Maryland has shown that it can reduce sediment concentrations by up to six times, compared to exposed soils without stabilization (Schueler and Lugbill 1990). A review of over 20 field test plot studies of hydroseeding and various mulches on construction site soils indicates an average sediment reduction of about 80 to 90% (see Technical Note 81). ESC experts almost universally recommended mulching and seeding in the Brown and Caraco (1996) survey.

An effective ESC plan will clearly define time limits to establish grass or mulch covers, outline the rates and species of either cool-season or warm-season grasses to be hydroseeded (or type of mulch), and define the conditions under which temporary cover must be reinforced such as drought, severe erosion or poor germination. In particular, a pre-winter meeting should be held at northern construction sites to assess whether the existing soil cover will be adequate throughout the demanding months ahead. A good construction contract should also include a contingency line item for replacing temporary cover in the event that the cover does not take. The last objective of the ESC plan is to permanently stabilize disturbed soils with vegetation at the conclusion of each phase of construction.

Research in Maryland has shown that soil stabilization can reduce sediment concentrations by as much as six times more effectively than not using this practice.

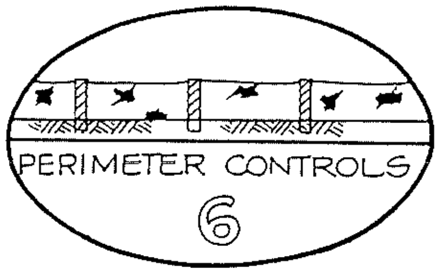


Steep slopes are the most highly erodible surface of a construction site and require special attention on the part of the designer. Steep slopes are variously defined as being 6:1 to 3:1 or greater for existing topography depending on the region of the country. In addition, grading often creates engineered slopes on cut or fill of as much as 50% (2:1 h:v). Wherever possible, clearing and grading of existing steep slopes should be avoided altogether.

If clearing cannot be avoided, special techniques can be used to prevent upland runoff from flowing down a slope. Otherwise severe gullies quickly form, and the slope can fail. The best method involves diverting upland flow around the slope using an earthen dike or slope drain pipe. An upslope line of silt fence can also be used for this purpose, but only if it is adequately anchored, contributing flow lengths are 50 feet or less, and a permanent drainage structure is installed to protect the slope.

Silt fencing at the toe of slope should be applied with great care as high flow velocities and sediment movement downslope will quickly overload or knock the silt fence down. In addition, the performance of silt fences on the toe of slopes is rather low, ranging from 36 to 65% in two Oregon test plot studies (W&H Pacific 1993). It may be advisable to use a scoop trap or super silt fence under these demanding field conditions. For a description of these techniques, see Technical Note 82.

Temporary seeding or mulch, by themselves, may not be effective in preventing erosion on the exposed soils of the slope (Harding 1990). Additional stabilization methods may be needed such as erosion control blankets and mulch binders. Alternatively, the mulch application rate can be increased. In some cases, steep slopes can be protected in the winter months using plastic sheeting that is suitably anchored (e.g. temporary soil stockpiles.)



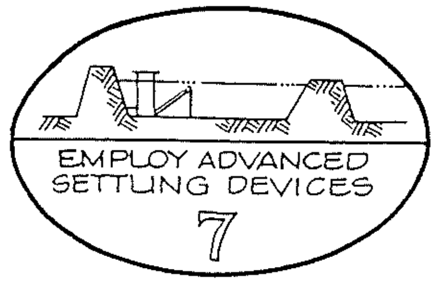
Perimeter controls are established at the edge of a construction site to retain or filter concentrated runoff from relatively short distances before it leaves the site. The two most common perimeter control options are silt fences and earth dikes or diversions. Other options are available, including using sidewalk gravel as a perimeter filter on very small and flat areas (Portland BES 1994).

When properly installed, located and maintained, silt fences are moderately effective in filtering sediment, with reported removal rates ranging from 75 to 86% (Goldman et al. 1986, and review in Technical Note 82). A majority of the ESC experts, however, report chronic problems in maintaining silt fences (Brown and Caraco 1996; Paterson 1994). A field assessment of over 100 silt fences in North Carolina indicated that 42% of all site fences were improperly installed and 66% were inadequately maintained (Paterson 1994). The correct placement of silt fences is discussed in detail in Technical Note 82.

Sediment traps and basins have sediment removal capability of 70 to 90 percent.

The use of straw bale dikes as a perimeter control is not recommended for most communities, except in special circumstances. Only 27 percent of ESC experts rated the straw bale as an effective ESC practice, although its use was still allowed in half of the communities surveyed (Brown and Caraco 1996).

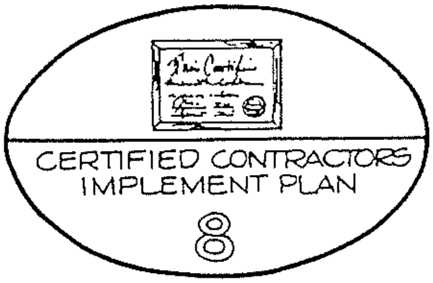
Earth dikes can also be employed as a perimeter control. For small sites, a compacted two-foot tall dike is usually suitable, if it is hydroseeded. When larger dikes are employed it should be kept in mind that they will actually divert runoff to another portion of the site, usually to a downstream sediment trap or basin. Therefore, the designer should ensure they have a stabilized outlet, have capacity for the ten-year storm event, and that the channel created behind the dike is properly stabilized to prevent erosion. ESC experts typically report fewer maintenance problems with these earth dikes if they are properly engineered (Brown and Caraco 1996).



Even when the best ESC practices are employed, construction sites will still discharge high concentrations of suspended sediments during larger storms. Therefore, the ESC plan should include some kind of trap or basin to capture sediments, and allow time for them to settle out. These settling devices face an imposing performance challenge, as they must operate at a 95 to 99% efficiency to produce a non-turbid discharge. Recent field research, however, indicates that most sediment traps and basins have sediment removal capabilities only on the order of 70 to 90%. They also have a discharge TSS concentration of several hundred mg/l. For further discussion, see Technical Note 83.

The limited trapping efficiency of sediment basins in the field appears to be caused by two major factors: the extreme difficulty in settling out fine-grained sediment particles in suspension (i.e. fine silts and clays) and the simplistic design of existing basins. Most basin designs fail to produce ideal settling conditions over the range of storm events that can be expected at a construction site. Indeed, most sediment basins are nothing more than a hole in the ground.

To improve their trapping efficiency, sediment basins must be designed in a more sophisticated manner. These design features include greater wet or dry storage volume, perforated risers, better internal geometry, use of baffles, skimmers and other outlet devices, gentler side-slopes and multiple cell construction. A series of recent field and lab research studies has evaluated the effectiveness of these additional sediment basin design features (see Technical Note 84). In addition, the ESC plan should contain a detailed inspection and clean out schedule for the basin, along with procedures for converting the basin into a permanent stormwater management facility.

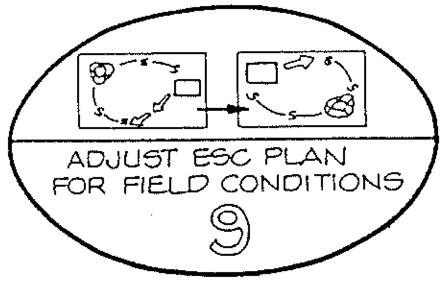


Plans don't stop sediments from eroding, contractors do. Therefore, the single most important element in ESC plan implementation is a trained and experienced contractor, as they are ultimately responsible for the proper installation and upkeep of ESC practices. In recognition of this fact, many communities now require that key on-site construction staff be certified to implement the ESC plan. For example, both Maryland and Delaware require that at least one person on any construction project be formally certified.

Certification is obtained by completing a mandatory state-sponsored ESC training course. The certified ESC contractor is trained on why ESC is so important in stream protection, how to read ESC plans, and the proper installation and upkeep of ESC practices. Typically, the certified contractor is the liaison with the local inspector, and keeps a maintenance and inspection log.

Even if no formal certification program yet exists in a community, there are still several opportunities to train and educate construction personnel on how to implement the ESC plan. These include a mandatory preconstruction meeting, regular inspection visits, a pre-wintering meeting, and the final inspection upon completion of a phase or the entire project. For example, Paterson (1994) documented that a preconstruction meeting can increase ESC plan compliance by as much as 15 percent.

An inspector should view every meeting and site inspection as an educational opportunity, to provide insight into why ESC practices worked or failed, and what maintenance may be needed in the future. This last item is especially important, as many contractors may not realize that ESC practices require maintenance or repair from time to time. Given tight construction budgets and schedules, it is not surprising that many contractors wait until a local inspector tells them what needs to be fixed. Local governments that make a strong commitment to contractor education report that inspectors and contractors develop a more constructive and responsive partnership at the site.



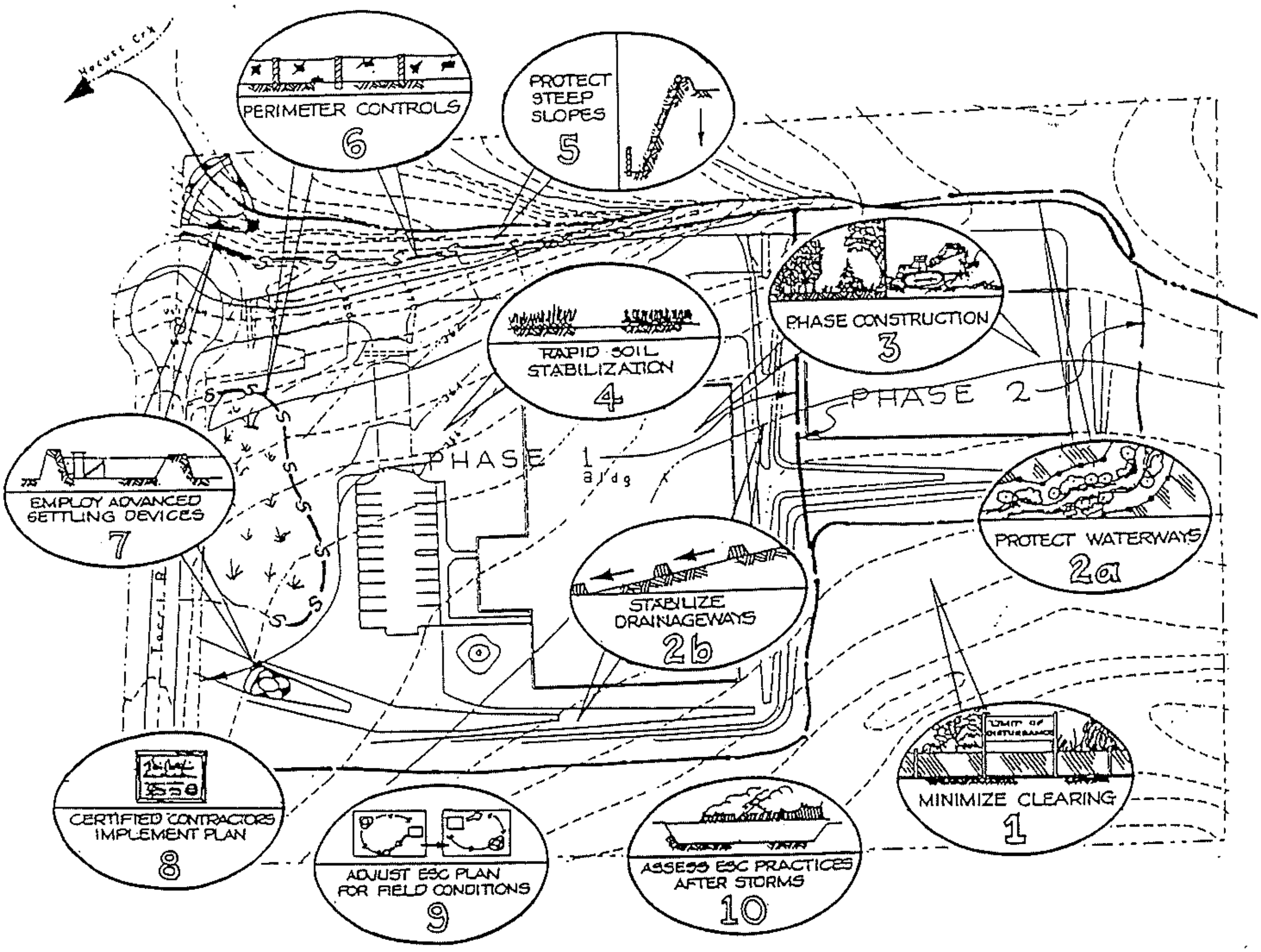
Plans are usually the first casualty in any military engagement, and must be rapidly revised if the battle is to be won. ESC plans are not much different. An effective ESC plan is usually modified as it moves from the office to the construction site, because of discrepancies between planned and as-built grades, weather conditions, altered drainage, and unforseen construction requirements. The first two opportunities to revise the ESC plan occur during the preconstruction meeting and the initial inspection of ESC practice installation. Table 1 highlights some of the more common revisions to the ESC plan that may be needed.

Plans don't stop sediment from eroding, contractors do.

Regular inspections are needed to ensure that ESC plans are properly implemented, with an ideal frequency of a week or every two weeks. If this inspection frequency is not possible given local staffing, then a community may wish to utilize independent private-sector inspectors to supplement the efforts of local ESC inspectors (see Technical Note 85).

After a storm passes, it is very clear whether or not an ESC plan actually "worked" at the construction site. If the storm was unusually large or intense, it is very likely that many ESC practices will need repair, clean out or reinforcement. For example, hydroseeding may wash away, silt fences over-top, earth dikes blow out, sediment basins fill up or new gullies form. Therefore, the last element of an effective ESC plan is a rapid response after a storm to assess the damage to ESC practices and quickly correct it.

FIGURE 1: Ten Critical Elements of an Effective ESC Plan



Every site designer and plan reviewer should analyze the construction site to see if it can achieve the ten critical elements of an effective ESC plan, as shown above. (Site plan courtesy of North Carolina Erosion and Sedimentation Control Manual.)

TABLE 1: Stages of Construction When Plan Revisions Should be Considered (Source: U.S. EPA 1993)

Stage	Basis of Plan Changes
Preconstruction meeting	Plan impractical from the contractors' standpoint (e.g., not enough space for materials storage)
	Site visit confirms that the plan will not work based on other site characteristics
After clearing/grading and sediment control installation	"As built" grading or sediment controls are different from the original plan
During construction of the drainage system	Hydrology changes may require new different ESC measures
During house construction	Importing materials and site preparation for home construction will alter the landscape
As needed based on routine inspection visits	Failing measures may need to be modified
After major storms	Major storm events reveal under- or poorly designed practices
Close of season	Depending on weather or season, stabilization may be different than on the original plan

The dynamic conditions at a construction site make maintenance of ESC practices critical. Some contractors will wait until an inspector threatens them with an enforcement action. The underlying reason for their reluctance is financial—most construction contracts include ESC as a single lump sum *installation* item in the bid estimate. More often than not, contractors "low ball" the ESC item to be competitive on the overall bid. Thus, they often balk at incurring the "extra" cost to maintain or repair ESC practices because it decreases their profit margin on a job. To avoid these problems, a good construction contract will also include a *contingency line item for maintaining and repairing ESC practices*. Some estimates of the expected cost of maintaining selected ESC practices as a percent of the total cost of installing the practice can be found in Table 2.

Other maintenance requirements in the ESC plan include the designation of an on-site (certified) contractor responsible for maintenance, a minimum maintenance schedule, and a periodic self-inspection of the limits of disturbance.

How Can Local Communities Foster Better ESC Plan Implementation?

Over ninety percent of ESC programs are administered by municipal, local, or natural resource or soil conservation district agencies (Brown and Caraco 1996). According to the same survey, sixty percent of local ESC programs were mandated by state law, but provided no funding to support local implementation. Local ESC agencies are chronically strapped for funds, and over 75% rely on local property taxes or application fees as their sole source of revenue. ESC programs must routinely compete with many other un-met spending priorities within a community—and they often lose. Absent a dedicated funding source, it is doubtful whether many communities can ever afford the full complement of inspectors and plan reviewers they probably need. Given shoestring budgets faced by so many local ESC programs, how can they realistically improve the performance of ESC plans?

When resources are limited, the only means to become more productive is to dramatically improve how existing ESC program resources are managed. With this in mind, the Center suggests ten modest management tips to get more results with fewer resources.

1. Leadership. According to Shaver (1996), the best ESC programs in the country share a common feature which is committed local leadership. Key characteristics of effective leaders include a strong belief that ESC is a critical element of local environmental

TABLE 2: Maintenance Costs as Percentage of Installation Costs (Source: U.S. EPA 1993)

Practice	Annual Maintenance as % of Installation
Seeding	20%
Mulching	2%
Silt Fence	100%
Sediment Trap	20%
Sediment Basin	25%
Inlet Protection	60%

protection, a tireless commitment to educate designers, contractors, and the public about the need for better erosion and sediment control, and a willingness to try new approaches and techniques to continually improve the quality of the ESC program.

2. Re-deploy existing staff from the office to the field or the training room. Plan reviewers can be assigned more time at construction sites to get better feedback on the ESC plans they review, and to increase inspection frequency. In addition, training and education should become an integral element of the job description of both inspectors and plan reviewers, with as much as 10% of their time assigned to contractor training or public outreach.

3. Cross-train local development review and inspection staff. An effective management approach involves cross-training in stream protection for all local development review and inspection staff. The cross-training provides ESC reviewers and inspectors with an understanding of important stream protection concerns at the site, such as forest conservation, stream buffer, wetland and stormwater management. At the same time, non-ESC staff are able to spot and refer ESC problems when they visit the site, and integrate ESC concerns in their plan review efforts.

The best ESC programs have a common feature: committed local leadership.

4. Submit erosion prevention elements for early planning review. Amend the development review process to require early review of the erosion prevention elements of the ESC plan (minimize clearing and grading, protect waterways, and construction phasing). Review of these elements should be closely coordinated with early site plan concepts. In some cases, review of erosion prevention elements can be shifted from the ESC permitting agency to the local planning agency.

5. Prioritize inspections based on erosion risk. Use a simple spreadsheet model to schedule inspections more frequently for the construction sites most vulnerable to erosion (Brown and Caraco 1996). Vulnerability is based on such factors as site area, slope, erodible soils and proximity to waterways. Even if staff resources are spread too thin to inspect sites, this approach ensures that the most likely problem sites will get the attention they need.

6. Require designer to certify initial installation of ESC practices. The inspection process should be amended so that the ESC plan designer must visit the site to certify that the ESC practices called for in the plan were correctly installed at the construction site (adjusting for any changes that may have been made at the preconstruction meeting). This simple requirement accomplishes two things. First, it is a useful enforcement mechanism to ensure that all ESC practices are actually installed correctly. Second, it is also a great learning opportunity for ESC plan designers, as they can see how their plan works under the demanding conditions of a construction site.

7. Invest in contractor certification and private inspector programs. The ESC workforce can be quickly multiplied when a community invests in a contractor certification or private inspector program. The Delaware model is described in detail in Horner et al. (1994), and in Technical Note 85.

8. Use public-sector construction projects to demonstrate effective ESC controls. Local governments are a source of a lot of construction projects—new schools, roads, and other infrastructure. Needless to say, ESC practices on public sector projects should always be first class, so they can be used as demonstration sites for contractor training and tangible evidence of local commitment to ESC. In addition, public sector construction documents should include contingency items and other contractual provisions that allow contractors to recover the full cost of maintaining ESC practices.

9. Enlist the talents of developers and engineering consultants in the ESC program. Both groups provide useful input on how ESC practices can be applied more cost-effectively or how the plan review process can be streamlined. Many communities have found that an advisory group is very helpful in developing a constructive partnership for improving ESC plans.

10. "Reinvent" the local ESC manual. A productive task to assign to the advisory group is to revisit the current ESC manual and local training materials. This will improve the quality of ESC plans and the overall performance of ESC measures installed at construction sites.

If these measures are taken, the murky mixture that usually leaves construction sites will be considerably less sediment laden. ESC plans will never produce 100 percent sediment free output, but the dollars communities spend on this task can be put to their best use if erosion prevention and sediment control practices are applied with greater care, vigor and ingenuity.

References

Brown, W., and D. Caraco. 1996. *Task 2 Technical Memorandum: Innovative and Effective Erosion and Sediment Control Practices for Small Sites.* Center for Watershed Protection. Silver Spring, MD. 37 pp.

Corish, K. 1995. *Clearing and Grading: Strategies for Urban Watersheds. Environmental Land Planning Series.* Metropolitan Washington Council of Governments. Washington, D.C. 66 pp.

Dreher, D.W., and L. Mertz-Erwin. 1991. *Effectiveness of Urban Soil Erosion and Sediment Control Programs in Northeastern Illinois.* Northeastern Illinois Planning Commission (NIEP). Chicago, IL. 24 pp.

Goldman, S.J., K. Jackson and T.A. Bursztynsky. 1986. *Erosion and Sediment Control Handbook.* McGraw-Hill Book Co. New York, NY. 443 pp.

Harding, M.V. 1990. Erosion Control Effectiveness: Comparative Studies of Alternative Mulching Techniques. In: *Environmental Restoration : Science and Strategies for Restoring the Earth.* Island Press. Covello, CA. 149-156.

Horner, R., J. Skupien, E. Livingston and E. Shaver. 1994. *Fundamentals of Urban Runoff Management.* Appendices A and B. Terrene Institute. Alexandria, VA. 302 pp.

Mitchell, G. 1993. *Assessment of Erosion/Sediment Control in Highway Construction Projects.* Ohio University Center for Geotechnical and Environmental Research. Final Report to Ohio Department of Transportation. FWHA/OH-93/011. Columbus, OH. 200 pp.

Ohrel, R.L. 1996. *Technical Memorandum: Survey of Local Erosion and Sediment Control Programs.* Center for Watershed Protection. Silver Spring, MD. 25 pp.

Paterson, R.G. et al. 1993. Costs and Benefits of Erosion and Sediment Control: The North Carolina Experience. *Environmental Management* 17(2):167-178.

Paterson, R.G. 1994. Construction Practices: The Good, the Bad and the Ugly. *Watershed Protection Techniques* 1(3): 95-99.

Portland Bureau of Environmental Services (BES). 1994. *Erosion Prevention and Sediment Control Plans - Technical Guidance Handbook.* Portland, OR. 40 pp.

Schueler, T. 1995. *Site Planning for Urban Stream Protection.* Center for Watershed Protection. Metropolitan Washington Council of Governments. Silver Spring, MD. 222 pp.

Schueler, T., and J. Lugbill. 1990. *Performance of Current Sediment Control Measures at Maryland Construction Sites.* Metroplitan Washington Council of Governments. 90 pp.

Shaver, E. Personal Communication. September 26, 1996. Delaware Department of Natural Resources and Environmental Control. Dover, DE.

U.S. EPA. 1993. *Guidance for Specifying Management Measures for Nonpoint Pollution in Coastal Waters.* EPA 840-B-92-002, Washington, D.C. 740 pp.

Water Resources Administration (WRA). 1986. *Maryland's Guidelines to Waterway Construction.* Department of Natural Resources. State of Maryland, Annapolis, MD. 56 pp.

W&H Pacific and CH2M-Hill. 1993. *Demonstration Project Using Yard Debris Compost for Erosion Control.* Portland Metropolitan Service District. Portland, OR. 90 pp.

Technical Note No. 80

Practical Tips for Construction Site Phasing

"Just in Time" Grading Is an Effective ESC Strategy

What is construction site phasing and why is it important? Questions such as these are frequently asked by both developers and regulators seeking to implement erosion and sediment controls (ESC) at construction sites. Construction phasing is different than construction sequencing. As most contractors and developers will tell you, construction sequencing is the standard practice of completing one portion or aspect of a project at a time, with site grading typically completed in a single step. In many circumstances, the time difference between building and actual building construction can take years. Table 80.1 illustrates a typical construction sequence for a single family residential subdivision.

Construction site *phasing* minimizes soil erosion through a somewhat more complex construction process. Only one portion of a site is disturbed at any one time to construct the infrastructure necessary to complete that phase. Subsequent phases are not started until earlier phases are substantially completed and exposed soils are mostly stabilized. This "just-in-time" construction practice can dramatically reduce disturbed soil exposure times and resulting erosion problems.

Despite the value of construciton phasing, very few projects are successfully phased. Because many *sediment control* practices are at best 90 percent efficient in removing suspended solids, *erosion prevention* techniques that limit the erosion of sediments in the first place can have dramatic results in reducing sediment loss from construction sites (Corish 1995). Uncontrolled urban construction sites can have between 20 and 200 tons/acre of sediment loss per year (Dreher and Mertz-Erwin 1991). Contrast this with an undisturbed meadow or forest with less than one ton/acre of sediment loss per year and the potential exists for substantial reductions in total solids loading. As can be seen in Table 80.2, a carefully phased project can reduce sediment loss by more than 40 percent over a typical mass-graded site.

Construction phasing is only one of several *erosion prevention* techniques that can be used to reduce soil loss. Instead of relying on trapping already suspended solids, the phasing techniques rely on erosion prevention. Other erosion prevention strategies involve minimizing disturbed areas through various techniques such as fitting the development to the topographic "lay of the land"; minimizing the development footprint by clearing only the land required for buildings, roads, and utilities; providing buffers from natural drainage systems and water bodies; and conserving or retaining existing forest cover. Immediate stabilization of disturbed areas by use of tackifiers, re-vegetative practices, mulching or stabilization blankets can also dramatically reduce soil loss caused by erosion.

> "Just-in-time" construction practice can dramatically reduce disturbed soil exposure times and resulting erosion problems.

Recent research consistently shows that erosion prevention techniques are among the most effective in reducing suspended solid concentrations leaving construction sites. Many erosion prevention

TABLE 80.1: Typical Construction Sequence of a Single Phase Residential Subdivision

1. Hold preconstruction meeting
2. Clear/grub areas necessary to construct ESC practices
3. Construct ESC practices
4. Construct stormwater management measures to be used for temporary ESC
5. Clear/grub remaining site areas
6. Grade site to rough grades
7. Construct utilities (water, sewer, storm drain, etc.)
8. Construct roads (paving, curb and gutter, sidewalks)
9. Construct housing (provide on-lot ESC practices)
10. Stabilize disturbed areas
11. Convert stormwater management measures to permanent functions
12. Remove ESC measures
13. Stabilize remaining disturbed areas

TABLE 80.2: Sample 100-Acre Single Family Residential Development Project: Potential Sediment Loss for a Mass-Graded Project Versus a Phased Project

Development Scenario - Conventional Project
100-acre site, mass-graded over a 6 month period.

Assumptions:
Good sediment control practices, successful vegetative stabilization of disturbed areas within 30 days of completion of grading.. Approximately 3/4 of site exposed during 6 month grading operation, with 1 month stabilization period. 20 tons/ year lost from construction site with sediment trapping effectiveness of 60% for sediment control devices

Sediment loss:
Exposure: 3/4 of 100 acres exposed over 7 months
Sediment loss: (.75) (100 ac)(20 tons/yr)(7/12 yr)(0.6) = 525 tons

---

Development Scenario - Phased Project
100-acre site, graded in 4 separate phases over a 6 month period, each phased exposed for one and a-half months.

Assumptions:
Good sediment control practices, successful vegetative stabilization of disturbed areas within 30 days of completion of grading. Each phase completely disturbed during 1½ month grading operation, with a 1 month stabilization period. 20 tons/year lost from construction site with sediment trapping effectiveness of 60% for sediment control devices. 1 ton/year lost from undisturbed site, 2 tons/year lost from stabilized portions of site.

Exposure:	Sediment loss:
4 phases of 25 ac exposed over 2.5 month period	(4)(25 ac)(2.5/12 yr)(20 tons/yr)(0.6) = 250 tons
1 phase of 25 ac undisturbed for 4.5 months	(25 ac)(4.5/12 yr)(1 ton/yr) = 9.4 tons
1 phase of 25 ac undisturbed for 3 months	(25 ac)(3/12 yr)(1 ton/yr) = 6.3 tons
1 phase of 25 ac undisturbed for 1.5 months	(25 ac)(1.5/12 yr)(1 ton/yr) = 3.1 tons
1 phase of 25 ac completed for 4.5 months	(25 ac)(4.5/12 yr)(2 tons/yr) = 18.8 tons
1 phase of 25 ac completed for 3 months	(25 ac)(3/12 yr)(2 tons/yr) = 12.6 tons
1 phase of 25 ac completed for 1.5 months	(25 ac)(1.5/12 yr)(2 tons/yr) = 6.2 tons
	Total: 306.4 tons

Result: Phasing results in a 42% reduction in sediment export compared to regular mass grading

methods can reduce sediment loads by as much as 90%, whereas sediment trapping devices often have lower removal efficiencies, particularly for fine-grained soils and clays (Brown and Caraco 1996). The conclusion is obvious. Erosion prevention works. When it can be implemented in a cost effective manner, it is certainly worth pursuing. Clearly, construction phasing falls in this category.

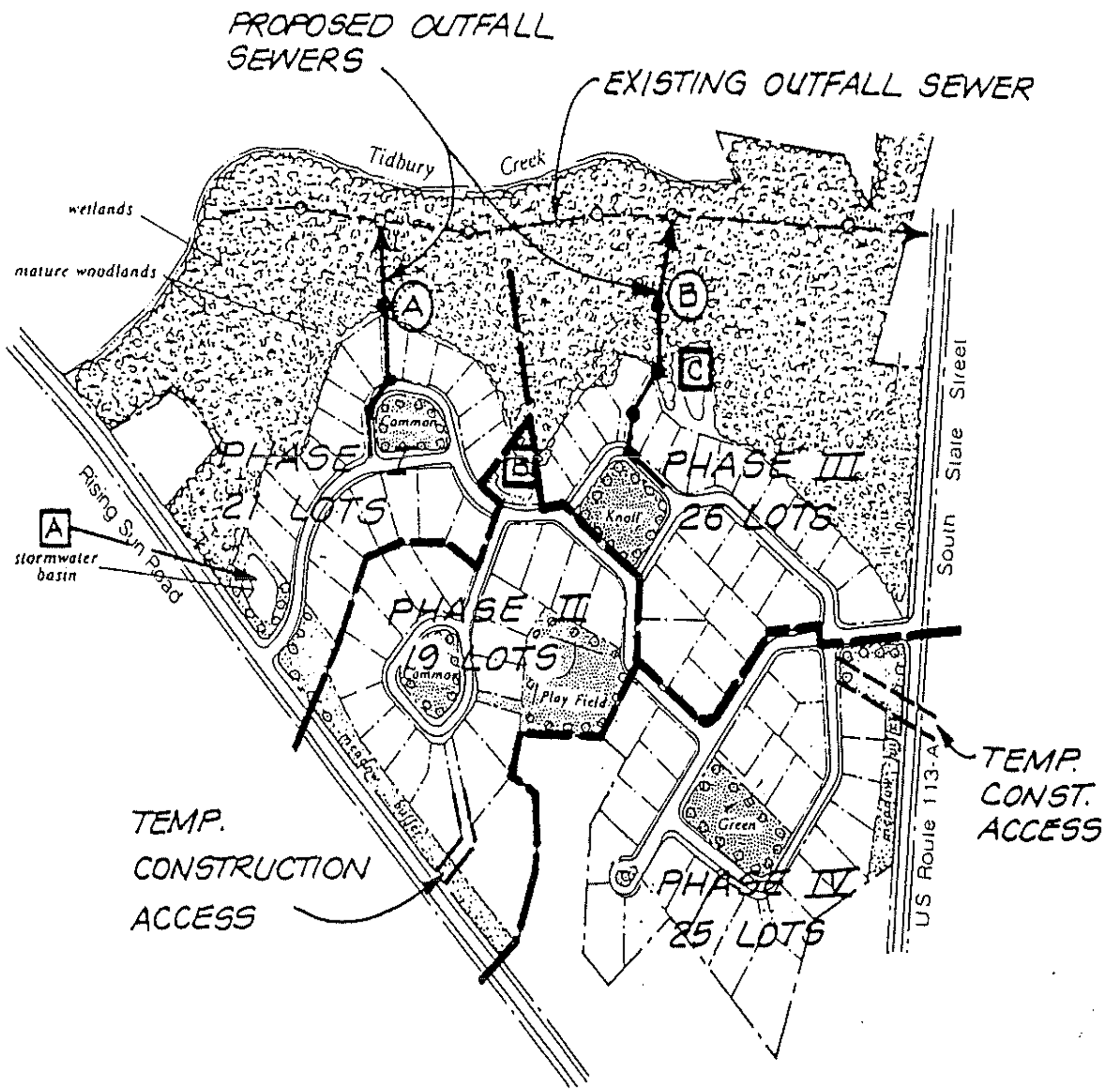
Foundations of Successfully Phased Projects

Why is it so hard to get successfully phased projects implemented? The answer involves several practical problems in construction logistics, any one of which can doom a phased project to failure. First, phasing must be carefully planned at the early design stages of the development process. As most land planners will tell you, good planning is hard. It is difficult to think about phasing and other construction-related issues at the project's layout stage. Why is this important to do early on? Because in order to construct a phased project that conserves soil loss, portions of the site that will be developed in the future must remain undisturbed. To do this, cut and fill quantities must balance by phase so that other site areas are not raided to either borrow or spoil dirt.

Other elements to consider during the planning stage include evaluating how stormwater will be conveyed and managed in each phase, whether water and sewer connections/extensions can be accommodated in a phased project and what happens to already completed downhill phases. It is also preferable to separate construction access from resident access to avoid conflicts between people living in earlier stages of the project and construction equipment working on later stages.

FIGURE 80.1: Typical Phasing Plan and Important Elements for A Single Family Residential Subdivision

Source: Adapted from Natural Lands Trust 1996, used with permission



Construction phasing is a major ESC strategy for this large residential subdivision project. The site is subdivided into four distinct phases; clearing cannot proceed on a phase until the prior phase has been largely stabilized.

Notes:

1. Earthwork balances between each phase.
2. Phase I & II are sewered through outfall Ⓐ.
3. Water loops through project in phases starting at Rising Sun Road to South State Street
4. Stormwater management provided as follows:
   - Phase I - [A]
   - Phase II - [B]
   - Phase III & IV- [C]
5. Temporary construction access provided as shown.
6. Each phase consists of at least 19 lots. At least 50% of houses must be completed within a phase before constructiion on next phase can proceed.
7. Phase IV is uphill from Phase III. Utilize stormwater facility [C] as a temporary sediment basin until Phase IV is complete. Flush stormwater system through Phases III and IV.

TABLE 80.3: Some Keys to Planning Successfully Phased Projects

- Phasing plan is developed early in the project planning and design stage
- Natural features such as streams or drainage boundaries are considered in multiple phases
- Earth removal is balanced within each phase so cut soil from one area matches fill requirements elsewhere
- Size of project is conducive to phasing
- Phasing is not cost prohibitive

Obviously, the overall size of the project is a major factor in determining whether phasing can be successful. The results of a recent survey of more than 80 local ESC programs provide some insight into this issue. While approximately 45% of respondents used phasing, many relayed that phasing was only appropriate for larger sites (i.e., greater than 25 acres). Only a few programs utilize phasing on projects smaller than five acres (Brown and Caraco 1996). Table 80.3 provides a summary of the some of the key requirements for planning phased projects.

Figure 80.1 graphically shows how phasing elements are considered in a construction project. One of the more important considerations for phased projects is the influence of market forces. Land developers often locate model homes in prominent locations that may or may not fit with the phasing plan. Furthermore, developers and homebuilders also want the flexibility to provide buyers with a variety of housing options and therefore are often hesitant to restrict construction to just one section. Another uncertainty is the size of individual sections and the construction rate of individual houses. The phasing plan must address these market forces and designate how many houses must be completed within a given section before allowing construction to begin on the next phase.

How much does phasing really cost? While some recent studies and many urban water managers agree that phasing is a desirable erosion prevention technique, most also concede that phasing probably costs developers more money. The cost to a municipal agency of implementing an aggressive phasing program may also be higher. Permit review of phasing plans and construction site inspection costs will certainly be higher.

Obviously, limiting mass grading as an allowable construction technique will tend to increase earthwork costs—already one of the more expensive components of site development. Economies of scale may be undermined by project phasing. Costs may rise due to multiple visits with heavy earth moving equipment, increased storage requirements and equipment handling. How much more expense does phasing add to a typical construction project? The answer is that we don't really know because very little economic research has been done to answer this question.

Cahill and Horner (1992), however, contend that non-structural, minimum disturbance techniques re-

TABLE 80.4: Eleven Phasing Principles for Design Engineers and Plan Reviewers

1. Provide temporary construction access in each phase separately from access for permanent residents.
2. Determine if site meets minimum "threshold" size (approximately 25 acres for ¼ acre single family residential projects).
3. Balance earthwork within each phase.
4. Locate temporary stockpiles and staging areas to prevent additional soil disturbance.
5. Establish "trigger" for completion of each phase identified to go to next phase (e.g., # of houses completed in previous phase, or % of previous phase stabilized).
6. Accommodate water/sewer and other utility construction within each phase.
7. Incorporate road segments, temporary turn-arounds, and emergency access within each phase.
8. Address both temporary and permanent stormwater management in each phase.
9. Clearly identify sequence of construction of each phase and entire project on plan.
10. Identify key construction elements for inspection (e.g., after installation of perimeter sediment controls).
11. Ensure that later upstream phases address potential impacts to already completed down stream phases.

duce the operation and maintenance costs substantially over structural practices. It does stand to reason that a carefully coordinated phased project can actually save developers money in reduced ESC practice maintenance costs and perhaps in reduced interest carrying costs. Because the entire project is not constructed at one time, only a fraction of the infrastructure installation and maintenance costs are incurred up-front. Developers make smaller construction loan payments for smaller components of construction, which can be paid off as home sales proceed. Furthermore, if the project takes several years to complete, then phasing may result in less re-grading due to erosion caused by slope failures.

Phasing can also be very hard to enforce. Incomplete or confusing phasing plans make permit compliance difficult. Inspectors can face difficulties caused by the several stages of development occurring at one time. For example, if mass-grading is occurring in one phase, simultaneously with drainage and road construction in another phase, and house construction in yet a third phase, it can be next to impossible for inspectors to enforce. One way to deal with this problem is to clearly specify in the phasing plan the allowable construction elements that can occur simultaneously. Table 80.4 presents a list of eleven "phasing principles" for plan reviewers and designers to consider when designing or reviewing phased projects.

How can more widespread use of phasing in construction site development be encouraged? Some communities are trying an enforcement approach, while others are looking for more voluntary measures. Prince George's County, Maryland, requires a phasing plan to be submitted with the erosion and sediment control plan. The phasing plan becomes part of the enforceable erosion and sediment control plan, and can be used to inspect compliance in the field. Some municipalities utilize clearing ordinances to limit total disturbed areas (Corish 1995). Other municipalities are looking at incentives such as *faster review times*, or *more flexible permit conditions* to encourage developers to consider phased projects. One incentive which has not yet enjoyed widespread use, but may have a great deal of promise, is the use of economic incentives such as *reduced or waived permit fees or bonds* for projects with phased sections. Many jurisdictions already refund bonds for completed sections so this incentive may be a logical step.

What lessons can be learned about phasing? Construction site phasing provides a viable, practical technique to reduce sediment loads leaving construction sites. There are practical considerations that must be addressed to ensure that phasing works. It is difficult enough to get compliance on many aspects of a construction site, so good planning at the design stage coupled with an enforceable phasing plan is essential.

Little research has been done to assess the costs of phasing versus conventional construction costs, but obviously the larger the project, the easier it will be to implement successful phasing. Communities must strive to use a combination of enforcement measures and incentives to encourage wider use of this practice. Finally, we cannot forget to consider how market forces govern home sales. While the best phasing plans have strict provisions describing when certain elements of a project can begin and what must be accomplished first, they don't necessarily reflect the market pressures influencing developers. To accommodate market realities it may be wise to integrate a developer's sales strategy with the requirements of a phasing plan.

—*RAC*

References:

Brown, W., and Caraco, D. 1996. *Task 2 Technical Memorandum: Innovative and Effective Erosion and Sediment Control Practices for Small Sites*. Center for Watershed Protection. Silver Spring, MD. 37 pp.

Cahill, T.H., and Horner, W.R. 1992. *Structural and Nonstructural Best Management Practices for the Management of Nonpoint Source Pollution in Coastal Waters: A Cost-Effectiveness Comparison. Cahill Associates.* Trenton, NJ. 22 pp.

Corish, K.A., 1995. Clearing and Grading Strategies for Urban Watersheds, Final Review Draft. Metropolitan Washington Council of Governments, Washington, D.C. 66 pp.

Dreher, D.W., and L. Mertz-Erwin. 1991. *Effectiveness of Urban Soil Erosion and Sediment Control Programs in Northeastern Illinois.* Northeastern Illinois Planning Commission. Chicago, IL. 23 pp.

Ohrel, R.L. 1996. *Technical Memorandum: Survey of Local Erosion and Sediment Control Programs.* Center for Watershed Protection. Silver Spring, MD. 25 pp.

Technical Note No. 81

Keeping Soil in Its Place

Options for Preventing Erosion at Construction Sites

Perhaps the most critical stage at a construction site is when soils are exposed both during and after clearing and grading. Erosion of these exposed soils can be sharply reduced by stabilizing the soil surface with erosion controls. For many contractors, erosion control is just shorthand for hydroseeding. However, a wide range of erosion control options are available including mulching, blankets, plastic sheeting, and sodding, among others.

In this note, the performance, costs and constraints of these often-confusing erosion control options are compared. Guidance is provided on when each method should be used or avoided. In addition, the note outlines options for effective erosion control under challenging site conditions, such as the non-growing season, steep slopes, drought, concentrated flows, stockpiles and poor soils.

Effectiveness of Erosion Controls

Four recent studies evaluated the effectiveness of fifteen erosion controls (Table 81.1). With a few exceptions, suspended solids load reductions were in the 80 to 90% range. These illustrate that, even under rigorous testing, these erosion controls can be extremely effective compared with the approximately 60 to 70% removal of most structural controls (Technical Notes 84 and 85).

Benefits of Erosion Controls

Erosion controls have benefits beyond controlling erosion. First, they can improve the performance of structural controls. Controlling erosion reduces the volume of sediment going to a sediment control device. Consequently, less of the treatment volume is reduced by sedimentation and "clean out" frequencies are lower. In addition, many erosion controls can lower surface runoff velocities and volumes, preventing damage of perimeter controls (Technical Note 82).

Erosion controls can actually preserve topsoil, the upper soil layer with organic matter and nutri-

TABLE 81.1: Sediment Removal Efficiency of Surficial Erosion Controls

Erosion Prevention Technique	Sediment Reduction (%)
Straw (1.25 tons/ac)[1]	93.2[a]
Straw (2 tons/ac)[2]	89.3[b]
Fiber mulches (about 1.0 tons/ac)[3]	65.0-97.1[b]
Fiber mulch (at least 1.0 tons/ac)[4] 3% tackifier	91.8[c]
Fiber mulch (1.25 tons/ac)[1] fertilized, seeded	89.1[a]
Fiber mulch (1.25 tons/ac)[1] fertilized, seeded 90 gal/ac tackifier	85.9-99.1[a]
70% wheat straw/30% coconut fiber blanket [2]	98.7[b]
Straw blankets [3]	89.2-98.6[b]
Straw blanket[1]	92.8[a]
Curled wood fiber blanket[1]	28.8[a]
Curled wood fiber blanket[3]	93.6[b]
Curled wood fiber blanket [2]	93.5[b]
Jute mat[1]	60.6[a]
Synthetic fiber blanket[1]	71.2[a]
Nylon Monofilament blanket [2]	53.0[b]
Mixed Yard Debris (410 cy/ac)[4]	95.0[c]
Leaf Compost (410 cy/ac)[4]	85.9[c]

[a] TSS load reduction [b] Soil load reduction [c] TSS event concentration reduction

[1] 24% slope gravelly sandy loam for 13 storms over two Washington winters. (Horner et al. 1990)

[2] 9% slope silt loam soil. Subjected to 5.8", one hour simulated storm. (Harding 1990)

[3] 30% slope clay loam soil; subjected to 3.1", ½ hour simulated storm. (Wall 1991)

[4] 34% slope clay cap and top-soil mixed slope. Five March Oregon storms. (W+H Pacific and CH2M-Hill, 1993)

TABLE 81.2: Comparison of Erosion Control Materials

Materials Type	Cost ($/sy)	Uses	Limitations/Disadvantages
Seeding	0.10[a]	As a permanent or temporary erosion control Established grass is the most effective erosion control	Climate (dry or cold weather) Infertile soils (needs fertilizer, lime, etc.) Needs some other surficial cover on most slopes
Mulch	0.20-0.35[a]	As a protection for seeds Alone as a temporary erosion control	Slopes steeper than 20% for straw Slopes steeper than 40% for bark/ compost Can interfere with grading operations Straw or Hay mulch needs to be secured to the soil surface
Blankets	1.00-2.00[b]	Useful on steeper slopes than mulches Protects seeds and prevents erosion	Installation is more complicated and time-consuming than for mulches
Plastic Sheeting	0.05-0.15[b]	Temporary control for very small areas	Does not allow infiltration of runoff Edges must be weighed down or runoff will flow under the sheeting Unsuitable for areas greater than 2,000 sq. ft.
Sodding	1.80[a]	Use of sod to provide immediate vegetative cover Can be used in low-flow channels	Drought or poor soils can impede growth Most expensive

[a] Costs adapted from U.S. EPA 1993. [b] Costs based on phone survey information.

ents necessary for plant growth. In addition, preventing these nutrients and organic matter from reaching lakes and streams is valuable, as these pollutants can lead to eutrophication and reduced dissolved oxygen levels. It also reduces the need for re-grading because of rill and gull formation. Furthermore, erosion control reduces landscaping costs by limiting the need for importing topsoil.

Seeding

Establishing grass cover is the most effective erosion control next to limiting disturbance. Lee and Skogergboe (1985) found that suspended solids load decreases by 99% when biomass increases from 0 to 2464 lb/ac. Although some surficial erosion controls, such as mulch and blankets, can achieve similar removal rates, grass can provide permanent erosion control. Establishing grass cover can be challenging, however, and requirements can vary considerably from site to site. Choosing the right species and providing an adequate growing environment are critical to vegetative establishment (Table 81.4). Specific information varies both regionally and seasonally.

The three most common seeding methods are *broadcast seeding, hydroseeding* and *drill seeding*. In broadcast seeding, seeds are scattered on the soil surface. It is most appropriate for small areas and patching of areas where the grass is thin. In hydroseeding, seed is sprayed on the surface with a slurry of water. It is appropriate for most areas in excess of 5,000 square feet. Tackifiers, fertilizers, and fiber mulch are often added during this step. In drill seeding, a tractor-drawn implement actually injects seeds into the soil surface. Seeds are protected because they are covered by soil. This method is best suited for areas greater than two acres because it is cost prohibitive on a small scale. According to Northcutt (1993) drill seeding is about twice as expensive as broadcast seeding with mulch.

Mulching

Mulches are natural or synthetic materials spread on the soil surface to prevent erosion and sometimes protect seeds by intercepting and lowering the energy of falling rain. A variety of materials are available to accomplish this task, but they all operate on this same basic principle (see Table

81.3). The simplest way to improve the effectiveness of any mulch is to apply a thicker layer.

While compost mulch and wood chips can be useful in some circumstances, straw and fiber mulches are the most commonly used, primarily because of their low cost. Both of these alternatives can be very effective (Table 81.1). While straw mulches provide a thicker cover to protect seeds and soil, fiber mulches are easier to apply.

Straw mulch is straw spread over the soil surface to prevent erosion. It can be effective alone or in combination with seeding (see Table 81.1), but needs to be secured to the soil surface. When straw mulch is not properly secured or "tacked" it can slide down slope during large storms (Harding 1990) or even blown away. Four options to secure it are: 1) spraying a chemical tackifier, or glue, to the surface of the mulch, 2) using a tractor-drawn implement to "punch" the straw into the surface, 3) using a fiber mulch as a tackifier, and, 4) covering the mulch with plastic netting.

Fiber mulches can be wood, paper or synthetic materials sprayed onto the soil surface. In general, wood fibers are the most effective erosion control mulches and paper fibers should only be used for extremely short-term erosion control because they degrade quickly. Fiber mulches do not provide as thick a cover as straw mulches and are generally the most effective when used in combination with seeding. One major advantage is the ease of application; seed, water, mulch and a tackifier can all be applied in one step with a hydroseeder. Although using a tackifier is not necessary, it can improve performance (Horner et al. 1990) and only increases the cost of application by between one and two cents per square yard.

Erosion Control Blankets

Erosion control blankets are usually either synthetic or organic fibers held together with plastic netting. They are significantly more expensive than mulches, but can be used on steeper slopes than traditional mulches. Like mulches, they are most effective when used in combination with vegetative establishment.

While erosion control blankets can be effective, their performance varies. Some general trends are that organic materials tend to be the most effective (Harding 1990) and that thicker materials are generally superior (Fifield 1992), but there are exceptions to both of these rules. Information about product testing of blankets is generally lacking. One notable exception is the Texas Department of Transportation. They publish the findings of their testing program in the form of a list of acceptable and unacceptable materials for specific uses.

Another option to traditional EC blankets is the use of spray-on blankets—three-dimensional matri-

TABLE 81.3: Mulching Alternatives

Type	Description/Uses
Straw or Hay	Straw or hay surface applied at 2 to 4 tons per acre Mechanically or chemically secured to the soil surface Provides the densest cover to protect seeds and soil
Wood Fiber	Chopped up fibers (usually wood) applied to the soil surface with a hydroseeder Tackifier is not always necessary, but can be applied with fiber, seeds and fertilizer in one step Effective erosion control, but not as dense a cover as straw mulch Best use is in combination with fast-growing seeds
Compost	Efficiency on par with wood fiber Compost acts as a soil amendment Can act as a longer-term control (up to three years) Expensive compared with other mulches (about $1/square yard)
Wood Chips	Using wood chips as a mulch Effective when applied at high levels (about 6 tons/acre) Can actually save money if on-site materials are used Effective on up to 35% slopes

TABLE 81.4: Effective Vegetative Establishment

Choose the right species:
- For temporary cover, use fast growing species such as rye.
- Plant warm- or cold-season grasses based on regional conditions.
- Use drought tolerant species in dry climates.
- Consider use of native species generally for increased longevity and hardiness.

Provide an adequate growing environment:
- Plant dense seed cover, based on local recommendations.
- Use soil test information to determine lime and fertilization requirements.
- Use a mulch or blanket to protect seeds from animals, dehydration, cold and erosion especially when seeds are surface applied.
- Irrigate where necessary.

Practices to avoid:
- Hydroseeding in arid regions; grass will be poorly established.
- Seeding after the growing season ends. Instead apply a very thick mulch layer (about 4 tons/ac).

ces applied with a hydroseeder. They cost about the same amount as traditional blankets and are reported to provide similar erosion protection (Godfrey et al. 1994).

Plastic Sheeting

Plastic sheeting is a very simple erosion control technique, although not widely used. Plastic sheeting is only appropriate as a short-term control, and on very small areas. In order to be effective, the edges of the plastic need to be weighed down properly. Topsoil stockpiles are one example where plastic sheeting may be helpful. Since these piles are often disturbed within a few weeks, plastic sheeting, which can be frequently moved and reused, may be a good alternative.

Another synthetic erosion control technique, effective in the short-term of about six months, is using *copolymers*. In this method, a synthetic material is applied in a mixture with water using a hydroseeder. The benefit of this approach is that it is effective for covering larger areas than plastic sheeting and it provides immediate cover. The best copolymers contain chemicals that increase flexibility which prevents cracking that can cause failure. Like plastic sheeting, these semi-permeable covers also increase runoff volumes slightly.

Sodding

Sodding, another option to control erosion, is much more expensive than seeding. Sod provides immediate cover, but some evidence suggests that root establishment is shallower for seed grass than sod grass, causing higher nitrate leaching (Petrovic 1990). The two best uses for sod are when final landscaping will include a sod lawn after construction or when immediate grass cover is needed, such as in areas of concentrated flow.

Choosing the Right Erosion Control

With the wide range of techniques available to control erosion, choosing the right control for a specific application can be confusing. Too often, the cost alone determines the erosion control method used. While cost is an important consideration, other site specific data need to be considered. Site factors related to soil quality, climate, flow velocities and construction activity can influence erosion control applicability (Table 81.5). Simple guidelines can dramatically improve erosion control such as limiting planting to the growing season and using erosion controls on slopes appropriate to their use.

In some geographic regions, effectively controlling erosion is almost always difficult. For example, the Pacific Northwest has winter conditions where vegetation cannot be established but intense rains cause a high erosion potential. Sites in this region need special "wet season" provisions such as very thick mulch cover on disturbed areas. In arid regions, for other climatic reasons, establishing vegetation can be challenging. One adaptation specifically designed for these conditions is the use of "tracking." In this method, a heavy vehicle is driven perpendicular to the slope. The resulting impressions can trap limited water and organic material, increasing plant growth. Using spray-on chemicals for dust control is another important tool for erosion control in arid climates.

Closing the Window

The method of erosion control may often be less important than how quickly it is established and the extent of coverage. With most seeding operations, a window of at least two weeks exists from germination until production of a vigorous grass cover. This window may be further extended if a contractor waits a few days, weeks or months to get started, or if the grass crop fails and needs to be restarted. During this time period, exposed soils are most vulnerable to erosion.

Although most ESC experts recognize the importance of limiting the *time* of disturbance, only 55% of the respondents to the Center's ESC write-in survey enforced time limits to vegetative establishment. Often, phrases like "as soon as practical" appear in vegetative establishment requirements. Cordova (1991) found such vague phrases to be a major stumbling block to effective ESC.

Although it is unreasonable to expect contractors to grow vegetation during a drought or outside the growing season, options are available to provide cover during this critical period. For example, a non-vegetative option such as mulch can be required outside the growing season.

Conclusion

The basic concept behind erosion control remains the same regardless of site conditions—cover the ground as quickly as possible to prevent erosion. Covering the ground with the right material quickly enough is the hard part. Establishing specific materials guidelines and time limits is necessary to provide consistent erosion control. Only by following thoughtful, region-specific guidance can soil be preserved during the critical construction period.

—DSC

TABLE 81.5: Erosion Control Options for Challenging Conditions

Condition	Choice
Non-Growing Season	Straw mulch (2 tons/ac) Bark/Compost mulch (4 to 6 tons/ac) Erosion control blankets Plastic sheeting
Poor Soils	Straw mulch Erosion control blankets Plastic sheeting Seeding or sodding with soil amendments, irrigation, lime, etc. Seeding with imported topsoil
Drought/Arid	Straw mulch Erosion control blankets Drought tolerant seeds combined with tracking, irrigation
Steep Slopes	Erosion control blankets with seeding Compost or Bark mulch Plastic sheeting Sodding
Concentrated Flows	Erosion control blankets/ mats Sod checkdams to line channel
Frequent Disturbance	Plastic sheeting (preferred) Temporary seeding

References

Cordova, A.J. 1991. The Effectiveness of a Sediment and Erosion Control Ordinance: Richland County, SC. Master's Thesis. University of South Carolina.Columbia, SC. 142 pp.

Fifield, J. S. 1992. Comparative Evaluation of Erosion Control Products. In: *Proceedings: High Altitude Revegetation Workshop*. 10: 133-149.

Godfrey, S.H., J.P. Long and J. A. McFalls. 1994. *The Performance of Flexible Erosion Control Materials and Hydraulic Mulches.* Texas Transportation Institute. Texas Department of Transportation. College Station, TX. 254 pp.

Harding, M.V. 1990. Erosion Control Effectiveness: Comparative Studies of Alternative Mulching Techniques. In: *Environmental Restoration: Science and Strategies for Restoring the Earth.* Island Press. Covello, CA. 149-156.

Horner, R.R., J. Guedry and M.H. Kortenhog. 1990. *Improving the Cost Effectiveness of Highway Construction Site Erosion and Pollution Control. Washington State Transportation Center.* Federal Highway Administration. Seattle, WA. 79 pp.

Lee, C.R., and J.G. Skogerboe. 1985. Quantification of Erosion Control by Vegetation on Problem Soils. In: *Soil Erosion and Conservation. Soil Conservation Society of America.* Arkeny, IA. pp 437-444.

Northcutt, P. 1993. *A Practical Guide to the Establishment of Vegetative Cover on Highway Rights-of-Way.* Texas Department of Transportation. Austin, TX. 92 pp.

Petrovic, A. 1990. The Fate of Nitrogenous Fertilizers Applied to Turfgrass. *J. Environ. Quality* 19:1 1-14.

U.S. EPA. 1992. *Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.* EPA 832-R-92-005. Washington, D.C. 245 pp.

U.S. EPA. 1993. *Guidance for Specifying Management Measures for Nonpoint Pollution in Coastal Waters.* EPA 840-B-92-002. Washington, D.C. 740 pp.

W&H Pacific and CH2M-Hill. 1993. *Demonstration Project Using Yard Debris Compost for Erosion Control.* Portland Metropolitan Service District. Portland, OR. 90 pp.

Wall, G.J. 1991. *The Effectiveness of Surficial Erosion Control Products.* Ontario Ministry of Transportation. Toronto, Ontario, Canada. 55 pp.

Technical Note No. 82

Strengthening Silt Fence

Innovative Ideas for Improving Silt Fence Performance

Silt fences are one of the most widely used and misused erosion and sediment control (ESC) techniques. Recent data suggest that they can perform well under some circumstances. In addition, their cost-effectiveness continues to make them a popular ESC technique. Unfortunately, silt fences are often used inappropriately or are improperly installed or maintained, resulting in poor performance. Simple improvements to the standard silt fence as well as some innovative designs can help to improve the current state of silt fences.

> The popularity of silt fence endures for social, economic and technical reasons despite often lackluster performance.

How, and How Well, Do They Work?

Silt fences trap sediment in construction runoff before it washes into the street, a neighboring property or, in the worst case, a nearby stream or wetlands. As sediment-laden runoff flows through the silt fence, the pores in the geotextile fabric filter out sediment particles. In reality, settling not filtering is actually the most important sediment removal function of silt fences (Kouwen 1990); runoff is temporarily stored behind the fence giving sediment time to settle out.

Three recent studies report sediment removal efficiencies ranging from 36 to 86% (Table 82.1). It is almost impossible to accurately predict the field performance of silt fences because relatively little research has been done, and the results are so variable. This being said, some useful information emerges from available data. First, these studies suggest that silt fences are more effective at removing coarser-grained materials. Conversely, silt fences are ineffective at reducing turbidity, which is disproportionately influenced by finer particles (Horner et al. 1990). A second finding is that silt fences are less effective on steeper slopes.

Why Are They So Widely Used?

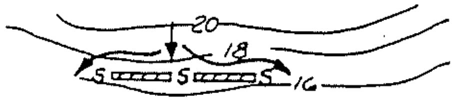
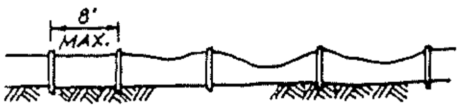
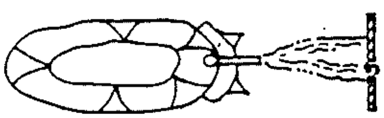
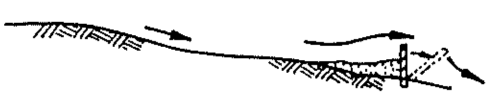
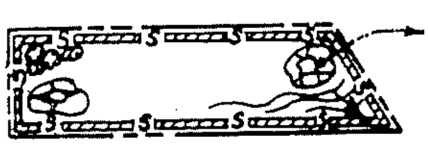
Surveys consistently report that silt fences are one of the most widely used ESC techniques (Ohrel 1996; Johnson 1992). Their popularity can be ex-

TABLE 82.1: A Summary of Recent Performance Monitoring of Silt Fences

Study	Parameter	Efficiency	Description
W&H Pacific and CH2M-Hill (1993)	TSS Turbidity	36%[a] -4.7%[a]	Average removal efficiency for five storms in March of 1993. Plot is on the 34% slope of a landfill. Soil is clay cap mixed with topsoil. Plot of bare soil is 32' by 9'.
W&H Pacific and CH2M-Hill (1993)	TSS Turbidity	65%[a] -1.5%[a]	Same study as above, but the test site is a 42% graded embankment with thick brown clay soil.
Horner et al. (1990)	TSS Turbidity	86%[b] 2.9%[a]	Construction site stockpile with a 24% slope. Gravelly sandy loam soil. Thirteen storms recorded over two winters on a 36' by 9' test plot.
Wyant (1993)	TSS	75%[c]	Efficiency determined by calculating sediment in a silty soil that will not settle after 25 minutes.

a. Efficiency calculated as the average removal for all storm events
b. Efficiency in reducing total loading for all storm events
c. Theoretical maximum for silty soils based on settling rates

TABLE 82.2: Conditions that Limit the Effectiveness of Silt Fences

1		**Slope and/or Length of Slope** 5% to 10%: no more than 50 feet 10% to 20%: no more than 25 feet more than 20%: no more than 15 feet
2		Silt fence is not **aligned parallel** to slope contours
3		Edges of the silt fence are not **curved uphill,** allowing flow to bypass the fence
4		**Contributing length** to fence is greater than 100 feet
5		Fabric is not **entrenched deeply** enough to prevent undercutting
6		**Spacing between posts** is greater than eight feet
7		Fence receives **concentrated flow** without reinforcement
8		Installed **below an outlet pipe** or weir
9		Silt fence is ***upslope*** of the exposed area
10		Silt fence alignment does not consider **construction traffic**
11		**Sediment deposits** behind silt fence reduce capacity and increase breach potential
12		Alignment of silt fence **mirrors the property line** or limits of disturbance, but does not reflect ESC needs

plained by both technical, economic and social reasons.

Silt fences can be a cost-effective ESC technique. They are inexpensive (about $3 per linear foot) and can be effective in trapping sediment when used appropriately. In addition, straw bales, their most common alternative, have been demonstrated to be almost completely ineffective. Many communities now specifically recommend that straw bales *not* be used by themselves, and some states such as North Carolina do not accept them on state projects. Consequently, silt fences are the most readily used perimeter control option in situations where other options such as diversion are not viable.

Silt fences are also popular because they have been so widely used in the past. Because developers and contractors feel they are familiar with the maintenance and installation requirements of silt fences, they can comfortably estimate the cost of using them on a project.

The visibility of silt fences is also a benefit. According to one survey respondent, they act as an "advertisement" for erosion and sediment control. In addition, this visibility sometimes makes inspection easier for both contractors and government inspectors.

What Are Their Disadvantages and Limitations?

In a recent survey of ESC experts (Brown and Caraco 1996), almost 90% of respondents recommended silt fences with reservations. Some problems related to both installation and maintenance of silt fences are described in Table 82.2. In a North Carolina survey, only 58% of silt fences were installed properly and a mere 34% were maintained properly (Paterson 1994).

Silt fences require ongoing maintenance that can cost as much as the original installation (U.S. EPA 1993). They are often damaged by construction equipment and storm runoff. Part of the regular maintenance of silt fences includes patching or repairing broken fences. In addition, the sediment trapped behind fences can reduce the volume available to store and treat runoff.

Because silt fences are a temporary, nondurable ESC technique, installing them to prevent damage and assure treatment of runoff is challenging. High flow volumes caused by large contributing areas or high velocities resulting from concentrated flows or steep slopes can damage silt fences. This permits runoff to flow through untreated. Runoff can bypass the fence when it does not flow perpendicular to the fence. Other errors in installation, such as improperly entrenching fabric, can also cause failure.

How Can They Be Improved?

Although using silt fences effectively is challenging, some simple techniques can improve their performance (Table 82.3). Selecting the right materials and fence designs are only one part of improving this technique. Education and common sense also play a strong role.

Silt fence fabrics are defined by standardized parameters that indirectly determine how strong the

TABLE 82.3: Techniques and Materials to Improve Standard Silt Fences

Geotextile[1]
- Slurry flow rate lower than 0.3 cfs
- Tensile strength greater than 50 lbs/in
- Ultraviolet stability>90%
- Filtering efficiency >75%

Stakes/ Posts[2]
- Use wood stakes at least three inches in diameter or 2" X 4" and five feet tall or metal posts of 1.3 lb/ft

Installation
- Drive posts a minimum of 16" into the ground
- Embed geotextile placed in a 8"x8" trench
- Place stakes a maximum of eight feet apart, unless a wire backing is used (10 ft.)
- Maintain a ten-foot border between the silt fence and construction activity
- Install along contour lines
- Use a continuous sheet of geotextile to prevent failure at joints

Maintenance
- Check after every ½ inch storm and weekly
- Remove sediment when it reaches one half of fence height
- Patch torn fences, or replace the entire fence section when tears occur

[1] MDE 1994 [2] Richardson and Wyant 1987

fence is, how much flow it can withstand and what size particle it can remove. The best materials are strong fabrics with low flow-through because they offer the greatest settling time. The recommendations in Table 82.4 represent some minimum guidelines for what can be confusing measurements.

The other material consideration is the poles that hold the fabric in place. A simple way to improve silt fences is to use thicker, longer posts and to place them closer together. These changes decrease the chance of fence failures and sagging, but also increase costs.

One recommendation to prevent damage to silt fences from construction activity is to include a minimum of a ten- foot grass buffer between construction activity and silt fences. Although this option may not be available on all sites, it can decrease damage to silt fences where applied.

Field performance ultimately can only be improved through a combination of enforcement and education on construction sites. For example, designers and plan reviewers should carefully outline conditions where silt fences should *not* be used (Table 82.2) and where other structural measures should replace them. In addition, it is useful if one person on site is responsible for inspecting and maintaining silt fences (see Technical Note 85).

Finally, the best way to improve silt fence performance is to practice effective erosion control. With proper erosion control, less sediment builds up behind silt fences. In addition, erosion control techniques also lower runoff volumes reducing the potential for failure (see Technical Note 81).

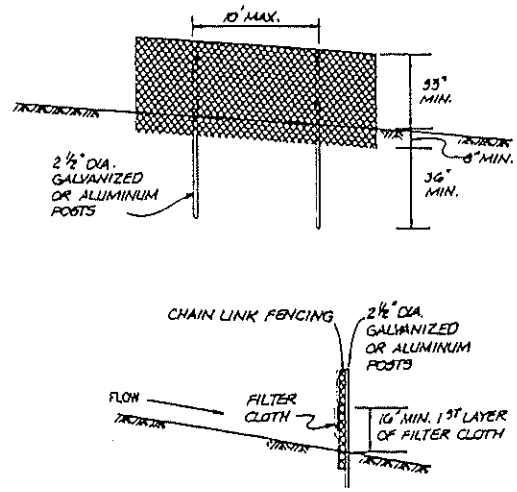
Beyond a Standard Silt Fence

In some sensitive watersheds, or where site conditions prohibit the use of the standard silt fence, it may be necessary to radically change fence design. Three innovative or alternative methods to increase silt fence efficiency are described in Table 82.4. They include a "super silt fence," a "bucket trap" and "silt fence anchors."

The "super silt fence," (Figure 82.1) developed in suburban Maryland, utilizes a chain link fence to support the geotextile material. Although super silt fences are unlikely to structurally fail, they are about three times more expensive than traditional silt fences ($9 per linear foot).

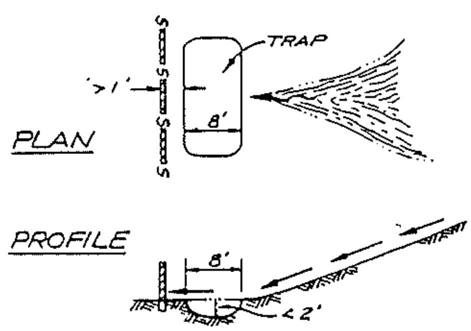
The "scoop trap," (Figure 82.2) also used in suburban Maryland, is a mini-sediment trap excavated with a tractor bucket placed before the silt fence at the point of concentration to provide additional ponding volume. Ordinarily, silt fences should not be applied in areas of concentrated flow. However, at times when other preferred structural

FIGURE 82.1: Super Silt Fence



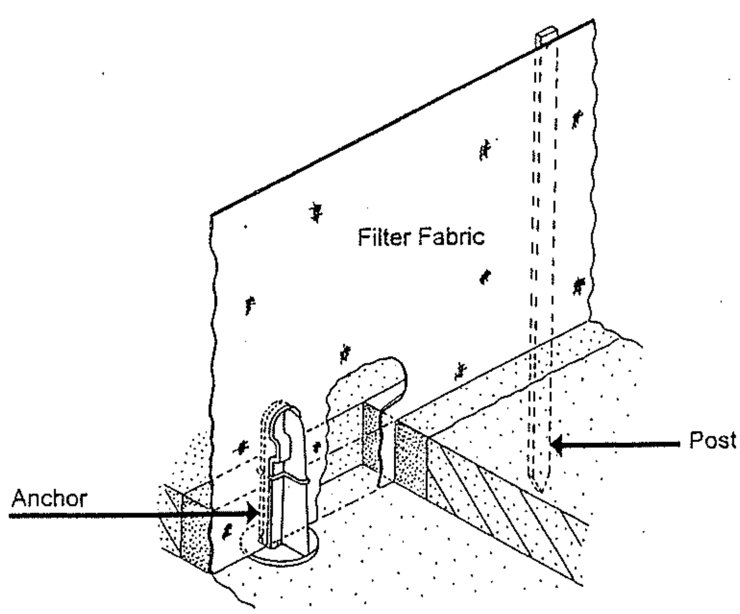
Super silt fence is a useful option in some construction sites where flow lengths or slopes are expected to be too stressful for normal silt fence.

FIGURE 82.2: Silt Fence with Scoop Trap



A scoop trap is a practical solution when silt fence is located at the toe of a steep slope.

FIGURE 82.3: Silt Fence Anchors



Anchors can be a remedy to prevent undercutting of silt fences, where site conditions make entrenching difficult.

TABLE 82.4: Silt Fence Innovations

Technique	Description
Super Silt Fence	Use of strong, thick geotextile backed by a chain link fence. The additional strength prevents failure.
Scoop Trap	A small sediment trap dug where flow concentrates. Provides additional detention volume.
Anchors	Plastic clips attached to the bottom of the geotextile to keep it entrenched.

devices are not practical because of limits on space, scoop traps can be useful measures to protect the fence.

"Silt fence anchors" (Figure 82.3) are plastic clips that hold the fabric in the trench. The anchors are clipped to the bottom of the geotextile and then entrenched in the ground. Their purpose is to prevent fabric from being pulled out of the ground. These anchors, however, have not been extensively field tested.

Conclusion

Silt fences are a deceptively simple practice. It is far too easy to draw them as a straight line on construction drawings, and then construct them according to conventional specifications.

When silt fences are planned and installed without careful thought the results are almost always poor. Also, once installed, silt fences tend to be forgotten and are perceived as a "no maintenance" practice. In reality, most silt fences will need extensive repair to function properly. We can expect little improvement in silt fence performance as long as they are perceived as a simple, mindless practice.

—DSC

References

Brown, W., and D. Caraco. *1996. Task 2 Technical Memorandum: Innovative and Effective Erosion and Sediment Control Practices for Small Sites.* Center for Watershed Protection. Silver Spring, MD. 37 pp.

Horner, R.R., J. Guedry and M.H. Kortenhof. 1990. *Improving the Cost Effectiveness of Highway Construction Site Erosion and Pollution Control.* Washington State Transportation Center and the Federal Highway Administration. Seattle, WA. 79 pp.

Johnson, A.M. 1992. *Turf Establishment and Erosion Control.* Braun Intertec Pavement. Minnesota Local Road Research Board. Saint Paul, MN. 21 pp.

Kouwen, N. 1990. *Silt Fences to Control Sediment Movement on Construction Sites.* University of Waterloo. Ontario Ministry of Transportation. MAT-90-03. Ontario, Canada. 63 pp.

Maryland Department of the Environment (MDE). 1994. *Maryland Standards and Specifications for Soil Erosion and Sediment Control.* Baltimore, MD. 140 pp.

Ohrel, R.L. 1996. *Technical Memorandum: Survey of Local Erosion and Sediment Control Programs.* Center for Watershed Protection. Silver Spring, MD. 25 pp.

Paterson, R.G. 1994. Construction Practices: The Good, the Bad and the Ugly. *Watershed Protection Techniques* 1(3): 95-99.

Richardson, and D.C. Wyant. 1987. Geotextile Testing and The Design Engineer. ASTM Special Technical Publication. 131 pp.

U.S. EPA. 1992. *Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.* EPA 832-R-92-005. Washington, D.C. 245 pp.

U.S. EPA. 1993. *Guidance for Specifying Management Measures for Nonpoint Pollution in Coastal Waters.* EPA 840-B-92-002. Washington, D.C. 740 pp.

W&H Pacific and CH2M-Hill. 1993. *Demonstration Project Using Yard Debris Compost for Erosion Control.* Portland Metropolitan Service District. Portland, OR. 90 pp.

Wyant, D.C. 1993 *Developing VTM-51 into an ASTM Test Method.* Virginia Transportation Research Council. Virginia Department of Transportation. Charlottesville, VA. 24 pp.

Technical Note No. 84

Improving the Trapping Efficiency of Sediment Basins

Sediment basins that are designed to settle out suspended sediments in stormwater runoff are typically the last line of defense at construction sites. Many communities employ the same basic and fairly simple design specification for sediment basins (see Table 84.1). While most specifications refer to optional design features such as de-watering devices, baffles or perforated risers, these "extras" are seldom installed in the field for cost reasons. In practice, the criteria are often used to tell the contractor how much dirt needs to be scooped out to provide the requisite storage.

> Some innovative techniques that can make a basin work better are beginning to prove themselves under various field conditions.

Consequently, in many regions sediment basins are really no more than an engineered hole in the ground (HIG). HIGs can be seen at almost any construction site around the country—steep-sided rectangular holes, that may or may not have standing water, with a ring of bright orange safety fencing, a reusable corrugated metal pipe (CMP) riser and perhaps a truckload of rip-rap dumped near the outlet.

It is not surprising, then, that most HIGs are a poor settling environment, and few are probably capable of consistently removing 70% of incoming sediment, much less the 98 to 99% removal needed to achieve a relatively clear water discharge. (See Technical Note 83). A large number of factors work to reduce the trapping efficiency of a basin in the field (Table 84.2), some of which could conceivably be "engineered away" through better design. Thus, the key question is how much improvement in performance can be expected if the basic design of sediment basins is modified?

A steady stream of sediment basin design improvements have been advocated over the years, including perforated risers, perforated risers with gravel or filter fabric jackets, filter fence baffles, floating skimmers, "dual basins in series," greater storage volumes and various combinations thereof (see Figure 84.1). Until recently, however, these design improvements were seldom subjected to experimental testing or field monitoring to determine if they actually improved trapping efficiency. Lacking proven performance data, many local and state erosion programs have been reluctant to make these improvements a mandatory part of sediment basin design, given the potential cost and maintenance ramifications.

Sediment Basin Re-Design

Our understanding about the performance of innovative sediment basin designs has recently been increased by a series of laboratory experiments, field monitoring and modeling studies conducted by A. R. Jarrett and his colleagues at Pennsylvania State University and Rich Horner of the University of Washington. While it is difficult to make direct comparisons between studies because of differences in soils, rainfall, design storage and experimental techniques, the research does offer some insight into these innovative techniques.

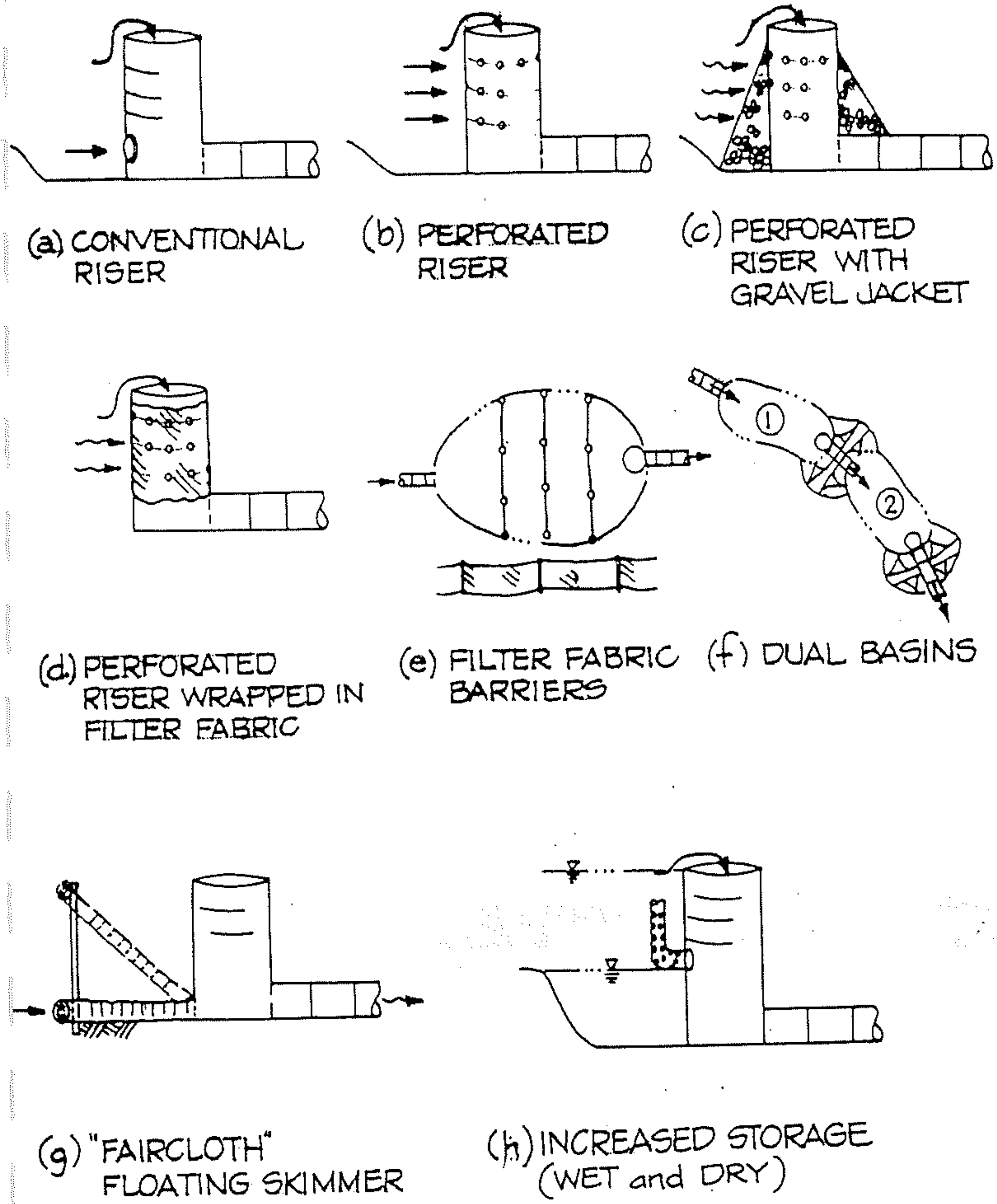
TABLE 84.1: "Standard" Sediment Basin Design Criteria Compiled from Various State and Local ESC Manuals

- provide 1,800 cubic feet of storage per contributing acre *
- surface area equivalent to one percent of drainage area **
- riser w/ spillway capacity of 0.2 cfs/acre of drainage area (peak discharge for two-year storm, undeveloped condition)
- spillway capacity to handle ten-year storm with one-foot freeboard
- length-to-width ratio of 2 or greater **
- basin sideslopes no steeper than 2: 1 (h:v)
- safety fencing, perforated riser, de-watering **

* A number of States (MD, PA, GA and DE) recently increased storage requirement to 3600 ft^3 or more.

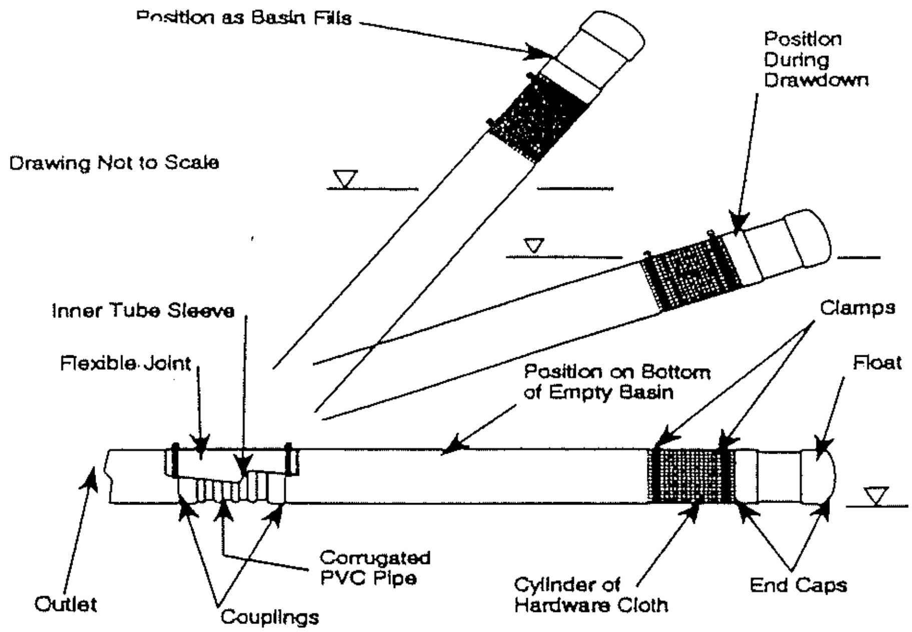
** Optional technique, but seldom actually required during plan review.

FIGURE 84.1: Options for Design Improvements



The standard riser configuration in a sediment trap may not provide enough detention time or the proper conditions for settling. Some alternative design options include a perforated riser (panel b), and wrapping the riser in filter fabric or gravel (panels c and d). To prevent short circuiting, some designers use filter fabric or a dual pond in series (panel e and f). Floating skimmers (panel g) and increased wet/dry storage volume (panel h) show the greatest promise.

FIGURE 84.2: Floating Skimmer Design (*Adapted from Faircloth* 1995)



Comments: Barrel pipe is 10.2 cm (4 in) schedule 40; float is lightweight drainage pipe. Barrel pipe length should be slightly longer than the depth of basin to crest of principle outlet. Corrugated PVC pipe in flexible joint prevents inner tube sleeve collapsing under water pressure. Outlet pipe is fitted with an end cap with a small hole (size varies with volume of basin) to restrict outflow and maximize sedimentation, typically .5 to .75 inch diameter. Fence posts are placed on both sides of skimmer as guides; wire across the top limits floating and can be used to stop and sink skimmer when water level reaches desired elevation.

The floating skimmer rests on the floor of a sediment basin in between storms. The float causes the skimmer to rise during a storm, thereby increasing detention time and withdrawing from the less turbid surface waters.

TABLE 84.2: Factors that Impair Trapping Efficiency of Sediment Basins and Traps
(compiled from various references)

Factors that Impair Trapping Efficiency
Large storm events (greater than two-year storm)
Moderate to low incoming TSS concentrations
Sediment deposits on bottom are re-suspended, or sides erode
Fine particle sizes in incoming runoff (silt and clay particles 40 microns or less)
Advanced stage of construction, with storm drains and paved roadways increasing runoff volume/velocity
Low intensity, long duration rainfall events
Length-to-width ratio of 1:1 or less
Multiple inlets, particularly if not stabilized or if their invert is more than a foot above basin floor
Steep side-slopes, particularly in non-growing season or poor vegetative cover
Turbulent energy in runoff
Cold water temperatures (below 40 degrees F)
Absence of standing water in basin
Upland soils are in C and D hydrologic soil groups, or highly erodible soils

Perforated Riser. A simple means of achieving greater detention times is to replace the standard riser (with its large flow orifice) with a perforated riser (see Figure 84.1). The perforations should slightly increase detention times in the basin for smaller storms, and therefore increase trap efficiency. In practice, the effect of a perforated riser on detention time and basin hydraulics is poorly understood, although an excellent design methodology has been proposed by Jarrett (1993). Test tank research has shown that the perforated riser, by itself, only results in sediment removal on the order of 60 to 70%, depending on the de-watering time achieved (Table 84.3, Engle and Jarrett 1995). The perforated riser was generally unable to settle out fine-grained silt and clay particles, which accounted for the mediocre removal rate.

Perforated Riser with Gravel Jacket. The use of a "jacket" of gravel around the perforated riser has been used in some communities to provide more filtering, further increase detention times, and promote greater settling. The experimental work of Engle and Jarrett generally supports this notion (Table 84.3). Sediment removal increased by 15 to 18 percent compared to a perforated riser alone. The same authors found that encasing the riser with expanded polystyrene chips (EPS), similar to those used in packing, had the same effect on trapping efficiency, as well.

TABLE 84.3: Effect of Riser Configuration on Sediment Basin Removal Efficiency (from Engle and Jarrett 1995)

Riser Configuration	TSS Removal 1.5 hour dewatering time	TSS Removal 3.0 hour dewatering time
Perforated riser (PR)	59.8%	71.0%
PR w/ Gravel Filter	78.3%	85.6%
PR w/ EPS Chips Filter	78.3%	89.0%

***Test Conditions:** experimental settling tank, 18 trials, initial TSS concentration of 5880 mg/l; particle size distribution 24% clay, 35% silt, and 41% sand.*

Perforated Riser with Filter Fabric Lining. The use of gravel jackets can be fairly expensive, can lead to clogging, and may make maintenance operations more difficult. As an alternative, several communities allow a layer of permeable filter fabric to be wrapped around the outside of the perforated riser. Based on experimental tests of Fisher and Jarrett (1984), however, this approach is not likely to increase trapping efficiency much. Of six fabrics tested, none performed well in trapping silt and clay particles, although most fabrics did prevent sand from passing through. Also, field experience has shown that the pores of filter fabric clog very rapidly, transforming the fabric from a filter to a barrier. When filter fabric clogs, basins tend to fill up with water to the crest of the riser thereby losing valuable storage capacity.

Recent experiments by Brown (1997) using two types of filter fabric on a perforated riser, where the uncovered perforated riser, basin and storms had a 48-hour de-watering time, showed that the filter fabric clogged quickly, greatly extending the de-watering time. In addition, the particle size distribution of suspended sediment passing through the filter fabric was essentially the same as measured for the influent in the particle range smaller than 45 micro-meters.

Silt Fence Barriers. To achieve the desired length-to-width ratio of 2:1 or 5:1, some communities require that baffles or silt fence barriers be placed perpendicular to the flow path within a sediment basin. Experiments by both Millen and Jarrett (1996) and Horner et al. (1990) found silt fence barriers to be of relatively little value in improving sediment removal in test basins, primarily because they had little or no influence on detention time (see Table 84.4). Dye tests reported by Jarrett (1996) did show that the barriers reduced short-circuiting to near zero, but tended to increase the volume of dead storage in the basin. Poorly-mixed dead storage zones provide less detention time for incoming sediments as they move from inlet to the riser. The research implies that while baffles are important in basins with multiple inlets or poor geometry, they provide only a marginal sediment removal benefit for a well-designed basin.

Faircloth "Floating Skimmer." The floating skimmer was developed by William Faircloth of Orange County, North Carolina (Faircloth 1995). The simple, inexpensive device consists of a straight section of PVC pipe attached via a flexible coupling to the low-flow outlet situated at the base of a riser (see Figure 84.2). Equipped with a float, the skimmer pipe will rise and fall along with water levels in the sediment basin. The inlet to the skimmer pipe is a small hole located at the end-cap (this small hole, often only 1/2 to one-inch in diameter restricts flow, and therefore increases detention time). Fence posts

TABLE 84.4: Effect of Design Features on Sediment Basin Trapping Efficiency (from Jarrett 1996)

Basin Design Feature	Sediment Removal
Perforated Riser	94.2%
Perforated Riser w/ Barriers	95.4%
Skimmer on PR	96.9%
Skimmer on PR, w/ Barriers	96.6%

Test Conditions: *full-scale sedimentation basin, one-acre construction site, 6250 ft³ capacity, two-year, 24-hour rainfall event, peak inflow Q_p of 0.83 cfs, 12 trials, 2000 to 5000 mg/l average. TSS inflow; particle size distribution: 6% clay, 21% silt, 51% sand, 22% gravel.*

are driven in on both sides of the skimmer pipe, guiding it up and down.

Prior to the storm, the skimmer pipe rests on the floor of the sediment basin. During the first part of a storm, the inlet hole restricts flow, backing water up in the basin, and causing the skimmer pipe to rise. Sediment-laden runoff encounters a permanent pool which promotes greater settling. After the storm, the basin gradually de-waters, and the skimmer slowly descends back to the floor of the basin. This de-watering allows full recovery of storage capacity in the sediment basin for the next storm. In addition, the skimmer is always drawing cleaner runoff near the top of the pool, rather than the dirtier bottom sediments. Several prototypes have been tested in the Chapel Hill, North Carolina region, and Faircloth reports that they appear to perform well and are very durable. In addition, the cost of the skimmer is less than $100, and is comprised of readily available materials. The performance of the floating skimmer was recently tested under simulated field conditions by Jarrett (1996). Nearly 97% of sediment removal was achieved by the test basin during a simulated two-year, 24-hour design storm event (Table 84.4), the highest trapping efficiency observed for any of basin designs tested. The trapping efficiency of the floating skimmer appears to be ultimately limited by turbulent energy of incoming runoff. According to Jarrett (1996), fine-grained particles (smaller than 45 microns) are not subject to effective settling when turbulent energy exceeds 0.3 feet per second, which is quite common in many basins.

Dual Basins. A promising, if not always practical, means of improving sediment basin efficiency is to split the total storage volume into two basins in series rather than one. Laboratory experiments by Horner et al. (1990), for example, suggested that a dual basin arrangement was the single most effective design strategy to increase detention time, and therefore, settling potential (i.e., greater than baffles or increasing basin length). While this option is certainly more expensive than others, it may be appropriate for highway and other development sites that have long and narrow areas available for treatment.

Increase Storage Volume. Several states such as Maryland, Georgia and Delaware have increased the storage capacity of sediment basins from the traditional 1800 ft³ per acre (i.e., one-half inch over contributing watershed area) to 3600 ft³ /acre. The extra storage and changes to the basin's outlet should increase the detention times for many storms, particularly those that measure less than one-inch in depth. For smaller storms, it may be possible to achieve "zero discharge" during a storm event if it is smaller than the capacity of the basin. It is important to note that the expected improvement in efficiency will not occur unless the principal spillway is also modified to increase detention at the same time. This is done by raising or constraining the low-flow orifice, creating a partial permanent pool with a riser elbow modification, or using the floating skimmer or perforated riser (Jarrett 1996; McBurnie et al. 1990; Schueler and Lugbill 1990). Further, it should be noted that the effect of increasing storage volume on basin efficiency has not yet been documented experimentally in the lab or the field, although anecdotal evidence suggests that it produces more zero discharge events than the old criteria.

Summary: Recommended Basin Design Specifications

While a large number of sediment basin design refinements are being promoted, current research suggests that some may not substantially improve performance. In addition, more field research is needed under a wider range of construction site conditions to accurately assess which design refinements are worth adopting. In particular, the value of the basin design improvements in capturing extremely-fine grained sediments needs more assessment. Further, new design refinements must be carefully assessed from the standpoint of future maintenance and con-

TABLE 84.5: Recommended Sediment Basin Design Criteria

1	Provide a minimum storage of at least 3,600 ft^3 per acre.
2	Provide storage in wet and dry stages.
3	Silt fence barriers required if l/w is less than two.
4	Evaluate all proposed inlets for stability.
5	Employ a floating skimmer, or at least a perforated riser w/ gravel jacket.
6	Incorporate storage in multiple cells, where possible.
7	Limit side-slopes to no greater than 3:1.
8	Check water table to determine if basin can/should fully de-water.
9	Paint depth markers on principal spillway to measure sediment deposition to better trigger cleanouts.
10	Stabilize side-slopes and basin bottom.

.actor expertise—an overly complex design refinement that works great in the lab may be difficult to onstruct or maintain in the field. Lastly, if the degn refinements greatly increase the cost of sediment basins, it is probable that many designers will shift to ^heaper (and presumably less effective) sediment conols that are available in the local ESC handbooks. With these considerations in mind, some possible refinements to traditional sediment basin design criteria e proposed in Table 84.5.

—*TRS*

eferences

Brown, E.R. 1997. Filtering Efficiency and Water Transmissibility of Geotextiles Utilized in the Design of Sedimentation Discharge Riser Pipes. Unpublished MS Thesis. Civil Engineering. Pennsylvania State University. University Park, PA.

ıgle, B.W and A.R. Jarrett. 1995. Sedimentation Retention Efficiencies of Sedimentation Basin Filtered Outlets. *Transactions of ASAE* 38(2): 435-439.

Faircloth, W. 1995. Experimental De-watering Device to Improve Sedimentation Basin Efficiency. Unpublished manuscript. Orange County Planning and Inspections Dept. Hillsborough, NC. 12 pp.

Fisher, L., and A.R. Jarrett. 1984. Sediment Retention Efficiency of Synthetic Filter Fabrics. *Transactions of ASAE* 27(2): 429-436.

Horner, R., J. Guedry, and M. Kortenhoff. 1990. *Improving Cost-Effectiveness of Construction Site Erosion and Pollution Control.* Washington State Dept. of Transportation. WA-RD-200.1 Seattle, WA. 64 pp.

Jarrett, A.R. 1993. Design of Perforated Risers to Control De-watering of Sedimentation Basins. *Transactions of ASAE. Applied Engineering in Agriculture* 9(1):37-42.

Jarrett, A.R. 1996. *Sedimentation Basins: Evaluation and Design Improvements.* Final Report. Orange County Planning Commission. Pennsylvania State University. 77 pp.

McBurnie, J., B. Barfield, M. Clar, and E. Shaver. 1990. Maryland Sediment Detention Pond Design Criteria and Performance. *Applied Engineering in Agriculture* 6(2): 167-172.

Millen, J.A., and A.R. Jarrett. 1996. Improved Sedimentation Basin Performance with Barriers and a Skimmer. ASAE Microfiche No. 96-2056.

Schueler, T., and J. Lugbill. 1990. *Performance of Current Sediment Control Measures at Maryland Construction Sites.* Metropolitan Washington Council of Governments. Washington, D.C. 90 pp.

***Editor's Note:** Special thanks to Dr. Jarrett for his review and comments on this note. In addition, he supplied us with a new and improved design for the Faircloth skimmer that we received too late to print. If you are interested, call us at the Center and we will be happy to fax it to you.*

A NONPOINT SOURCE CONTROL PLAN FOR THE MENOMONEE RIVER PRIORITY WATERSHED PROJECT

The Wisconsin Nonpoint Source Water Pollution Abatement Program

March 1992

This Plan Was Cooperatively Prepared By:

The Wisconsin Department of Natural Resources and
The Department of Agriculture, Trade, and Consumer Protection
In cooperation with
The Ozaukee, Washington, and Waukesha County
Land Conservation Departments
and
The Menomonee River Advisory Subcommittee

Publication WR-244-92

For copies of this document please contact:

Wisconsin Department of Natural Resources
Bureau of Water Resources Management
Nonpoint Source and Land Management Section
P.O. Box 7291
Madison, WI 53707

The Wisconsin Department of Natural Resources acknowledges the Environmental Protection Agency's Region V Office for their involvement in the partial funding of this activity through Section 319 of the Water Quality Act.

Table 21 shows the results of applying the management category criteria to the livestock operations in the watershed. Management Category I includes two livestock operations and Management Category II includes an estimated eight livestock operations. Together, these categories include 20 percent of the livestock operations and about 80 percent of the estimated critical acres winter-spread with manure annually.

Table 21. Livestock Operations Targeted for Control of Winter Spreading Manure in the Menomonee River Watershed.

Management Category	Livestock Operations		Critical Acres Spread	
	Number	Percent	Number	Percent
I	2	4 percent	33	25 percent
II	8	16 percent	73	55 percent
TOTAL	10	20 percent	106	80 percent

Source: Wisconsin Department of Natural Resources and Wisconsin Department of Agriculture Trade and Consumer Protection.

As discussed for barnyard pollution control, the pollution potential of manure spreading for targeted livestock operations does not need to be reduced to zero. At a minimum, targeted livestock operations should reduce critical acres winter-spread with manure down to five acres. This would afford a 60 percent reduction in the watershed pollution loading from targeted livestock operations. Control beyond this level should consider incremental costs to determine if additional control is cost effective.

This identification of high priority livestock operations does not determine eligibility for technical and/or cost-share assistance. The actual number of critical acres spread for each livestock operation will be recalculated by land conservation department staff during project implementation. The new information and the criteria in Table 19 will be used to assign updated management categories to each livestock operation.

MANAGEMENT CATEGORY CRITERIA FOR ERODING UPLANDS

Management category criteria were established for eroding uplands contributing sediment to rivers and streams. The criteria are expressed in terms of tons of sediment delivered annually to rivers and streams. Specific criteria were not developed for eroding uplands impacting wetlands. The means for addressing these areas are discussed below.

Uplands Delivering Sediment to Rivers and Streams: Eroding uplands contribute more than 40 percent of the sediment load to surface waters in the Washington and Ozaukee County portions of the watershed. They will continue to be an important localized source of sediment impacting streams despite the large amount of new urban development anticipated to occur in the future. Eroding uplands are important sources of sediment in several other areas of the watershed in Waukesha and Milwaukee Counties, and contribute to downstream sedimentation problems.

Sediment delivery from eroding uplands can be controlled by reducing soil loss. Generally, the tolerable soil loss rate (T) for most agricultural land in the watershed is three tons per acre per year (T/A/Y). The T value is viewed as the amount of soil erosion which can occur for purposes of maintaining long-range soil productivity. Historically, soil erosion control programs have been successful in using a combination of best management practices to achieve rates approaching T.

As discussed in Chapter III, "Watershed Planning Methods," an evaluation of soil erosion rates and the associated amount of sediment delivered to surface waters was conducted. This results of this analysis, water quality information, and aquatic habitat investigations were used to establish a goal for reducing the amount of sediment impacting streams.

The sediment reduction goal for the streams in this watershed is 50 percent. Sediment delivery criteria were selected which combine the estimated amount of sediment delivered to streams with calculated erosion rates. Generally, the sediment reduction goals can be achieved if erosion rates of two tons per acre per year are attained in most areas of the watershed.

Table 22 shows the management categories and eligibility criteria used to target eroding uplands for management.

Lands where sediment reductions are achieved by reducing soil loss to two T/A/Y and sediment delivery to a rate corresponding to a 50 percent decrease are designated as Management Category I. Areas where sediment delivery above the sediment delivery cut-off but the soil loss rate is less than two T/A/Y are designated as Management Category II. Lands with sediment delivery rates below the specified cut-off were placed in Management Category III.

Table 23 shows the amount of control that will be achieved by implementing this strategy for uplands. On a watershed basis, sediment delivered to streams will be reduced 47 percent. This will require better management on 5,258 acres, or about one-third of the agricultural land in the watershed.

As shown of Map 12, control of sediment originating from eroding agricultural lands is needed in 12 of the 20 subwatersheds. The Germantown, Lilly Creek, Upper Menomonee, and Victory Center Subwatersheds together account for about 50 percent of the land needing improved management to reduce erosion and sediment delivery.

Uplands Delivering Sediment to Wetlands: The management category criteria in Table 22 are based on sediment delivery to rivers and streams. These criteria do not address eroding uplands draining to either wetlands adjacent to streams and rivers or isolated wetlands. Wetlands serve to trap most of the sediment contained in runoff during certain periods of the year and in the process provide a valuable water quality function. It is recognized, however, that in the process the wetland may itself suffer environmental

Table 22. Criteria and Management Categories for Eroding Agricultural Uplands in the Menomonee River Watershed.

Subwatershed[1]	Management Category	Criteria[2] Sediment Delivery	Soil Loss
Dretzka Park	I	over 0.20 T/A/Y &	over 2 T/A/Y
	II	over 0.20 T/A/Y &	under 2 T/A/Y
	III	under 0.20 T/A/Y	
Goldenthal	I	over 0.09 T/A/Y &	over 2 T/A/Y
	II	over 0.09 T/A/Y &	under 2 T/A/Y
	III	under 0.09 T/A/Y	
Germantown	I	over 0.18 T/A/Y &	over 2 T/A/Y
	II	over 0.18 T/A/Y &	under 2 T/A/Y
	III	under 0.18 T/A/Y	
Granville	I	over 0.10 T/A/Y &	over 2 T/A/Y
	II	over 0.10 T/A/Y &	under 2 T/A/Y
	III	under 0.10 T/A/Y	
Lilly Creek	I	over 0.23 T/A/Y &	over 2 T/A/Y
	II	over 0.23 T/A/Y &	under 2 T/A/Y
	III	under 0.23 T/A/Y	
Little Menomonee	I	over 0.08 T/A/Y &	over 2 T/A/Y
	II	over 0.08 T/A/Y &	under 2 T/A/Y
	III	under 0.08 T/A/Y	
Middle Menomonee	I	over 0.28 T/A/Y &	over 2 T/A/Y
	II	over 0.28 T/A/Y &	under 2 T/A/Y
	III	under 0.28 T/A/Y	
Mequon	I	over 0.09 T/A/Y &	over 2 T/A/Y
	II	over 0.09 T/A/Y &	under 2 T/A/Y
	III	under 0.09 T/A/Y	

Table 22. (continued)

Subwatershed[1]	Management Category	Criteria[2] Sediment Delivery	Soil Loss
Rockfield	I	over 0.08 T/A/Y &	over 2 T/A/Y
	II	over 0.08 T/A/Y &	under 2 T/A/Y
	III	under 0.08 T/A/Y	
Upper Menomonee	I	over 0.13 T/A/Y &	over 2 T/A/Y
	II	over 0.13 T/A/Y &	under 2 T/A/Y
	III	under 0.13 T/A/Y	
Victory Center	I	over 0.19 T/A/Y &	over 2 T/A/Y
	II	over 0.19 T/A/Y &	under 2 T/A/Y
	III	under 0.19 T/A/Y	
Willow Creek	I	over 0.11 T/A/Y	over 2 T/A/Y
	II	over 0.11 T/A/Y	under 2 T/A/Y
	III	under 0.11 T/A/Y	

1. Does not include watersheds where urban land use predominate and upland erosion is not a significant source of sediment.

2. T/A/Y - tons of sediment per acre per year.

Source: Wisconsin Department of Natural Resources and Wisconsin Department of Agriculture, Trade, and Consumer Protection.

damage. If it is severe enough, the wetland may lose its ability to continue to trap the eroding sediment and/or become degraded in terms of its ecological diversity and value as wildlife habitat.

If wetland degradation associated with sediment deposited from eroding uplands is suspected, site specific evaluations will be conducted during project implementation by the DNR Southeast District water resources management personnel and the county land conservation office staff. The DNR determines the eligibility for cost-sharing or technical assistance.

Table 23. Eroding Agricultural Uplands Targeted for Control in the Menomonee River Watershed.

Subwatershed	Management Category I Acres	Management Category I Tons	Management Category I Control	Management Category II Acres	Management Category II Tons	Management Category II Control	Total Control*
Dretzka Park	104	45	50%	--	--	--	50%
Goldenthal	503	58	35%	94	19	12%	47%
Germantown	630	215	48%	--	--	--	48%
Granville	362	54	38%	72	11	8%	46%
Lilly Creek	486	132	48%	--	--	--	48%
Little Menomonee	303	48	36%	97	16	6%	42%
Middle Menomonee	131	50	50%	--	--	--	50%
Mequon	252	45	41%	64	9	8%	49%
Rockfield	277	81	42%	156	26	6%	48%
Upper Menomonee	785	147	46%	--	--	--	46%
Victory Center	613	161	49%	--	--	--	49%
Willow Creek	246	48	41%	83	7	6%	47%
WATERSHED TOTAL	4,692	1,084	44%	566	88	3%	47%

*Control is the percent reduction in tons of sediment delivered to surface waters.

Source: Wisconsin Department of Natural Resources and Wisconsin Department of Agriculture, Trade, and Consumer Protection.

Cropland Eligible for Assistance to Comply With Other State or Federal Programs: Cropland eligible for assistance through the priority watershed project may also need practices beyond those required to achieve the sediment delivery reduction goals. In such cases, practices needed to reduce erosion to levels necessary to comply with requirements of the State Farmland Preservation or Federal Food and Security Act Programs may be eligible for funding under the priority watershed project. Generally, funding for these situations will be available for cropland needing low to moderate cost erosion control practices. Examples of such practices include contour strip cropping or reduced tillage. High cost measures to control erosion on these areas will not be eligible for funding under the priority watershed project. Examples include field diversions and terraces.

Management Category Criteria for Streambank Degradation

Management category criteria developed for eroding streambanks reflect the more localized nature of their impact. The criteria are based primarily on the rate at which streams are cutting into the streambanks and secondarily on the mass load of sediment being produced at the site.

Table 24 presents management category criteria for eroding streambanks. All sites having moderate to severe rates of lateral recession are targeted for control. Within this

A NONPOINT SOURCE CONTROL PLAN FOR THE MILWAUKEE RIVER SOUTH PRIORITY WATERSHED PROJECT

The Wisconsin Nonpoint Source Water Pollution Abatement Program

This Plan was Cooperatively Prepared by:

Wisconsin Department of Natural Resources
Wisconsin Department of Agriculture, Trade and Consumer Protection
Milwaukee River South Watershed Citizens Advisory Committee
and the Counties of: Ozaukee and Milwaukee

December 1991

PUBL-WR-245-91

For Copies of this Document Please Contact:

Wisconsin Department of Natural Resources
Bureau of Water Resources Management
Nonpoint Source and Land Management Section
P.O. Box 7921
Madison, WI 53707

The decision criteria presented in this table are designed to address about 85 percent of the critical acres spread annually in the watershed. This is close to the percent of the barnyard pollution potential targeted for control. The respective portions of the pollution potential from this source assigned to Management Categories I and II are also similar to those established for barnyard runoff. Livestock operations placed in Management Category I represent 60 percent of the pollution potential from this source, and livestock operations placed in Management Category II represent 25 percent. The management category criteria for this source are identical to those established in other watersheds in the Milwaukee River Basin.

Table 5-4 shows the results of applying the management category criteria to the livestock operations in the watershed. Management Category I includes an estimated 15 livestock operations and Management Category II includes an estimated 14 livestock operations. Together, these categories include about one-third of the livestock operations and 85 percent of the estimated critical acres winterspread with manure annually.

As with barnyards targeted for control, the pollution potential of manure spreading for targeted livestock operations does not need to be reduced to zero. At a minimum, targeted livestock operations should reduce critical acres winterspread with manure down to five acres. This would afford a 60 percent reduction in the watershed pollution loading from targeted livestock operations.

Control beyond this level should consider the incremental control costs to determine if the additional control is cost effective. For example, if changes in manure management can be made without constructing a manure storage facility, and if such changes will result in reducing critical acres being spread from 10 acres to 5 acres, then the added cost of constructing a manure storage unit to control the remaining five acres may not be cost effective. Once a manure storage unit is constructed, however, there must be a requirement that critical acres be avoided entirely.

It is important to recognize that the current identification of high priority livestock operations is only preliminary because of the many assumptions about manure spreading practices of each livestock operation. During implementation, Land Conservation Department staff will need to recalculate the actual number of critical acres that each livestock operation spreads annually. Acreage criteria presented in Table 5-3 must be applied to updated information about each livestock operation in order to assign a revised management category based on actual spreading practices.

Management Category Criteria For Eroding Croplands And Other Uplands

Uplands Delivering Sediment to Rivers and Streams: Eroding uplands contribute a large portion of the sediment load to surface waters in the Ozaukee County portion of this watershed. They are the primary sediment source for most of the rural portions of tributary streams such as Fredonia Creek, Mole Creek (Haneman Lake Subwatershed), Ulao Creek (Lakefield Subwatershed), and Pigeon Creek. They are also the dominant source of sediment to the Milwaukee River above Saukville, contributing 75 percent of the total watershed sediment load at River Point 1. The relative importance of this source is less in lower reaches of the river due to the addition of other sediment sources. Even so,

Table 5-3. Criteria and management categories for livestock operations that spread manure during winter in the Milwaukee River South Watershed.

Number of Critical Acres Spread Annually	Management Category	Portion of Critical Acres Spread Annually
15 acres or more	I	60%
7 to 15 acres	II	25%
0 to 7 acres	III	15%

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Ozaukee County Land Conservation Department.

Table 5-4. Livestock operations targeted for control of winterspreading manure in the Milwaukee River South Watershed.

Management Category	Livestock Operations		Critical Acres Spread	
	Number	%	Number	%
I	15	16%	297	60%
II	14	15%	131	25%
TOTAL	29	32%	428	85%

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade and Consumer Protection; and Ozaukee County Land Conservation Department.

this source remains important as it represents 30 to 40 percent of the watershed's sediment contribution to the river within Ozaukee County and 15 to 25 percent of the sediment contribution to the Milwaukee River within Milwaukee County.

Reducing soil loss from the upland fields can control sediment delivery from these uplands. However, there are limits as to how far rates of soil loss can be reduced while maintaining a viable agricultural land use. Generally, soil loss rates of 3 tons/acre/year (T/A/Y) are tolerable in this part of Ozaukee County for purposes of maintaining long-range soil productivity. Soil loss rates less than 2 T/A/Y can be achieved, although it becomes increasingly difficult to attain rates below this level over large areas. This is a concern, since in many of the subwatersheds, a large portion of the delivered sediment (60 to 70 percent) originates on croplands eroding at rates less than 2 T/A/Y. Consequently, the management categories and eligibility criteria were first defined for this watershed based on the sediment reduction goals established for the water resources, and then modified to reflect the limitations in controlling soil loss.

Generally, the sediment reduction goal for surface waters in this watershed is 50 percent. Since eroding uplands in Ozaukee County have a significant impact on all major tributaries and points along the Milwaukee River, a 50 percent reduction in sediment from this source was established. This reduction level was set as a minimum desired level of control that should be achievable through the selected management category criteria. Where advantageous, this level of reduction could be increased in specified areas to achieve additional control.

Practical limitations on controlling soil erosion are used to separate that portion of the total achievable control that is assigned to each management category. Two alternative soil loss rates were investigated as a criterion for separating Management Category I and Management Category II. These are 3 T/A/Y and 2 T/A/Y. If 3 T/A/Y is used, too much of the potential control falls into Management Category II. Since lands assigned to this management category do not have to be controlled as part of a cost share agreement, there is less likelihood the desired management will occur. Consequently, 2 T/A/Y is chosen as the criterion for separating eligible sources into Management Category I or II.

Table 5-5 shows the management categories and eligibility criteria that will be used to target eroding uplands for management in this watershed project.

* In the Fredonia, Waubeka, Saukville, Haneman Lake, Grafton, and Pigeon Creek Subwatersheds only the land parcels having sediment delivery rates above a specified level are targeted for control. That portion of the sediment reduction that can be achieved by reducing soil loss rates down to 2 T/A/Y is designated as Management Category I. That portion that requires reducing soil loss rates to less than 2 T/A/Y is designated as Management Category II. Land parcels that have sediment delivery rates below the specified cut-off will not be targeted for management and are placed in Management Category III.

* In the Lakefield and Mequon Subwatersheds, a significant amount of additional control can be achieved by expanding Management Category II to include all lands with soil erosion rates over 2 T/A/Y. This

Table 5-5. Criteria and management categories for eroding agricultural uplands in the Milwaukee River South Watershed.

Subwatershed	Management Category	Criteria	
		Sediment Delivery	Soil Loss
Fredonia	I	over .05 T/A/Y	& over 2 T/A/Y
	II	over .05 T/A/Y	& under 2 T/A/Y
	III	under .05 T/A/Y	
Waubeka	I	over .05 T/A/Y	& over 2 T/A/Y
	II	over .05 T/A/Y	& under 2 T/A/Y
	III	under .05 T/A/Y	
Saukville	I	over .09 T/A/Y	& over 2 T/A/Y
	II	over .09 T/A/Y	& under 2 T/A/Y
	III	under .09 T/A/Y	
Haneman Lake	I	over .08 T/A/Y	& over 2 T/A/Y
	II	over .08 T/A/Y	& under 2 T/A/Y
	III	under .08 T/A/Y	
Grafton	I	over .15 T/A/Y	& over 2 T/A/Y
	II	over .15 T/A/Y	& under 2 T/A/Y
	III	under .15 T/A/Y	
Lakefield	I	over .16 T/A/Y	& over 2 T/A/Y
	II	over .16 T/A/Y	& under 2 T/A/Y
	II	under .16 T/A/Y	& over 2 T/A/Y
	III	under .16 T/A/Y	& under 2 T/A/Y
Pigeon Creek	I	over .10 T/A/Y	& over 2 T/A/Y
	II	over .10 T/A/Y	& under 2 T/A/Y
	III	under .10 T/A/Y	
Mequon	I	over .18 T/A/Y	& over 2 T/A/Y
	II	over .18 T/A/Y	& under 2 T/A/Y
	II	under .18 T/A/Y	& over 2 T/A/Y
	III	under .18 T/A/Y	& under 2 T/A/Y

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and the Ozaukee County Land Conservation Department.

option is being exercised because these two subwatersheds have very high mass loadings of sediment delivered from uplands.

Table 5-6 shows the control strategy for eroding uplands. On a watershed basis, 60 percent of the sediment load from this source is targeted for control. In all subwatersheds, the portion of the sediment load from this source that is targeted for control equals or exceeds 50 percent. This will be adequate to improve habitat quality in major and minor tributary streams. Levels of control are significantly higher in the Fredonia, Waubeka, Mequon, and Lakefield Subwatersheds consistent with the importance of those areas as sediment sources to the Milwaukee River. The potential sediment reduction from eroding uplands under this management package varies from 65 percent at River Point 1 to 60 percent at River Point 4.

That portion of the control program that is designated Management Category I varies. This portion is 25 to 30 percent for Fredonia Creek and Mole Creek, 40 to 50 percent for Ulao Creek and Pigeon Creek, and ranges from 30 to 40 percent for points along the Milwaukee River within Ozaukee County.

This control strategy for eroding cropland and other uplands will require better management on 14,000 acres, or about one-third of the eroding uplands. Map 14 shows the distribution of eroding uplands in the watershed that are targeted for control.

Table 5-6. Eroding agricultural uplands targeted for control in the Milwaukee River South Watershed.

Subwatershed	Management Category I			Management Category II			Total
	Acres	Tons	Control*	Acres	Tons	Control*	Control*
Fredonia	646	49	26%	502	69	36%	62%
Waubeka	2,168	244	33%	1,365	249	34%	67%
Saukville	696	108	39%	147	32	12%	51%
Haneman Lake	680	67	30%	290	43	20%	50%
Grafton	196	40	49%				49%
Lakefield	1,435	298	48%	1,749	66	11%	59%
Pigeon Creek	750	137	43%	215	29	9%	52%
Mequon	1,463	399	50%	1,755	146	18%	68%
WATERSHED	8,034	1,342	41%	6,023	634	19%	60%

* Control is the percent reduction in tons of sediment delivered to surface waters.

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and the Ozaukee County Land Conservation Department.

Uplands Delivering Sediment to Wetlands: The management category criteria identified in Table 5-5 are based on sediment delivery to rivers and streams. Eroding uplands that are buffered from streams and rivers by wetlands are not identified through the criteria in the table as needing management, since the wetlands act as sediment traps that reduce the sediment reaching surface waters. It is recognized, however, that in the process the wetland may itself suffer environmental damage. If it is severe enough, the wetland may lose its ability to continue to trap the eroding sediment.

If wetland degradation associated with sediment deposited from eroding uplands is suspected, site specific evaluations will be conducted during implementation by the DNR water resources management personnel and the county project management staff. The DNR will be determine eligibility for cost-sharing or technical assistance.

Cropland Eligible for Assistance to Comply With Other State or Federal Programs: Eligible croplands targeted through the priority watershed project may need practices in addition to those prescribed through the priority watershed project to meet other resource management objectives. In such cases, practices needed to further reduce erosion to levels necessary to comply with requirements of the State Farmland Preservation or Federal Food and Security Act programs may be eligible for funding under the priority watershed project. In general, funding for these additional practices will be eligible so long as the costs for these practices are low to moderate. Examples of such practices include contour strip cropping or reduced tillage. High cost measures to provide additional erosion control on these lands will not be eligible for funding under the priority watershed project. Examples of such practices include field diversions or terraces. The county project management staff will make eligibility determinations for practices needed to achieve this additional level of soil loss control.

MANAGEMENT CATEGORY CRITERIA FOR STREAMBANK DEGRADATION

Streambank erosion contributes a low to moderate portion of the total sediment load to the Milwaukee River and its four principal tributary streams (Fredonia Creek, Pigeon Creek, Ulao Creek, Mole Creek) located within Ozaukee County. Although this source is less significant than others as a contributor to the total sediment load, localized habitat impacts occur as a result of sediment deposition and degradation of streambank structure.

Management category criteria developed for eroding streambanks reflect the more localized nature of this impact. The criteria are based primarily on the rate at which streams are cutting into the streambanks and secondarily on the mass load of sediment being produced at the site.

Table 5-7 presents management category criteria for this source. All sites having moderate to severe rates of lateral recession are targeted for control. Within this group of sites, those producing 10 tons or more of sediment per year are the highest priority for control and are placed in Management Category I. Those producing less than 10 tons of sediment per year have a lower priority for control and are placed in Management Category II. Sites having low to moderate rates of lateral recession are targeted for control only if the site produces at least 10 tons of sediment per year. This type of site has a lower priority for control and is placed in Management Category II. Sites with slight rates of lateral recession are not targeted for control under any circumstances.

(3) WOODED AREA

Mequon Steam Evaluation

Stream Name: MQ-I Date of Field Inventory: 6/5/97 Conducted by: JB

Reach Description: From Pond 5 to Donges Bay Rd

Reach Length: 11 1/4

		Excellent		Good		Fair		Poor	
upper bank	Landform slope	Bank Slope <30%	(2)	Bank Slope 30% to 40%	4	Bank Slope 40% to 60%	6	Bank Slope 60%+	8
	Mass Wasting or Failure	No Evidence of past or any potential for future mass wasting into channel	(3)	Infrequent and/or very small. Mostly healed over. Low future Potential	6	Moderate frequency & size, with some raw spits eroded by water during high flows	9	Frequent or large, causing sediment nearly yearlong or imminent danger of same.	12
	Debris Jam Potential	Essentially absent from immediate channel area	(2)	Present by mostly small twigs and limbs.	4	Present, volume and size are both increasing	6	Moderate to heavy amounts, predominately larger sizes.	8
	Vegetative Bank Protection	90% plant density. Vigor and variety suggests a deep dense, soil binding root mass	(3)	70% to 90% Density. Fewer plant species or lower vigor suggests a less dense or deep root mass.	6	50% to 70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	9	< 50% density plus fewer species & less vigor indicate poor, discontinuous and shallow root mass.	12
lower bank	Channel Capacity	Ample for present plus some increases. Peak flows contained	(1)	Adequate. Overbank flows rare. Width to Depth ratio 8 to 15	2	Barely contains present peaks. Occasional overbank floods. W/D ratio 15 to 25	3	Inadequate. Overbank flows common. W/D ratio > 24.	4
	Bank Rock Content	65% + with large angular boulders 12" + numerous	2	40 to 65%. mostly small boulders to cobbles 6 - 12"	4	20 to 40%, with nose in the 3-6" diameter class.	6	> 20% rock fragments of gravel sizes 1 - 3" or less.	(8)
	Obstructions - flow defectors, sediment traps	Rocks and old logs firmly embedded. Flow pattern without cutting or deposition. Pools and riffles stable.	(2)	Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm.	4	Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	6	Frequent obstructions and deflector cause bank erosion yearlong. Sediment traps full, channel migration occurring.	8
	Cutting	Little or none evident. Infrequent raw banks less than 6" high generally	4	Some. intermittently at outcurves and constrictions. Raw banks may be up to 12"	(8)	Significant. Cuts 12" - 24" high. Root mat overhangs and sloughing evident	12	Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16
	Deposition	Little or no enlargement of cannel or point bars.	(4)	Some new increase in bar formation, mostly from coarse gravels.	8	Moderate deposition of new gravel & coarse sand on old and some new bars.	12	Extensive deposits of predominately fine particles. Accelerated bar development	16
		Column Total	17	Column Total	8	Column Total	0	Column Total	8

TOTAL POINTS FOR REACH = 33

Excellent 23 | (Good) 46 | Fair 69 | Poor

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
1	FS-A : Tributary to Lake Michigan	From junction with FS-B S past major blockage to point approximately E of Juniper Cir.	0.5	G	E	G	F	G	P	G	G	F	59	Fair	Some bar formation observed past junction with FS-B; wooded area
2	FS-A : Tributary to Lake Michigan	From junction with FS-B NE to block just W of Lake Michigan	0.1	E	E	G	F	G	P	E	G	F	50	Fair	Wide channel with clearly defined banks; bars and channelside deposition found E of blockage; wooded area
3	FS-A : Tributary to Lake Michigan	From blockage E to Lake Michigan	0.2	G	E	E	F	G	P	E	G	G	46	Good	Large sedimentation/bar found at point just short of where FS-A emptys into Lake Michigan; wooded area
1	FS-B : Secondary tributary to Lake Michigan	From Otto Rd. SE to major block	0.1	G	E	G	F	G	P	E	E	G	44	Good	Deep ravine with wooded area
2	FS-B : Secondary tributary to Lake Michigan	From major block SE to junction with FS-D	0.1	F	E	F	P	G	P	G	F	F	65	Fair	Deep ravine/valley with some stretches of heavy sedimentation, cutting, and fallen debris
3	FS-B : Secondary tributary to Lake Michigan	From junction with FS-D E to junction with FS-A	0.4	F	E	F	P	G	P	P	P	P	77	Poor	Deep ravine with heavy debris which caused extensive cutting and deposition; waterfall found during stretch but conditions were same beyond it; some rocks were seen along channel bottom
1	FS-C : Tertiary tributary to Lake Michigan	From junction with FS-B N to plastic drain pipe E of Zedler Ln.	0.3	F	E	G	P	G	P	G	F	G	53	Fair	Deep ravine; wooded area; frequent debris blocks with resultant deposition and cutting
1	FS-D : Tertiary tributary to Lake Michigan	From conduit to junction with FS-B	0.1	F	E	G	P	G	P	G	G	G	55	Fair	underground pipe/conduit controls flow to point just SE of junction with FS-B
1	FS-E	From Zedler Road S to junction with FS-F	0.2	F	F	G	F	G	P	E	F	G	60	Fair	
2	FS-E	From point just S of junction with FS-F to end of blocks	0.1	G	E	P	F	F	P	P	G	G	59	Fair	Deep, wooded ravine with heavy blockage due to fallen trees and build-up of limbs
3	FS-E	From blockage S to location of major cutting E of Circle Ct.	0.1	F	E	G	F	G	P	E	G	G	50	Fair	Bare slopes began to become evident; a fork was found that would fill during high water
4	FS-E	From location of major cutting S to waterfall E of Cedar Ct.	0.1	F	E	G	P	G	P	G	P	G	63	Fair	
5	FS-E	From water fall S to first of series of rocky rapids	0.1	F	G	G	P	G	P	G	P	P	74	Poor	A few slumps were evident; a 2-3 ft. waterfall was seen which heavily affected erosion downstream; E wall seemed to be cut into ~5-6 ft.; some rock was found along channel bottom
6	FS-E	From rock rapids S to County Line Rd.	0.1	G	E	G	F	G	P	E	P	P	64	Fair	E wall was heavily cut into; more rock was seen long channel bed but size is still minimal
1	FS-F	From Grasslyn Rd. W to wooded wetland area approximately due S of court 8 on map	0.1	E	E	G	F	G	P	G	E	E	40	Good	
2	FS-F	From Grasslyn Rd. E to Port Washington Rd.	0.6	E	E	G	F	G	P	F	E	E	42	Fair	Wooded area with few 200' patches of grass where creek meanders out of wooded area
3	FS-F	From Kathleen Drive south to Juction with FS-E	0.2	F	G	F	E	F	P	P	G	E	52	Fair	
1	FS-G	From Donges Bay Rd. S to concrete channel and junction with FS-H	0.4	P	E	G	G	G	P	E	E	F	49	Fair	Steep wooded valley with heavy deposition due to culvert on Donges Bay Rd. and fill lining banks
2	FS-G	From junction with FS-H SE to Port Washington Rd. and junction with FS-F	0.3	G	E	E	E	E	P	E	E	E	31	Good	V-shaped Concrete lined channel
1	FS-H	From Grasslyn Rd. E to junction with FS-G	0.5	G	E	E	E	E	P	E	E	E	31	Good	Roadside storm sewer within subdivision
1	FS-I	From pool/pond NW to underground enclosure	0.1	G	E	E	G	G	P	E	E	E	35	Good	Grassy area between houses
2	FS-I	From wooded area NW to pool/pond	0.1	E	E	G	F	G	P	G	G	E	44	Good	One reedy area observed along with pond created from cutting due to high water
3	FS-I	From County Line Rd. NW to wooded area	0.1	E	E	G	E	E	P	E	E	E	31	Good	Very thick grassy area; culvert with rocks found but had little to no effect of conditions beyond it

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
4	FS-I	From County Line Rd. N along Port Washington Rd. E under culvert to point S of Heritage Ct.	0.1	F	E	G	E	G	P	E	E	E	36	Good	Reeded area
5	FS-I	From end of reeded area NE to wetland area	0.1	F	G	G	G	E	P	E	G	G	49	Fair	Some past evidence of slumping was evident; wooded area
6	FS-I	From wetland area S to County Line Rd.	0.1	E	E	G	F	G	P	G	G	G	48	Fair	Wooded area; some grasses; major meandering observed
1	Little Menomonee Creek; Secondary tributary to Milwaukee River	From Highland Rd. S to end of wooded area	0.1	E	E	E	G	G	P	E	E	E	33	Good	Very grassy; braided/meandering stream
2	Little Menomonee Creek; Secondary tributary to Milwaukee River	From junction with LM-B N to point just S of Highland Rd.	0.8	E	E	G	F	G	P	G	G	G	48	Fair	Wooded area; bare slopes but it doesn't seem to be due to erosion unless it occurred under heavy rain
3	Little Menomonee Creek; Secondary tributary to Milwaukee River	From Freistadt Rd. N to junction with LM-B	0.3	G	E	E	E	G	P	E	G	G	40	Good	Trees line one side; crops/farmland line the other
4	Little Menomonee Creek; Secondary tributary to Milwaukee River	From Freistadt Rd. S to wooded area NW of corner between Granville Rd. and Mequon Rd.	0.8	G	E	G	F/P	G	P	E	G	G	50	Fair	Wooded area; bare slopes evident
5	Little Menomonee Creek; Secondary tributary to Milwaukee River	From wooded area S to grassy area	0.2	E	E	G	G	G	P	G	E	E	37	Good	Wooded area; channel bedrock seen rapids encountered
6	Little Menomonee Creek; Secondary tributary to Milwaukee River	From Grassy area S to Mequon Rd.	0.1	E	E	E	F	G	P	E	G	E	40	Good	Tall grassy area on W side; trees and shrubs on other; rapids and some bottom rock seen
7	Little Menomonee Creek; Secondary tributary to Milwaukee River	From wooded area N under Granville Rd. to Mequon Rd.	0.5	E	E	G	F	G	P	E	E/G	G	44	Good	Wooded area; channel bottom rock observed; creek lies close to Granville Rd.
8	Little Menomonee Creek; Secondary tributary to Milwaukee River	From wooded area NW to wooded area	0.4	E	E	E	E	G	P	E	G	G	38	Good	Grassy area; some undercutting; meandering; trees interspersed
9	Little Menomonee Creek; Secondary tributary to Milwaukee River	From fork NW to turn in creek and grassy area	0.3	E	E	G	G	G	P	G	G	G	45	Good	Wooded area; rapids and some channel bottom rock observed
1	Little Menomonee River; Tributary to Milwaukee River	From junction with Pigeon Creek S to point just N of Countyline Rd.	1.3	G	E	G	F	G	P	G/F	G	G	51	Fair	Wooded area; well contained
2	Little Menomonee River; Tributary to Milwaukee River	From Countyline Rd. N to wooded area	0.1	E	E	E	E	G	P	E	G	E	34	Good	Grassy area
1	LM-A : Tributary to Lake Michigan	From Lake Shore Rd. E to point short of Eastwyn Bar Dr.	0.1	E	E	G	G	G	P	G	E	E	37	Good	Moves runnoff from detention ponds SE into Lake Micigan; wooded area with grass and shrubs
2	LM-A : Tributary to Lake Michigan	From point NE of Eastwyn Bar Dr. SE to Eastwyn Bar Dr.	0.1	E	E	F	F	G	P	G	G	E	46	Good	Some rock and concrete found along channel sides; more cutting and obstructions than found upstream
3	LM-A : Tributary to Lake Michigan	From Eastwyn Bar Dr. SE to waterfall	0.1	G	E	F	F	G	P	G	G	G	52	Fair	Heavy meandering found; 4-6ft. waterfall encountered with pool under private driveway; some rock found along channel bottom and in meander curves
4	LM-A : Tributary to Lake Michigan	From waterfall E to Lake Michigan	0.3	F	E	G	F	G	P	G	F/P	F/P	64	Fair	Deep ravine; wooded area; heavy debris problems; significant cutting and deposition; upper banks have heavy erosion with no vegetation
1	LM-C	From junction with Little Menomonee Creek W	0.8	F	E	G	F	G	P	E	E	G	46	Good	Wooded area; little flow; bare slopes
1	MQ-A : Tributary to Milwaukee River	From country Club Dr. N to stream junction with MQ-D	0.6	E	E	E	E	G	P	E	E	E	30	Good	Flows from marsh
2	MQ-A : Tributary to Milwaukee River	From major block N to series of blocks just S of Mequon Rd.	0.1	E	E	F	G	G	P	P	G	G	51	Fair	Some increase in rock content but not too significant
3	MQ-A : Tributary to Milwaukee River	From point just S of Mequon Rd. N to point right before junction with MQ-C	0.1	E	G	G	G	G	F	F	F	G	52	Fair	Wooded area with high banks, undercutting, and blocks
4	MQ-A : Tributary to Milwaukee River	Right before junction with MQ-B N to culvert past Chestnut Rd.	0.3	E	E	G	E	G	P	G	E	E	34	Good	
5	MQ-A : Tributary to Milwaukee River	From end of reeds N to broadening of creek just N of Hickory Ln.	0.1	E	E	G	G	E	P	E	E	E	34	Good	
6	MQ-A : Tributary to Milwaukee River	From point N of Hickory Ln. N past Ranch Rd. to wetland area	0.1	E	E	G	E	F	P	E	E	E	33	Good	Stream emptys and dies out in wetland just S of bay of Milwaukee River
1	MQ-B : Secondary tributary to Milwaukee River	From Chestnut Rd. SW along St. James Ln. and under Mequon Rd.	0.6	G	E	G	G	G	P	G	E	E	39	Good	
1	MQ-C : Secondary tributary to Milwaukee River	0.063 mile west of Range Line Rd. NE to Mequon Rd.	0.3	E	E	G	G	G	P	G	E	E	37	Good	Some increase in obstructions (fallen trees); moderately forested area

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
8	MQ-W : Tributary to Milwaukee River	From NW of Willow Rd. to extention of Arrowhead Rd.	0.2	G	E	G	G	G	P	E	F	E	45	Good	
9	MQ-W : Tributary to Milwaukee River	From extention of Arrowhead Rd. to Trinty Luthern Property	0.2	F	G	F	F	G	P	F	F	G	63	Fair	
10	MQ-W : Tributary to Milwaukee River	From Trininty Luthern Property to Cedarburg Road	0.2	E	E	G	E	F	P	G	G	E	39	Good	
11	MQ-W : Tributary to Milwaukee River	From Cedarburg Road to Milwaukee River	0.2	G	E	E	E	F	P	E	E	E	29	Good	
1	MU-A : Secondary tributary to Milwaukee River	From wetland/grassy area W to where it dies out into wetland/field	0.6	G	E	G	G	G	P	G	E	E	39	Good	Wooded boundary with some totally wooded areas; boundary between woods and wetland/grassy area
1	PG-A	From Sunset Rd. N to wooded area	0.2	E	E	E	E	G	P	E	E	E	30	Good	Grassy area; found within subdivision; no flow
2	PG-A	From junction with Pigeon Creek to end of wooded area where flow ceases to be seen	0.8	E	E	G	E	G	P	G	E	E/G	36	Good	Wooded area with grass banks; meandering observed; found within subdivision
1	PG-C : Secondary tributary to Milwaukee River	From Bonniwell Rd. S to culvert leading into pond	0.1	E	E	G	G	G	P	G	E	E	37	Good	Wetland area; channel not well defined
2	PG-C : Secondary tributary to Milwaukee River	From pond S along railroad tracks to Highland Rd.	1.0	E	E	E	G	G	P	E	E	E	33	Good	Trees lie along E side; grassy ditch
1	PG-E	From Hawthorne Rd. NW to pond past junction with PG-E	0.1	E	E	G	G	G	P	G	E/G	E	39	Good	Wooded area with grass banks; bottom rock found
2	PG-E : Secondary tributary to Milwaukee River	From wooded area N to Hawthorne Rd.	0.3	E	E	G	P	G	F	G	G	E	45	Good	Grassy areas possibly due to fallen trees found interspersed; small rapids; rocky cliff seen at S end of stream; possible dam/concrete formation observed
3	PG-E : Secondary tributary to Milwaukee River	From end of wooded area N past farm to wooded area	0.3	E	E	E	E	G	P	E	E	E	30	Good	Grassy; moderate flow; small rapids and bottom rock seen at times; cuting and deposition (slight) along meanders
4	PG-E : Secondary tributary to Milwaukee River	From blockages NW to grassy area	0.1	E	E	F	F	G	P	F	G	G	52	Fair	Major blockages seen due to fallen limbs and branches; seris of high water diversions found all over reach
5	PG-E : Secondary tributary to Milwaukee River	From junction with Pigeon Creek NW to series of major blockages	0.1	E	E	G	F	G	P	G	E	E	40	Good	Wooded area
1	PG-F	From pond NW to ponds E of junction with PG-H	0.5	E	E	G	E	E	P	E	E	E	33	Good	Grassy area with some trees; some bottom rock and rapids found
1	PG-H	From Pioneer Rd. S to catch basin	0.1	G	E	G	G	G	P	G	G/F	E	45	Good	Wooded area with grass banks; some evidence of major flooding observed; catch basin found which leads into 18" drain tile; moderate erosion found near basin itself
2	PG-H	From Bonniwell Rd. N to area of no flow	0.1	G	E	E	E	G	P	E	E	E	32	Good	Very grassy; no flow; under power lines; previous dredging evident; it is a bypass for times of heavy water due to 18" underground catch basin observed upstream
3	PG-H	From Bonniwell Rd. S to junction with PG-F and pond	0.6	E	E	G	G	G	P	G	G	E	41	Good	Wooded area with grassy banks and sections; empties into pond; clearly defined channel
1	Pigeon Creek : Tributary to Milwaukee River	From Mequon Rd. S to junction with Little Menomonee River	0.9	E	E	G	P	G	P	G/F	G	G	52	Fair	Said to be dredged in 1914; burms on either side set back from channel; wooded area; some rapids and rock along channel bottom; some areas more heavily vegetated but is still sparce; well defined channel
2	Pigeon Creek : Tributary to Milwaukee River	From Mequon Rd. N to wooded area	0.1	E	E	E	E	G	P	E	E	E	30	Good	Grassy area
3	Pigeon Creek : Tributary to Milwaukee River	From Freistadt Rd. S to point just N of Mequon Rd.	1.0	E	E	G	F/P	G	P	G	E	G	46	Good	Wooded area; past dredging evident
4	Pigeon Creek : Tributary to Milwaukee River	From Freistadt Rd. N to pond and wetland	0.8	G	E	G	F	G	P	G	E	G	46	Good	Wooded area; past dredging evident

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
5	Pigeon Creek : Tributary to Milwaukee River	From foot bridge SW to wetland/grassy area	0.1	G	E	G	F	G	P	G	G	G/F	52	Fair	Burms found on each side due to possible dredging years ago; wooded area
6	Pigeon Creek : Tributary to Milwaukee River	From Highlands Rd. SW to foot bridge near gas line	0.3	E	E	E	E	F	P	E	E	G	35	Good	Grassy/marshy area; distinct channel evident with several pools
7	Pigeon Creek : Tributary to Milwaukee River	From Highland Rd. N to Wauwatosa Rd.	0.1	E	E	E	E	G	P	E	G	E	34	Good	Relatively deep channel; grass lined; trees found farther away from banks
8	Pigeon Creek : Tributary to Milwaukee River	From Wauwatosa Rd. E to wooded area	0.3	E	E	E	E	G	P	E	G	E	34	Good	Grassy area with trees lining S side; some rock found along channel bottom
9	Pigeon Creek : Tributary to Milwaukee River	From wooded area SE to junction with MO-E	0.3	E	E	G	F	G	P	G	G	G	48	Fair	Wooded area; moderate meandering; some large areas of debris problems seen
10	Pigeon Creek : Tributary to Milwaukee River	From rapids NW to junction with PG-E	0.2	E	E	G	G	G	P	E	E/G	E	37	Good	Well defined; wooded area; moderate flow observed
11	Pigeon Creek : Tributary to Milwaukee River	From blockage NW to upstream rapids	0.3	E	E	G/F	G	G	P	G	G	G	46	Good	Some smaller rapids seen; wooded area; some cutting and deposition found along meandering curves
12	Pigeon Creek : Tributary to Milwaukee River	From Highland Rd. NW to major blockage	0.1	E	E	G	G	G	P	E	E	E	35	Good	Wooded area; some larger sized rocks found along channel bottom
13	Pigeon Creek : Tributary to Milwaukee River	From Highland Rd. S to railroad tracks	0.6	E	E	G	F	G	P	G	G	E	44	Good	Heavily wooded area; rapids found occasionally; floods during high water; moderate blockage at times with respect to size but channel is in good shape despite amount of water which flows through it
14	Pigeon Creek : Tributary to Milwaukee River	From railroad tracks S to Friestadt Rd.	0.9	E	E	G	G	G	P	E	E	G	39	Good	Heavily wooded area; wetland area was found; area of moderate deposition was found downstream prior to Freistadt Rd.
15	Pigeon Creek : Tributary to Milwaukee River	From Freistadt Rd. S to Seminary Dr.	0.3	E	E	G	F	G	P	G	E	G	44	Good	Wooded area; pond was found beyond driveway
16	Pigeon Creek : Tributary to Milwaukee River	From pond S to bikepath bridge	0.3	E	E	G	E	E	P	E	G	G	39	Good	Wooded area;some moderately sized rocks were found along channel bottom
17	Pigeon Creek : Tributary to Milwaukee River	From bikepath bridge S to culvert under Cedarburg Rd.	0.1	E	E	G	E	E	P	E	E	E	31	Good	Wooded area;underground culvert
18	Pigeon Creek : Tributary to Milwaukee River	From Cedarburg Rd. S under Bunchrock Ave. to Milwaukee River	0.3	G	E	G	F	G	P	E	E	E	40	Good	Wooded area surrounded by development (buildings/parking lots); rapids found occasionally; concrete and rock line one side while vegetation lines the other
1	Ulao Crek : Tributary to Milwaukee River	From Pioneer Rd. S to wetland area	0.2	E	E	G	G	G	P	G	G	E	41	Good	Moderately wide channel with heavy grass banks; some undercutting was observed
2	Ulao Crek : Tributary to Milwaukee River	S from reach 1 to wetland area	0.2	E	E	E	G	F	P	G	G	P	52	Fair	Very marshy, wet, reeds
3	Ulao Crek : Tributary to Milwaukee River	S from reach 2 from wetland area to culvert under dirt roads	0.4	E	E	G	G	F	P	G	G	G	46	Good	
4	Ulao Crek : Tributary to Milwaukee River	S from culvert to major block across from two red barns	0.1	E	E	F	F	G	P	F	F	G	56	Fair	Rocks by culvert for protection
5	Ulao Crek : Tributary to Milwaukee River	S of barns to junction th Ul-8	0.2	E	E	E	G	F	P	G	E	E	36	Good	Some areas of bank not well defined; one area of rock with small rapids
6	Ulao Crek : Tributary to Milwaukee River	SW of junction to block	0.2	G	E	F	F	G	F	G	F	E	50	Fair	
7	Ulao Crek : Tributary to Milwaukee River	SW of block to dirt road crossing	0.1	E	E	G	G	F	P	E	G	E	40	Good	Bare slopes near bridges
8	Ulao Crek : Tributary to Milwaukee River	SW of dirt crossing to Milwaukee River	0.4	E	G	F	G	G	P	G	G	G	50	Fair	50' section has jamming, loose debris, and cutting
1	UL-8 : Tributary to Ulao Creek	From junction with Ulao Creek S to wetland area	0.3	E	E	G	E	F	P	G	E	E	35	Good	Banks not well defined
1	UL-C : Tributay to Ulao Creek	S of wetland area to Port Washingon Rd.	0.4	E	E	G	E	F	P	F	E	E	33	Good	Little to no flow; widens at NW corner of hospital with more deposition
2	UL-C : Tributay to Ulao Creek	From Port Washington Rd. SE to I-43	0.4	E	E	G	E	F	P	G	E	E	35	Good	No flow evident; questionably defined channel

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
1	UL-D : Tributary to Ulao Creek	From Port Washington Rd. NW to junction with UL-C	0.7	E	E	G	E	G	P	G	E	E	34	Good	
			39.4												

SUMMARY REPORT ON AN EVALUATION OF THE WETLANDS

OF THE CITY OF MEQUON

FOR THEIR POTENTIAL FOR STORM WATER DETENTION

AND SURFACE WATER QUALITY IMPROVEMENT

August 1997

Completed for:

Camp Dresser & McKee Inc.
5215 N. Ironwood Road, Suite 250
Milwaukee, Wisconsin 53217

by

James A. Reinartz
Wetland Ecology and Restoration Consulting
3175 Blue Goose Road
Saukville, Wisconsin 53080
Phone: (414) 675-6318

Introduction

Two well documented functional values of wetlands are their capacity to detain surges of storm water runoff, and their ability to remove sediment and nutrients from surface water. The large storage capacity and controlled outflow of many wetlands detains storm water and releases it slowly following a storm event, thereby dampening both extreme peak flows, and the low flows associated with prolonged dry periods. The long detention time of water in wetlands, the complex flow patterns developed by the structure of the wetland vegetation, and nutrient uptake by wetland plants, combine to make many wetlands very effective for removal and storage of sediment and for the removal and transformation of some dissolved nutrients from surface waters. The wetlands of the City of Mequon were evaluated both for their existing capacity to contribute to storm water management and for their potential to provide additional benefits with modification or restoration.

When Mequon was surveyed in the 1830's (before extensive settlement), the entire upland area of the city was covered with an almost unbroken forest dominated by American beech, sugar maple, basswood, red oak, white oak, and black oak. The vast majority of the wetland acreage of Mequon was forested, supporting cedar-tamarack conifer swamp, hardwood swamp, or floodplain forest along the Milwaukee River. The extensive wetland along the Little Menomonee River was an area of conifer swamp large enough to be depicted on the map of the "Original Vegetation Cover of Wisconsin" (Finley 1976). All of the wetlands of Mequon have been disturbed since settlement, most of them severely disturbed. I found no conifer swamp (white cedar and tamarack) remaining in the city. The least disturbed type of wetland in Mequon are some of the floodplain forests along the Milwaukee River, which have been logged and grazed but which have never been plowed, drained, or filled. Unlike the wildlife habitat functions of wetlands, the ability of wetlands to improve quality and flow characteristics of surface water is not negatively affected by the replacement of native vegetation with the plant communities which typically colonize after severe disturbance. Many of Mequon's wetlands have been ditched, however, which does seriously reduce their ability to provide water quality functional values.

Methods

There are two conceptual measures, "Effectiveness" and "Opportunity", which are useful for evaluating the potential water quality and water detention values of wetlands. These concepts, and a methodology for evaluating wetland functions are developed in: Adamus, P.R., Clairain, E.J., Jr., Smith, R.D., and Young, R.E. 1987. "Wetland Evaluation Technique (WET); Volume II: Methodology, " Operational Draft Technical Report Y-87-__, US Army Engineer Waterways Experiment Station, Vicksburg, Miss. Effectiveness assesses the capability of a wetland to perform a function based on the features of the wetland itself. For the storm water detention and water quality functions of interest to this project these features are primarily the physical characteristics of the wetland such as size, slope, and the physical traits of the inlet and outlet. Effectiveness does not evaluate the current opportunity for the wetland to perform the function, which with respect to flow and quality functions is based on the delivery of runoff, sediment, and nutrient loading to the wetland. Opportunity assesses the opportunity that a wetland has to perform a function. For example, a wetland may posses the physical attributes required to perform flood flow alteration, but if the wetland is positioned in the watershed where it will not receive much runoff, it will not have the opportunity to perform a storm water detention function.

With respect to development of a storm water management plan for Mequon both effectiveness and opportunity are important measures of value of a wetland area, however both of these functional features can change over time with changes in land use or with intentional changes to the wetland characteristics. For planning purposes the effectiveness of the wetland based on physical traits may be more important than the opportunity based on watershed characteristics. The loading of runoff, sediment, and nutrients to a specific wetland will change as the land use surrounding the wetland changes. For planning storm water management it may, therefore, be more important to evaluate the potential effectiveness of the wetland to perform desirable water quality functions, than it is to assess the current opportunity for that function. If a wetland area has a tremendous capacity, ie. effectiveness, to perform a function, in many cases the opportunity can be provided through the planning and design process.

I attempted to locate and roughly map the boundaries of all wetlands over two acres in area in the City of Mequon using the following materials: 1) 1" = 200'scale, 2' contour interval, topographic maps. These maps had sub-basin or hydrologic unit boundaries delineated and the area of each hydrologic unit was determined. 2) 1995 SEWRPC aerial photographs covering the entire area. 3) DNR, 1986, Final Wetland Inventory Maps for Mequon. 4) NRCS Draft Wetland Inventory Maps showing an estimate of the boundaries of wetland, farmed wetland, and prior-converted wetland areas. Nearly every area determined to be wetland using these materials was field inspected (at least from the nearest roadway), and in the process I drove every rural roadway in the City of Mequon. Approximately half of all of the identified wetlands were photographed. While an effort was made to locate all wetlands over 2 acres, the results of this study should not be considered a complete inventory of all Mequon wetlands since at least a few small wetlands were probably not detected.

Many farmed, prior-converted, and severely disturbed wetlands have very high potential for restoration of the features required to perform valuable water quality and flow improvement functions. For storm water management planning, it is probably as, or more, important to recognize the potential of these disturbed and converted wetlands, as it is to evaluate the value of existing wetlands. Existing wetlands are protected by law, and there are practical and legal limits on the extent to which they can be modified to improve either their effectiveness or opportunity for surface water improvement. On the other hand, restoration of the effectiveness of storm water functions to prior-converted wetlands is often technically very simple, if the opportunity exists, can be supplied, or develops with land use changes. While NRCS maps depict the location of prior-converted wetlands, the maps are draft interpretations of aerial photographs and are not always accurate. Furthermore, the NRCS maps depict the location of all areas estimated to have been wetland (ie. areas which may have supported wetland vegetation), but not all of these former wetlands have the physical traits to have been very effective for surface water improvement. In addition to all existing wetlands over two acres, I have attempted to locate and map all previously altered or prior-converted wetlands, where restoration of the wetland has the potential to provide highly effective flood flow alteration or water quality functions.

The effectiveness, or capacity, of each wetland to provide flood flow alteration (detention), sediment retention, and nutrient removal and transformation was evaluated using a methodology which I devised by modifying the WET model. The vegetation type in a wetland has little effect on the ability of a wetland to perform the storm water detention function. While there probably is some correlation between wetland vegetation type and the relative capacity of the wetland to remove sediments and nutrients, this relationship is not understood well enough to use as an important predictor of the relative levels of these functions. If there is a consistent relationship between vegetation and the water quality functions, it is probably that the "disturbance" vegetation types for the Mequon area (ie. cattail, reed canary grass, and other non-forested wetlands) are somewhat more effective at the removal of sediment and nutrients than is swamp forest. For this study, the effectiveness of Mequon wetlands for storm water detention and water quality improvement was assessed based on the physical attributes of the wetland. Following a modified WET model, effectiveness was evaluated based on estimates of the following parameters: acreage, slope or flow gradient, wetland soil elevation relative to the mean water surface elevation, presence of inlets and outlets (ie. depressional or flow-through wetland), outlet water level control and flow characteristics, and flooding extent and duration. The physical attributes of wetlands which allow them to detain storm water (ie. those that allow water to have very slow flow, and storage capacity spread over a large area) are the same characteristics favorable for high water quality functional values. Effectiveness for storm water detention and for sediment and nutrient removal could, therefore, be assessed with a single value.

Opportunity to perform flow and quality improvement functions is somewhat more difficult to assess than is effectiveness. Opportunity estimates were based on a combination of the following factors: sediment and nutrient sources within the drainage basin of the wetland, surface water drainage area of the wetland and size of the wetland relative to its watershed, relationship to other wetlands within the sub-basin, local slope and topography as it relates to delivery of surface runoff to the wetland.

To obtain a standardized scoring or ranking for describing the relative water quality and flood alteration values of wetlands in the project area, wetlands were rated from none = 0, low = 1, to very high = 6, for 1) existing capacity or effectiveness, 2) existing opportunity, and 3) potential to add capacity or effectiveness with modification or restoration. These scores or rankings can be multiplied by the area of each wetland to obtain an index of total relative value or potential of the wetland. Any wetland area having a high or very high additional potential is an excellent candidate for more thorough study as a restoration site if it is located in an area where storm water could be delivered, or where additional capacity would be desirable.

Although the primary focus of this study was storm water management potential, wetlands having exceptionally high value for wildlife, native vegetation, or recreational opportunities were noted. These wetlands were field inspected to a limited extent to confirm their suspected high natural area value.

Summary of Results

The basic results of the study are presented in tabular format showing the summary evaluation of each identified wetland area. A key to the codes and abbreviations used in the table is as follows:

HU = Hydrologic Unit (or sub-basin) identification number;
Basin Area = Total area (acres) of the hydrologic unit;
Wetl. Area = Area (acres) of the individual wetlands in the hydrologic unit;
R-E = Range-East (21 or 22);
Sec = Section;
E/PC = Majority of the identified area is an Existing wetland, or is Prior Converted wetland no longer identified as wetland on the wetland inventory maps:
- 0 = prior converted,
- 1 = existing wetland;

Veg = General vegetation types:
- FRM = farmed,
- PND = constructed pond,
- E1K = Emergent/wet meadow, perennial vegetation on wet soil,
- E2K = Emergent/wet meadow, perennial narrow-leaved (eg. cattail) on wet soil,
- E2H = Emergent/wet meadow, perennial narrow-leaved (eg. cattail) in standing water,
- S3K = Shrub vegetation on wet soil,
- S3H = Shrub vegetation in standing water,
- T3K = Broad-leaved deciduous swamp forest;

Src = Source of sediment and nutrient loading:
- N = none,
- F = farm,
- R = residential,
- H = highway,
- I = industrial or commercial;

Cst = Surface water outlet constriction:
- O = none,
- D = depressional wetland, no outlet,
- N = natural constriction,
- C = culvert or bridge;

Dth = Wetland substantially impacted by presence of a ditch or outlet alteration:
- 0 = no,
- 1 = yes;

Slp = Average <u>slope</u> of the wetland surface (feet/0.25 miles):
- 1 = 30'/0.25 miles,
- 2 = 25',
- 3 = 20',
- 4 = 15',
- 5 = 10',
- 6 = 7.5',
- 7 = 5',
- 8 = 2.5'/0.25 miles,
- 9 = flat;

Val = Current value (ie. effectiveness, or capacity):
- 0 = none,
- 1 = low,
- 2 = low to moderate,
- 3 = moderate,
- 4 = moderate to high,
- 5 = high,
- 6 = very high;

Add Pot = Potential for additional effectiveness (same scale as current value);

Imp = Possible methods for improvement of effectiveness:
- C = control outflow,
- D = ditch modification (filling or rerouting),
- S = slope changes;

Opp = Current opportunity (same scale as current value);

Val Acres = Acreage with a current value (effectiveness) of moderately-high or higher;

Pot Acres = Acreage with a potential for additional effectiveness that is moderately-high or higher.

This study identified 202 wetland areas, totaling over 3,400 acres of wetland, in the City of Mequon, including existing wetlands and prior converted wetlands with potential for restoration of surface water improvement functional values. The area of Mequon is approximately 48.25 mi^2 (30,900 acres) so the existing or restorable wetland is at least 11% of the land area of the City. The quality of existing wetlands for surface water improvement is variable; approximately 1,960 acres (57% of studied wetland area) currently have at least moderately high value for surface water quality and flow improvement. 2,120 acres (62% of the total acreage) have at least moderately high additional potential for surface water improvement. Most of this area with high potential is prior converted wetland and most of it has been ditched. Prior converted wetlands comprise 73 (36%) of the inventoried wetland areas. Ditching has had a substantial impact on the hydrology of approximately 130 (64%) of the 202 wetlands of Mequon.

The existing wetlands are not distributed uniformly across the City of Mequon. The most intensively developed areas of the City have the lowest remaining acreage of wetland because of historical drainage and filling of wetlands in the developed areas (Table). In the approximately 12,200 acres of intensively developed land in the City, only about 640 acres of wetland and restorable wetland acreage remain (Table). Wetlands therefore represent about 5% of the acreage in the developed parts of the city. In the less intensively developed parts of the city wetlands comprise approximately 15% of the land area. It is possible to crudely estimate the pre-settlement acreage of Mequon wetlands which would have had the characteristics to be valuable for surface water improvement by assuming that before destruction of wetlands by development about 15% of the land was wetland. It should be emphasized that the estimates presented in Table __ include as existing wetland all prior converted wetland which is still capable of restoration, and include only those wetlands with the physical characteristics to be highly valuable for storm water detention and surface water quality improvement. For example, converted wetland areas found on slopes where ground water discharge maintained wet soils are not included in this inventory of wetland areas, because this type of wetland has little potential for storm water detention.

There is a strong negative correlation between the current estimated value, or effectiveness, for surface water improvement and the estimated potential for added value with restoration or modification (Figure). Most wetlands that already have high functional value possess little additional potential, and conversely, most wetland with little current value have high additional potential.

The part of Mequon with the highest potential for the use of wetlands for storm water management is the area west and southwest of Thiensville where approximately 22 to 23% of the land in the Menomonee Creek and Little Menomonee River drainage basins is existing or restorable wetlands. Most of this land is in extensive prior converted wetlands along the drainage ditches which form the current waterways. In general there is a tremendous capacity to utilize wetlands for storm water management in the City of Mequon.

All of the wetlands I inspected in the City of Mequon were disturbed, most of them severely. I found no conifer swamp despite the fact that this was probably the single most common wetland vegetation type in the city before settlement and extensive disturbance of wetlands. The wetlands which currently are the nearest to being of natural area quality, and which have the highest wildlife value in the city, are those floodplain forests which are found along the Milwaukee River. The important corridor for wildlife movement along the Milwaukee River floodplain contributes substantially to the wildlife value of these forests.

Table . Existing wetland acreage and estimated pre-settlement wetland acreage in the City of Mequon by major subdivisions of the area of Mequon. The overall mean number of existing acres of wetland per undeveloped acre of Mequon is 0.1492. The total acreage in each of the subdivisions of the area of Mequon was multiplied by 0.1492 to estimate the total pre-settlement wetland acreage in that area.

Area		Total Acres	Existing Wetland Acres	Wetland ac. per Total ac.	Estimated pre-settlement Wetland ac.
R22E	Total	7,900	710	0.0899	1,180
	Developed	5,400	340	0.0630	805
	Undeveloped	2,500	370	0.1480	375
R21E	Total	23,000	2,720	0.1183	3,430
	Developed	6,800	300	0.0441	1,010
	Undeveloped	16,200	2,420	0.1494	2,420
Mequon	Total	30,900	3,430	0.1110	4,610

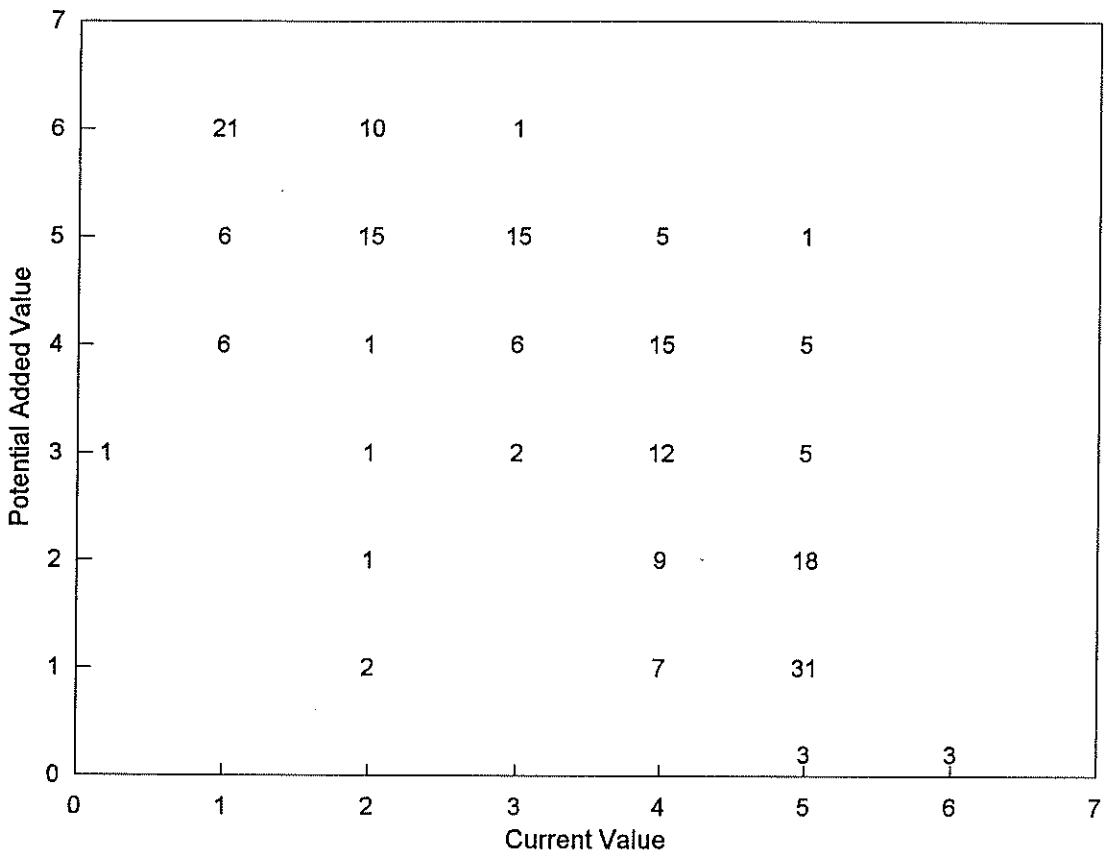


Figure . Relationship between the estimated current value, or effectiveness, for storm water detention and surface water quality improvement and the estimated potential added value with modification or restoration of the wetland area. Numbers represent the number of wetlands observed with that combination of current value and potential added value. $N = 202$; $r = -0.782$; $r^2 = 0.611$; $p < 0.001$.

	WATERSHED	ID	HU		Basin Area	Wetl. Area	R-E	Sec	E/ PC	Veg	Src	Cst	Dth	Slp	Val	Add Pot	Imp	Opp	Val Acres	Pot Acres
7	FISH CREEK	FS	10070	1	342.22	10.1	22	30	0	E2K/PND	R	C	1	9	5	2		6	10.1	0
8	FISH CREEK		10070	2		21.4	22	30	0	FRM/E2K	RF	N	1	6	3	4	SD	6	0	21.4
21	FISH CREEK	FS	10330		121.55	14.1	22	32	1	E2K/S3K	R	C	1	6	4	5	SC	6	14.1	14.1
366	FISH CREEK	FS	22E-31	1		5.7	22	31	1	S3K	R	C	0	7	5	1		6	5.7	0
367	FISH CREEK	FS	22E-31	2		4.8	22	31	1	S3K	R	C	1	6	4	3	D	6	4.8	0
370	FISH CREEK	FS	22E-30NE			10.8	22	30	0	E2K/PND	R	N	1	9	5	4	CD	6	10.8	10.8
Total acres					3398	67									4.3	3.2			45.5	46.3
% of total						1.97													1.34	1.36
28	MEQUON	MQ	MQ 20110		115.9	26.6	21	36	1	E2K/S3K	R	O	1	6	3	4	SC	6	0	26.6
30	MEQUON	MQ	MQ 20130		101.19	11.6	21	36	1	T3K	R	O	1	9	2	1		6	0	0
44	MEQUON	MQ	MQ 21010	1	83.92	10	21	35	1	E2K	R	O	1	7	4	3	CS	6	10	0
45	MEQUON	MQ	21010	2		7.5	21	35	1	S3K	R	C	1	8	4	1		5	7.5	0
46	MEQUON	MQ	MQ 21020		181.2	10.5	21	35	1	T3K	R	C	1	8	4	4	CD	6	10.5	10.5
47	MEQUON	MQ	MQ 21030		101.19	13.6	21	26	0	FRM	FR	C	1	9	1	6	CD	5	0	13.6
48	MEQUON	MQ	MQ 21040	1	554.69	10.4	21	27	0	FRM	FI	N	1	1	0	3	CS	5	0	0
49	MEQUON	MQ	21040	2		3.6	21	27	1	E2K	FI	N	1	4	3	5	CD	5	0	3.6
50	MEQUON	MQ	21040	3		16.9	21	35	0	S3K/E2H/FRM	FR	O	1	6	1	6	CDS	5	0	16.9
51	MEQUON	MQ	21040	4		18.1	21	35	1	S3H/E2H	FR	N	1	8	5	4	CD	6	18.1	18.1
53	MEQUON	MQ	MQ 21060	1	553.16	9.8	21	35	0	FRM	FR	O	1	9	1	6	CD	4	0	9.8
54	MEQUON	MQ	21060	2		5.5	21	35	0	E2K	FR	O	1	9	1	6	CD	4	0	5.5
55	MEQUON	MQ	21060	3		15.4	21	35	0	FRM	FR	O	1	9	1	6	CD	4	0	15.4
56	MEQUON	MQ	21060	4		10.3	21	34	0	FRM	FR	O	1	5	1	5	CD	4	0	10.3
57	MEQUON	MQ	21060	5		8.7	21	34	0	FRM	FR	O	1	5	1	5	CD	4	0	8.7
58	MEQUON	MQ	21060	6		51.4	21	34	1	T3K/E2K	FR	O	1	8	5	4	CD	4	51.4	51.4
59	MEQUON	MQ	21060	7		27	21	34	0	FRM	FR	O	1	8	2	6	CD	4	0	27
60	MEQUON	MQ	21060	8		32.5	21	34	0	T3K/FRM	FR	O	1	6	3	5	CDS	3	0	32.5
61	MEQUON	MQ	MQ 21070		398.58	12.6	21	33	0	FRM/E2K	F	C	1	8	3	6	CD	4	0	12.6
65	MEQUON	MQ	MQ 22120		211.52	1.6	21	27	1	E2H	I	C	1	8	5	1		3	1.6	0
70	MEQUON	MQ	MQ 22223		295.72	23.1	21	22	1	S3K/E2K/T3K	RF	O	0	4	4	1		6	23.1	0
81	MEQUON	MQ	MQ 22310		122.98	6.8	21	14	1	E2K/S3K/T3K	R	C	0	4	4	1		6	6.8	0
90	MEQUON	MQ	MQ 22350	1	944.62	5.3	22	18	1	S3K	R	O	0	9	5	1		5	5.3	0
91	MEQUON	MQ	22350	2		25.5	22	18	1	E2H/T3H	R	O	0	9	5	1		5	25.5	0
92	MEQUON	MQ	22350	3		2.2	22	18	1	T3K	N	O	0	9	5	1		4	2.2	0
93	MEQUON	MQ	22350	4		5.7	22	18	1	T3K	N	O	0	9	5	1		4	5.7	0
94	MEQUON	MQ	22350	5		2.6	22	18	1	T3K	N	O	0	9	5	1		4	2.6	0
95	MEQUON	MQ	22350	6		2.5	22	18	1	T3K	N	O	0	9	5	1		4	2.5	0
96	MEQUON	MQ	22350	7		4.2	22	18	1	T3K	N	O	0	9	5	1		4	4.2	0
97	MEQUON	MQ	22350	8		12.3	22	18	1	T3K	R	O	0	9	5	1		4	12.3	0
98	MEQUON	MQ	22350	9		4.1	22	18	1	S3K	R	O	0	9	5	1		4	4.1	0
99	MEQUON	MQ	22350	10		6.9	21	13	1	E2H	F	O	0	9	5	1		4	6.9	0
100	MEQUON	MQ	22350	11		26.5	22	19	1	S3H	R	O	0	9	5	1		6	26.5	0
101	MEQUON	MQ	22350	12		5.6	21	24	1	T3K	R	O	0	9	5	1		4	5.6	0
102	MEQUON	MQ	MQ 22400		45.96	5.4	21	2	0	E2K	F	C	1	7	2	5	CD	4	0	5.4
103	MEQUON	MQ	MQ 22410	1	595.25	6.7	21	12	1	E1K	F	N	0	9	4	4	C	3	6.7	6.7
104	MEQUON	MQ	22410	2		9.6	21	11	1	E2K/FRM	F	N	0	8	5	3	C	3	9.6	0
107	MEQUON	MQ	MQ 22520	1	172.67	6.2	21	2	0	E2K	F	O	1	4	2	5	CDS	2	0	6.2
108	MEQUON	MQ	22520	2		8.2	21	1	0	E2K	F	O	1	4	2	5	CDS	2	0	8.2
109	MEQUON	MQ	22520	3		2.5	21	2	0	E2K	F	O	1	4	2	5	CDS	3	0	2.5
111	MEQUON	MQ	MQ 22602	1	518.02	18.1	21	12	1	E1K/T3K	F	O	0	9	5	1		3	18.1	0
112	MEQUON	MQ	22602	2		3.4	21	12	1	T3K	F	O	0	9	5	1		3	3.4	0
113	MEQUON	MQ	MQ 22605	1	534.6	4.8	22	6	1	S3K	N	O	0	9	5	1		4	4.8	0
114	MEQUON	MQ	22605	2		26.9	22	6	1	S3K	R	O	0	9	5	1		4	26.9	0
115	MEQUON	MQ	22605	3		9.5	21	1	1	E2K	F	O	0	9	5	1		4	9.5	0
116	MEQUON	MQ	22605	4		18	22	6	0	FRM	FH	O	0	8	4	3	S	4	18	0
117	MEQUON	MQ	MQ 22610		148.9	2.6	21	1	0	FRM	F	C	0	6	3	5	C	1	0	2.6
120	MEQUON	MQ	MQ 22630		62.59	11	21	1	1	E2K	F	O	0	9	5	1		3	11	0
126	MEQUON	MQ	MQ 27125		25.59	6	22	17	1	E2H	FH	C	0	8	5	1		4	6	0
134	MEQUON	MQ	MQ 28150		131.89	73.4	22	20	1	E2K	RH	C	0	9	6	0		6	73.4	0
137	MEQUON	MQ	MQ 28350		36.15	3.1	22	20	1	S3K	H	C	0	8	4	1		3	3.1	0
140	MEQUON	MQ	MQ 28475		83.51	16.2	22	19	1	PND/S3K/E1K	R	C	1	9	6	0		6	16.2	0
141	MEQUON	MQ	MQ 28480		38.12	5.7	22	19	1	E1K	RI	N	0	9	4	4	C	6	5.7	5.7
142	MEQUON	MQ	MQ 28500		43.25	11.7	22	20	1	E1K	RIH	C	1	9	4	3	C	6	11.7	0
143	MEQUON	MQ	MQ 28550	1	310.81	30.7	22	19	1	E2H/PND	R	O	0	9	5	0		6	30.7	0
144	MEQUON	MQ	28550	2		9.9	22	19	1	S3K	RH	C	1	8	4	4	C	6	9.9	9.9
145	MEQUON	MQ	MQ 28575		16.87	6.1	22	19	0	FRM	FR	O	1	6	2	4	CDS	5	0	6.1

No.	WATERSHED	ID	HU		Basin Area	Wetl. Area	R-E	Sec	E/ PC	Veg	Src	Cst	Dth	Slp	Val	Add Pot	Imp	Opp	Val Acres	Pot Acres
368	MEQUON MQ	MQ	22E-30NW			12.4	22	30	0	E2K/S3K	R	N	1	8	3	5	CS	6	0	12.4
369	MEQUON MQ	MQ	22E-30NW			4.4	22	30	0	S3K	R	C	1	9	4	4	C	6	4.4	4.4
	Total acres				12966	749 5.78									3.7	2.8			501.5 3.87	332.6 2.57
150	PIGEON CR.	PG	30015		68.02	6.7	21	22	1	T3K	R	O	0	8	6	0		6	6.7	0
151	PIGEON CR.	PG	30020		170.01	65.1	21	15	1	E2K/PND	R	O	0	9	5	1		6	65.1	0
153	PIGEON CR.	PG	30032		4.1	2.6	21	10	1	E2K/S3K	H	O	0	7	5	2	C	4	2.6	0
154	PIGEON CR.	PG	30034		17.04	3.9	21	10	1	E2K/S3K	H	O	0	7	5	2	C	4	3.9	0
155	PIGEON CR.	PG	30040		32.43	17.9	21	15	1	T3K	N	O	0	8	5	1		4	17.9	0
156	PIGEON CR.	PG	30045		101.22	14.2	21	15	0	E1K	FH	N	0	6	2	5	SC	3	0	14.2
160	PIGEON CR.	PG	30050	1	275.97	29.3	21	10	1	T3K	F	O	0	6	5	0		4	29.3	0
161	PIGEON CR.		30050	2		5.2	21	10	1	E1K/T3K	N	O	0	8	5	1		4	5.2	0
163	PIGEON CR.	PG	30070		217.59	6.4	21	9	1	E1K	F	O	1	6	4	2		4	6.4	0
165	PIGEON CR.	PG	30075	1	167.33	18.1	21	16	0	E1K	F	O	1	7	2	6	D	4	0	18.1
166	PIGEON CR.		30075	2		11.1	21	16	0	FRM	F	O	1	7	2	6	D	4	0	11.1
167	PIGEON CR.		30075	3		49.2	21	16	1	S3K/E1K/T3K	F	O	1	7	4	5	D	4	49.2	49.2
167	PIGEON CR.	PG	30077		59.42	12.3	21	17	0	FRM	F	O	1	4	1	4	CDS	1	0	12.3
171	PIGEON CR.	PG	30220		213.27	10.3	21	14	1	E1K	RI	C	1	9	5	0		5	10.3	0
175	PIGEON CR.	PG	30300		200.44	11.9	21	15	1	T3K/FRM	F	O	1	6	4	3	CD	3	11.9	0
179	PIGEON CR.	PG	30440		156.76	10.3	21	2	1	E2H/E2K	FR	N	1	8	4	3	CD	3	10.3	0
180	PIGEON CR.	PG	30450		59.5	4.2	21	3	1	T3K	F	C	0	6	4	2		3	4.2	0
181	PIGEON CR.	PG	30460	1	151.14	3.6	21	3	1	T3K	F	N	0	8	5	2		1	3.6	0
182	PIGEON CR.		30460	2		10.3	21	3	1	T3K/E2K	FR	C	0	6	5	2		3	10.3	0
183	PIGEON CR.		30460	3		3.5	21	3	1	T3K	FH	C	1	6	5	3	CD	4	3.5	0
184	PIGEON CR.		30460	4		14.6	21	3	1	E1K/S3K	N	C	0	9	5	2		5	14.6	0
193	PIGEON CR.	PG	30540		74.98	10.9	21	9	1	E2K/S3K	F	O	1	5	4	3	D	4	10.9	0
195	PIGEON CR.	PG	30560		98.53	24.9	21	4	0	FRM	F	C	1	8	1	5	D	4	0	24.9
196	PIGEON CR.	PG	30570		143.64	45.8	21	4	0	FRM/E2K	F	O	1	8	3	5	D	4	0	45.8
197	PIGEON CR.	PG	30580		77.03	30.1	21	4	1	T3K/FRM	F	O	1	6	3	4	CD	3	0	30.1
198	PIGEON CR.	PG	30590	1	204.79	8.9	21	5	1	S3K/PND	F	O	0	6	5	1		3	8.9	0
199	PIGEON CR.		30590	2		7.6	21	5	1	S3K/PND	F	O	1	6	5	2		2	7.6	0
200	PIGEON CR.	PG	30600		57.58	13.8	21	4	1	S3K	F	O	0	7	5	2		3	13.8	0
201	PIGEON CR.	PG	30610	1	128.1	5.6	21	5	1	T3K	F	N	0	9	4	1		1	5.6	0
202	PIGEON CR.		30610	2		12.8	21	5	1	T3K/E1K	F	C	0	5	4	2		3	12.8	0
203	PIGEON CR.		30610	3		9.9	21	9	1	E2K	F	O	1	6	4	4	D	4	9.9	9.9
205	PIGEON CR.	PG	30620	1	117.75	2.7	21	4	1	S3H	F	C	0	9	5	1		2	2.7	0
206	PIGEON CR.		30620	2		11.9	21	4	1	S3K/E1K	F	O	1	8	5	4	D	2	11.9	11.9
208	PIGEON CR.	PG	30630		138.34	46.2	21	3	1	E2K/S3K	F	O	1	8	5	5	D	5	46.2	46.2
209	PIGEON CR.	PG	30635		16.99	1.5	21	10	0	E2K	F	D	0	9	2	2		1	0	0
211	PIGEON CR.	PG	30720		37.72	7.5	21	9	1	E2K/S3K	F	O	1	6	3	3	D	3	0	0
214	PIGEON CR.	PG	30750		203	30.6	21	8	1	T3K	FR	C	0	7	5	1		4	30.6	0
219	PIGEON CR.	PG	30770		85.65	48.8	21	8	0	FRM/T3K	F	O	1	8	2	5	CD	4	0	48.8
227	PIGEON CR.	PG	30840		22.03	5.1	21	5	1	E2K	F	C	0	8	5	1		3	5.1	0
229	PIGEON CR.		30860	1	155.8	5.1	21	5	0	FRM	F	O	1	5	2	3	D	1	0	0
230	PIGEON CR.		30860	2		26.8	21	5	1	E1K/S3K	F	C	1	8	5	4	D	4	26.8	26.8
231	PIGEON CR.		30860	3		38.4	21	5	0	E1K/FRM	F	C	1	8	2	5	CD	4	0	38.4
232	PIGEON CR.		30860	4		8.5	21	5	0	E1K/S3K	F	O	1	7	4	3	D	2	8.5	0
233	PIGEON CR.	PG	30865		57.58	5.5	21	6	1	E2H	N	C	0	9	5	1		3	5.5	0
234	PIGEON CR.	PG	30885	1	126.76	13.3	21	6	1	T3K/PND	F	D	0	9	5	2		2	13.3	0
235	PIGEON CR.		30885	2		9.3	21	6	1	T3K	F	N	1	8	4	2		2	9.3	0
	Total acres				8338	742 8.90									4	2.7			484.4 5.81	387.7 4.65
236	MEQUON MU	MU	40100	1	953.02	16.6	21	28	0	FRM	R	D	1	9	2	5	D	3	0	16.6
237	MEQUON MU		40100	2		72.6	21	29	0	FRM	F	O	1	8	1	6	D	4	0	72.6
238	MEQUON MU		40100	3		20.9	21	29	1	FRM/T3K/E2K	F	O	1	8	4	4	D	4	20.9	20.9
239	MEQUON MU		40100	4		49.7	21	29	0	FRM	F	O	1	8	1	6	D	4	0	49.7
240	MEQUON MU		40100	5		6	21	29	0	FRM	F	O	1	8	1	6	D	4	0	6
241	MEQUON MU		40100	6		13.7	21	29	1	E2K	FC	O	1	8	4	4	D	3	13.7	13.7
242	MEQUON MU	MU	40200	1	453.77	60.5	21	21	1	T3K	FR	O	1	9	3	5	D	6	0	60.5
243	MEQUON MU		40200	2		4.5	21	21	0	FRM	FR	O	1	9	2	6	D	5	0	4.5
244	MEQUON MU		40200	3		55.4	21	20	1	T3K	F	O	1	9	4	4	D	4	55.4	55.4
245	MEQUON MU		40200	4		32.7	21	20	0	FRM	F	O	1	8	2	5	D	3	0	32.7
246	MEQUON MU		40200	5		35.8	21	20	0	FRM	F	O	1	8	1	6	D	4	0	35.8

#	WATERSHED	ID	HU		Basin Area	Wetl. Area	R-E	Sec	E/ PC	Veg	Src	Cst	Dth	Slp	Val	Add Pot	Imp	Opp	Val Acres	Pot Acres
247	MEQUON MU		40200	6		5.1	21	20	0	FRM	F	O	1	8	1	6	D	4	0	5.1
248	MEQUON MU		40200	7		20.5	21	20	0	FRM	F	O	1	8	1	6	D	4	0	20.5
249	MEQUON MU		40200	8		3.2	21	28	0	FRM	R	D	1	9	2	5	D	4	0	3.2
250	MEQUON MU		40200	9		3	21	29	0	FRM	F	O	1	8	1	6	D	4	0	3
251	MEQUON MU		40200	10		21.3	21	29	0	FRM	F	O	1	8	1	6	D	4	0	21.3
252	MEQUON MU		40200	11		27.5	21	29	0	FRM	F	O	1	8	1	6	D	4	0	27.5
254	MEQUON MU	MU	40207		150.78	14.9	21	20	0	FRM	FR	N	1	7	2	6	CD	3	0	14.9
255	MEQUON MU	MU	40210		66.36	1.8	21	28	0	FRM	R	D	1	9	2	5	D	3	0	1.8
257	MEQUON MU	MU	40300	1	69.98	19.9	21	20	0	FRM	F	O	1	8	1	6	D	3	0	19.9
258	MEQUON MU		40300	2		3.2	21	20	1	T3K	F	O	1	9	3	5	D	3	0	3.2
261	MEQUON MU	MU	40350	1	128.14	25.5	21	21	1	T3K	F	O	1	9	3	5	D	4	0	25.5
262	MEQUON MU		40350	2		13.6	21	21	0	E2K/FRM	F	O	1	8	2	6	D	5	0	13.6
263	MEQUON MU	MU	40410	1	839.52	24.7	21	16	0	FRM	F	O	1	7	2	6	D	3	0	24.7
264	MEQUON MU		40410	2		66.3	21	16	1	S3K/T3K/E2K	F	O	1	7	4	4	D	3	66.3	66.3
265	MEQUON MU		40410	3		32.1	21	16	0	FRM	F	O	1	7	2	5	D	3	0	32.1
266	MEQUON MU		40410	4		8.7	21	16	0	FRM	F	O	1	7	2	6	D	3	0	8.7
267	MEQUON MU		40410	5		17.2	21	16	0	FRM	F	O	1	7	2	6	D	3	0	17.2
	Total acres				2912	677									2	5.4			156.3	676.9
						23.24													5.37	23.24
268	LTTL MENOM	LM	50010	1	129.97	6	21	29	0	E2K/FRM	F	O	1	7	2	6	CD	4	0	6
269	LTTL MENOM		50010	2		6.8	21	29	0	FRM	F	O	1	7	1	6	D	4	0	6.8
271	LTTL MENOM	LM	50020		189.35	10.4	21	19	1	S3K/E2K	FR	O	1	4	3	4	D	4	0	10.4
272	LTTL MENOM	LM	50030	1	242.03	9	21	19	1	S3K/E2K/FRM	F	O	0	8	5	2		2	9	0
273	LTTL MENOM		50030	2		8.2	21	19	1	S3K/E2K/FRM	F	O	1	6	1	4	D	4	0	8.2
274	LTTL MENOM		50030	3		14.5	21	19	1	S3K/E2K/FRM	F	O	1	4	3	4	D	4	0	14.5
277	LTTL MENOM	LM	50040		38.56	7.2	21	18	1	E2K/FRM	FR	O	1	7	1	4	D	4	0	7.2
279	LTTL MENOM	LM	50050	1	178.37	9.4	21	17	1	T3K/E2K	R	O	1	7	4	4	D	5	9.4	9.4
280	LTTL MENOM		50050	2		15.5	21	18	1	T3K/E2K	F	O	1	7	1	4	D	4	0	15.5
283	LTTL MENOM	LM	50050	3	28.09	22.6	21	17	1	E2K	F	O	1	7	4	4	D	4	22.6	22.6
285	LTTL MENOM	LM	50065		114.9	13.2	21	7	1	E2K/S3K	R	C	0	8	4	1		4	13.2	0
286	LTTL MENOM	LM	50070		42.1	10.4	21	8	0	FRM/E2K	F	C	1	8	2	5	CD	3	0	10.4
287	LTTL MENOM	LM	50075		259.15	19	21	7	1	S3K/E2K	FR	N	0	7	4	2		3	19	0
288	LTTL MENOM	LM	50100		40.22	5.3	21	19	1	E2K	FR	O	1	7	1	5	D	4	0	5.3
295	LTTL MENOM	LM	50300	1	141.36	19.7	21	17	0	FRM	F	O	1	7	2	5	D	3	0	19.7
296	LTTL MENOM		50300	2		76.8	21	17	1	T3K/E2H/PND	FR	O	1	7	4	4	D	4	76.8	76.8
355	LTTL MENOM	LM	46000	1		4.1	21	32	0	FRM	FR	O	1	8	1	6	D	4	0	4.1
356	LTTL MENOM	LM	46000	2		5.3	21	32	0	FRM	FR	O	1	8	1	6	D	4	0	5.3
357	LTTL MENOM	LM	46000	3		47.1	21	32	0	FRM	FR	O	1	8	1	6	D	4	0	47.1
358	LTTL MENOM	LM	46000	4		16.4	21	29	1	T3K	F	O	1	8	3	5	D	4	0	16.4
359	LTTL MENOM	LM	46000	5		14.5	21	29	0	FRM	F	O	1	7	1	6	D	4	0	14.5
360	LTTL MENOM	LM	45300	1		4.4	21	32	0	FRM	FR	O	1	8	3	5	D	4	0	4.4
361	LTTL MENOM	LM	45300	2		31.5	21	32	1	T3K	FR	O	1	8	4	5	D	4	31.5	31.5
362	LTTL MENOM	LM	45300	3		10.5	21	32	0	FRM	FR	O	1	8	3	5	D	3	0	10.5
363	LTTL MENOM	LM	45300	4		34.3	21	32	1	T3K	FR	C	1	8	4	3	C	5	34.3	0
364	LTTL MENOM	LM	45200	1		41.5	21	32	1	T3K/E1K	FR	C	1	8	4	3	C	4	41.5	0
365	LTTL MENOM	LM	45200	2		1.8	21	33	1	T3K	F	D	0	9	2	1		1	0	0
	Total acres				2136	465									2.6	4.3			257.3	346.6
						21.79													12.05	16.23
298	GRANVILLE	GV	60110		100.03	10.1	21	31	0	FRM	F	N	1	5	3	4	CD	2	0	10.1
300	GRANVILLE	GV	60130	1	259.85	17.4	21	31	1	E2K/S3K	F	N	1	7	4	3	D	3	17.4	0
301	GRANVILLE		60130	2		35.3	21	31	0	FRM	F	C	1	8	1	5	CD	4	0	35.3
303	GRANVILLE	GV	60200		97.79	42.5	21	30	0	FRM	F	N	1	6	1	4	CD	3	0	42.5
305	GRANVILLE		60300		189.27	9.4	21	30	1	T3K	F	N	1	6	3	3	D	3	0	0
306	GRANVILLE	GV	60400		139.99	12	21	30	1	S3K/T3K	FR	O	0	8	4	2		3	12	0
	Total acres				1877	127									2.7	3.5			29.4	87.9
						6.75													1.57	4.68
312	VICTORY C.	VC	70100	1	238.26	15	21	30	0	FRM	F	O	1	7	1	4	CD	3	0	15
313	VICTORY C.		70100	2		39.4	21	30	1	T3K/E2H/E2K	FR	C	0	8	5	1		4	39.4	0
314	VICTORY C.	VC	70020		182.71	8.7	21	19	1	S3K	F	N	0	8	4	3	C	1	8.7	0
	Total acres				421	63									3.3	2.7			48.1	15

	WATERSHED	ID	HU		Basin Area	Wetl. Area	R-E	Sec	E/PC	Veg	Src	Cst	Dth	Slp	Val	Add Pot	Imp	Opp	Val Acres	Pot Acres
						14.99													11.43	3.56
315	ULAO CREEK	UL	80100	1	117.75	107.8	22	7	1	T3K/E2H/FRM	FIR	C	1	8	4	4	D	5	107.8	107.8
316	ULAO CREEK		80100	2		29.8	22	7	1	T3K/E1K	F	O	0	8	5	1		4	29.8	0
317	ULAO CREEK	UL	80110		52.26	10.5	22	8	1	E1K	FH	C	1	9	5	2		5	10.5	0
323	ULAO CREEK	UL	80140	1	151.93	3	22	8	1	E1K	F	C	0	4	3	5	C	4	0	3
324	ULAO CREEK		80140	2		5.6	22	8	1	T3K	I	N	0	9	4	2		5	5.6	0
326	ULAO CREEK	UL	80162		81.48	1.4	22	17	1	E2K	FH	C	1	6	4	5	CD	4	1.4	1.4
327	ULAO CREEK	UL	80163		14.5	1.4	22	17	1	E2K	FH	C	1	6	4	5	CD	4	1.4	1.4
329	ULAO CREEK	UL	80165		67.79	1.8	22	17	1	E2K	FH	C	1	6	3	5	CD	4	0	1.8
330	ULAO CREEK	UL	80200		82.63	13.8	22	5	1	S3K	H	C	0	9	5	2		5	13.8	0
333	ULAO CREEK	UL	80203		71.85	17.7	22	5	1	S3K/T3K	RH	C	0	6	5	2		5	17.7	0
334	ULAO CREEK	UL	80204	1	58.07	6.2	22	5	1	T3K	RH	C	0	8	5	2		4	6.2	0
335	ULAO CREEK		80204	2		2	22	5	1	T3K	RH	C	0	8	5	2		3	2	0
341	ULAO CREEK	UL	80220		35.16	6.7	22	5	1	S3K	FH	C	0	9	5	2		5	6.7	0
342	ULAO CREEK	UL	80222		30.28	10.8	22	5	1	E2K	H	C	0	9	5	2		5	10.8	0
345	ULAO CREEK	UL	80300	1	117.75	49.4	22	6	1	E1H/S3K	N	O	1	9	5	3	D	4	49.4	0
346	ULAO CREEK		80300	2		55.2	22	6	1	E2H	F	O	1	8	5	3	D	4	55.2	0
347	ULAO CREEK	UL	80310		117.75	3.1	22	6	1	S3K	F	C	0	9	5	2	C	3	3.1	0
	Total acres				8242	326									4.5	2.9			321.4	115.4
						3.96													3.90	1.40
371	MENOMONEE		21E-7	1		12.8	21	7	1	T3K	F	C	1	9	4	4	D	1	12.8	12.8
372	MENOMONEE		21E-7	2		23.3	21	7	1	T3K	F	O	1	9	3	5	D	3	0	23.3
373	MENOMONEE		21E-7	3		23.5	21	7	1	T3K	F	O	1	7	3	5	D	4	0	23.5
374	MENOMONEE		21E-6NW			13.2	21	6	1	S3K/T3K	F	C	0	8	4	1		2	13.2	0
375	MENOMONEE		21E-6NW			8.1	21	6	1	E1K/FRM	F	C	0	7	4	2		2	8.1	0
376	MENOMONEE		21E-6SW			82.3	21	6	1	T3K/S3K/E1K	F	N	1	8	5	3	D	3	82.3	0
377	MENOMONEE		21E-6SW			19.2	21	6	0	FRM	F	C	1	6	1	5	CD	4	0	19.2
	Total acres					182									3.4	3.6			116.4	78.8
378	CEDAR CR.		21E-2	1		14	21	2	0	FRM	F	N	1	7	1	6	C	1	0	14
379	CEDAR CR.		21E-2	2		2.1	21	2	1	S3K	F	O	0	9	4	2	C	2	2.1	0
380	CEDAR CR.		21E-2	3		18.8	21	2	0	E1K/S3K	F	C	1	8	2	5	CD	3	0	18.8
	Total acres					35									2.3	4.3			2.1	32.8

Table 1
Mequon Wetland Data Summary

Subbasin Value <u>or</u> Additional Potential <u>and</u> Opportunity of 5 or above								
Watershed	**Subbasin**	**Range**	**Section**	**Value**	**Add. Pot.**	**Opp.**	**Val. Acres**	**Pot. Acres**
Pigeon Creek (PG)	30015	21	22	6	0	6	6.7	0
	30020	21	15	5	1	6	65.1	0
	30220	21	14	5	0	5	10.3	0
	30460	21	3	5	2	5	14.6	0
	30630	21	3	5	5	5	46.2	46.2
Mequon (MU)	40200	21	21	3	5	6	0	60.5
	40200	21	21	2	6	5	0	4.5
	40350	21	21	2	6	5	0	13.6
Ulao Creek (UL)	80110	22	8	5	2	5	10.5	0
	80200	22	5	5	2	5	13.8	0
	80203	22	5	5	2	5	17.7	0
	80220	22	5	5	2	5	6.7	0
	80222	22	5	5	2	5	10.8	0
Fish Creek (FS)	10070	22	30	5	2	6	10.1	0
	10330	22	32	4	5	6	14.1	14.1
	22E-31	22	31	5	1	6	5.7	0
	22E-30NE	22	30	5	4	6	10.8	10.8
Mequon (MQ)	21030	21	26	1	6	5	0	13.6
	21040	21	27	3	5	5	0	3.6
	21040	21	35	1	6	5	0	16.9
	21040	21	35	5	4	6	18.1	18.1
	22350	22	18	5	1	5	5.3	0
	22350	22	18	5	1	5	25.5	0
	22350	22	19	5	1	6	26.5	0
	28150	22	20	6	0	6	73.4	0
	28475	22	19	6	0	6	16.2	0
	28550	22	19	5	0	6	30.7	0
	22E-30NW	22	30	3	5	6	0	12.4

Table 2
Mequon Wetland Data Summary

Subbasin Opportunity of 5 or above								
Watershed	**Subbasin**	**Range**	**Section**	**Value**	**Add. Pot.**	**Opp.**	**Val. Acres**	**Pot. Acres**
Fish Creek (FS)	10070	22	30	3	4	6	0	21.4
	22E-31	22	31	4	3	6	4.8	0
Mequon (MQ)	20110	21	36	3	4	6	0	26.6
	20130	21	36	2	1	6	0	0
	21010	21	35	4	3	6	10	0
	21010	21	35	4	1	5	7.5	0
	21020	21	35	4	4	6	10.5	10.5
	21040	21	27	0	3	5	0	0
	22223	21	22	4	1	6	23.1	0
	22310	21	14	4	1	6	6.8	0
	28480	22	19	4	4	6	5.7	5.7
	28500	22	20	4	3	6	11.7	0
	28550	22	19	4	4	6	9.9	9.9
	28575	22	19	2	4	5	0	6.1
Little Menomonee (LM)	50050	21	17	4	4	5	9.4	9.4
	45300	21	32	4	3	5	34.3	0

Table 3
Mequon Wetland Data Summary

Subbasin Value of 5 or above								
Watershed	**Subbasin**	**Range**	**Section**	**Value**	**Add. Pot.**	**Opp.**	**Val. Acres**	**Pot. Acres**
Fish Creek (FS)	10070	22	30	5	2	6	10.1	0
	22E-31	22	31	5	1	6	5.7	0
	22E-30NE	22	30	5	4	6	10.8	10.8
Mequon (MQ)	21040	21	35	5	4	6	18.1	18.1
	21060	21	34	5	4	4	51.4	51.4
	22120	21	27	5	1	3	1.6	0
	22350	22	18	5	1	5	5.3	0
	22350	22	18	5	1	5	25.5	0
	22350	22	18	5	1	4	2.2	0
	22350	22	18	5	1	4	5.7	0
	22350	22	18	5	1	4	2.6	0
	22350	22	18	5	1	4	2.5	0
	22350	22	18	5	1	4	4.2	0
	22350	22	18	5	1	4	12.3	0
	22350	22	18	5	1	4	4.1	0
	22350	21	13	5	1	4	6.9	0
	22350	22	19	5	1	6	26.5	0
	22350	21	24	5	1	4	5.6	0
	22410	21	11	5	3	3	9.6	0
	22602	21	12	5	1	3	18.1	0
	22602	21	12	5	1	3	3.4	0
	22605	22	6	5	1	4	4.8	0
	22605	22	6	5	1	4	26.9	0
	22605	21	1	5	1	4	9.5	0
	22630	21	1	5	1	3	11	0
	28150	22	20	6	0	6	73.4	0
	28475	22	19	6	0	6	16.2	0
	28550	22	19	5	0	6	30.7	0
Pigeon Creek (PG)	30015	21	22	6	0	6	6.7	0
	30020	21	15	5	1	6	65.1	0
	30032	21	10	5	2	4	2.6	0
	30034	21	10	5	2	4	3.9	0
	30040	21	15	5	1	4	17.9	0
	30050	21	10	5	0	4	29.3	0
	30050	21	10	5	1	4	5.2	0
	30220	21	14	5	0	5	10.3	0
	30460	21	3	5	2	1	3.6	0
	30460	21	3	5	2	3	10.3	0
	30460	21	3	5	3	4	3.5	0
	30460	21	3	5	2	5	14.6	0
	30590	21	5	5	1	3	8.9	0
	30590	21	5	5	2	2	7.6	0
	30600	21	4	5	2	3	13.8	0
	30620	21	4	5	1	2	2.7	0
	30620	21	4	5	4	2	11.9	11.9
	30630	21	3	5	5	5	46.2	46.2
	30750	21	8	5	1	4	30.6	0
	30840	21	5	5	1	3	5.1	0
	30860	21	5	5	4	4	26.8	26.8
	30865	21	6	5	1	3	5.5	0
	30885	21	6	5	2	2	13.3	0

Table 3
Mequon Wetland Data Summary

Little Menomonee (LM)	50030	21	19	5	2	2	9	0
Victory Center (VC)	70100	21	30	5	1	4	39.4	0
Ulao Creek (UL)	80100	22	7	5	1	4	29.8	0
	80110	22	8	5	2	5	10.5	0
	80200	22	5	5	2	5	13.8	0
	80203	22	5	5	2	5	17.7	0
	80204	22	5	5	2	4	6.2	0
	80204	22	5	5	2	3	2	0
	80220	22	5	5	2	5	6.7	0
	80222	22	5	5	2	5	10.8	0
	80300	22	6	5	3	4	49.4	0
	80300	22	6	5	3	4	55.2	0
	80310	22	6	5	2	3	3.1	0
Menomonee	21E-6SW	21	6	5	3	3	82.3	0

Table 4
Mequon Wetland Data Summary

Subbasin Additional Potential of 5 or above								
Watershed	**Subbasin**	**Range**	**Section**	**Value**	**Add. Pot.**	**Opp.**	**Val. Acres**	**Pot. Acres**
Fish Creek (FS)	10330	22	32	4	5	6	14.1	14.1
Mequon (MQ)	21030	21	26	1	6	5	0	13.6
	21040	21	27	3	5	5	0	3.6
	21040	21	35	1	6	5	0	16.9
	21060	21	35	1	6	4	0	9.8
	21060	21	35	1	6	4	0	5.5
	21060	21	35	1	6	4	0	15.4
	21060	21	34	1	5	4	0	10.3
	21060	21	34	1	5	4	0	8.7
	21060	21	34	2	6	4	0	27
	21060	21	34	3	5	3	0	32.5
	21070	21	33	3	6	4	0	12.6
	22400	21	2	2	5	4	0	5.4
	22520	21	2	2	5	2	0	6.2
	22520	21	1	2	5	2	0	8.2
	22520	21	2	2	5	3	0	2.5
	22610	21	1	3	5	1	0	2.6
	22E-30NW	22	30	3	5	6	0	12.4
Pigeon Creek (PG)	30045	21	15	2	5	3	0	14.2
	30075	21	16	2	6	4	0	18.1
	30075	21	16	2	6	4	0	11.1
	30075	21	16	4	5	4	49.2	49.2
	30560	21	4	1	5	4	0	24.9
	30570	21	4	3	5	4	0	45.8
	30630	21	3	5	5	5	46.2	46.2
	30770	21	8	2	5	4	0	48.8
	30860	21	5	2	5	4	0	38.4
Mequon (MU)	40100	21	28	2	5	3	0	16.6
	40100	21	29	1	6	4	0	72.6
	40100	21	29	1	6	4	0	49.7
	40100	21	29	1	6	4	0	6
	40200	21	21	3	5	6	0	60.5
	40200	21	21	2	6	5	0	4.5
	40200	21	20	2	5	3	0	32.7
	40200	21	20	1	6	4	0	35.8
	40200	21	20	1	6	4	0	5.1
	40200	21	20	1	6	4	0	20.5
	40200	21	28	2	5	4	0	3.2
	40200	21	29	1	6	4	0	3
	40200	21	29	1	6	4	0	21.3
	40200	21	29	1	6	4	0	27.5
	40207	21	20	2	6	3	0	14.9
	40210	21	28	2	5	3	0	1.8
	40300	21	20	1	6	3	0	19.9
	40300	21	20	3	5	3	0	3.2
	40350	21	21	3	5	4	0	25.5
	40350	21	21	2	6	5	0	13.6
	40410	21	16	2	6	3	0	24.7
	40410	21	16	2	5	3	0	32.1
	40410	21	16	2	6	3	0	8.7
	40410	21	16	2	6	3	0	17.2
Little Menomonee (LM)	50010	21	29	2	6	4	0	6
	50010	21	29	1	6	4	0	6.8
	50070	21	8	2	5	3	0	10.4
	50100	21	19	1	5	4	0	5.3

Table 4
Mequon Wetland Data Summary

	50300	21	17	2	5	3	0	19.7
	46000	21	32	1	6	4	0	4.1
	46000	21	32	1	6	4	0	5.3
	46000	21	32	1	6	4	0	47.1
	46000	21	29	3	5	4	0	16.4
	46000	21	29	1	6	4	0	14.5
	45300	21	32	3	5	4	0	4.4
	45300	21	32	4	5	4	31.5	31.5
	45300	21	32	3	5	3	0	10.5
Granville (GV)	60130	21	31	1	5	4	0	35.3
Ulao Creek	80140	22	8	3	5	4	0	3
	80162	22	17	4	5	4	1.4	1.4
	80163	22	17	4	5	4	1.4	1.4
	80165	22	17	3	5	4	0	1.8
Menomonee	21E-7	21	7	3	5	3	0	23.3
	21E-7	21	7	3	5	4	0	23.5
	21E-6SW	21	6	1	5	4	0	19.2
Cedar Creek	21E-2	21	2	1	6	1	0	14
	21E-2	21	2	2	5	3	0	18.8

Appendix D

Hydrologic/ Hydraulic Data

Hydrologic Data
by Subbasin

MU Existing

SHEET B : CREATED: 03/01/91 EDITED: 12/08/94

This spreadsheet computes weighted land use parameters for input to CDM RUNOFF given land use percentages by hydrologic unit. Check global land use categories and parameters as appropriate.
Enter the numbers highlighted in green.

BASIN: MENOMONEE RIVER

SUBBASIN: MEQUON - MU EXISTING

SCENARIO :

NOTES:

#	GLOBAL LAND USE CATEGORIES
1	FOREST, PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

GLOBAL LAND USE PARAMETERS

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

PERCENT BY LAND USE CATEGORY

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	40100	25	35	25	15	0	0	0	0	0	0	100.0	92.3	4.8	3.0	100.0	.020	.251	.10	.34
	40101	25	35	25	15	0	0	0	0	0	0	100.0	92.3	4.8	3.0	100.0	.020	.251	.10	.34
	40102	25	35	25	15	0	0	0	0	0	0	100.0	92.3	4.8	3.0	100.0	.020	.251	.10	.34
	40105	25	35	25	15	0	0	0	0	0	0	100.0	92.3	4.8	3.0	100.0	.020	.251	.10	.34
2	40200	30	40	0	30	0	0	0	0	0	0	100.0	90.5	5.5	4.0	100.0	.020	.252	.10	.34
3	40205	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
4	40207	10	90	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.246	.10	.31
5	40210	0	0	20	80	0	0	0	0	0	0	100.0	82.6	8.0	9.4	100.0	.020	.230	.10	.25
6	40215	0	20	0	80	0	0	0	0	0	0	100.0	83.0	8.0	9.0	100.0	.020	.230	.10	.25
7	40300	40	60	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.260	.10	.37
8	40305	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
9	40307	0	50	0	50	0	0	0	0	0	0	100.0	87.5	6.5	6.0	100.0	.020	.234	.10	.26
10	40350	60	0	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.265	.10	.39
11	40410	30	55	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.253	.10	.34

SHEET C :   CREATED: 03/01/90   EDITED: 12/08/94

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: MENOMONEE RIVER

SUBBASIN: MEQUON - MU EXISTING

SCENARIO :

NOTES:

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	40100	0	20	70	10	100.0
2	40101	0	20	70	10	100.0
	40102	0	20	70	10	100.0
	40105	0	20	70	10	100.0
3	40200	0	30	60	10	100.0
4	40205	0	0	100	0	100.0
5	40207	0	50	40	10	100.0
6	40210	0	10	80	10	100.0
7	40215	0	0	100	0	100.0
8	40300	0	0	100	0	100.0
9	40305	0	15	85	0	100.0
10	40307	0	15	85	0	100.0
11	40350	0	10	80	10	100.0
12	40410	0	30	60	10	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDM-RUNOFF. DON'T FORGET TO CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS. GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
: HIGHLIGHTED IN GREEN.

BASIN : MENOMONEE RIVER

SUBBASIN: MEQUON - HU EXISTING

SCENARIO: SUBBASIN 40101 ADDED BUT IS NOT PART OF THE WATER QUALITY MODEL DIGITIZED SUBBASIN MAP

NOTES:

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	40100	MU02800	3512.7	547	2.8	.0088	.020	0.249	.10	.34	6.29	0.16	.00080720
2	H1	1	40101	MUE6064	1206	161	2.5	.0088	.020	0.254	.10	.34	6.20	0.16	.00080720
	H1	1	40102	MUE2645	1000	134	6.5	.0088	.020	0.254	.10	.34	6.20	0.16	.00080720
	H1	1	40105	MUE4729	600	72	2.5	.0088	.020	0.254	.10	.34 #	6.20	0.16	.00080720
3	H1	1	40200	MU06270	3753.08	454	4.0	.0104	.020	.252	.10	.34	6.50	0.20	.00077980
4	H1	1	40205	MUA2500	1401.12	50	1.0	.0248	.020	.241	.10	.29	5.76	0.10	.00083000
5	H1	1	40207	MUB4482	2408.75	151	1.0	.0236	.020	.246	.10	.31	7.20	0.28	.00072500
6	H1	1	40210	MU00800	1700.45	66	9.4	.0121	.020	.230	.10	.25	5.74	0.12	.00083460
7	H1	1	40215	MUF1000L	1577.62	58	9.0	.0233	.020	.230	.10	.25	5.47	0.09	.00083000
8	H1	1	40300	MUC3530	1032.12	70	1.0	.0178	.020	.260	.10	.37	5.76	0.10	.00083000
9	H1	1	40305	MUC1800	2256.98	79	1.0	.0359	.020	.241	.10	.29	6.19	0.15	.00078890
10	H1	1	40307	MUD0686	1366.01	64	6.0	.0341	.020	.234	.10	.26	6.00	0.15	.00078890
11	H1	1	40350	MU09070	1419.14	128	5.0	.0133	.020	.265	.10	.39	5.90	0.12	.00083460
12	H1	1	40410	MU12702	6198.24	840	2.5	.0087	.020	.253	.10	.34	6.56	0.20	.00077980

MU Future

SHEET B : CREATED: 03/01/91 EDITED: 12/08/94

This spreadsheet computes weighted land use parameters for input to CDM RUNOFF given land use percentages by hydrologic unit. Check global land use categories and parameters as appropriate.
Enter the numbers highlighted in green.

BASIN: MENOMONEE RIVER

SUBBASIN: MEQUON - MU FUTURE

SCENARIO :

NOTES:

#	GLOBAL LAND USE CATEGORIES
1	FOREST. PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

<------ GLOBAL LAND USE PARAMETERS ------>

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

<------ (FUTURE) PERCENT BY LAND USE CATEGORY ------>

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	40100	20	30	35	15	0	0	0	0	0	0	100.0	92.1	4.8	3.2	100.0	.020	.249	.10	.33
	40101	20	30	40	10	0	0	0	0	0	0	100.0	92.7	4.5	2.8	100.0	.020	.249	.10	.34
	40102	20	30	40	10	0	0	0	0	0	0	100.0	92.7	4.5	2.8	100.0	.020	.249	.10	.34
	40105	20	30	40	10	0	0	0	0	0	0	100.0	92.7	4.5	2.8	100.0	.020	.249	.10	.34
2	40200	35	30	0	35	0	0	0	0	0	0	100.0	89.8	5.8	4.5	100.0	.020	.254	.10	.34
3	40205	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
4	40207	10	90	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.246	.10	.31
5	40210	0	0	20	80	0	0	0	0	0	0	100.0	82.6	8.0	9.4	100.0	.020	.230	.10	.25
6	40215	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
7	40300	40	60	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.260	.10	.37
8	40305	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
9	40307	0	50	0	50	0	0	0	0	0	0	100.0	87.5	6.5	6.0	100.0	.020	.234	.10	.26
10	40350	60	0	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.265	.10	.39
11	40410	25	45	0	30	0	0	0	0	0	0	100.0	90.5	5.5	4.0	100.0	.020	.249	.10	.33

SHEET C : CREATED: 03/01/90 EDITED: 12/08/94

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: MENOMONEE RIVER

SUBBASIN: MEQUON - HU FUTURE

SCENARIO :

NOTES:

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	40100	0	20	70	10	100.0
2	40101	0	20	70	10	100.0
	40102	0	20	70	10	100.0
	40105	0	20	70	10	100.0
3	40200	0	30	60	10	100.0
4	40205	0	0	100	0	100.0
5	40207	0	50	40	10	100.0
6	40210	0	10	80	10	100.0
7	40215	0	0	100	0	100.0
8	40300	0	0	100	0	100.0
9	40305	0	15	85	0	100.0
10	40307	0	15	85	0	100.0
11	40350	0	10	80	10	100.0
12	40410	0	30	60	10	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDM-RUNOFF. DON'T FORGET TO
CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS.
GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK
FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING
OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
S HIGHLIGHTED IN GREEN.

BASIN : MENOMONEE RIVER

SUBBASIN: MEQUON - MU FUTURE

SCENARIO: SUBBASIN 40101 ADDED BUT IS NOT PART OF THE WATER QUALITY MODEL DIGITIZED SUBBASIN MAP

NOTES:

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	40100	MU02800	3512.7	547	2.0	.0088	.020	.249	.10	0.3	6.29	0.16	.00080720
2	H1	1	40101	MUE6064	1206	161	2.5	.0088	.020	0.254	.10	.34	6.20	0.16	.00080720
	H1	1	40102	MUE2645	1000	134	6.5	.0088	.020	0.254	.10	.34	6.20	0.16	.00080720
	H1	1	40105	MUE4729	600	72	2.5	.0088	.020	0.254	.10	.34	6.20	0.16	.00080720
3	H1	1	40200	MU06270	3753.084422	454	4.5	.0104	.020	.254	.10	.34	6.48	0.20	.00077980
4	H1	1	40205	MUA2500	1401.110583	50	1.0	.0248	.020	.241	.10	.29	5.76	0.10	.00083000
5	H1	1	40207	MUB4402	2408.753633	151	1.0	.0236	.020	.246	.10	.31	7.20	0.20	.00072500
6	H1	1	40210	MU00800	1700.445663	66	9.4	.0121	.020	.230	.10	.25	5.74	0.12	.00083460
7	H1	1	40215	MUF1000L	1577.622851	58	11.0	.0233	.020	.227	.10	.23	5.39	0.09	.00083000
8	H1	1	40300	MUC3530	1032.116831	70	1.0	.0178	.020	.260	.10	.37	5.76	0.10	.00083000
9	H1	1	40305	MUC1800	2256.979805	79	1.0	.0359	.020	.241	.10	.29	6.19	0.15	.00078890
10	H1	1	40307	MU00686	1366.005273	64	6.0	.0341	.020	.234	.10	.26	6.00	0.15	.00078890
11	H1	1	40350	MU09070	1419.143619	128	5.0	.0133	.020	.265	.10	.39	5.90	0.12	.00083460
12	H1	1	40410	MU12702	6198.243915	840	4.0	.0087	.020	.249	.10	.33	6.50	0.20	.00077980

MQ Existing

SHEET B : CREATED: 03/01/91 EDITED: #REF!

This spreadsheet computes weighted land use parameters for input to CDM RUNOFF given land use percentages by hydrologic unit. Check global land use categories and parameters as appropriate.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: MEQUON - MQ EXISTING

SCENARIO : This file contains a new subbasin numbered 29101 whose area is comprised of 30% of 29100.

NOTES: This subbasin is not in the water quality model or the digitized subbasin map.

#	GLOBAL LAND USE CATEGORIES
1	FOREST, PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

<---------- GLOBAL LAND USE PARAMETERS ---------->

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

<---------- PERCENT BY LAND USE CATEGORY ---------->

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	20110	0	0	40	50	0	0	0	0	5	5	100.0	79.7	6.1	14.2	100.0	.020	.232	.10	.27
2	20120	0	0	40	55	0	0	0	0	0	5	100.0	81.2	6.6	12.3	100.0	.020	.233	.10	.27
3	20130	10	0	5	0	0	0	0	0	0	85	100.0	14.2	0.6	85.3	100.0	.020	.273	.10	.43
4	20140	20	0	35	40	0	0	0	0	5	0	100.0	86.1	5.8	8.2	100.0	.020	.244	.10	.32
5	20210	30	0	0	45	0	0	10	0	0	15	100.0	66.0	5.8	28.3	100.0	.020	.251	.10	.34
6	20220	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
7	20300	0	0	95	0	0	0	0	0	0	5	100.0	88.4	3.8	7.9	100.0	.020	.241	.10	.32
8	20310	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
9	20315	0	0	60	25	0	0	10	0	5	0	100.0	79.8	5.2	15.1	100.0	.020	.235	.10	.29
10	20410	20	0	0	80	0	0	0	0	0	0	100.0	83.0	8.0	9.0	100.0	.020	.240	.10	.29
11	20430	0	0	0	70	0	0	30	0	0	0	100.0	60.5	7.8	31.7	100.0	.020	.224	.10	.23
12	20440	0	0	0	90	0	0	0	0	0	10	100.0	72.0	8.1	19.9	100.0	.020	.227	.10	.23
13	20450	5	0	0	85	0	0	5	0	0	5	100.0	73.5	8.1	18.4	100.0	.020	.230	.10	.25
14	20455	0	0	0	85	0	0	10	0	5	0	100.0	72.0	8.2	19.9	100.0	.020	.225	.10	.23
15	20460	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
16	20465	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
17	21010	15	0	0	75	0	0	10	0	0	0	100.0	75.8	7.9	16.4	100.0	.020	.237	.10	.28
18	21020	20	0	0	45	0	0	0	30	5	0	100.0	65.9	7.0	27.2	100.0	.020	.239	.10	.30
19	21030	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
20	21040	5	30	0	0	0	0	30	0	35	0	100.0	55.3	2.9	41.9	100.0	.020	.228	.10	.29
21	21050	5	60	0	30	0	0	0	0	0	5	100.0	85.8	5.3	9.0	100.0	.020	.239	.10	.29
22	21055	0	20	0	50	0	0	0	25	0	5	100.0	66.0	7.1	27.0	100.0	.020	.228	.10	.25

23	21060	5	75	0	20	0	0	0	0	0	0	100.0	92.0	5.0	3.0	100.0	.020	.241	.10	.29
24	21070	0	80	0	10	0	0	5	0	0	5	100.0	84.8	4.4	10.9	100.0	.020	.239	.10	.29
25	21080	0	60	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.235	.10	.27
26	21090	0	90	0	0	10	0	0	0	0	0	100.0	93.0	4.6	2.4	100.0	.020	.239	.10	.29
27	22110	0	0	0	80	10	0	10	0	0	0	100.0	73.0	8.7	18.3	100.0	.020	.226	.10	.23
28	22120	10	0	0	10	20	0	25	35	0	0	100.0	46.1	7.0	47.0	100.0	.020	.229	.10	.27
29	22200	10	0	0	40	0	0	40	0	0	10	100.0	47.5	6.0	46.5	100.0	.020	.233	.10	.28
30	22201	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
31	22209	15	0	0	75	0	0	0	0	0	10	100.0	74.3	7.4	18.4	100.0	.020	.238	.10	.28
32	22210	0	0	20	60	0	0	20	0	0	0	100.0	69.6	7.2	23.2	100.0	.020	.228	.10	.26
33	22223	5	30	0	30	0	0	35	0	0	0	100.0	62.5	5.9	31.7	100.0	.020	.234	.10	.28
34	22224	0	0	0	90	0	0	10	0	0	0	100.0	73.5	8.6	17.9	100.0	.020	.226	.10	.23
35	22225	0	15	0	85	0	0	0	0	0	0	100.0	82.3	8.3	9.5	100.0	.020	.229	.10	.24
36	22250	0	0	0	70	0	0	30	0	0	0	100.0	60.5	7.8	31.7	100.0	.020	.224	.10	.23
37	22260	0	0	0	90	0	0	0	0	0	10	100.0	72.0	8.1	19.9	100.0	.020	.227	.10	.23
38	22265	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
39	22268	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
40	22300	0	0	65	10	20	0	0	0	0	5	100.0	83.5	5.5	11.1	100.0	.020	.236	.10	.30
41	22302	0	0	40	0	60	0	0	0	0	0	100.0	82.2	7.6	10.2	100.0	.020	.231	.10	.27
42	22303	0	0	40	0	60	0	0	0	0	0	100.0	82.2	7.6	10.2	100.0	.020	.231	.10	.27
43	22304	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
44	22305	0	0	95	0	0	0	0	0	0	5	100.0	88.4	3.8	7.9	100.0	.020	.241	.10	.32
45	22310	5	0	0	75	0	0	20	0	0	0	100.0	67.8	8.0	24.3	100.0	.020	.229	.10	.25
46	22312	0	0	20	60	0	0	20	0	0	0	100.0	69.6	7.2	23.2	100.0	.020	.228	.10	.26
47	22313	0	0	70	30	0	0	0	0	0	0	100.0	89.1	5.5	5.4	100.0	.020	.237	.10	.30
48	22314	0	0	100	0	0	0	0	0	0	0	100.0	93.0	4.0	3.0	100.0	.020	.241	.10	.32
49	22315	0	0	40	55	0	0	0	0	5	0	100.0	83.7	6.6	9.8	100.0	.020	.232	.10	.27
50	22316	0	0	80	20	0	0	0	0	0	0	100.0	90.4	5.0	4.6	100.0	.020	.238	.10	.30
51	22317	0	0	100	0	0	0	0	0	0	0	100.0	93.0	4.0	3.0	100.0	.020	.241	.10	.32
52	22318	0	0	50	50	0	0	0	0	0	0	100.0	86.5	6.5	7.0	100.0	.020	.234	.10	.28
53	22320	75	0	0	0	25	0	0	0	0	0	100.0	90.0	5.5	4.5	100.0	.020	.274	.10	.43
54	22350	40	0	0	30	10	0	0	0	0	20	100.0	69.5	5.3	25.2	100.0	.020	.259	.10	.37
55	22400	5	90	0	5	0	0	0	0	0	0	100.0	94.3	4.3	1.5	100.0	.020	.242	.10	.30
56	22410	20	45	0	30	0	0	0	0	0	5	100.0	85.8	5.3	9.0	100.0	.020	.247	.10	.32
57	22505	20	40	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.245	.10	.31
58	22510	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
59	22520	5	95	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.243	.10	.30
60	22600	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
61	22602	40	0	0	40	5	0	0	0	0	15	100.0	73.8	5.7	20.6	100.0	.020	.257	.10	.36
62	22605	30	50	0	10	0	0	0	0	0	10	100.0	84.0	4.1	11.9	100.0	.020	.255	.10	.35
63	22607	10	60	0	15	0	0	0	0	0	15	100.0	78.5	4.2	17.4	100.0	.020	.244	.10	.31
64	22610	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
65	22620	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
66	22630	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
67	27000	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
68	27100	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
69	27110	0	0	0	0	0	0	100	0	0	0	100.0	15.0	5.0	80.0	100.0	.020	.193	.10	.21
70	27115	0	0	0	0	0	0	100	0	0	0	100.0	15.0	5.0	80.0	100.0	.020	.193	.10	.21
71	27120	25	0	0	0	0	0	70	0	0	5	100.0	34.3	4.5	61.3	100.0	.020	.254	.10	.39
72	27125	25	0	0	0	0	0	70	0	0	5	100.0	34.3	4.5	61.3	100.0	.020	.254	.10	.39
73	27130	0	0	0	0	0	0	0	0	100	0	100.0	50.0	0.0	50.0	100.0	.020	.200	.10	.25
74	27140	0	0	0	95	0	0	0	0	0	5	100.0	76.0	8.6	15.5	100.0	.020	.227	.10	.23
75	27150	0	0	0	50	0	0	0	0	50	0	100.0	65.0	4.5	30.5	100.0	.020	.217	.10	.24
76	27200	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
77	27250	0	0	0	0	0	0	100	0	0	0	100.0	15.0	5.0	80.0	100.0	.020	.193	.10	.21
78	28000	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
79	28100	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
80	28150	60	0	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.265	.10	.39
81	28200	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
82	28300	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
83	28350	45	0	0	50	0	0	0	0	0	5	100.0	82.8	6.3	11.0	100.0	.020	.258	.10	.36
84	28400	60	0	0	0	0	0	0	0	40	0	100.0	77.0	2.4	20.6	100.0	.020	.266	.10	.42
85	28450	0	0	0	0	0	0	100	0	0	0	100.0	15.0	5.0	80.0	100.0	.020	.193	.10	.21
86	28475	20	0	0	20	20	0	40	0	0	0	100.0	56.0	6.6	37.4	100.0	.020	.241	.10	.31
87	28480	60	0	0	0	20	0	20	0	0	0	100.0	75.0	5.4	19.6	100.0	.020	.270	.10	.42
88	28500	10	0	0	0	0	0	75	0	0	15	100.0	20.8	4.2	75.1	100.0	.020	.231	.10	.32
89	28550	0	0	0	70	5	0	0	0	5	20	100.0	62.3	6.8	31.0	100.0	.020	.226	.10	.24
90	28575	70	0	0	30	0	0	0	0	0	0	100.0	90.5	5.5	4.0	100.0	.020	.271	.10	.41
91	28600	10	0	0	90	0	0	0	0	0	0	100.0	81.5	8.5	10.0	100.0	.020	.234	.10	.26
92	29000	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
93	29100	0	0	50	35	0	0	15	0	0	0	100.0	76.8	5.9	17.4	100.0	.020	.234	.10	.28
94	29101	0	0	50	35	0	0	15	0	0	0	100.0	76.8	5.9	17.4	100.0	.020	.234	.10	.28
95	29150	5	0	0	50	20	10	15	0	0	0	100.0	68.5	8.7	22.9	100.0	.020	.227	.10	.25

SHEET C : CREATED: 03/01/90 EDITED: #REF!

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: MEQUON - MQ EXISTING

SCENARIO : This file contains a new subbasin numbered 29101 whose area is comprised of 34% of 29100.

NOTES: This subbasin is not in the water quality model or the digitized subbasin map.

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	20110	0	20	80	0	100.0
2	20120	0	0	100	0	100.0
3	20130	80	0	20	0	100.0
4	20140	0	0	100	0	100.0
5	20210	0	15	85	0	100.0
6	20220	0	0	100	0	100.0
7	20300	0	5	95	0	100.0
8	20310	0	0	100	0	100.0
9	20315	0	0	100	0	100.0
10	20410	0	0	100	0	100.0
11	20430	0	0	100	0	100.0
12	20440	0	0	100	0	100.0
13	20450	0	0	100	0	100.0
14	20455	0	0	100	0	100.0
15	20460	0	0	100	0	100.0
16	20465	0	0	100	0	100.0
17	21010	0	60	20	20	100.0
18	21020	0	40	35	25	100.0
19	21030	0	65	20	15	100.0
20	21040	0	0	100	0	100.0
21	21050	0	10	90	0	100.0
22	21055	0	5	95	0	100.0
23	21060	0	20	80	0	100.0
24	21070	0	0	100		100.0
25	21080	0	20	80	0	100.0
26	21090	0	20	80	0	100.0
27	22110	0	70	15	15	100.0
28	22120	0	15	75	10	100.0
29	22200	10	10	80	0	100.0
30	22201	0	0	100	0	100.0
31	22209	0	40	60	0	100.0
32	22210	0	70	0	30	100.0
33	22223	0	15	85	0	100.0
34	22224	0	5	90	5	100.0
35	22225	0	5	95	0	100.0
36	22250	0	5	95	0	100.0
37	22260	0	10	85	5	100.0
38	22265	0	5	90	5	100.0
39	22268	0	0	100	0	100.0
40	22300	0	30	50	20	100.0
41	22302	0	0	100	0	100.0
42	22303	0	0	100	0	100.0
43	22304	0	50	50	0	100.0
44	22305	0	100	0	0	100.0
45	22310	0	0	100	0	100.0
46	22312	0	0	100	0	100.0
47	22313	0	0	100	0	100.0
48	22314	0	0	100	0	100.0
49	22315	0	0	100	0	100.0
50	22316	0	0	70	30	100.0
51	22317	0	0	80	20	100.0
52	22318	0	0	100	0	100.0
53	22320	0	50	50	0	100.0
54	22350	10	30	60	0	100.0
55	22400	0	0	85	15	100.0
56	22410	0	0	100	0	100.0
57	22505	0	20	80	0	100.0
58	22510	0	0	100	0	100.0
59	22520	0	0	100	0	100.0
60	22600	0	0	100	0	100.0
61	22602	15	15	70	0	100.0
62	22605	15	20	65	0	100.0
63	22607	10	20	70	0	100.0
64	22610	100	0	0	0	100.0
65	22620	0	0	100	0	100.0
66	22630	0	0	100	0	100.0
67	27000	0	0	100	0	100.0
68	27100	0	0	100	0	100.0
69	27110	0	0	100	0	100.0
70	27115	0	0	100	0	100.0
71	27120	0	0	90	10	100.0
72	27125	0	0	100	0	100.0
73	27130	0	0	100	0	100.0
74	27140	0	0	100	0	100.0
75	27150	0	0	100	0	100.0
76	27200	0	0	100	0	100.0
77	27250	0	0	100	0	100.0
78	28000	0	0	100	0	100.0
79	28100	0	0	100	0	100.0
80	28150	0	0	80	20	100.0
81	28200	0	0	100	0	100.0
82	28300	0	0	100	0	100.0
83	28350	0	0	100	0	100.0
84	28400	0	0	80	20	100.0
85	28450	0	0	90	10	100.0
86	28475	0	0	85	15	100.0
87	28480	0	0	100	0	100.0
88	28500	0	0	75	25	100.0
89	28550	0	0	90	10	100.0
90	28575	0	0	75	25	100.0
91	28600	0	0	100	0	100.0
92	29000	0	0	100	0	100.0
93	29100	0	0	100	0	100.0
94	29101	0	0	100	0	100.0
95	29150	0	0	95	5	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDM-RUNOFF. DON'T FORGET TO
CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS.
GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK
FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING
OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
HIGHLIGHTED IN GREEN.

BASIN :	MILWAUKEE RIVER
SUBBASIN:	MEQUON - MQ EXISTING
SCENARIO:	This file contains a new subbasin numbered 29101 whose area is comprised of 30% of 29100.
NOTES:	This subbasin is not in the water quality model or the digitized subbasin map.

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	20110	MQE0000L	1741	116	14.2	.0100	.020	.232	.10	.27	6.13	0.17	.00077520
2	H1	1	20120	MQQ4478	1487	150	12.3	.0194	.020	.233	.10	.27	5.55	0.09	.00083000
3	H1	1	20130	MQE3848	2938	101	85.3	.0043	.020	.273	.10	.43	10.36	0.79	.00061080
4	H1	1	20140	MQE4568	3830	299	8.2	.0215	.020	.244	.10	.32	5.62	0.09	.00083000
*5	H1	1	20210	0	######	619	28.3	#DIV/0!	.020	.251	.10	.34	5.93	0.15	.00078890
*6	H1	1	20220	0	837.2	27	11.0	.0157	.020	.227	.10	.23	5.39	0.09	.00083000
7	H1	1	20300	MQY0000L	1984	132	7.9	.0202	.020	.241	.10	.32	5.90	0.12	.00081630
8	H1	1	20310	MQY2936	1455	82	13.0	.0338	.020	.226	.10	.24	5.41	0.09	.00083000
9	H1	1	20315	MQY0000L	919.8	34	15.1	.0122	.020	.235	.10	.29	5.64	0.09	.00083000
*10	H1	1	20410	0	1082	41	9.0	.0264	.020	.240	.10	.29	5.47	0.09	.00083000
11	H1	1	20430	MQY2936	440.9	11	31.7	.0101	.020	.224	.10	.23	5.31	0.09	.00083000
*12	H1	1	20440	0	708	12	19.9	.0115	.020	.227	.10	.23	5.39	0.09	.00083000
13	H1	1	20450	MQM3001	1544	146	18.4	.0149	.020	.230	.10	.25	5.40	0.09	.00083000
14	H1	1	20455	MQP2452	2681	236	19.9	.0092	.020	.225	.10	.23	5.39	0.09	.00083000
15	H1	1	20460	MQN1690	900.9	48	13.0	.0153	.020	.226	.10	.24	5.41	0.09	.00083000
16	H1	1	20465	MQN0000	1040	61	13.0	.0159	.020	.226	.10	.24	5.41	0.09	.00083000
17	H1	1	21010	MQA0000	1025	84	16.4	.0038	.020	.237	.10	.28	7.07	0.29	.00072960
18	H1	1	21020	MQB2000	2614	181	27.2	.0035	.020	.239	.10	.30	6.51	0.22	.00080040
19	H1	1	21030	MQB4062	1619	103	13.0	.0044	.020	.226	.10	.24	7.17	0.31	.00069990
20	H1	1	21040	MQC4094	2730	555	41.9	.0063	.020	.228	.10	.29	5.70	0.10	.00083000
21	H1	1	21050	MQC13509	3425	325	9.0	.0149	.020	.239	.10	.29	5.93	0.13	.00080260
22	H1	1	21055	MQD1350	1313	110	27.0	.0279	.020	.228	.10	.25	5.56	0.11	.00081630
23	H1	1	21060	MQA9065	3096	553	3.0	.0051	.020	.241	.10	.29	6.26	0.17	.00077520
24	H1	1	21070	MQK2010	3215	399	10.9	.0130	.020	.239	.10	.29	5.71	0.10	.00083000
25	H1	1	21080	MQA5765	2356	97	5.0	.0219	.020	.235	.10	.27	6.18	0.17	.00077520
26	H1	1	21090	MQA13359	4182	211	2.4	.0287	.020	.239	.10	.29	6.29	0.17	.00077520
27	H1	1	22110	MQL3000	2127	153	18.3	.0042	.020	.226	.10	.23	7.24	0.33	.00068620
28	H1	1	22120	MQL3034	1706	212	47.0	.0081	.020	.229	.10	.27	5.60	0.13	.00082090
*29	H1	1	22200	0	1166	164	46.5	.0060	.020	.233	.10	.28	6.13	0.20	.00077520
*30	H1	1	22201	0	1989	111	13.0	.0124	.020	.226	.10	.24	5.41	0.09	.00083000
*31	H1	1	22209	0	######	52	18.4	#DIV/0!	.020	.238	.10	.28	6.55	0.24	.00072040
32	H1	1	22210	MQR0615	1016	49	23.2	.0065	.020	.228	.10	.26	7.34	0.32	.00073420
33	H1	1	22223	MRQ3600	2342	296	31.7	.0121	.020	.234	.10	.28	5.90	0.15	.00078890
*34	H1	1	22224	0	######	82	17.9	#DIV/0!	.020	.226	.10	.23	5.51	0.10	.00083230
35	H1	1	22225	MQR6048	3163	231	9.5	.0228	.020	.229	.10	.24	5.59	0.11	.00081630
36	H1	1	22250	MQS1950	1192	60	31.7	.0192	.020	.224	.10	.23	5.45	0.11	.00081630
37	H1	1	22260	MQS3300	872.9	80	19.9	.0102	.020	.227	.10	.23	5.66	0.12	.00081860
38	H1	1	22265	MQS1950	1074	28	11.0	.0140	.020	.227	.10	.23	5.53	0.10	.00083230
39	H1	1	22268	MQS1950	1124	31	11.0	.0163	.020	.227	.10	.23	5.39	0.09	.00083000
40	H1	1	22300	MQT1600	1611	73	11.1	.0107	.020	.236	.10	.30	6.47	0.19	.00081180
41	H1	1	22302	MA1785	888.9	16	10.2	.0190	.020	.231	.10	.27	5.49	0.09	.00083000
42	H1	1	22303	MA0395	710.2	22	10.2	.0137	.020	.231	.10	.27	5.49	0.09	.00083000
*43	H1	1	22304	0	792.7	15	11.0	.0140	.020	.227	.10	.23	6.74	0.27	.00069300
44	H1	1	22305	MQT1400	685.3	26	7.9	.0063	.020	.241	.10	.32	8.63	0.48	.00055600
45	H1	1	22310	MQT6180	1786	123	24.3	.0145	.020	.229	.10	.25	5.37	0.09	.00083000
46	H1	1	22312	MQRR552	1915	37	23.2	.0437	.020	.228	.10	.26	5.44	0.09	.00083000
47	H1	1	22313	MQT3448	1962	154	5.4	.0150	.020	.237	.10	.30	5.65	0.09	.00083000
*48	H1	1	22314	0	734.8	10	3.0	.0510	.020	.241	.10	.32	5.75	0.10	.00083000
49	H1	1	22315	MQU2845	2409	161	9.8	.0182	.020	.232	.10	.27	5.56	0.09	.00083000
50	H1	1	22316	MQTT724	1689	21	4.6	.0117	.020	.238	.10	.30	5.69	0.07	.00092600
51	H1	1	22317	MQ02548	49.26	6	3.0	.0028	.020	.241	.10	.32	5.75	0.08	.00089400
52	H1	1	22318	MA1971	74.62	12	7.0	.0011	.020	.234	.10	.28	5.58	0.09	.00083000

53	H1	1	22320	MQU0200	692.6	13	4.5	.0038	.020	.274	.10	.43	7.07	0.28	.00069300
*54	H1	1	22350	0	4572	945	25.2	.0104	.020	.259	.10	.37	6.97	0.29	.00072040
55	H1	1	22400	MQV10084	1362	46	1.5	.0134	.020	.242	.10	.30	5.74	0.08	.00087800
56	H1	1	22410	MQV0066	3917	595	9.0	.0099	.020	.247	.10	.32	5.65	0.09	.00083000
57	H1	1	22505	MQW0550	682.5	21	5.0	.0200	.020	.245	.10	.31	6.18	0.17	.00077520
58	H1	1	22510	MQW1700	3269	53	1.0	.0190	.020	.241	.10	.29	5.76	0.10	.00083000
59	H1	1	22520	MQW4650	1593	173	1.0	.0162	.020	.243	.10	.30	5.76	0.10	.00083000
60	H1	1	22600	MQZ0000L	1283	54	1.0	.0305	.020	.241	.10	.29	5.76	0.10	.00083000
*61	H1	1	22602	0	3994	518	20.6	.0042	.020	.257	.10	.36	6.82	0.27	.00074780
*62	H1	1	22605	0	2708	535	11.9	.0036	.020	.255	.10	.35	7.15	0.30	.00073410
*63	H1	1	22607	0	5237	517	17.4	.0163	.020	.244	.10	.31	6.84	0.26	.00074780
64	H1	1	22610	MQZ1042	2845	149	1.0	.0219	.020	.241	.10	.29	11.52	0.96	.00055600
65	H1	1	22620	MQZ1000	1700	62	1.0	.0150	.020	.241	.10	.29	5.76	0.10	.00083000
*66	H1	1	22630	0	1549	63	1.0	.0196	.020	.241	.10	.29	5.76	0.10	.00083000
67	H1	1	27000	MQG5540	575.8	15	1.0	.0168	.020	.241	.10	.29	5.76	0.10	.00083000
68	H1	1	27100	MQH1144	641.6	19	1.0	.0105	.020	.241	.10	.29	5.76	0.10	.00083000
*69	H1	1	27110	0	986.9	14	80.0	.0118	.020	.193	.10	.21	4.50	0.08	.00083000
*70	H1	1	27115	0	1346	13	80.0	.0540	.020	.193	.10	.21	4.50	0.08	.00083000
71	H1	1	27120	MQH1209	682.8	15	61.3	.0159	.020	.254	.10	.39	5.30	0.08	.00086200
72	H1	1	27125	MQH1736	580.5	26	61.3	.0090	.020	.254	.10	.39	5.30	0.09	.00083000
73	H1	1	27130	MQH2395	234.9	11	50.0	.0109	.020	.200	.10	.25	6.00	0.10	.00083000
74	H1	1	27140	MQH2828	2215	75	15.5	.0138	.020	.227	.10	.23	5.39	0.09	.00083000
75	H1	1	27150	MQH2828	305.3	11	30.5	.0034	.020	.217	.10	.24	5.61	0.09	.00083000
*76	H1	1	27200	0	957.9	24	11.0	.0141	.020	.227	.10	.23	5.39	0.09	.00083000
*77	H1	1	27250	0	2048	44	80.0	.0290	.020	.193	.10	.21	4.50	0.08	.00083000
78	H1	1	28000	MQI1490	1886	60	11.0	.0208	.020	.227	.10	.23	5.39	0.09	.00083000
79	H1	1	28100	MQJ0976	456.1	7	11.0	.0206	.020	.227	.10	.23	5.39	0.09	.00083000
80	H1	1	28150	MQI0045	2553	132	5.0	.0041	.020	.265	.10	.39	5.62	0.08	.00089400
81	H1	1	28200	MQJ0242	930.4	21	11.0	.0072	.020	.227	.10	.23	5.39	0.09	.00083000
82	H1	1	28300	MQI0045	536.4	9	13.0	.0193	.020	.226	.10	.24	5.41	0.09	.00083000
83	H1	1	28350	MQG7086	1158	36	11.0	.0137	.020	.258	.10	.36	5.58	0.09	.00083000
84	H1	1	28400	MQG8836	1116	43	20.6	.0057	.020	.266	.10	.42	5.82	0.08	.00089400
85	H1	1	28450	MC0000	2478	71	80.0	.0050	.020	.193	.10	.21	4.50	0.07	.00086200
86	H1	1	28475	MC0000	1945	84	37.4	.0107	.020	.241	.10	.31	5.37	0.08	.00087800
87	H1	1	28480	MC1252	965.3	38	19.6	.0083	.020	.270	.10	.42	5.60	0.09	.00083000
88	H1	1	28500	MQG5600	1178	43	75.1	.0046	.020	.231	.10	.32	5.00	0.07	.00091000
89	H1	1	28550	MQG1000	3009	311	31.0	.0032	.020	.226	.10	.24	5.41	0.08	.00086200
90	H1	1	28575	MQG5540	854.4	17	4.0	.0140	.020	.271	.10	.41	5.66	0.08	.00091000
91	H1	1	28600	MQG10686	2353	335	10.0	.0061	.020	.234	.10	.26	5.43	0.09	.00083000
92	H1	1	29000	MQF1850	1333	112	11.0	.0076	.020	.227	.10	.23	5.39	0.09	.00083000
93	H1	1	29100	MQF4803	3382	349	17.4	.0120	.020	.234	.10	.28	5.57	0.09	.00083000
94	H1	1	29101	MQX0700L	1449	150	17.4	.0120	.020	.234	.10	.28	5.57	0.09	.00083000
95	H1	1	29150	MQG12886	2857	197	22.9	.0093	.020	.227	.10	.25	5.33	0.09	.00084600

MQ Future

SHEET B : CREATED: 03/01/91 EDITED: #REF!

This spreadsheet computes weighted land use parameters for input to CDM RUNOFF given land use percentages by hydrologic unit. Check global land use categories and parameters as appropriate.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: MEQUON - MQ FUTURE

SCENARIO : This file contains a new subbasin numbered 29101 whose area is comprised of 30% of 29100.

NOTES: This subbasin is not in the water quality model or the digitized subbasin map.

#	GLOBAL LAND USE CATEGORIES
1	FOREST, PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

GLOBAL LAND USE PARAMETERS

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

(FUTURE) PERCENT BY LAND USE CATEGORY

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	20110	0	0	40	50	0	0	0	0	5	5	100.0	79.7	6.1	14.2	100.0	.020	.232	.10	.27
2	20120	0	0	40	55	0	0	0	0	0	5	100.0	81.2	6.6	12.3	100.0	.020	.233	.10	.27
3	20130	10	0	5	0	0	0	0	0	0	85	100.0	14.2	0.6	85.3	100.0	.020	.273	.10	.43
4	20140	20	0	35	40	0	0	0	0	5	0	100.0	86.1	5.8	8.2	100.0	.020	.244	.10	.32
5	20210	30	0	0	45	0	0	10	0	0	15	100.0	66.0	5.8	28.3	100.0	.020	.251	.10	.34
6	20220	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
7	20300	0	0	95	0	0	0	0	0	0	5	100.0	88.4	3.8	7.9	100.0	.020	.241	.10	.32
8	20310	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
9	20315	0	0	60	25	0	0	10	0	5	0	100.0	79.8	5.2	15.1	100.0	.020	.235	.10	.29
10	20410	20	0	0	80	0	0	0	0	0	0	100.0	83.0	8.0	9.0	100.0	.020	.240	.10	.29
11	20430	0	0	0	70	0	0	30	0	0	0	100.0	60.5	7.8	31.7	100.0	.020	.224	.10	.23
12	20440	0	0	0	90	0	0	0	0	0	10	100.0	72.0	8.1	19.9	100.0	.020	.227	.10	.23
13	20450	5	0	0	85	0	0	5	0	0	5	100.0	73.5	8.1	18.4	100.0	.020	.230	.10	.25
14	20455	0	0	0	85	0	0	10	0	5	0	100.0	72.0	8.2	19.9	100.0	.020	.225	.10	.23
15	20460	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
16	20465	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
17	21010	15	0	0	75	0	0	10	0	0	0	100.0	75.8	7.9	16.4	100.0	.020	.237	.10	.28
18	21020	20	0	0	45	0	0	0	30	5	0	100.0	65.9	7.0	27.2	100.0	.020	.239	.10	.30
19	21030	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
20	21040	5	0	0	30	0	0	30	0	35	0	100.0	50.8	4.4	44.9	100.0	.020	.220	.10	.26

21	21050	5	60	0	30	0	0	0	0	0	5	100.0	85.8	5.3	9.0	100.0	.020	.239	.10	.29
22	21055	0	20	0	50	0	0	0	25	0	5	100.0	66.0	7.1	27.0	100.0	.020	.228	.10	.25
23	21060	10	0	0	40	50	0	0	0	0	0	100.0	79.0	9.0	12.0	100.0	.020	.232	.10	.26
24	21070	0	80	0	10	0	0	5	0	0	5	100.0	84.8	4.4	10.9	100.0	.020	.239	.10	.29
25	21080	0	60	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.235	.10	.27
26	21090	0	90	0	0	10	0	0	0	0	0	100.0	93.0	4.6	2.4	100.0	.020	.239	.10	.29
27	22110	0	0	0	80	10	0	10	0	0	0	100.0	73.0	8.7	18.3	100.0	.020	.226	.10	.23
28	22120	10	0	0	10	20	0	25	35	0	0	100.0	46.1	7.0	47.0	100.0	.020	.229	.10	.27
29	22200	10	0	0	40	0	0	40	0	0	10	100.0	47.5	6.0	46.5	100.0	.020	.233	.10	.28
30	22201	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
31	22209	15	0	0	75	0	0	0	0	0	10	100.0	74.3	7.4	18.4	100.0	.020	.238	.10	.28
32	22210	0	0	20	60	0	0	20	0	0	0	100.0	69.6	7.2	23.2	100.0	.020	.228	.10	.26
33	22223	5	0	0	45	15	0	35	0	0	0	100.0	57.3	7.5	35.3	100.0	.020	.227	.10	.25
34	22224	0	0	0	90	0	0	10	0	0	0	100.0	73.5	8.6	17.9	100.0	.020	.226	.10	.23
35	22225	0	15	0	85	0	0	0	0	0	0	100.0	82.3	8.3	9.5	100.0	.020	.229	.10	.24
36	22250	0	0	0	70	0	0	30	0	0	0	100.0	60.5	7.8	31.7	100.0	.020	.224	.10	.23
37	22260	0	0	0	90	0	0	0	0	0	10	100.0	72.0	8.1	19.9	100.0	.020	.227	.10	.23
38	22265	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
39	22268	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
40	22300	0	0	65	10	20	0	0	0	0	5	100.0	83.5	5.5	11.1	100.0	.020	.236	.10	.30
41	22302	0	0	40	0	60	0	0	0	0	0	100.0	82.2	7.6	10.2	100.0	.020	.231	.10	.27
42	22303	0	0	40	0	60	0	0	0	0	0	100.0	82.2	7.6	10.2	100.0	.020	.231	.10	.27
43	22304	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
44	22305	0	0	95	0	0	0	0	0	0	5	100.0	88.4	3.8	7.9	100.0	.020	.241	.10	.32
45	22310	5	0	0	75	0	0	20	0	0	0	100.0	67.8	8.0	24.3	100.0	.020	.229	.10	.25
46	22312	0	0	20	60	0	0	20	0	0	0	100.0	69.6	7.2	23.2	100.0	.020	.228	.10	.26
47	22313	0	0	70	30	0	0	0	0	0	0	100.0	89.1	5.5	5.4	100.0	.020	.237	.10	.30
48	22314	0	0	100	0	0	0	0	0	0	0	100.0	93.0	4.0	3.0	100.0	.020	.241	.10	.32
49	22315	0	0	40	55	0	0	0	0	5	0	100.0	83.7	6.6	9.8	100.0	.020	.232	.10	.27
50	22316	0	0	80	20	0	0	0	0	0	0	100.0	90.4	5.0	4.6	100.0	.020	.238	.10	.30
51	22317	0	0	100	0	0	0	0	0	0	0	100.0	93.0	4.0	3.0	100.0	.020	.241	.10	.32
52	22318	0	0	50	50	0	0	0	0	0	0	100.0	86.5	6.5	7.0	100.0	.020	.234	.10	.28
53	22320	75	0	0	0	25	0	0	0	0	0	100.0	90.0	5.5	4.5	100.0	.020	.274	.10	.43
54	22350	40	0	0	30	10	0	0	0	0	20	100.0	69.5	5.3	25.2	100.0	.020	.259	.10	.37
55	22400	5	90	0	5	0	0	0	0	0	0	100.0	94.3	4.3	1.5	100.0	.020	.242	.10	.30
56	22410	20	30	0	45	0	0	0	0	0	5	100.0	83.5	6.1	10.5	100.0	.020	.245	.10	.31
57	22505	20	40	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.245	.10	.31
58	22510	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
59	22520	5	95	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.243	.10	.30
60	22600	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
61	22602	40	0	0	40	5	0	0	0	0	15	100.0	73.8	5.7	20.6	100.0	.020	.257	.10	.36
62	22605	30	50	0	10	0	0	0	0	0	10	100.0	84.0	4.1	11.9	100.0	.020	.255	.10	.35
63	22607	10	60	0	15	0	0	0	0	0	15	100.0	78.5	4.2	17.4	100.0	.020	.244	.10	.31
64	22610	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
65	22620	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
66	22630	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
67	27000	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
68	27100	0	0	0	40	0	0	60	0	0	0	100.0	41.0	6.6	52.4	100.0	.020	.218	.10	.23
69	27110	0	0	0	0	0	0	100	0	0	0	100.0	15.0	5.0	80.0	100.0	.020	.193	.10	.21
70	27115	0	0	0	0	0	0	100	0	0	0	100.0	15.0	5.0	80.0	100.0	.020	.193	.10	.21
71	27120	25	0	0	0	0	0	70	0	0	5	100.0	34.3	4.5	61.3	100.0	.020	.254	.10	.39
72	27125	25	0	0	0	0	0	70	0	0	5	100.0	34.3	4.5	61.3	100.0	.020	.254	.10	.39
73	27130	0	0	0	0	0	0	0	0	100	0	100.0	50.0	0.0	50.0	100.0	.020	.200	.10	.25
74	27140	0	0	0	95	0	0	0	0	0	5	100.0	76.0	8.6	15.5	100.0	.020	.227	.10	.23
75	27150	0	0	0	50	0	0	0	0	50	0	100.0	65.0	4.5	30.5	100.0	.020	.217	.10	.24
76	27200	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
77	27250	0	0	0	0	0	0	100	0	0	0	100.0	15.0	5.0	80.0	100.0	.020	.193	.10	.21
78	28000	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
79	28100	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
80	28150	60	0	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.265	.10	.39
81	28200	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
82	28300	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
83	28350	45	0	0	50	0	0	0	0	0	5	100.0	82.8	6.3	11.0	100.0	.020	.258	.10	.36
84	28400	60	0	0	0	0	0	0	0	40	0	100.0	77.0	2.4	20.6	100.0	.020	.266	.10	.42
85	28450	0	0	0	0	0	0	100	0	0	0	100.0	15.0	5.0	80.0	100.0	.020	.193	.10	.21
86	28475	20	0	0	20	20	0	40	0	0	0	100.0	56.0	6.6	37.4	100.0	.020	.241	.10	.31
87	28480	60	0	0	0	20	0	20	0	0	0	100.0	75.0	5.4	19.6	100.0	.020	.270	.10	.42
88	28500	10	0	0	0	0	0	75	0	0	15	100.0	20.8	4.2	75.1	100.0	.020	.231	.10	.32
89	28550	0	0	0	70	5	0	0	0	5	20	100.0	62.3	6.8	31.0	100.0	.020	.226	.10	.24
90	28575	70	0	0	30	0	0	0	0	0	0	100.0	90.5	5.5	4.0	100.0	.020	.271	.10	.41
91	28600	10	0	0	90	0	0	0	0	0	0	100.0	81.5	8.5	10.0	100.0	.020	.234	.10	.26
92	29000	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
93	29100	0	0	50	35	0	0	15	0	0	0	100.0	76.8	5.9	17.4	100.0	.020	.234	.10	.28
94	29101	0	0	50	35	0	0	15	0	0	0	100.0	76.8	5.9	17.4	100.0	.020	.234	.10	.28

95	29150	5	0	0	50	20	10	15	0	0	0	100.0	68.5	8.7	22.9	100.0	.020	.227	.10	.25

SHEET C : CREATED: 03/01/90 EDITED: #REF!

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: MEQUON - MQ FUTURE

SCENARIO : This file contains a new subbasin numbered 29101 whose area is comprised of 30% (

NOTES: This subbasin is not in the water quality model or the digitized subbasin map.

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	20110	0	20	80	0	100.0
2	20120	0	0	100	0	100.0
3	20130	80	0	20	0	100.0
4	20140	0	0	100	0	100.0
5	20210	0	15	85	0	100.0
6	20220	0	0	100	0	100.0
7	20300	0	5	95	0	100.0
8	20310	0	0	100	0	100.0
9	20315	0	0	100	0	100.0
10	20410	0	0	100	0	100.0
11	20430	0	0	100	0	100.0
12	20440	0	0	100	0	100.0
13	20450	0	0	100	0	100.0
14	20455	0	0	100	0	100.0
15	20460	0	0	100	0	100.0
16	20465	0	0	100	0	100.0
17	21010	0	60	20	20	100.0
18	21020	0	40	35	25	100.0
19	21030	0	65	20	15	100.0
20	21040	0	0	100	0	100.0
21	21050	0	10	90	0	100.0
22	21055	0	5	95	0	100.0
23	21060	0	20	80	0	100.0
24	21070	0	0	100		100.0
25	21080	0	20	80	0	100.0
26	21090	0	20	80	0	100.0
27	22110	0	70	15	15	100.0
28	22120	0	15	75	10	100.0
29	22200	10	10	80	0	100.0
30	22201	0	0	100	0	100.0
31	22209	0	40	60	0	100.0
32	22210	0	70	0	30	100.0
33	22223	0	15	85	0	100.0
34	22224	0	5	90	5	100.0
35	22225	0	5	95	0	100.0
36	22250	0	5	95	0	100.0
37	22260	0	10	85	5	100.0
38	22265	0	5	90	5	100.0
39	22268	0	0	100	0	100.0
40	22300	0	30	50	20	100.0
41	22302	0	0	100	0	100.0
42	22303	0	0	100	0	100.0
43	22304	0	50	50	0	100.0
44	22305	0	100	0	0	100.0
45	22310	0	0	100	0	100.0
46	22312	0	0	100	0	100.0
47	22313	0	0	100	0	100.0
48	22314	0	0	100	0	100.0
49	22315	0	0	100	0	100.0
50	22316	0	0	70	30	100.0
51	22317	0	0	80	20	100.0
52	22318	0	0	100	0	100.0
53	22320	0	50	50	0	100.0
54	22350	10	30	60	0	100.0
55	22400	0	0	85	15	100.0
56	22410	0	0	100	0	100.0
57	22505	0	20	80	0	100.0
58	22510	0	0	100	0	100.0
59	22520	0	0	100	0	100.0
60	22600	0	0	100	0	100.0
61	22602	15	15	70	0	100.0
62	22605	15	20	65	0	100.0
63	22607	10	20	70	0	100.0
64	22610	100	0	0	0	100.0
65	22620	0	0	100	0	100.0
66	22630	0	0	100	0	100.0
67	27000	0	0	100	0	100.0
68	27100	0	0	100	0	100.0
69	27110	0	0	100	0	100.0
70	27115	0	0	100	0	100.0
71	27120	0	0	90	10	100.0
72	27125	0	0	100	0	100.0
73	27130	0	0	100	0	100.0
74	27140	0	0	100	0	100.0
75	27150	0	0	100	0	100.0
76	27200	0	0	100	0	100.0
77	27250	0	0	100	0	100.0
78	28000	0	0	100	0	100.0
79	28100	0	0	100	0	100.0
80	28150	0	0	80	20	100.0
81	28200	0	0	100	0	100.0
82	28300	0	0	100	0	100.0
83	28350	0	0	100	0	100.0
84	28400	0	0	80	20	100.0
85	28450	0	0	90	10	100.0
86	28475	0	0	85	15	100.0
87	28480	0	0	100	0	100.0
88	28500	0	0	75	25	100.0
89	28550	0	0	90	10	100.0
90	28575	0	0	75	25	100.0
91	28600	0	0	100	0	100.0
92	29000	0	0	100	0	100.0
93	29100	0	0	100	0	100.0
94	29101	0	0	100	0	100.0
95	29150	0	0	95	5	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDM-RUNOFF. DON'T FORGET TO
CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS.
GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK
FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING
OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
ERS HIGHLIGHTED IN GREEN.

BASIN : MILWAUKEE RIVER

SUBBASIN: MEQUON - HQ FUTURE

SCENARIO: This file contains a new subbasin numbered 29101 whose area is comprised of 30% of 29100.

NOTES: This subbasin is not in the water quality model or the digitized subbasin map.

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	20110	HQE0000L	1740.837848	116	14.2	.0100	.020	.232	.10	.27	6.13	0.17	.00077520
2	H1	1	20120	HQQ4478	1487.4651	150	12.3	.0194	.020	.233	.10	.27	5.55	0.09	.00083000
3	H1	1	20130	HQE3848	2938.44144	101	85.3	.0043	.020	.273	.10	.43	10.36	0.79	.00061080
4	H1	1	20140	HQE4568	3830.025677	299	8.2	.0215	.020	.244	.10	.32	5.62	0.09	.00083000
*5	H1	1	20210	0	#DIV/0!	619	28.3	#DIV/0!	.020	.251	.10	.34	5.93	0.15	.00078890
*6	H1	1	20220	0	837.1609714	27	11.0	.0157	.020	.227	.10	.23	5.39	0.09	.00083000
7	H1	1	20300	HQY0000L	1984.298008	132	7.9	.0202	.020	.241	.10	.32	5.90	0.12	.00081630
8	H1	1	20310	HQY2936	1455.327484	82	13.0	.0338	.020	.226	.10	.24	5.41	0.09	.00083000
9	H1	1	20315	HQY0000L	919.7578117	34	15.1	.0122	.020	.235	.10	.29	5.64	0.09	.00083000
*10	H1	1	20410	0	1081.872	41	9.0	.0264	.020	.240	.10	.29	5.47	0.09	.00083000
11	H1	1	20430	HQY2936	440.8600755	11	31.7	.0101	.020	.224	.10	.23	5.31	0.09	.00083000
*12	H1	1	20440	0	708.0033803	12	19.9	.0115	.020	.227	.10	.23	5.39	0.09	.00083000
13	H1	1	20450	HQN3001	1543.767786	146	18.4	.0149	.020	.230	.10	.25	5.40	0.09	.00083000
14	H1	1	20455	HQP2452	2680.728146	236	19.9	.0092	.020	.225	.10	.23	5.39	0.09	.00083000
15	H1	1	20460	HQN1690	900.9254936	48	13.0	.0153	.020	.226	.10	.24	5.41	0.09	.00083000
16	H1	1	20465	HQN0000	1039.849228	61	13.0	.0159	.020	.226	.10	.24	5.41	0.09	.00083000
17	H1	1	21010	HQA0000	1024.968908	84	16.4	.0038	.020	.237	.10	.28	7.07	0.29	.00072960
18	H1	1	21020	HQB2000	2613.683832	181	27.2	.0035	.020	.239	.10	.30	6.51	0.22	.00080040
19	H1	1	21030	HQB4062	1618.726654	103	13.0	.0044	.020	.226	.10	.24	7.17	0.31	.00069990
20	H1	1	21040	HQC4094	2730.230285	555	44.9	.0063	.020	.220	.10	.26	5.52	0.09	.00083000
21	H1	1	21050	HQC13509	3424.556339	325	9.0	.0149	.020	.239	.10	.29	5.93	0.13	.00080260
22	H1	1	21055	HQD1350	1312.517695	110	27.0	.0279	.020	.228	.10	.25	5.56	0.11	.00081630
23	H1	1	21060	HQA9065	3095.80378	553	12.0	.0051	.020	.232	.10	.26	5.93	0.16	.00077520
24	H1	1	21070	HQK2010	3215.244152	399	10.9	.0130	.020	.239	.10	.29	5.71	0.10	.00083000
25	H1	1	21080	HQA5765	2355.678	97	5.0	.0219	.020	.235	.10	.27	6.18	0.17	.00077520
26	H1	1	21090	HQA13359	4181.801818	211	2.4	.0287	.020	.239	.10	.29	6.29	0.17	.00077520
27	H1	1	22110	HQL3000	2126.768757	153	18.3	.0042	.020	.226	.10	.23	7.24	0.33	.00068620
28	H1	1	22120	HQL3034	1706.238062	212	47.0	.0081	.020	.229	.10	.27	5.60	0.13	.00082090
*29	H1	1	22200	0	1166.046574	164	46.5	.0060	.020	.233	.10	.28	6.13	0.20	.00077520
*30	H1	1	22201	0	1989.055891	111	13.0	.0124	.020	.226	.10	.24	5.41	0.09	.00083000
*31	H1	1	22209	0	#DIV/0!	52	18.4	#DIV/0!	.020	.238	.10	.28	6.55	0.24	.00072040
32	H1	1	22210	HQR0618	1015.568682	49	23.2	.0065	.020	.228	.10	.26	7.34	0.32	.00073420
33	H1	1	22223	HRQ3600	2342.102061	296	35.3	.0121	.020	.227	.10	.25	5.70	0.14	.00078890
*34	H1	1	22224	0	#DIV/0!	82	17.9	#DIV/0!	.020	.226	.10	.23	5.51	0.10	.00083230
35	H1	1	22225	HQR6048	3163.062951	231	9.5	.0228	.020	.229	.10	.24	5.59	0.11	.00081630
36	H1	1	22250	HQS1950	1192.158	60	31.7	.0192	.020	.224	.10	.23	5.45	0.11	.00081630
37	H1	1	22260	HQS3300	872.98973	80	19.9	.0102	.020	.227	.10	.23	5.66	0.12	.00081860
38	H1	1	22265	HQS1950	1074.337393	28	11.0	.0140	.020	.227	.10	.23	5.53	0.10	.00083230
39	H1	1	22268	HQS1950	1123.572814	31	11.0	.0163	.020	.227	.10	.23	5.39	0.09	.00083000
40	H1	1	22300	HQT1600	1610.62518	73	11.1	.0107	.020	.236	.10	.30	6.47	0.19	.00081160
41	H1	1	22302	HA1785	888.9105789	16	10.2	.0190	.020	.231	.10	.27	5.49	0.09	.00083000
42	H1	1	22303	HA0395	710.1869781	22	10.2	.0137	.020	.231	.10	.27	5.49	0.09	.00083000
*43	H1	1	22304	0	792.7401429	15	11.0	.0140	.020	.227	.10	.23	6.74	0.27	.00069300
44	H1	1	22305	HQT1400	605.2997317	26	7.9	.0063	.020	.241	.10	.32	8.63	0.48	.00055600
45	H1	1	22310	HQT6100	1785.64056	123	24.3	.0145	.020	.229	.10	.25	5.37	0.09	.00083000
46	H1	1	22312	HQRR552	1915.188	37	23.2	.0437	.020	.228	.10	.26	5.44	0.09	.00083000
47	H1	1	22313	HQT3448	1962.243871	154	5.4	.0150	.020	.237	.10	.30	5.65	0.09	.00083000
*48	H1	1	22314	0	734.7588387	10	3.0	.0510	.020	.241	.10	.32	5.75	0.10	.00083000
49	H1	1	22315	HQU2845	2408.897836	161	9.8	.0182	.020	.232	.10	.27	5.56	0.09	.00083000
50	H1	1	22316	HQTT724	1688.756667	21	4.6	.0117	.020	.238	.10	.30	5.69	0.07	.00092600
51	H1	1	22317	HQO2548	49.25696471	6	3.0	.0028	.020	.241	.10	.32	5.75	0.08	.00089400
52	H1	1	22318	HA1971	74.62450286	12	7.0	.0011	.020	.234	.10	.28	5.58	0.09	.00083000
53	H1	1	22320	HQU8200	692.604	13	4.5	.0038	.020	.274	.10	.43	7.07	0.28	.00069300
*54	H1	1	22350	0	4571.9608	945	25.2	.0104	.020	.259	.10	.37	6.97	0.29	.00072040
55	H1	1	22400	HQV10084	1361.918735	46	1.5	.0134	.020	.242	.10	.30	5.74	0.08	.00087800
56	H1	1	22410	HQV0066	3916.754647	595	10.5	.0099	.020	.245	.10	.31	5.59	0.09	.00083000
57	H1	1	22505	HQW0550	682.5467647	21	5.0	.0200	.020	.245	.10	.31	6.18	0.17	.00077520
58	H1	1	22510	HQW1700	3269.454085	53	1.0	.0190	.020	.241	.10	.29	5.76	0.10	.00083000
59	H1	1	22520	HQW4650	1592.616356	173	1.0	.0162	.020	.243	.10	.30	5.76	0.10	.00083000
60	H1	1	22600	HQZ0000L	1282.996721	54	1.0	.0305	.020	.241	.10	.29	5.76	0.10	.00083000
*61	H1	1	22602	0	3993.796673	518	20.6	.0042	.020	.257	.10	.36	6.82	0.27	.00074780
*62	H1	1	22605	0	2707.811163	535	11.9	.0036	.020	.255	.10	.35	7.15	0.30	.00073410
*63	H1	1	22607	0	5237.22893	517	17.4	.0163	.020	.244	.10	.31	6.84	0.26	.00074780
64	H1	1	22610	HQZ1042	2844.773604	149	1.0	.0219	.020	.241	.10	.29	11.52	0.96	.00055600
65	H1	1	22620	HQZ1000	1699.929	62	1.0	.0150	.020	.241	.10	.29	5.76	0.10	.00083000
*66	H1	1	22630	0	1549.1025	63	1.0	.0196	.020	.241	.10	.29	5.76	0.10	.00083000
67	H1	1	27000	HQG5540	575.7944211	15	11.0	.0168	.020	.227	.10	.23	5.39	0.09	.00083000
68	H1	1	27100	HQH1144	641.6111429	19	52.4	.0105	.020	.218	.10	.23	5.17	0.09	.00083000
*69	H1	1	27110	0	986.8518	14	80.0	.0118	.020	.193	.10	.21	4.50	0.08	.00083000
*70	H1	1	27115	0	1345.900206	13	80.0	.0540	.020	.193	.10	.21	4.50	0.08	.00083000
71	H1	1	27120	HQH1209	682.848375	15	61.3	.0159	.020	.254	.10	.39	5.30	0.08	.00086200
72	H1	1	27125	HQH1736	580.5050625	26	61.3	.0090	.020	.254	.10	.39	5.30	0.09	.00083000
73	H1	1	27130	HQH2395	234.938	11	50.0	.0109	.020	.200	.10	.25	6.00	0.10	.00083000
74	H1	1	27140	HQH2828	2214.714857	75	15.5	.0138	.020	.227	.10	.23	5.39	0.09	.00083000
75	H1	1	27150	HQH2828	305.273925	11	30.5	.0034	.020	.217	.10	.24	5.61	0.09	.00083000
*76	H1	1	27200	0	957.924	24	11.0	.0141	.020	.227	.10	.23	5.39	0.09	.00083000
*77	H1	1	27250	0	2047.783404	44	80.0	.0290	.020	.193	.10	.21	4.50	0.08	.00083000
78	H1	1	28000	HQI1490	1886.336029	60	11.0	.0208	.020	.227	.10	.23	5.39	0.09	.00083000
79	H1	1	28100	HQJ0976	456.0988235	7	11.0	.0206	.020	.227	.10	.23	5.39	0.09	.00083000
80	H1	1	28150	HQI0045	2553.2936	132	5.0	.0041	.020	.265	.10	.39	5.62	0.08	.00089400
81	H1	1	28200	HQJ0242	930.39804	21	11.0	.0072	.020	.227	.10	.23	5.39	0.09	.00083000
82	H1	1	28300	HQI0045	536.4102857	9	13.0	.0193	.020	.226	.10	.24	5.41	0.09	.00083000
83	H1	1	28350	HQO7086	1157.927294	36	11.0	.0137	.020	.258	.10	.36	5.58	0.09	.00083000
84	H1	1	28400	HQO8836	1115.806154	43	20.6	.0057	.020	.266	.10	.42	5.82	0.08	.00089400
85	H1	1	28450	HC0000	2478.247839	71	80.0	.0050	.020	.193	.10	.21	4.50	0.07	.00086200
86	H1	1	28475	HC0000	1945.221882	84	37.4	.0107	.020	.241	.10	.31	6.37	0.08	.00087800
87	H1	1	28480	HC1252	965.3098605	38	19.6	.0083	.020	.270	.10	.42	5.60	0.09	.00083000

88	H1	1	28500	HQ05600	1177.508475	43	25.1	.0046	.020	.231	.10	.32	5.00	0.07	.00091000
89	H1	1	28550	HQ01000	3008.66016	311	31.0	.0032	.020	.226	.10	.24	5.41	0.08	.00086200
90	H1	1	28575	HQ05540	854.383814	37	4.0	.0140	.020	.271	.10	.41	5.66	0.08	.00091000
91	H1	1	28600	HQG10686	2352.921503	335	10.0	.0061	.020	.234	.10	.26	5.43	0.09	.00083000
92	H1	1	29000	HQF1850	1332.758204	112	11.0	.0076	.020	.227	.10	.23	5.39	0.09	.00083000
93	H1	1	29100	HQF4803	3301.5144	349	17.4	.0120	.020	.234	.10	.28	5.57	0.09	.00083000
94	H1	1	29101	HQX0700L	1449.1928	150	17.4	.0120	.020	.234	.10	.28	5.57	0.09	.00083000
95	H1	1	29150	HQG12886	2657.0278	197	22.9	.0093	.020	.227	.10	.25	5.33	0.09	.00084600

PG Existing

SHEET B : CREATED: 03/01/91 EDITED: 12/08/94

This spreadsheet computes weighted land use parameters for input to CDM RUNOFF given land use percentages by hydrologic unit. Check global land use categories and parameters as appropriate.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: PIGEON CREEK - PG EXISTING

SCENARIO :

NOTES:

#	GLOBAL LAND USE CATEGORIES
1	FOREST, PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

<------------------------- GLOBAL LAND USE PARAMETERS ------------------------->

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

<------------------------- PERCENT BY LAND USE CATEGORY ------------------------->

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	30010	0	0	30	0	70	0	0	0	0	0	100.0	80.4	8.2	11.4	100.0	.020	.229	.10	.26
2	30015	0	0	40	60	0	0	0	0	0	0	100.0	85.2	7.0	7.8	100.0	.020	.233	.10	.27
3	30020	0	0	0	35	0	15	25	0	0	25	100.0	41.5	6.2	52.3	100.0	.020	.220	.10	.23
	30021	0	0	0	35	0	15	25	0	0	25	100.0	41.5	6.2	52.3	100.0	.020	.220	.10	.23
4	30030	50	0	0	0	0	0	50	0	0	0	100.0	55.0	4.5	40.5	100.0	.020	.273	.10	.44
5	30032	100	0	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
6	30034	100	0	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
7	30040	100	0	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
8	30045	25	55	0	0	0	0	0	5	0	15	100.0	77.4	3.6	19.1	100.0	.020	.255	.10	.35
9	30046	100	0	0		0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
10	30047	0	0	0	0	0	70	0	0	0	30	100.0	45.5	8.4	46.1	100.0	.020	.214	.10	.23
11	30048	85	0	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.280	.10	.45
12	30050	30	60	0	0	0	0	5	0	0	5	100.0	86.3	3.9	9.9	100.0	.020	.256	.10	.35
13	30060	40	60	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.260	.10	.37
14	30070	10	90	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.246	.10	.31
15	30072	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
16	30075	65	20	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.270	.10	.41
17	30077	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
18	30079	35	30	0	35	0	0	0	0	0	0	100.0	89.8	5.8	4.5	100.0	.020	.254	.10	.34
19	30100	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23

20	30110	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
21	30220	0	0	0	30	0	0	70	0	0	0	100.0	34.5	6.2	59.3	100.0	.020	.215	.10	.23
22	30225	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
23	30230	5	15	0	80	0	0	0	0	0	0	100.0	83.0	8.0	9.0	100.0	.020	.232	.10	.26
24	30240	0	0	50	45	0	0	5	0	0	0	100.0	83.3	6.3	10.5	100.0	.020	.234	.10	.28
25	30300	10	40	0	50	0	0	0	0	0	0	100.0	87.5	6.5	6.0	100.0	.020	.239	.10	.29
26	30305	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
27	30420	25	0	65	5	0	0	0	5	0	0	100.0	89.6	4.4	6.0	100.0	.020	.252	.10	.36
28	30430	25	55	0	0	0	0	0	0	0	20	100.0	76.0	3.2	20.8	100.0	.020	.256	.10	.35
29	30440	20	30	0	20	0	0	30	0	0	0	100.0	68.0	5.3	26.7	100.0	.020	.246	.10	.32
30	30450	30	30	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.250	.10	.33
31	30460	15	60	0	15	0	0	10	0	0	0	100.0	84.8	4.9	10.4	100.0	.020	.246	.10	.31
32	30470	10	65	0	20	0	0	5	0	0	0	100.0	88.0	5.1	7.0	100.0	.020	.243	.10	.30
33	30480	90	0	0	0	0	0	0	0	0	10	100.0	85.5	3.6	10.9	100.0	.020	.289	.10	.48
34	30485	100	0	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
35	30490	50	0	0	50	0	0	0	0	0	0	100.0	87.5	6.5	6.0	100.0	.020	.259	.10	.37
36	30510	50	20	30	0	0	0	0	0	0	0	100.0	94.4	4.0	1.6	100.0	.020	.265	.10	.40
37	30520	30	70	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.255	.10	.35
38	30530	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
39	30535	20	80	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.250	.10	.33
40	30540	5	95	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.243	.10	.30
41	30550	15	85	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.248	.10	.32
42	30560	20	50	0	30	0	0	0	0	0	0	100.0	90.5	5.5	4.0	100.0	.020	.247	.10	.32
43	30570	20	50	0	25	0	0	0	0	0	5	100.0	86.5	5.1	8.5	100.0	.020	.248	.10	.32
44	30580	20	80	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.250	.10	.33
45	30590	15	85	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.248	.10	.32
46	30600	0	0	0	90	0	0	0	0	0	10	100.0	72.0	8.1	19.9	100.0	.020	.227	.10	.23
47	30610	20	80	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.250	.10	.33
48	30615	30	25	0	45	0	0	0	0	0	0	100.0	88.3	6.3	5.5	100.0	.020	.250	.10	.33
49	30620	15	80	0	5	0	0	0	0	0	0	100.0	94.3	4.3	1.5	100.0	.020	.247	.10	.32
50	30625	0	85	0	0	0	0	15	0	0	0	100.0	83.0	4.2	12.9	100.0	.020	.239	.10	.29
51	30630	0	50	50	0	0	0	0	0	0	0	100.0	94.0	4.0	2.0	100.0	.020	.241	.10	.31
52	30635	15	85	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.248	.10	.32
53	30710	5	90	0	5	0	0	0	0	0	0	100.0	94.3	4.3	1.5	100.0	.020	.242	.10	.30
54	30720	10	85	0	0	0	0	0	0	0	5	100.0	90.3	3.8	6.0	100.0	.020	.246	.10	.31
55	30730	10	90	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.246	.10	.31
56	30740	5	40	0	55	0	0	0	0	0	0	100.0	86.8	6.8	6.5	100.0	.020	.236	.10	.27
57	30750	30	40	0	30	0	0	0	0	0	0	100.0	90.5	5.5	4.0	100.0	.020	.252	.10	.34
58	30755	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
59	30760	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
60	30765	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
61	30767	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
62	30770	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
63	30810	25	50	0	15	0	0	5	0	0	5	100.0	84.0	4.6	11.4	100.0	.020	.251	.10	.34
64	30815	15	40	0	25	15	0	0	0	0	5	100.0	83.5	6.0	10.6	100.0	.020	.243	.10	.30
65	30820	10	65	0	25	0	0	0	0	0	0	100.0	91.3	5.3	3.5	100.0	.020	.242	.10	.30
66	30825	15	35	0	25	25	0	0	0	0	0	100.0	86.3	6.8	7.0	100.0	.020	.241	.10	.30
67	30830	10	45	0	40	0	0	5	0	0	0	100.0	85.0	6.1	9.0	100.0	.020	.240	.10	.29
68	30835	0	85	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.239	.10	.28
69	30837	0	30	0	35	20	0	15	0	0	0	100.0	73.8	7.1	19.2	100.0	.020	.230	.10	.25
70	30840	30	70	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.255	.10	.35
71	30860	50	50	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.265	.10	.39
72	30865	5	90	0	0	0	0	0	0	0	5	100.0	90.3	3.8	6.0	100.0	.020	.243	.10	.30
73	30885	10	75	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.244	.10	.30

SHEET C : CREATED: 03/01/90 EDITED: 12/08/94

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: PIGEON CREEK - PG EXISTING

SCENARIO :

NOTES:

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	30010	0	40	60	0	100.0
2	30015	0	15	85	0	100.0
3	30020	45	10	40	5	100.0
	30021	45	10	40	5	100.0
4	30030	70	30	0	0	100.0
5	30032	100	0	0	0	100.0
6	30034	100	0	0	0	100.0
7	30040	40	50	0	10	100.0
8	30045	40	20	40	0	100.0
9	30046	0	50	50	0	100.0
10	30047	30	70	0	0	100.0
11	30048	10	50	40	0	100.0
12	30050	15	50	30	5	100.0
13	30060	0	0	100	0	100.0
14	30070	0	50	50	0	100.0
15	30072	0	0	100	0	100.0
16	30075	0	60	40	0	100.0
17	30077	0	25	75	0	100.0
18	30079	0	50	50	0	100.0
19	30100	0	60	40	0	100.0
20	30110	0	50	50	0	100.0
21	30220	0	20	80	0	100.0
22	30225	0	0	100	0	100.0
23	30230	0	15	85	0	100.0
24	30240	0	50	50	0	100.0
25	30300	0	25	75	0	100.0
26	30305	0	0	100	0	100.0
27	30420	5	15	80	0	100.0
28	30430	0	45	55	0	100.0
29	30440	10	50	40	0	100.0
30	30450	0	45	55	0	100.0
31	30460	0	30	70	0	100.0
32	30470	0	55	45	0	100.0
33	30480	0	10	90	0	100.0
34	30485	20	0	80	0	100.0
35	30490	0	70	0	30	100.0
36	30510	0	100	0	0	100.0
37	30520	0	80	20	0	100.0
38	30530	0	0	100	0	100.0
39	30535	0	50	50	0	100.0
40	30540	10	80	10	0	100.0
41	30550	0	55	20	25	100.0
42	30560	0	20	70	10	100.0
43	30570	0	45	55	0	100.0
44	30580	0	20	80	0	100.0
45	30590	0	25	75	0	100.0
46	30600	10	10	80	0	100.0
47	30610	0	75	20	5	100.0
48	30615	0	40	60	0	100.0
49	30620	0	20	70	10	100.0
50	30625	0	20	80	0	100.0
51	30630	0	50	50	0	100.0
52	30635	0	25	65	10	100.0
53	30710	0	60	40	0	100.0
54	30720	10	10	80	0	100.0
55	30730	15	25	50	10	100.0
56	30740	0	60	40	0	100.0
57	30750	0	50	45	5	100.0
58	30755	0	50	50	0	100.0
59	30760	0	45	55	0	100.0
60	30765	0	0	100	0	100.0
61	30767	0	0	100	0	100.0
62	30770	10	15	70	5	100.0
63	30810	0	20	80	0	100.0
64	30815	0	50	40	10	100.0
65	30820	0	70	30	0	100.0
66	30825	0	30	70	0	100.0
67	30830	0	20	80	0	100.0
68	30835	0	0	100	0	100.0
69	30837	0	50	50	0	100.0

70	30840	10	50	40	0	100.0
71	30860	30	30	30	10	100.0
72	30865	0	10	85	5	100.0
73	30885	0	10	80	10	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDM-RUNOFF. DON'T FORGET TO CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS. GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
: HIGHLIGHTED IN GREEN.

BASIN : MILWAUKEE RIVER

SUBBASIN: PIGEON CREEK - PG EXISTING

SCENARIO:

NOTES:

	HYE #		HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	30010	PG01800	2180.5	67	11.4	.0186	.020	.229	.10	.26	6.53	0.24	.00072040
2	H1	1	30015	PG03200	1975.2	68	7.8	.0408	.020	.233	.10	.27	5.96	0.15	.00078890
3	H1	1	30020	PG06400	1259	76	52.3	.0139	.020	.220	.10	.23	7.83	0.47	.00069530
	* created 30021 to drain into gravel pits														
	H1	1	30021	PG06401	1539	94	52.3	.0139	.020	.220	.10	.23	7.83	0.47	.00069530
	* not modeled: 30030 connected by storm sewer to Main St. outlet at PG1000														
4	*H:	1	30030	PG01000	915.61	32	40.5	.0022	.020	.273	.10	.44	10.26	0.79	.00055600
5	H1	1	30032	PG11200	510.52	4	1.0	.0267	.020	.289	.10	.48	11.52	0.96	.00055600
6	H1	1	30034	PG11625	270.84	17	1.0	.0152	.020	.289	.10	.48	11.52	0.96	.00055600
7	H1	1	30040	PG08500	888.46	32	1.0	.0192	.020	.289	.10	.48	9.50	0.63	.00061540
8	H1	1	30045	PG08500	1202.5	101	19.1	.0180	.020	.255	.10	.35	8.61	0.52	.00066560
9	H1	1	30046	PG08501L	572.41	26	1.0	.0298	.020	.289	.10	.48	7.20	0.29	.00069300
10	H1	1	30047	PG08500	4251.5	41	46.1	.0355	.020	.214	.10	.23	8.36	0.55	.00055600
11	H1	1	30048	PG08502L	928.68	47	2.5	.0203	.020	.280	.10	.45	7.71	0.37	.00066560
12	H1	1	30050	PGB3450	3119.8	276	9.9	.0261	.020	.256	.10	.35	8.04	0.41	.00066790
13	H1	1	30060	PG14625	1013.1	38	1.0	.0126	.020	.260	.10	.37	5.76	0.10	.00083000
14	H1	1	30070	PG16075	3090.7	218	1.0	.0248	.020	.246	.10	.31	7.20	0.29	.00069300
15	H1	1	30072	PG16975	647.82	16	1.0	.0329	.020	.241	.10	.29	5.76	0.10	.00083000
16	H1	1	30075	PG16975	2122.9	167	2.5	.0137	.020	.270	.10	.41	7.42	0.32	.00066560
17	H1	1	30077	PGH2300	1236.5	59	1.0	.0234	.020	.241	.10	.29	6.48	0.19	.00076150
18	H1	1	30079	PG19375	568.79	27	4.5	.0113	.020	.254	.10	.34	7.05	0.28	.00069300
	* not modeled: 30100 & 30110 connected by storm sewers to PG1000														
19	*H:	1	30100	PG01000	2561.5	151	11.0	.0107	.020	.227	.10	.23	7.01	0.31	.00066560
20	*H:	1	30110	PG01000	1213.3	56	11.0	.0133	.020	.227	.10	.23	6.74	0.27	.00069300
21	H1	1	30220	PG08502L	2692.3	214	59.3	.0108	.020	.215	.10	.23	5.59	0.15	.00077520
22	H1	1	30225	PG08502L	930.06	33	11.0	.0094	.020	.227	.10	.23	5.39	0.09	.00083000
23	H1	1	30230	PG08502L	1825.1	165	9.0	.0126	.020	.232	.10	.26	5.88	0.15	.00078890
24	H1	1	30240	PG08502L	2250.2	156	10.5	.0211	.020	.234	.10	.28	6.97	0.28	.00069300
25	H1	1	30300	PG06900	1946.1	200	6.0	.0228	.020	.239	.10	.29	6.28	0.19	.00076150
26	H1	1	30305	PGH1650	1064.3	38	11.0	.0179	.020	.227	.10	.23	5.39	0.09	.00083000
27	H1	1	30420	PGB3500	3634.6	217	6.0	.0366	.020	.252	.10	.36	6.43	0.20	.00077520
28	H1	1	30430	PGB9450	3672.7	99	20.8	.0370	.020	.256	.10	.35	7.05	0.27	.00070670
29	H1	1	30440	PGB9450	2893.4	157	26.7	.0291	.020	.246	.10	.32	7.51	0.36	.00066560
30	H1	1	30450	PGB5700	1238.1	60	5.0	.0264	.020	.250	.10	.33	6.89	0.26	.00070670
31	H1	1	30460	PGB9450	2414.6	151	10.4	.0227	.020	.246	.10	.31	6.53	0.21	.00074780
32	H1	1	30470	PGB10650	2904.9	256	7.0	.0168	.020	.243	.10	.30	7.23	0.30	.00067930
33	H1	1	30480	PGB5700	321.85	14	10.9	.0156	.020	.289	.10	.48	6.05	0.13	.00080260
34	H1	1	30485	PGB9450	1498.5	17	1.0	.0436	.020	.289	.10	.48	6.91	0.27	.00077520
35	H1	1	30490	PGB5700	729.94	23	6.0	.0104	.020	.259	.10	.37	7.54	0.33	.00073420
36	H1	1	30510	PG14625	466.18	11	1.6	.0168	.020	.265	.10	.40	8.63	0.48	.00055600
37	H1	1	30520	PGC1000	1198.8	55	1.0	.0251	.020	.255	.10	.35	8.06	0.40	.00061080
38	H1	1	30530	PGC2750	743.52	28	11.0	.0302	.020	.227	.10	.23	5.39	0.09	.00083000
39	H1	1	30535	PG14625	801.78	50	1.0	.0191	.020	.250	.10	.33	7.20	0.29	.00069300
40	H1	1	30540	PGC2750	1265.9	75	1.0	.0248	.020	.243	.10	.30	8.64	0.49	.00058340
41	H1	1	30550	PGC6000	2225.8	136	1.0	.0238	.020	.248	.10	.32	7.34	0.29	.00075930
42	H1	1	30560	PGE3850	2466.7	99	4.0	.0198	.020	.247	.10	.32	6.22	0.16	.00080720
43	H1	1	30570	PGE6100	2109.1	144	8.5	.0103	.020	.248	.10	.32	6.94	0.26	.00070670
44	H1	1	30580	PGE6100	1029.3	77	1.0	.0096	.020	.250	.10	.33	6.33	0.17	.00077520
45	H1	1	30590	PGI4000	3431.1	205	1.0	.0127	.020	.248	.10	.32	6.48	0.19	.00076150
46	H1	1	30600	PGG1175	2013.5	77	19.9	.0150	.020	.227	.10	.23	6.20	0.21	.00077520
47	H1	1	30610	PGG3925L	2268.3	128	1.0	.0206	.020	.250	.10	.33	7.92	0.38	.00064050
48	H1	1	30615	PGC2750	1080.7	71	5.5	.0195	.020	.250	.10	.33	6.72	0.24	.00072040
49	H1	1	30620	PGD3800	1831.9	118	1.5	.0100	.020	.247	.10	.32	6.32	0.17	.00080720
50	H1	1	30625	PGD7275	1883.4	51	12.9	.0302	.020	.239	.10	.29	6.29	0.17	.00077520
51	H1	1	30630	PGD3850	2194	138	2.0	.0101	.020	.241	.10	.31	7.19	0.29	.00069300
52	H1	1	30635	PGD3000	464.38	17	1.0	.0125	.020	.248	.10	.32	6.48	0.18	.00079350
53	H1	1	30710	PGC6000	1872	85	1.5	.0224	.020	.242	.10	.30	7.46	0.33	.00066560
54	H1	1	30720	PGC6000	1220.3	38	6.0	.0224	.020	.246	.10	.31	6.62	0.22	.00077520
55	H1	1	30730	PGC8700	1803.9	82	1.0	.0213	.020	.246	.10	.31	7.34	0.31	.00075240
56	H1	1	30740	PGF3490	1327.4	77	6.5	.0481	.020	.236	.10	.27	7.24	0.32	.00066560
57	H1	1	30750	PGF3490	2185.2	203	4.0	.0158	.020	.252	.10	.34	7.07	0.28	.00070900
58	H1	1	30755	PGF3490	594.83	21	1.0	.0226	.020	.241	.10	.29	7.20	0.29	.00069300
59	H1	1	30760	PGF6350L	2382.3	95	1.0	.0258	.020	.241	.10	.29	7.05	0.27	.00070670
60	H1	1	30765	PGF6350L	545.81	10	1.0	.0300	.020	.241	.10	.29	5.76	0.10	.00083000
61	H1	1	30767	PGF6350L	270.96	9	1.0	.0174	.020	.241	.10	.29	5.76	0.10	.00083000
62	H1	1	30770	PGC11851	1062	86	1.0	.0125	.020	.241	.10	.29	6.77	0.24	.00077750
63	H1	1	30810	PGE8950	3508.3	456	11.4	.0112	.020	.251	.10	.34	6.26	0.17	.00077520
64	H1	1	30815	PGD10300	3860.9	544	10.6	.0119	.020	.243	.10	.30	7.00	0.27	.00072500
65	H1	1	30820	PGJ1400L	2062.2	376	3.5	.0082	.020	.242	.10	.30	7.66	0.36	.00063820
66	H1	1	30825	PGD8600	2212.8	239	7.0	.0074	.020	.241	.10	.30	6.40	0.20	.00074780
67	H1	1	30830	PGJ7700	4384.1	590	9.0	.0093	.020	.240	.10	.29	6.16	0.17	.00077520
68	H1	1	30835	PGJ7700	986.46	22	2.5	.0165	.020	.239	.10	.28	5.71	0.10	.00083000
69	H1	1	30837	PGB12350	2086.5	177	19.2	.0162	.020	.230	.10	.25	6.84	0.27	.00069300
70	H1	1	30840	PGE21500	799.7	22	1.0	.0142	.020	.255	.10	.35	7.77	0.37	.00066560
71	H1	1	30860	PGE26900	1920.8	156	1.0	.0063	.020	.265	.10	.39	8.35	0.46	.00069760
72	H1	1	30865	PGE29950	1862.5	58	6.0	.0198	.020	.243	.10	.30	6.05	0.13	.00081860
73	H1	1	30885	PGK1150L	2407.7	127	2.5	.0115	.020	.244	.10	.30	5.99	0.13	.00083460

PG Future

SHEET B : CREATED: 03/01/91 EDITED: 12/08/94

This spreadsheet computes weighted land use parameters for input to CDM RUNOFF given land use percentages by hydrologic unit. Check global land use categories and parameters as appropriate. Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: PIGEON CREEK - PG FUTURE

SCENARIO :

NOTES:

#	GLOBAL LAND USE CATEGORIES
1	FOREST, PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

GLOBAL LAND USE PARAMETERS

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

(FUTURE) PERCENT BY LAND USE CATEGORY

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	30010	0	0	30	0	70	0	0	0	0	0	100.0	80.4	8.2	11.4	100.0	.020	.229	.10	.26
2	30015	0	0	40	60	0	0	0	0	0	0	100.0	85.2	7.0	7.8	100.0	.020	.233	.10	.27
3	30020	0	0	0	35	0	15	25	0	0	25	100.0	41.5	6.2	52.3	100.0	.020	.220	.10	.23
	30021	0	0	0	35	0	15	25	0	0	25	100.0	41.5	6.2	52.3	100.0	.020	.220	.10	.23
4	30030	50	0	0	0	0	0	50	0	0	0	100.0	55.0	4.5	40.5	100.0	.020	.273	.10	.44
5	30032	100	0	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
6	30034	100	0	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
7	30040	100	0	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
8	30045	25	55	0	0	0	0	0	5	0	15	100.0	77.4	3.6	19.1	100.0	.020	.255	.10	.35
9	30046	100	0	0		0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.289	.10	.48
10	30047	0	0	0	0	0	70	0	0	0	30	100.0	45.5	8.4	46.1	100.0	.020	.214	.10	.23
11	30048	85	0	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.280	.10	.45
12	30050	30	60	0	0	0	0	5	0	0	5	100.0	86.3	3.9	9.9	100.0	.020	.256	.10	.35
13	30060	40	60	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.260	.10	.37
14	30070	10	90	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.246	.10	.31
15	30072	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
16	30075	65	20	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.270	.10	.41
17	30077	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
18	30079	35	30	0	35	0	0	0	0	0	0	100.0	89.8	5.8	4.5	100.0	.020	.254	.10	.34
19	30100	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23

20	30110	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
21	30220	0	0	0	30	0	0	70	0	0	0	100.0	34.5	6.2	59.3	100.0	.020	.215	.10	.23
22	30225	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
23	30230	5	15	0	80	0	0	0	0	0	0	100.0	83.0	8.0	9.0	100.0	.020	.232	.10	.26
24	30240	0	0	50	45	0	0	5	0	0	0	100.0	83.3	6.3	10.5	100.0	.020	.234	.10	.28
25	30300	10	40	0	50	0	0	0	0	0	0	100.0	87.5	6.5	6.0	100.0	.020	.239	.10	.29
26	30305	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
27	30420	25	0	65	5	0	0	0	5	0	0	100.0	89.6	4.4	6.0	100.0	.020	.252	.10	.36
28	30430	25	55	0	0	0	0	0	0	0	20	100.0	76.0	3.2	20.8	100.0	.020	.256	.10	.35
29	30440	20	30	0	20	0	0	30	0	0	0	100.0	68.0	5.3	26.7	100.0	.020	.246	.10	.32
30	30450	30	30	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.250	.10	.33
31	30460	15	60	0	15	0	0	10	0	0	0	100.0	84.8	4.9	10.4	100.0	.020	.246	.10	.31
32	30470	10	65	0	20	0	0	5	0	0	0	100.0	88.0	5.1	7.0	100.0	.020	.243	.10	.30
33	30480	90	0	0	0	0	0	0	0	0	10	100.0	85.5	3.6	10.9	100.0	.020	.289	.10	.48
34	30485	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
35	30490	50	0	0	50	0	0	0	0	0	0	100.0	87.5	6.5	6.0	100.0	.020	.259	.10	.37
36	30510	50	20	30	0	0	0	0	0	0	0	100.0	94.4	4.0	1.6	100.0	.020	.265	.10	.40
37	30520	30	70	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.255	.10	.35
38	30530	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
39	30535	20	80	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.250	.10	.33
40	30540	5	95	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.243	.10	.30
41	30550	15	85	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.248	.10	.32
42	30560	20	50	0	30	0	0	0	0	0	0	100.0	90.5	5.5	4.0	100.0	.020	.247	.10	.32
43	30570	20	50	0	25	0	0	0	0	0	5	100.0	86.5	5.1	8.5	100.0	.020	.248	.10	.32
44	30580	20	80	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.250	.10	.33
45	30590	15	85	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.248	.10	.32
46	30600	0	0	0	90	0	0	0	0	0	10	100.0	72.0	8.1	19.9	100.0	.020	.227	.10	.23
47	30610	20	80	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.250	.10	.33
48	30615	30	25	0	45	0	0	0	0	0	0	100.0	88.3	6.3	5.5	100.0	.020	.250	.10	.33
49	30620	15	80	0	5	0	0	0	0	0	0	100.0	94.3	4.3	1.5	100.0	.020	.247	.10	.32
50	30625	0	85	0	0	0	0	15	0	0	0	100.0	83.0	4.2	12.9	100.0	.020	.239	.10	.29
51	30630	0	50	50	0	0	0	0	0	0	0	100.0	94.0	4.0	2.0	100.0	.020	.241	.10	.31
52	30635	15	85	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.248	.10	.32
53	30710	5	90	0	5	0	0	0	0	0	0	100.0	94.3	4.3	1.5	100.0	.020	.242	.10	.30
54	30720	10	85	0	0	0	0	0	0	0	5	100.0	90.3	3.8	6.0	100.0	.020	.246	.10	.31
55	30730	10	90	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.246	.10	.31
56	30740	5	40	0	55	0	0	0	0	0	0	100.0	86.8	6.8	6.5	100.0	.020	.236	.10	.27
57	30750	30	40	0	30	0	0	0	0	0	0	100.0	90.5	5.5	4.0	100.0	.020	.252	.10	.34
58	30755	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
59	30760	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
60	30765	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
61	30767	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
62	30770	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
63	30810	25	50	0	15	0	0	5	0	0	5	100.0	84.0	4.6	11.4	100.0	.020	.251	.10	.34
64	30815	15	40	0	25	15	0	0	0	0	5	100.0	83.5	6.0	10.6	100.0	.020	.243	.10	.30
65	30820	10	65	0	25	0	0	0	0	0	0	100.0	91.3	5.3	3.5	100.0	.020	.242	.10	.30
66	30825	15	35	0	25	25	0	0	0	0	0	100.0	86.3	6.8	7.0	100.0	.020	.241	.10	.30
67	30830	10	45	0	40	0	0	5	0	0	0	100.0	85.0	6.1	9.0	100.0	.020	.240	.10	.29
68	30835	0	85	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.239	.10	.28
69	30837	0	30	0	35	20	0	15	0	0	0	100.0	73.8	7.1	19.2	100.0	.020	.230	.10	.25
70	30840	30	70	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.255	.10	.35
71	30860	50	50	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.265	.10	.39
72	30865	5	90	0	0	0	0	0	0	0	5	100.0	90.3	3.8	6.0	100.0	.020	.243	.10	.30
73	30885	10	75	0	15	0	0	0	0	0	0	100.0	92.8	4.8	2.5	100.0	.020	.244	.10	.30

SHEET C : CREATED: 03/01/90 EDITED: 12/08/94

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: PIGEON CREEK - PG FUTURE

SCENARIO :

NOTES:

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	30010	0	40	60	0	100.0
2	30015	0	15	85	0	100.0
3	30020	45	10	40	5	100.0
	30021	45	10	40	5	100.0
4	30030	70	30	0	0	100.0
5	30032	100	0	0	0	100.0
6	30034	100	0	0	0	100.0
7	30040	40	50	0	10	100.0
8	30045	40	20	40	0	100.0
9	30046	0	50	50	0	100.0
10	30047	30	70	0	0	100.0
11	30048	10	50	40	0	100.0
12	30050	15	50	30	5	100.0
13	30060	0	0	100	0	100.0
14	30070	0	50	50	0	100.0
15	30072	0	0	100	0	100.0
16	30075	0	60	40	0	100.0
17	30077	0	25	75	0	100.0
18	30079	0	50	50	0	100.0
19	30100	0	60	40	0	100.0
20	30110	0	50	50	0	100.0
21	30220	0	20	80	0	100.0
22	30225	0	0	100	0	100.0
23	30230	0	15	85	0	100.0
24	30240	0	50	50	0	100.0
25	30300	0	25	75	0	100.0
26	30305	0	0	100	0	100.0
27	30420	5	15	80	0	100.0
28	30430	0	45	55	0	100.0
29	30440	10	50	40	0	100.0
30	30450	0	45	55	0	100.0
31	30460	0	30	70	0	100.0
32	30470	0	55	45	0	100.0
33	30480	0	10	90	0	100.0
34	30485	20	0	80	0	100.0
35	30490	0	70	0	30	100.0
36	30510	0	100	0	0	100.0
37	30520	0	80	20	0	100.0
38	30530	0	0	100	0	100.0
39	30535	0	50	50	0	100.0
40	30540	10	80	10	0	100.0
41	30550	0	55	20	25	100.0
42	30560	0	20	70	10	100.0
43	30570	0	45	55	0	100.0
44	30580	0	20	80	0	100.0
45	30590	0	25	75	0	100.0
46	30600	10	10	80	0	100.0
47	30610	0	75	20	5	100.0
48	30615	0	40	60	0	100.0
49	30620	0	20	70	10	100.0
50	30625	0	20	80	0	100.0
51	30630	0	50	50	0	100.0
52	30635	0	25	65	10	100.0
53	30710	0	60	40	0	100.0
54	30720	10	10	80	0	100.0
55	30730	15	25	50	10	100.0
56	30740	0	60	40	0	100.0
57	30750	0	50	45	5	100.0
58	30755	0	50	50	0	100.0
59	30760	0	45	55	0	100.0
60	30765	0	0	100	0	100.0
61	30767	0	0	100	0	100.0
62	30770	10	15	70	5	100.0
63	30810	0	20	80	0	100.0
64	30815	0	50	40	10	100.0
65	30820	0	70	30	0	100.0
66	30825	0	30	70	0	100.0
67	30830	0	20	80	0	100.0
68	30835	0	0	100	0	100.0
69	30837	0	50	50	0	100.0

70	30840	10	50	40	0	100.0
71	30860	30	30	30	10	100.0
72	30865	0	10	85	5	100.0
73	30885	0	10	80	10	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDM-RUNOFF. DON'T FORGET TO
CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS.
GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK
FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING
OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
ERS HIGHLIGHTED IN GREEN.

BASIN : MILWAUKEE RIVER

SUBBASIN: PIGEON CREEK - PG FUTURE

SCENARIO:

NOTES:

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	30010	PO01800	2180.501706	67	11.4	.0186	.020	.229	.10	.26	6.53	0.24	.00072040
2	H1	1	30015	PO03200	1975.233432	68	7.8	.0408	.020	.233	.10	.27	5.96	0.15	.00078890
3	H1	1	30020	PO06400	1259	76	52.3	.0139	.020	.220	.10	.23	7.83	0.47	.00069530
	* created 30021 to drain into gravel pits														
	H1	1	30021	PO06401	1539	94	52.3	.0139	.020	.220	.10	.23	7.83	0.47	.00069530
	* not modeled: 30030 connected by storm sewer to Main St. outlet at PO1000														
4	*H1	1	30030	PO01000	915.6085714	32	40.5	.0022	.020	.273	.10	.44	10.26	0.79	.00055600
5	H1	1	30032	PO11200	510.5232	4	1.0	.0267	.020	.289	.10	.48	11.52	0.96	.00055600
6	H1	1	30034	PO11625	270.8350949	17	1.0	.0152	.020	.289	.10	.48	11.52	0.96	.00055600
7	H1	1	30040	PO08500	888.4596226	32	1.0	.0192	.020	.289	.10	.48	9.50	0.63	.00061540
8	H1	1	30045	PO08500	1202.541265	101	19.1	.0180	.020	.255	.10	.35	8.61	0.52	.00066560
9	H1	1	30046	PO08501L	572.4090452	26	1.0	.0298	.020	.289	.10	.48	7.20	0.29	.00069300
10	H1	1	30047	PO08500	4251.456	41	46.1	.0355	.020	.214	.10	.23	8.36	0.55	.00055600
11	H1	1	30048	PO08502L	928.6784904	47	2.5	.0203	.020	.280	.10	.45	7.71	0.37	.00066560
12	H1	1	30050	POB3450	3119.778803	276	9.9	.0261	.020	.256	.10	.35	8.04	0.41	.00066790
13	H1	1	30060	PO14625	1013.062171	38	1.0	.0126	.020	.260	.10	.37	5.76	0.10	.00083000
14	H1	1	30070	PO16075	3090.712338	218	1.0	.0248	.020	.246	.10	.31	7.20	0.29	.00069300
15	H1	1	30072	PO16975	647.8164	16	1.0	.0329	.020	.241	.10	.29	5.76	0.10	.00083000
16	H1	1	30075	PO16975	2122.949548	167	2.5	.0137	.020	.270	.10	.41	7.42	0.32	.00066560
17	H1	1	30077	POH2300	1236.499034	59	1.0	.0234	.020	.241	.10	.29	6.48	0.19	.00076150
18	H1	1	30079	PO19375	560.7850321	27	4.5	.0113	.020	.254	.10	.34	7.05	0.28	.00069300
	* not modeled: 30100 & 30110 connected by storm sewers to PO1000														
19	*H1	1	30100	PO01000	2561.540787	151	11.0	.0107	.020	.227	.10	.23	7.01	0.31	.00066560
20	*H1	1	30110	PO01000	1213.32024	56	11.0	.0133	.020	.227	.10	.23	6.74	0.27	.00069300
21	H1	1	30220	PO08502L	2692.286231	214	59.3	.0108	.020	.215	.10	.23	5.59	0.15	.00077520
22	H1	1	30225	PO08502L	930.0628552	33	11.0	.0094	.020	.227	.10	.23	5.39	0.09	.00083000
23	H1	1	30230	PO08502L	1825.067619	165	9.0	.0126	.020	.232	.10	.26	5.88	0.15	.00078890
24	H1	1	30240	PO08502L	2250.165154	156	10.5	.0211	.020	.234	.10	.28	6.97	0.28	.00069300
25	H1	1	30300	PO06900	1946.064079	200	6.0	.0228	.020	.239	.10	.29	6.28	0.19	.00076150
26	H1	1	30305	POH1650	1064.271404	38	11.0	.0179	.020	.227	.10	.23	5.39	0.09	.00083000
27	H1	1	30420	POB3500	3634.649239	217	6.0	.0366	.020	.252	.10	.36	6.43	0.20	.00077520
28	H1	1	30430	POB9450	3672.735371	99	20.8	.0370	.020	.256	.10	.35	7.05	0.27	.00070670
29	H1	1	30440	POB9450	2893.446562	157	26.7	.0291	.020	.246	.10	.32	7.51	0.36	.00066560
30	H1	1	30450	POB5700	1238.142955	60	5.0	.0264	.020	.250	.10	.33	6.89	0.26	.00070670
31	H1	1	30460	POB9450	2414.560791	151	10.4	.0227	.020	.246	.10	.31	6.53	0.21	.00074780
32	H1	1	30470	POB10650	2904.874997	256	7.0	.0168	.020	.243	.10	.30	7.23	0.30	.00067930
33	H1	1	30480	POB5700	321.8474611	14	10.9	.0156	.020	.289	.10	.48	6.05	0.13	.00080260
34	H1	1	30485	POB9450	1498.464	17	11.0	.0436	.020	.227	.10	.23	6.47	0.25	.00077520
35	H1	1	30490	POB5700	729.9411429	23	6.0	.0104	.020	.259	.10	.37	7.54	0.33	.00073420
36	H1	1	30510	PO14625	466.17912	11	1.6	.0160	.020	.265	.10	.40	8.63	0.48	.00055600
37	H1	1	30520	POC1000	1198.847505	55	1.0	.0251	.020	.255	.10	.35	8.06	0.40	.00061080
38	H1	1	30530	POC2750	743.5213502	28	11.0	.0302	.020	.227	.10	.23	5.39	0.09	.00083000
39	H1	1	30535	PO14625	801.7822886	50	1.0	.0191	.020	.250	.10	.33	7.20	0.29	.00069300
40	H1	1	30540	POC2750	1265.869635	75	1.0	.0248	.020	.243	.10	.30	8.64	0.49	.00058340
41	H1	1	30550	POC6000	2225.829358	136	1.0	.0238	.020	.248	.10	.32	7.34	0.29	.00075930
42	H1	1	30560	POE3050	2466.672253	99	4.0	.0198	.020	.247	.10	.32	6.22	0.16	.00080720
43	H1	1	30570	POE6100	2109.108192	144	8.5	.0103	.020	.248	.10	.32	6.94	0.26	.00070670
44	H1	1	30580	POE6100	1029.282317	77	1.0	.0096	.020	.250	.10	.33	6.33	0.17	.00077520
45	H1	1	30590	PO14000	3431.054464	205	1.0	.0127	.020	.248	.10	.32	6.48	0.19	.00076150
46	H1	1	30600	PO01175	2013.537575	77	19.9	.0150	.020	.227	.10	.23	6.20	0.21	.00077520
47	H1	1	30610	PO03925L	2268.33	128	1.0	.0206	.020	.250	.10	.33	7.92	0.38	.00064050
48	H1	1	30615	POC2750	1080.688821	71	5.5	.0195	.020	.250	.10	.33	6.72	0.24	.00072040
49	H1	1	30620	POD3800	1031.07189	118	1.5	.0100	.020	.247	.10	.32	6.32	0.17	.00080720
50	H1	1	30625	POD7275	1083.370084	51	12.9	.0302	.020	.239	.10	.29	6.29	0.17	.00077520
51	H1	1	30630	POD3850	2193.986891	138	2.0	.0101	.020	.241	.10	.31	7.19	0.29	.00069300
52	H1	1	30635	POD3000	464.3834053	17	1.0	.0125	.020	.248	.10	.32	6.48	0.18	.00079350
53	H1	1	30710	POC6000	1871.99872	85	1.5	.0224	.020	.242	.10	.30	7.46	0.33	.00066560
54	H1	1	30720	POC6000	1220.252876	38	6.0	.0224	.020	.246	.10	.31	6.62	0.22	.00077520
55	H1	1	30730	POC8700	1803.884415	82	1.0	.0213	.020	.246	.10	.31	7.34	0.31	.00075240
56	H1	1	30740	POF3490	1327.4152	77	6.5	.0401	.020	.236	.10	.27	7.24	0.32	.00066560
57	H1	1	30750	POF3490	2185.208893	203	4.0	.0158	.020	.252	.10	.34	7.07	0.28	.00070900
58	H1	1	30755	POF3490	594.8252586	21	1.0	.0226	.020	.241	.10	.29	7.20	0.29	.00069300
59	H1	1	30760	POF6350L	2382.305202	95	1.0	.0258	.020	.241	.10	.29	7.05	0.27	.00070670
60	H1	1	30765	POF6350L	545.8120182	10	1.0	.0300	.020	.241	.10	.29	5.76	0.10	.00083000
61	H1	1	30767	POF6350L	270.9609796	9	1.0	.0174	.020	.241	.10	.29	5.76	0.10	.00083000
62	H1	1	30770	POC11651	1061.990195	86	1.0	.0125	.020	.241	.10	.29	6.77	0.24	.00077750
63	H1	1	30810	POE8950	3508.254988	456	11.4	.0112	.020	.251	.10	.34	6.28	0.17	.00077520
64	H1	1	30815	POD10300	3860.922392	544	10.6	.0119	.020	.243	.10	.30	7.00	0.27	.00072500
65	H1	1	30820	POJ1400L	2062.193966	376	3.5	.0082	.020	.242	.10	.30	7.66	0.36	.00063820
66	H1	1	30825	POD8600	2212.755319	239	7.0	.0074	.020	.241	.10	.30	6.40	0.20	.00074780
67	H1	1	30830	POJ7700	4384.135091	590	9.0	.0093	.020	.240	.10	.29	6.16	0.17	.00077520
68	H1	1	30835	POJ7700	986.4623646	22	2.5	.0165	.020	.239	.10	.28	5.71	0.10	.00083000
69	H1	1	30837	POB12350	2086.524	177	19.2	.0162	.020	.230	.10	.25	6.84	0.27	.00069300
70	H1	1	30840	POE21500	799.696997	22	1.0	.0142	.020	.255	.10	.35	7.77	0.37	.00066560
71	H1	1	30860	POE26900	1920.768642	156	1.0	.0063	.020	.265	.10	.39	8.35	0.46	.00069760
72	H1	1	30865	POE29950	1862.532091	58	6.0	.0198	.020	.243	.10	.30	6.05	0.13	.00081860
73	H1	1	30885	POK1150L	2407.727101	127	2.5	.0115	.020	.244	.10	.30	5.99	0.13	.00083460

UL Existing

SHEET B : CREATED: 03/01/91 EDITED: #REF!

This spreadsheet computes weighted land use parameters for input to CDM RUNOFF given land use percentages by hydrologic unit. Check global land use categories and parameters as appropriate.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: ULAO CREEK EXISTING

SCENARIO :

NOTES: This file contains a new subbasin numbered 80141 whose area is comprised of 40% of 80140 plus 50% of 80150.

Subbasin 80141 does not exist in exist in the water quality model or digitized subbasin map.

#	GLOBAL LAND USE CATEGORIES
1	FOREST. PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

GLOBAL LAND USE PARAMETERS

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

PERCENT BY LAND USE CATEGORY

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	80100	40	20	0	20	0	10	10	0	0	0	100.0	81.0	5.9	13.1	100.0	.020	.256	.10	.36
2	80110	0	60	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.235	.10	.27
3	80115	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
4	80120	0	80	20	0	0	0	0	0	0	0	100.0	94.6	4.0	1.4	100.0	.020	.241	.10	.30
5	80125	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
6	80127	50	0	25	0	0	0	0	0	25	0	100.0	83.3	3.0	13.8	100.0	.020	.262	.10	.40
7	80130	0	0	100	0	0	0	0	0	0	0	100.0	93.0	4.0	3.0	100.0	.020	.241	.10	.32
8	80140	20	30	0	30	0	0	20	0	0	0	100.0	74.5	5.7	19.8	100.0	.020	.245	.10	.32
9	80141	20	30	0	30	0	0	20	0	0	0	100.0	74.5	5.7	19.8	100.0	.020	.245	.10	.32
10	80150	0	0	50	0	0	0	50	0	0	0	100.0	54.0	4.5	41.5	100.0	.020	.232	.10	.30
11	80160	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
12	80162	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
13	80163	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
14	80164	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
15	80165	0	0	95	0	0	0	0	0	0	5	100.0	88.4	3.8	7.9	100.0	.020	.241	.10	.32
16	80200	20	80	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.250	.10	.33
17	80201	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
18	80202	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
19	80203	0	0	80	20	0	0	0	0	0	0	100.0	90.4	5.0	4.6	100.0	.020	.238	.10	.30
20	80204	0	60	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.235	.10	.27
21	80205	30	30	0	40	0	0	0	0	0	0	100.0	89.0	6.0	5.0	100.0	.020	.250	.10	.33
22	80206	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
23	80207	0	50	0	50	0	0	0	0	0	0	100.0	87.5	6.5	6.0	100.0	.020	.234	.10	.26

ULRUN2.XLS

24	80208	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
25	80210	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
26	80220	15	65	0	0	0	0	10	0	10	0	100.0	82.5	3.7	13.8	100.0	.020	.245	.10	.32
27	80222	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
28	80230	85	0	0	0	0	0	0	0	15	0	100.0	86.3	3.4	8.4	100.0	.020	.281	.10	.46
29	80235	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
30	80300	45	45	0	0	0	0	10	0	0	0	100.0	87.0	4.1	8.9	100.0	.020	.263	.10	.38
31	80310	15	85	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.248	.10	.32
32	80400	10	80	0	5	0	0	0	0	0	5	100.0	89.5	4.1	6.5	100.0	.020	.245	.10	.31
33	80410	15	75	0	5	0	0	0	0	0	5	100.0	89.5	4.1	6.5	100.0	.020	.248	.10	.32
34	80420	10	80	0	5	0	0	5	0	0	0	100.0	90.3	4.3	5.5	100.0	.020	.245	.10	.31
35	80430	15	75	0	5	0	0	0	0	5	0	100.0	92.0	4.1	4.0	100.0	.020	.246	.10	.32
36	80450	10	20	20	10	0	0	10	10	10	10	100.0	64.4	4.1	31.5	100.0	.020	.240	.10	.31
37	80460	10	50	0	10	0	0	0	0	0	30	100.0	65.0	3.3	31.7	100.0	.020	.246	.10	.31
38	80470	10	35	30	20	0	0	0	0	0	5	100.0	86.7	4.8	8.6	100.0	.020	.243	.10	.31

SHEET C : CREATED: 03/01/90 EDITED: #REF!

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: ULAO CREEK EXISTING

SCENARIO :

NOTES: This file contains a new subbasin numbered 80141 whose area is comprised of 40% of 8(

Subbasin 80141 does not exist in exist in the water quality model or digitized subbasin map.

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	80100	20	10	60	10	100.0
2	80110	0	0	95	5	100.0
3	80115	0	0	100	0	100.0
4	80120	0	0	100	0	100.0
5	80125	0	0	100	0	100.0
6	80127	0	0	100	0	100.0
7	80130	0	0	90	10	100.0
8	80140	0	0	100	0	100.0
9	80141	0	0	100	0	100.0
10	80150	15	0	85	0	100.0
11	80160	100	0	0	0	100.0
12	80162	0	0	90	10	100.0
13	80163	0	0	100	0	100.0
14	80164	0	0	100	0	100.0
15	80165	0	0	90	10	100.0
16	80200	0	0	75	25	100.0
17	80201	0	0	100	0	100.0
18	80202	0	0	100	0	100.0
19	80203	0	0	100	0	100.0
20	80204	0	0	100	0	100.0
21	80205	0	0	100	0	100.0
22	80206	0	0	100	0	100.0
23	80207	0	0	100	0	100.0
24	80208	0	0	100	0	100.0
25	80210	0	0	100	0	100.0
26	80220	0	15	70	15	100.0
27	80222	0	0	100	0	100.0
28	80230	0	0	100	0	100.0
29	80235	0	0	100	0	100.0
30	80300	15	20	50	15	100.0
31	80310	0	0	90	10	100.0
32	80400	0	25	50	25	100.0
33	80410	0	0	100	0	100.0
34	80420	0	20	80	0	100.0
35	80430	0	25	50	25	100.0
36	80450	0	25	50	25	100.0
37	80460	0	35	25	40	100.0
38	80470	0	25	50	25	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDH-RUNOFF. DON'T FORGET TO
CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS.
GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK
FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING
OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
; HIGHLIGHTED IN GREEN.

BASIN : MILWAUKEE RIVER

SUBBASIN: ULAO CREEK EXISTING

SCENARIO:

NOTES: This file contains a new subbasin numbered 80141 whose area is comprised of 40% of 80140 plus 50% of 80150.

Subbasin 80141 does not exist in exist in the water quality model or digitized subbasin map.

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	80100	ULA2072	690.0	118	13.1	.0026	.020	.256	.10	.36	6.99	0.29	.00077980
2	H1	1	80110	ULC1855	1538.1	52	5.0	.0133	.020	.235	.10	.27	5.62	0.09	.00084600
3	H1	1	80115	ULC3093	542.3	13	26.5	.0122	.020	.227	.10	.30	5.84	0.10	.00083000
4	H1	1	80120	ULA3730	1542.0	39	1.4	.0261	.020	.241	.10	.30	5.76	0.10	.00083000
5	H1	1	80125	ULA5270	576.1	11	26.5	.0112	.020	.227	.10	.30	5.84	0.10	.00083000
6	H1	1	80127	ULB5991	803.2	13	13.8	.0310	.020	.262	.10	.40	5.79	0.10	.00083000
7	H1	1	80130	ULB4205	1381.5	48	3.0	.0115	.020	.241	.10	.32	5.75	0.09	.00086200
8	H1	1	80140	ULC3325	1088.9	91	19.8	.0116	.020	.245	.10	.32	5.57	0.09	.00083000
9	H1	1	80141	ULA5745	1739.4	101	19.8	.0160	.020	.245	.10	.32	5.57	0.09	.00083000
10	H1	1	80150	ULB6279	1040.3	40	41.5	.0147	.020	.232	.10	.30	6.37	0.22	.00078890
	* CHANGED LOAD POINT FROM ULS1120 TO ULS3770														
11	H1	1	80160	ULS3770	641.8	15	11.0	.0268	.020	.227	.10	.23	10.79	0.90	.00055600
12	H1	1	80162	ULS3770	2246.3	81	11.0	.0342	.020	.227	.10	.23	5.39	0.08	.00086200
13	H1	1	80163	ULS0870	421.1	14	26.5	.0513	.020	.227	.10	.30	5.84	0.10	.00083000
14	H1	1	80164	ULS3815	944.3	9	11.0	.0176	.020	.227	.10	.23	5.39	0.09	.00083000
15	H1	1	80165	ULS0470	1501.5	68	7.9	.0120	.020	.241	.10	.32	5.75	0.09	.00086200
16	H1	1	80200	ULD1260	1301.0	83	1.0	.0052	.020	.250	.10	.33	5.76	0.08	.00091000
17	H1	1	80201	ULR0078	529.4	7	26.5	.0078	.020	.227	.10	.30	5.84	0.10	.00083000
18	H1	1	80202	ULD3818	686.7	11	26.5	.0046	.020	.227	.10	.30	5.84	0.10	.00083000
19	H1	1	80203	ULD4066	3945.1	72	4.6	.0141	.020	.238	.10	.30	5.69	0.09	.00083000
20	H1	1	80204	ULR0318	2143.7	58	5.0	.0122	.020	.235	.10	.27	5.62	0.09	.00083000
21	H1	1	80205	ULD7056	1342.0	52	5.0	.0249	.020	.250	.10	.33	5.62	0.09	.00083000
22	H1	1	80206	ULE0892	662.5	28	11.0	.0256	.020	.227	.10	.23	5.39	0.09	.00083000
23	H1	1	80207	ULT0500L	1578.4	58	6.0	.0246	.020	.234	.10	.26	5.59	0.09	.00083000
24	H1	1	80208	ULR1580	1334.2	41	11.0	.0279	.020	.227	.10	.23	5.39	0.09	.00083000
	*ELIMINATED CHANNEL/JUNCTION ULU1758														
25	H1	1	80210	ULU1758L	1013.9	18	1.0	.0199	.020	.241	.10	.29	5.76	0.10	.00083000
26	H1	1	80220	ULJ0858	1248.6	35	13.8	.0162	.020	.245	.10	.32	6.17	0.14	.00083690
27	H1	1	80222	ULJ2804	1293.1	30	11.0	.0149	.020	.227	.10	.23	5.39	0.09	.00083000
28	H1	1	80230	ULJ2084	1158.4	22	8.4	.0171	.020	.281	.10	.46	5.78	0.10	.00083000
29	H1	1	80235	ULV1600L	519.3	18	1.0	.0159	.020	.241	.10	.29	5.76	0.10	.00083000
30	H1	1	80300	UL03714	2779.1	349	8.9	.0049	.020	.263	.10	.38	7.16	0.29	.00078210
31	H1	1	80310	ULD0552	1505.7	42	1.0	.0090	.020	.248	.10	.32	5.76	0.09	.00086200
32	H1	1	80400	ULG5000L	5222.3	863	6.5	.0072	.020	.245	.10	.31	6.46	0.17	.00084150
33	H1	1	80410	ULH2500L	3544.7	412	6.5	.0078	.020	.248	.10	.32	5.74	0.10	.00083000
34	H1	1	80420	UL21260	5426.8	1304	5.5	.0021	.020	.245	.10	.31	6.30	0.17	.00077520
35	H1(	1	80430	ULH3122L	4169.5	376	4.0	.0133	.020	.246	.10	.32	6.47	0.17	.00084150
36	H11	1	80450	ULH3300L	5951.8	792	31.5	.0158	.020	.240	.10	.31	6.35	0.17	.00084150
37	H12	1	80460	UL27210	9950.4	2452	31.7	.0014	.020	.246	.10	.31	6.71	0.20	.00086210
38	H13	1	80470	ULP4000L	7774.0	547	8.6	.0174	.020	.243	.10	.31	6.40	0.17	.00084150

UL Future

SHEET B : CREATED: 03/01/91 EDITED: #REF!

This spreadsheet computes weighted land use parameters for input to CDM RUNOFF given land use percentages by hydrologic unit. Check global land use categories and parameters as appropriate.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: ULAO CREEK FUTURE

SCENARIO :

NOTES: This file contains a new subbasin numbered 80141 whose area is comprised of 40% of 80140 plus 50% of 80150.

Subbasin 80141 does not exist in exist in the water quality model or digitized subbasin map.

#	GLOBAL LAND USE CATEGORIES
1	FOREST. PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

<-- GLOBAL LAND USE PARAMETERS---------------------------------->

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

<---------------------------------- (future) PERCENT BY LAND USE CATEGORY------------------------------->

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	80100	30	0	0	45	0	10	15	0	0	0	100.0	73.3	7.2	19.6	100.0	.020	.247	.10	.33
2	80110	0	40	0	60	0	0	0	0	0	0	100.0	86.0	7.0	7.0	100.0	.020	.233	.10	.26
3	80115	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
4	80120	0	0	0	80	0	0	20	0	0	0	100.0	67.0	8.2	24.8	100.0	.020	.225	.10	.23
5	80125	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
6	80127	50	0	25	0	0	0	0	0	25	0	100.0	83.3	3.0	13.8	100.0	.020	.262	.10	.40
7	80130	0	0	50	50	0	0	0	0	0	0	100.0	86.5	6.5	7.0	100.0	.020	.234	.10	.28
8	80140	0	0	0	80	0	0	20	0	0	0	100.0	67.0	8.2	24.8	100.0	.020	.225	.10	.23
9	80141	0	0	0	80	0	0	20	0	0	0	100.0	67.0	8.2	24.8	100.0	.020	.225	.10	.23
10	80150	0	0	50	0	0	0	50	0	0	0	100.0	54.0	4.5	41.5	100.0	.020	.232	.10	.30
11	80160	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
12	80162	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
13	80163	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
14	80164	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
15	80165	0	0	0	0	0	0	95	0	0	5	100.0	14.3	4.8	81.0	100.0	.020	.193	.10	.21
16	80200	20	80	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.250	.10	.33
17	80201	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
18	80202	0	0	50	0	0	0	0	0	50	0	100.0	71.5	2.0	26.5	100.0	.020	.227	.10	.30
19	80203	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
20	80204	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
21	80205	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
22	80206	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
23	80207	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
24	80208	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
25	80210	0	100	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.241	.10	.29
26	80220	15	30	0	0	0	0	45	0	10	0	100.0	54.5	4.1	41.5	100.0	.020	.242	.10	.32
27	80222	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
28	80230	85	0	0	0	0	0	0	0	15	0	100.0	88.3	3.4	8.4	100.0	.020	.281	.10	.46
29	80235	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
30	80300	45	40	0	0	0	0	15	0	0	0	100.0	83.0	4.2	12.9	100.0	.020	.264	.10	.39
31	80310	15	85	0	0	0	0	0	0	0	0	100.0	95.0	4.0	1.0	100.0	.020	.248	.10	.32
32	80400	10	75	0	10	0	0	0	0	0	5	100.0	88.8	4.3	7.0	100.0	.020	.244	.10	.31
33	80410	15	70	0	10	0	0	0	0	0	5	100.0	88.8	4.3	7.0	100.0	.020	.247	.10	.32
34	80420	10	70	0	10	0	0	10	0	0	0	100.0	85.5	4.6	9.9	100.0	.020	.244	.10	.31
35	80430	15	65	0	10	0	0	5	0	5	0	100.0	87.3	4.4	8.4	100.0	.020	.245	.10	.32
36	80450	10	5	20	20	0	0	15	10	10	10	100.0	58.9	4.7	36.5	100.0	.020	.237	.10	.30
37	80460	10	35	0	20	0	0	5	0	0	30	100.0	59.5	3.9	36.7	100.0	.020	.244	.10	.30
38	80470	10	25	30	30	0	0	0	0	0	5	100.0	85.2	5.3	9.6	100.0	.020	.242	.10	.31

SHEET C : CREATED: 03/01/90 EDITED: #REF!

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: MILWAUKEE RIVER

SUBBASIN: ULAO CREEK FUTURE

SCENARIO :

NOTES: This file contains a new subbasin numbered 80141 whose area is comprised of 40% of 8

Subbasin 80141 does not exist in exist in the water quality model or digitized subbasin map.

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	80100	20	10	60	10	100.0
2	80110	0	0	95	5	100.0
3	80115	0	0	100	0	100.0
4	80120	0	0	100	0	100.0
5	80125	0	0	100	0	100.0
6	80127	0	0	100	0	100.0
7	80130	0	0	90	10	100.0
8	80140	0	0	100	0	100.0
9	80141	0	0	100	0	100.0
10	80150	15	0	85	0	100.0
11	80160	100	0	0	0	100.0
12	80162	0	0	90	10	100.0
13	80163	0	0	100	0	100.0
14	80164	0	0	100	0	100.0
15	80165	0	0	90	10	100.0
16	80200	0	0	75	25	100.0
17	80201	0	0	100	0	100.0
18	80202	0	0	100	0	100.0
19	80203	0	0	100	0	100.0
20	80204	0	0	100	0	100.0
21	80205	0	0	100	0	100.0
22	80206	0	0	100	0	100.0
23	80207	0	0	100	0	100.0
24	80208	0	0	100	0	100.0
25	80210	0	0	100	0	100.0
26	80220	0	15	70	15	100.0
27	80222	0	0	100	0	100.0
28	80230	0	0	100	0	100.0
29	80235	0	0	100	0	100.0
30	80300	15	20	50	15	100.0
31	80310	0	0	90	10	100.0
32	80400	0	25	50	25	100.0
33	80410	0	0	100	0	100.0
34	80420	0	20	80	0	100.0
35	80430	0	25	50	25	100.0
36	80450	0	25	50	25	100.0
37	80460	0	35	25	40	100.0
38	80470	0	25	50	25	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDM-RUNOFF. DON'T FORGET TO CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS. GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
S HIGHLIGHTED IN GREEN.

BASIN : MILWAUKEE RIVER

SUBBASIN: ULAO CREEK FUTURE

SCENARIO:

NOTES: This file contains a new subbasin numbered 80141 whose area is comprised of 40% of 80140 plus 50% of 80150.

Subbasin 80141 does not exist in exist in the water quality model or digitized subbasin map.

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Io in	PER Io in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	80100	ULA2072	690.0	118	19.6	.0026	.020	.247	.10	.33	6.83	0.28	.00077980
2	H1	1	80110	ULC1855	1538.1	52	7.0	.0133	.020	.233	.10	.26	5.55	0.09	.00084600
3	H1	1	80115	ULC3093	542.3	13	26.5	.0122	.020	.227	.10	.30	5.84	0.10	.00083000
4	H1	1	80120	ULA3730	1542.0	39	24.8	.0261	.020	.225	.10	.23	5.35	0.09	.00083000
5	H1	1	80125	ULA5270	576.1	11	26.5	.0112	.020	.227	.10	.30	5.84	0.10	.00083000
6	H1	1	80127	ULB5991	803.2	13	13.8	.0310	.020	.262	.10	.40	5.79	0.10	.00083000
7	H1	1	80130	ULB4205	1381.5	48	7.0	.0115	.020	.234	.10	.28	5.58	0.09	.00086200
8	H1	1	80140	ULC3325	1088.9	91	24.8	.0116	.020	.225	.10	.23	5.35	0.09	.00083000
9	H1	1	80141	ULA5745	1739.4	101	24.8	.0160	.020	.225	.10	.23	5.35	0.09	.00083000
10	H1	1	80150	ULB6279	1040.3	40	41.5	.0147	.020	.232	.10	.30	6.37	0.22	.00078890
	* CHANGED LOAD POINT FROM ULS1120 TO ULS3770														
11	H1	1	80160	ULS3770	641.8	15	11.0	.0268	.020	.227	.10	.23	10.79	0.90	.00055600
12	H1	1	80162	ULS3770	2246.3	81	11.0	.0342	.020	.227	.10	.23	5.39	0.08	.00086200
13	H1	1	80163	ULS0870	421.1	14	26.5	.0513	.020	.227	.10	.30	5.84	0.10	.00083000
14	H1	1	80164	ULS3815	944.3	9	11.0	.0376	.020	.227	.10	.23	5.39	0.09	.00083000
15	H1	1	80165	ULS0470	1501.5	68	81.0	.0120	.020	.193	.10	.21	4.50	0.07	.00086200
16	H1	1	80200	ULD1260	1301.0	83	1.0	.0052	.020	.250	.10	.33	5.76	0.08	.00091000
17	H1	1	80201	ULR0078	529.4	7	26.5	.0078	.020	.227	.10	.30	5.84	0.10	.00083000
18	H1	1	80202	ULD3818	686.7	11	26.5	.0046	.020	.227	.10	.30	5.84	0.10	.00083000
19	H1	1	80203	ULD4066	3945.1	72	11.0	.0141	.020	.227	.10	.23	5.39	0.09	.00083000
20	H1	1	80204	ULR0318	2143.7	58	11.0	.0122	.020	.227	.10	.23	5.39	0.09	.00083000
21	H1	1	80205	ULD7056	1342.0	52	11.0	.0249	.020	.227	.10	.23	5.39	0.09	.00083000
22	H1	1	80206	ULE0892	662.5	28	11.0	.0256	.020	.227	.10	.23	5.39	0.09	.00083000
23	H1	1	80207	ULT0500L	1578.4	58	11.0	.0246	.020	.227	.10	.23	5.39	0.09	.00083000
24	H1	1	80208	ULR1580	1334.2	41	11.0	.0279	.020	.227	.10	.23	5.39	0.09	.00083000
	*ELIMINATED CHANNEL/JUNCTION ULU1758														
25	H1	1	80210	ULU1758L	1013.9	18	1.0	.0199	.020	.241	.10	.29	5.76	0.10	.00083000
26	H1	1	80220	ULJ0858	1248.6	35	41.5	.0162	.020	.242	.10	.32	6.00	0.14	.00083690
27	H1	1	80222	ULJ2804	1293.1	30	11.0	.0149	.020	.227	.10	.23	5.39	0.09	.00083000
28	H1	1	80230	ULJ2084	1158.4	22	8.4	.0171	.020	.281	.10	.46	5.78	0.10	.00083000
29	H1	1	80235	ULV1600L	519.3	18	11.0	.0159	.020	.227	.10	.23	5.39	0.09	.00083000
30	H1	1	80300	ULO3714	2779.1	349	12.9	.0049	.020	.264	.10	.39	7.14	0.29	.00078210
31	H1	1	80310	ULD0552	1505.7	42	1.0	.0090	.020	.248	.10	.32	5.76	0.09	.00086200
32	H1	1	80400	ULO5000L	5222.3	863	7.0	.0072	.020	.244	.10	.31	6.44	0.17	.00084150
33	H1	1	80410	ULH2500L	3544.7	412	7.0	.0078	.020	.247	.10	.32	5.72	0.10	.00083000
34	H1	1	80420	UL21260	5426.8	1304	9.9	.0021	.020	.244	.10	.31	6.26	0.17	.00077520
35	H10	1	80430	ULM3122L	4169.5	376	8.4	.0133	.020	.245	.10	.32	6.43	0.17	.00084150
36	H11	1	80450	ULM3300L	5951.8	792	36.5	.0158	.020	.237	.10	.30	6.26	0.17	.00084150
37	H12	1	80460	UL27210	9950.4	2452	36.7	.0014	.020	.244	.10	.30	6.62	0.20	.00086210
38	H13	1	80470	ULP4000L	7774.0	547	9.6	.0174	.020	.242	.10	.31	6.35	0.17	.00084150

F Existing

SHEET B:

BASIN: FISH CREEK EXISTING

SUBBASIN:

SCENERIO:SCENERIO:SCENERIO:SCENERIO:

NOTES: PRESENT LAND USE IS THE SAME AS FUTURE LAND USE FOR FISH CREEK.

#	GLOBAL LAND USE CATEGORIES
1	FOREST, PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

<------------------------ GLOBAL LAND USE PARAMETERS ------------------------>

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

<------------------------ PERCENT BY LAND USE CATEGORY ------------------------>

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	10010	50	0	0	40	0	0	0	0	10	0	100.0	84.5	5.6	9.9	100.0	.020	.259	.10	.37
2	10020	10	0	0	30	30	20	10	0	0	0	100.0	70.5	9.0	20.5	100.0	.020	.230	.10	.26
3	10030	10	0	0	90	0	0	0	0	0	0	100.0	81.5	8.5	10.0	100.0	.020	.234	.10	.26
4	10040	0	0	30	60	0	0	0	0	10	0	100.0	80.9	6.6	12.5	100.0	.020	.230	.10	.26
5	10050	0	0	20	70	0	0	0	0	10	0	100.0	79.6	7.1	13.3	100.0	.020	.228	.10	.25
6	10060	0	0	0	0	0	0	90	0	10	0	100.0	18.5	4.5	77.0	100.0	.020	.194	.10	.22
	10061	0	0	0	0	0	0	90	0	10	0	100.0	18.5	4.5	77.0	100.0	.020	.194	.10	.22
7	10070	10	0	35	35	5	5	5	0	5	0	100.0	80.3	6.3	13.4	100.0	.020	.237	.10	.30
	10071	10	0	35	35	5	5	5	0	5	0	100.0	80.3	6.3	13.4	100.0	.020	.237	.10	.30
	10072	10	0	35	35	5	5	5	0	5	0	100.0	80.3	6.3	13.4	100.0	.020	.237	.10	.30
8	10100	30	0	0	65	0	0	0	0	5	0	100.0	83.0	7.1	10.0	100.0	.020	.246	.10	.32
9	10110	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
10	10120	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
11	10130	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
12	10140	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
13	10200	0	0	30	0	0	40	0	0	30	0	100.0	68.9	6.0	25.1	100.0	.020	.222	.10	.27
14	10210	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
15	10220	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
16	10230	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
17	10300	0	0	100	0	0	0	0	0	0	0	100.0	93.0	4.0	3.0	100.0	.020	.241	.10	.32
18	10310	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
19	10320	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
20	10330	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
21	10340	0	0	0	45	0	0	0	50	5	0	100.0	52.5	7.6	40.0	100.0	.020	.219	.10	.23
22	10400	25	0	0	65	10	0	0	0	0	0	100.0	83.3	7.9	8.9	100.0	.020	.243	.10	.30
23	10500	0	0	15	80	0	0	0	0	5	0	100.0	80.5	7.8	11.8	100.0	.020	.228	.10	.25
24	10510	0	0	0	20	35	0	15	0	5	25	100.0	47.0	6.1	47.0	100.0	.020	.221	.10	.23
25	11000	0	0	0	30	30	30	10	0	0	0	100.0	67.5	9.8	22.7	100.0	.020	.221	.10	.23
26	11010	10	0	0	60	0	0	30	0	0	0	100.0	62.0	7.3	30.7	100.0	.020	.233	.10	.27

SHEET C : CREATED: 03/01/90 EDITED: 12/08/94

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: FISH CREEK - FS EXISTING

SUBBASIN:

SCENARIO :

NOTES:

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	10010	0	0	100	0	100.0
2	10020	0	0	90	10	100.0
3	10030	0	0	100	0	100.0
4	10040	0	0	67	33	100.0
5	10050	0	0	90	10	100.0
6	10060	0	0	67	33	100.0
	10061	0	0	67	33	100.0
7	10070	0	0	80	20	100.0
	10071	0	0	80	20	100.0
	10072	0	0	80	20	100.0
8	10100	0	0	100	0	100.0
9	10110	0	0	100	0	100.0
10	10120	0	0	100	0	100.0
11	10130	0	0	100	0	100.0
12	10140	0	0	100	0	100.0
13	10200	0	0	60	40	100.0
14	10210	0	0	100	0	100.0
15	10220	0	0	100	0	100.0
16	10230	0	0	100	0	100.0
17	10300	0	0	67	33	100.0
18	10310	0	0	80	20	100.0
19	10320	0	0	90	10	100.0
20	10330	0	0	100	0	100.0
21	10340	0	0	100	0	100.0
22	10400	0	0	100	0	100.0
23	10500	0	0	67	33	100.0
24	10510	0	0	100	0	100.0
25	11000	0	0	100	0	100.0
26	11010	0	0	100	0	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CUH-RUNOFF. DON'T FORGET TO
CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS.
GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK
FOR EARORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING
OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
ENTER THE NUMBERS HIGHLIGHTED IN GREEN.

BASIN : FISH CREEK - FS EXISTING

SUBBASIN:

SCENARIO:

NOTES:

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	10010	FS00000	1215.23	38	9.9	.0189	.020	.259	.10	.37	5.63	0.09	.00083000
2	H1	1	10020	FS03800	3201.15	632	20.5	.0079	.020	.230	.10	.26	5.32	0.08	.00086200
3	H1	1	10030	FS09000	5946.93	71	10.0	.0054	.020	.234	.10	.26	5.43	0.09	.00083000
4	H1	1	10040	FS10550	1042.42	45	12.5	.0203	.020	.230	.10	.26	5.55	0.07	.00093560
5	H1	1	10050	FS13270	1762.44	71	13.3	.0205	.020	.228	.10	.25	5.51	0.08	.00086200
	* created subbasin 10061 from 10060 to drain into detention basin FS15631														
6	H1	1	10060	FS15180	2095	111	77.0	.0116	.020	.194	.10	.22	4.03	0.06	.00093560
	H1	1	10061	FS15631	284.101	15	77.0	.0116	.020	.194	.10	.22	4.03	0.06	.00093560
	* created subbasin 10071 and 10072 to drain into det.basin and upstream of d.b.														
7	H1	1	10070	FS16990	758	68	13.4	.0064	.020	.237	.10	.30	5.56	0.08	.00089400
	H1	1	10071	FS17940	1516	137	13.4	.0064	.020	.237	.10	.30	5.56	0.08	.00089400
	H1	1	10072	FS19640	1516	137	13.4	.0064	.020	.237	.10	.30	5.56	0.08	.00089400
8	H1	1	10100	FSA0550	1160.15	59	10.0	.0481	.020	.246	.10	.32	5.53	0.09	.00083000
9	H1	1	10110	FSA2250	919.244	16	11.0	.0193	.020	.227	.10	.23	5.39	0.09	.00083000
10	H1	1	10120	FSB1000	1819.33	68	13.0	.0508	.020	.226	.10	.24	5.41	0.09	.00083000
11	H1	1	10130	FSB2267	1638.6	51	13.0	.0105	.020	.226	.10	.24	5.41	0.09	.00083000
12	H1	1	10140	FSB3190	1584.22	39	13.0	.0107	.020	.226	.10	.24	5.41	0.09	.00083000
13	H1	1	10200	FS10550	1602.41	42	25.1	.0323	.020	.222	.10	.27	5.52	0.06	.00095800
14	H1	1	10210	FSF1150	778.456	44	11.0	.0130	.020	.227	.10	.23	5.39	0.09	.00083000
15	H1	1	10220	FS13870	1425.29	84	13.0	.0186	.020	.226	.10	.24	5.41	0.09	.00083000
16	H1	1	10230	FSF4083	2605.26	146	11.0	.0154	.020	.227	.10	.23	5.39	0.09	.00083000
17	H1	1	10300	FS12420	554.694	15	3.0	.0188	.020	.241	.10	.32	5.75	0.07	.00093560
18	H1	1	10310	FSG1142	1281.18	35	13.0	.0079	.020	.226	.10	.24	5.41	0.08	.00089400
19	H1	1	10320	FSG1750	1971.01	61	11.0	.0077	.020	.227	.10	.23	5.39	0.08	.00086200
	* changed load point to channel upstream of Waterleaf Dr - increased impervious area from 13 to 25%														
20	H1	1	10330	FS03700	1708.01	122	25.0	.0069	.020	.226	.10	.24	5.41	0.09	.00083000
21	H1	1	10340	FS05735L	625.355	39	40.0	.0050	.020	.219	.10	.23	5.25	0.09	.00083000
22	H1	1	10400	FSH2750	1387.14	137	8.9	.0116	.020	.243	.10	.30	5.48	0.09	.00083000
23	H1	1	10500	FS15180	1387.42	76	11.8	.0097	.020	.228	.10	.25	5.47	0.07	.00093560
24	H1	1	10510	FSE2250	2981.17	107	47.0	.0055	.020	.221	.10	.23	5.32	0.09	.00083000
25	H1	1	11000	FS09000	3050.91	275	22.7	.0196	.020	.221	.10	.23	5.24	0.09	.00083000
26	H1	1	11010	FSD6600L	5002.55	658	30.7	.0058	.020	.233	.10	.27	5.37	0.09	.00083000

F Future

SHEET B:

BASIN: FISH CREEK FUTURE

SUBBASIN:

SCENERIO:SCENERIO:SCENERIO:SCENERIO:

NOTES: PRESENT LAND USE IS THE SAME AS FUTURE LAND USE FOR FISH CREEK.

#	GLOBAL LAND USE CATEGORIES
1	FOREST, PRESERVATION (UNCONNECTED WETLANDS)
2	AGRICULTURE
3	RURAL RESIDENTIAL PARK(3.0 - 10 ACRES)
4	LOW DENSITY RESIDENTIAL (.75 - 3.0 ACRES)
5	MEDIUM DENSITY RESIDENTIAL (.4 - .75 ACRES)
6	HIGH DENSITY RESIDENTIAL (.16 - .4 ACRES)
7	COMMERCIAL
8	INDUSTRIAL
9	HIGHWAY ROW
10	CONNECTED WETLANDS AND OPEN WATER

<---- GLOBAL LAND USE PARAMETERS ---->

	1	2	3	4	5	6	7	8	9	10
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
PERVIOUS n	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.200	0.300
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.50	0.30	0.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% IMPERVIOUS	5.0	5.0	7.0	20.0	25.0	35.0	85.0	72.0	50.0	100.0
% DCIA	1.0	1.0	3.0	11.0	15.0	23.0	80.0	65.0	50.0	100.0
% NDCIA	4.0	4.0	4.0	9.0	10.0	12.0	5.0	7.0	0.0	0.0
% PERVIOUS	95.0	95.0	93.0	80.0	75.0	65.0	15.0	28.0	50.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**THIS SPREADSHEET MUST BE ADJUSTED IF THE SCS APPROACH OF 0.2 TIMES SOIL STORAGE IS DESIRED.

<---- PERCENT BY LAND USE CATEGORY ---->

	HYDROLOGIC UNIT ID	1 FOREST	2 AGRIC	3 RRP	4 LDR	5 MDR	6 HDR	7 COMMER	8 INDUST	9 HIGHWAY	10 WATER	CHECK %	PERVIOUS %	NDCIA %	DCIA %	CHECK %	DCIA n	NDCIA & PERVIOUS n	DCIA Ia	NDCIA & PERVIOUS Ia
1	10010	50	0	0	40	0	0	0	0	10	0	100.0	84.5	5.6	9.9	100.0	.020	.259	.10	.37
2	10020	10	0	0	30	30	20	10	0	0	0	100.0	70.5	9.0	20.5	100.0	.020	.230	.10	.26
3	10030	10	0	0	90	0	0	0	0	0	0	100.0	81.5	8.5	10.0	100.0	.020	.234	.10	.26
4	10040	0	0	30	60	0	0	0	0	10	0	100.0	80.9	6.6	12.5	100.0	.020	.230	.10	.26
5	10050	0	0	20	70	0	0	0	0	10	0	100.0	79.6	7.1	13.3	100.0	.020	.228	.10	.25
6	10060	0	0	0	0	0	0	90	0	10	0	100.0	18.5	4.5	77.0	100.0	.020	.194	.10	.22
	10061	0	0	0	0	0	0	90	0	10	0	100.0	18.5	4.5	77.0	100.0	.020	.194	.10	.22
7	10070	10	0	35	35	5	5	5	0	5	0	100.0	80.3	6.3	13.4	100.0	.020	.237	.10	.30
	10071	10	0	35	35	5	5	5	0	5	0	100.0	80.3	6.3	13.4	100.0	.020	.237	.10	.30
	10072	10	0	35	35	5	5	5	0	5	0	100.0	80.3	6.3	13.4	100.0	.020	.237	.10	.30
8	10100	30	0	0	65	0	0	0	0	5	0	100.0	83.0	7.1	10.0	100.0	.020	.246	.10	.32
9	10110	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
10	10120	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
11	10130	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
12	10140	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
13	10200	0	0	30	0	0	40	0	0	30	0	100.0	68.9	6.0	25.1	100.0	.020	.222	.10	.27
14	10210	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
15	10220	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
16	10230	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
17	10300	0	0	100	0	0	0	0	0	0	0	100.0	93.0	4.0	3.0	100.0	.020	.241	.10	.32
18	10310	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
19	10320	0	0	0	100	0	0	0	0	0	0	100.0	80.0	9.0	11.0	100.0	.020	.227	.10	.23
20	10330	0	0	0	95	0	0	0	0	5	0	100.0	78.5	8.6	13.0	100.0	.020	.226	.10	.24
21	10340	0	0	0	45	0	0	0	50	5	0	100.0	52.5	7.6	40.0	100.0	.020	.219	.10	.23
22	10400	25	0	0	65	10	0	0	0	0	0	100.0	83.3	7.9	8.9	100.0	.020	.243	.10	.30
23	10500	0	0	15	80	0	0	0	0	5	0	100.0	80.5	7.8	11.8	100.0	.020	.228	.10	.25
24	10510	0	0	0	20	35	0	15	0	5	25	100.0	47.0	6.1	47.0	100.0	.020	.221	.10	.23
25	11000	0	0	0	30	30	30	10	0	0	0	100.0	67.5	9.8	22.7	100.0	.020	.221	.10	.23
26	11010	10	0	0	60	0	0	30	0	0	0	100.0	62.0	7.3	30.7	100.0	.020	.233	.10	.27

SHEET C :	CREATED:	03/01/90	EDITED:	12/08/94

This file computes soils parameters by hydrologic unit. Check global soils categories and parameters as appropriate. The weighting scheme assumes that pavement is equally distributed among all soil groups. Therefore, you must adjust the spreadsheet if you want to account for paving over a specific soil group.
Enter the numbers highlighted in green.

BASIN: FISH CREEK - FS FUTURE

SUBBASIN:

SCENARIO :

NOTES:

<-----GLOBAL SOILS PARAMETERS----->

SOIL TYPE	INITIAL INFILT. RATE (IN/HR)	FINAL INFILT. RATE (IN/HR)	DECAY RATE (1/SEC)	SOIL STORAGE (IN)
A	12.00	1.00	0.000556	6.75
B	9.00	0.50	0.000556	5.00
C	6.00	0.10	0.00083	3.80
D	6.00	0.03	0.00115	1.40

<---------PERCENT BY HYDROLOGIC UNIT------->

	HYDROLOGIC UNIT ID	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL
1	10010	0	0	100	0	100.0
2	10020	0	0	90	10	100.0
3	10030	0	0	100	0	100.0
4	10040	0	0	67	33	100.0
5	10050	0	0	90	10	100.0
6	10060	0	0	67	33	100.0
	10061	0	0	67	33	100.0
7	10070	0	0	80	20	100.0
	10071	0	0	80	20	100.0
	10072	0	0	80	20	100.0
8	10100	0	0	100	0	100.0
9	10110	0	0	100	0	100.0
10	10120	0	0	100	0	100.0
11	10130	0	0	100	0	100.0
12	10140	0	0	100	0	100.0
13	10200	0	0	60	40	100.0
14	10210	0	0	100	0	100.0
15	10220	0	0	100	0	100.0
16	10230	0	0	100	0	100.0
17	10300	0	0	67	33	100.0
18	10310	0	0	80	20	100.0
19	10320	0	0	90	10	100.0
20	10330	0	0	100	0	100.0
21	10340	0	0	100	0	100.0
22	10400	0	0	100	0	100.0
23	10500	0	0	67	33	100.0
24	10510	0	0	100	0	100.0
25	11000	0	0	100	0	100.0
26	11010	0	0	100	0	100.0

SHEET D:

THIS SPREADSHEET WRITES THE H1 "CARDS" FOR CDM-RUNOFF. DON'T FORGET TO CHOOSE HYETOGRAPHS, IDENTIFY LOAD POINTS, AND CHECK PRINT CONTROLS. GAPS HAVE BEEN PLACED BETWEEN HU # AND LP # IN ORDER TO BETTER CHECK FOR ERRORS AT THIS POINT. THE GAPS CAN BE DELETED PRIOR TO PRINTING OR CAN BE EDITED WITH A FULL SCREEN EDITOR.
ENTER THE NUMBERS HIGHLIGHTED IN GREEN.

BASIN : FISH CREEK - FS FUTURE

SUBBASIN:

SCENARIO:

NOTES:

		HYE #	HU #	LP #	W ft	A ac	DCIA %	SLOPE ft/ft	IMP n	PER n	IMP Ia in	PER Ia in	MAX I in/hr	MIN I in/hr	DECAY RATE 1/sec
1	H1	1	10010	FS00000	1215.23	38	9.9	.0489	.020	.259	.10	.37	5.63	0.09	.00083000
2	H1	1	10020	FS03800	3201.15	632	20.5	.0079	.020	.230	.10	.26	5.32	0.08	.00086200
3	H1	1	10030	FS09000	5946.93	71	10.0	.0054	.020	.234	.10	.26	5.43	0.09	.00083000
4	H1	1	10040	FS10550	1042.42	45	12.5	.0203	.020	.230	.10	.26	5.55	0.07	.00093560
5	H1	1	10050	FS13270	1762.44	71	13.3	.0205	.020	.228	.10	.25	5.51	0.08	.00086200
	* created subbasin 10061 from 10060 to drain into detention basin FS15631														
6	H1	1	10060	FS15180	2095	111	77.0	.0116	.020	.194	.10	.22	4.83	0.06	.00093560
	H1	1	10061	FS15631	284.101	15	77.0	.0116	.020	.194	.10	.22	4.83	0.06	.00093560
	* created subbasin 10071 and 10072 to drain into det.basin and upstream of d.b.														
7	H1	1	10070	FS16990	758	68	13.4	.0064	.020	.237	.10	.30	5.56	0.08	.00089400
	H1	1	10071	FS17940	1516	137	13.4	.0064	.020	.237	.10	.30	5.56	0.08	.00089400
	H1	1	10072	FS19640	1516	137	13.4	.0061	.020	.237	.10	.30	5.56	0.08	.00089400
8	H1	1	10100	FSA0550	1168.15	59	10.0	.0481	.020	.246	.10	.32	5.53	0.09	.00083000
9	H1	1	10110	FSA2250	919.244	16	11.0	.0193	.020	.227	.10	.23	5.39	0.09	.00083000
10	H1	1	10120	FSB1000	1019.33	68	13.0	.0508	.020	.226	.10	.24	5.41	0.09	.00083000
11	H1	1	10130	FSB2267	1638.6	51	13.0	.0105	.020	.226	.10	.24	5.41	0.09	.00083000
12	H1	1	10140	FSB3190	1584.22	39	13.0	.0107	.020	.226	.10	.24	5.41	0.09	.00083000
13	H1	1	10200	FS10550	1602.41	42	25.1	.0323	.020	.222	.10	.27	5.52	0.06	.00095800
14	H1	1	10210	FSF1150	778.456	44	11.0	.0130	.020	.227	.10	.23	5.39	0.09	.00083000
15	H1	1	10220	FS13870	1425.29	84	13.0	.0186	.020	.226	.10	.24	5.41	0.09	.00083000
16	H1	1	10230	FSF4083	2605.26	146	11.0	.0154	.020	.227	.10	.23	5.39	0.09	.00083000
17	H1	1	10300	FS12420	554.694	15	3.0	.0188	.020	.241	.10	.32	5.75	0.07	.00093560
18	H1	1	10310	FSG1142	1281.18	35	13.0	.0079	.020	.226	.10	.24	5.41	0.08	.00089400
19	H1	1	10320	FSG1750	1971.01	61	11.0	.0077	.020	.227	.10	.23	5.39	0.08	.00086200
	* changed load point to channel upstream of Waterleaf Dr - increased impervious area from 13 to 25%														
20	H1	1	10330	FS03700	1708.01	122	25.0	.0069	.020	.226	.10	.24	5.41	0.09	.00083000
21	H1	1	10340	FS05735L	625.355	39	40.0	.0050	.020	.219	.10	.23	5.25	0.09	.00083000
22	H1	1	10400	FSH2750	1387.14	137	8.9	.0116	.020	.243	.10	.30	5.48	0.09	.00083000
23	H1	1	10500	FS15180	1387.42	76	11.8	.0097	.020	.220	.10	.25	5.47	0.07	.00093560
24	H1	1	10510	FSE2250	2901.17	107	47.0	.0055	.020	.221	.10	.23	5.32	0.09	.00083000
25	H1	1	11000	FS09000	3050.91	275	22.7	.0196	.020	.221	.10	.23	5.24	0.09	.00083000
26	H1	1	11010	FSD6600L	5002.55	658	30.7	.0058	.020	.233	.10	.27	5.37	0.09	.00083000

Flow and Elevation Results

Appendix
Culvert Capacity Analysis Results - Maximum Elevations
Fish Creek Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Upstream Junction	Road	Shape	Size (in)	Estimated Top of Road Elevation (ft)	2-Year Elevation (ft)	10-Year Elevation (ft)	25-Year Elevation (ft)	100-Year Elevation (ft)
FS232090	FS07720	Ravine Baye Road	Arch	47 x 71	664.0	630.3	634.8	640.3	651.6
FS232014	FS10550	County Line Road	Arch	101 x 161	682.0	656.0	657.1	657.9	659.8
FS232023	FS13870	I-43	Box	48 x 96	667.5	664.6	666.7	667.6	667.9
FS231015	FS14280	Port Washington Road	Box	48 x 96	677.6	673.3	675.3	676.4	678.2
FS231001	FS16990	County Line Road	Circular	36	682.4	677.1	677.5	678.0	680.5
FS231081	FS17540	Donges Bay Road (inlet into existing detention basin)	Circular	18	681.0	680.8	681.6	681.6	681.3
FS233019	FSA2250	Lake Shore Drive	Circular	12	680.5	671.2	675.6	680.6	680.7
FS232046	LSB2267	Otto Road	Arch	2 @ 31 x 40	673.5	665.2	665.5	666.1	667.6
FS232051	FSB3190	Zedler Lane	Arch	2 @ 18 x 24	675.0	672.9	673.3	674.5	675.2
FS232016	FSF1150	Port Washington Road	Circular	2 @ different sizes	676.0	671.3	672.2	672.9	674.5
FS231003	FSF3383	County Line Road	Box	36 x 72	687.1	683.2	683.6	684.1	685.3
FS232024	FSG1142	Zedler Lane	Arch	47 x 71	679.8	677.1	677.9	678.4	679.6
FS232082	FSG1800	UPRR Tracks	Box	72 x 96	688.5	678.1	678.5	678.9	679.9
FS232067	FSG2905	Waterleaf Drive	Arch	5 @ different sizes	679.6	678.6	679.1	679.6	680.1
FS232066	FSG3775	Aster Lane	4 Archs, 1 Circular	5 @ different sizes	682.1	678.9	679.3	679.8	680.4
FS232062	FSG4305	Trillium Road	Arch	4 @ 20 x 28	682.1	679.1	679.6	680.1	681.2
FS232074	FSG5685	Donges Bay Road	Arch	2 @ 20 x 28	696.4	689.8	691.0	692.7	696.5
FS231080	FSH0250	Port Washington Road	Circular	2 @ 42	681.5	673.5	673.6	673.7	675.3

Appendix
Culvert Capacity Analysis Results - Maximum Elevations
Pigeon Creek Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Upstream Junction	Road	Shape	Size (in)	Estimated Top of Road Elevation (ft)	2-Year Elevation (ft)	10-Year Elevation (ft)	25-Year Elevation (ft)	100-Year Elevation (ft)
PG122042	PG01800	WCRR Tracks	Bridge	98 x 576	658.4	657.2	657.5	657.8	658.5
PG122044	PG02680	Williamsburg Drive	Bridge	48 x 288	664.5	659.5	659.9	660.2	660.9
PG122029	PG03200	Seminary Drive	Box	108 x 156	670.5	662.5	663.5	664.5	668.9
PG115004	PG04000	Freistadt Road	Box	90 x 228	671.0	663.0	663.7	664.6	669.0
PG115028	PG08050	WCRR Tracks	Bridge	120 x 720	680.8	668.9	669.3	669.5	670.2
PG110003	PG11200	Highland Road	Bridge	72 x 360	682.0	675.7	676.0	676.5	677.8
PG110011	PG11675	WCRR Tracks	Bridge	48 x 336	691.8	678.0	678.2	678.5	679.6
PG109005	PG16075	Wauwatosa Road	Box	48 x 90	737.5	727.5	727.6	727.6	728.8
PG109010	PG16975	Highland Road	Circular	48	729.7	728.5	728.8	729.1	730.0
PG110006	PGB3500	Cedarburg Road	Ellipse	3 @ 38 x 60	707.2	700.3	700.6	700.9	702.3
PG110010	PGB5350	WCRR Spur	Circular	24	707.2	707.4	707.6	707.7	708.2
PG103013	PGB5700	Bonniwell Road	Box	48 x 72	713.5	707.8	708.2	708.6	710.3
PG103028	PGB10650	WCRR Tracks	Circular	48	742.0	737.0	737.2	737.4	738.5
PG103031	PGB11850	Concord Street	Circular	28	740.5	740.8	740.9	740.9	741.2
PG102012	PGB12250	Pioneer Road	Circular	27	749.7	748.8	749.7	749.9	750.4
PG109006	PGC1000	Wauwatosa Road	Box	3 @ 72 x 108	738.0	729.4	729.6	729.9	731.1
PG109002	PGC2750	Hawthorne Road	Circular	2 @ 48	760.7	748.4	748.9	749.6	756.0
PG109011	PGC6980	Hawthorne Road	Circular	2 @ different sizes	790.5	780.9	781.1	781.3	782.5
PG104001	PGD3050	Bonniwell Road	Arch	2 @ 55 x 73	777.7	773.8	773.8	774.1	776.1
PG103023	PGD3850	Wauwatosa Road	Circular	15	781.3	780.3	781.0	781.6	782.2
PG103002	PGD7325	Pioneer Road	Box	46.8 x 72	787.8	782.8	783.3	783.6	784.9
PG104002	PGE3450	Bonniwell Road	Arch	75 x 112	808.0	797.2	797.4	797.9	799.9
PG104003	PGE8950	Pioneer Road	Box	54 x 96	813.0	806.5	806.9	807.6	809.5
PG105005	PGE21500	Pioneer Road	Box	54 x 120	860.7	854.5	854.9	855.3	856.8
PG105004	PGE22900	Pioneer Road	Arch	79 x 117	876.8	862.0	862.4	862.7	864.3
PG105003	PGE25550	Pioneer Road	1 Circular, 1 Box	2 @different sizes	873.0	864.4	864.7	865.3	866.3
PG105001	PGE29950	Granville Road	Circular	36	875.3	872.1	872.3	873.1	875.4
PG108015	PGF3490	Hawthorne Road	Circular	2 @ different sizes	802.9	797.5	797.7	797.9	799.3
PG105010	PGF5350	Bonniwell Road	Box	24 x 36	834.7	830.5	830.7	831.0	833.9
PG104011	PGG2925	Davis Road	Arch	20 x 28	821.8	818.6	818.7	818.8	819.1
PG105006	PGI2800	Davis Road	Arch	41 x 53	826.3	821.1	821.2	821.7	823.4
PG105002	PGK0650	Granville Road	Box	30 x 42	872.4	869.7	870.0	870.7	872.4

Appendix
Culvert Capacity Analysis Results - Maximum Elevations
Mequon MU Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Upstream Junction	Road	Shape	Size (in)	Estimated Top of Road Elevation (ft)	2-Year Elevation (ft)	10-Year Elevation (ft)	25-Year Elevation (ft)	100-Year Elevation (ft)
MU120007	MU04870	Mequon Road	Box	75 x 80.4	733.5	727.2	728.4	728.7	729.8
MU116018	MU10552	Freistadt Road	Bridge	55.2 x 204	736.5	730.7	731.0	731.6	732.7
MU120005	MUB2482	Farmdale Road	Box	31 x 40.8	763.7	759.5	759.6	759.7	761.3
MU120006	MUC3480	Farmdale Road	Box	44.4 x 48	779.6	773.4	773.7	774.3	775.2
MU117001	MUD0686	Freistadt Road	Box	24 x 36	761.3	756.8	757.0	757.6	760.5
MU129004	MUE2645	Donges Bay Road	Box	49.2 x 96	740.7	735.0	735.2	735.3	736.3
MU132043	MUE3489	Concord Drive	Arch	33 x 49	739.9	735.7	735.9	736.5	737.8
MU132049	MUE4729	Swan Road	Arch	47 x 71	742.1	736.9	737.2	737.8	739.2
MU133001	MUE6064	Donges Bay Road	Box	27.6 x 42	742.3	738.3	738.5	738.9	740.3

Appendix
Culvert Capacity Analysis Results - Maximum Elevations
Mequon MQ Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Upstream Junction	Road	Shape	Size (in)	Estimated Top of Road Elevation (ft)	2-Year Elevation (ft)	10-Year Elevation (ft)	25-Year Elevation (ft)	100-Year Elevation (ft)
MQ135029	MQA1098	Cedarburg Road	Arch	2 @ 71 x 103	650.0	648.9	649.5	649.9	650.8
MQ135037	MQA3265	WCRR Tracks	Bridge	66 x 288	665.0	651.5	651.9	652.2	652.9
MQ135033	MQA5765	Baehr Road	Box	72 x 138	660.8	654.6	654.8	655.2	656.7
MQ133004	MQA11709	Wauwatosa Road	Circular	2 @ 60	673.6	667.7	668.1	670.0	671.2
MQ135003	MQB2000	Westfield Road	Circular	3 @ 24	656.3	652.8	653.2	653.4	654.0
MQ135035	MQB4062	Donges Bay Road	Circular	3 @ 30	657.9	654.2	654.4	654.5	654.9
MQ134006	MQC4094	Baehr Road	Arch	5 @ 41 x 53	665.9	663.8	664.6	665.5	666.8
MQ134012	MQC6259	Enterprise Drive	Arch	3 @ 47 x 71	681.0	675.1	675.6	675.9	676.9
MQ134009	MQC6709	Donges Bay Road	Arch	3 @ 47 x 71	687.0	678.5	678.9	679.1	680.0
MQ127034	MQC11309	Wauwatosa Road	Circular	3 @ 54	716.0	711.5	711.8	712.1	713.0
MQ127031	MQD1350	Wauwatosa Road	Circular	48	736.1	728.6	729.2	729.9	732.2
MQ133009	MQK2010	Wauwatosa Road	Circular	2 @ 30	680.5	678.8	680.5	681.0	681.5
MQ136050	MQE1248	Le Mont Blvd	Circular	72	659.0	652.3	652.6	653.0	653.8
MQ136061	MQE3893	Le Grande Blvd	Arch	41 x 53	657.3	653.6	654.1	655.1	657.8
MQ136042	MQE4568	Donges Bay Road	Circular	42	666.5	662.2	662.8	664.2	667.2
MQ219043	MQF1050	Ranch Road	Arch	2 @ 52 x 77	666.8	661.7	662.3	662.9	664.5
MQ219042	MQF1850	Hickory Lane	Arch	2 @ 52 x 77	666.0	663.3	663.9	664.9	666.7
MQ219045	MQF2600	Chestnut Road	Arch	3 @ different sizes	665.6	664.6	665.6	666.3	666.9
MQ219046	MQF3405	Glenbrook Lane	Arch	2 @ 43 x 64	669.5	667.1	667.8	668.6	670.1
MQ230085	MQF4005	Mequon Road	Circular	2 @ 48	671.6	669.6	670.1	670.6	672.1
MQ230039	MQF4803	Range Line Road	Arch	47 x 71	693.8	688.7	689.4	690.3	694.1
MQ219020	MQG3540	Country Lane	Circular	5 @ 48	664.3	659.4	659.8	660.1	660.6
MQ220037	MQG5600	Port Washington Road	Box	60 x 126	669.6	660.6	661.0	661.3	661.7
MQ220046	MQG7086	I-43	Circular	2 @ 36	666.5	663.8	664.1	664.4	664.9
MQ229064	MQG10686	Mequon Road	Box	48 x 120	671.1	667.5	667.9	668.3	669.2
MQ219003	MQH0944	Glen Oaks Lane	Box	48 x 48	675.0	667.2	667.6	668.0	669.2
MQ217012	MQH1209	Port Washington Road	Box	42 x 60	679.7	669.9	670.1	670.3	671.3
MQ217008	MQH1736	Corporate Parkway	Circular	3 @ 18	675.4	672.7	673.6	674.7	676.0
MQ217020	MQH2395	I-43	Circular	36	676.0	674.4	675.2	676.2	676.7
MQ217016	MQH2828	UPRR Tracks	Circular	30	687.0	678.1	678.9	681.8	687.4
MQ220040	MQI0045	UPRR Tracks	Circular	2 @ 48	675.7	662.7	663.1	663.7	664.2
MQ220017	MQI1490	Lake Shore Drive	Arch	20 x 28	666.7	663.9	664.9	666.1	667.2
MQ220018	MQJ0242	Lake Shore Drive	Circular	15	666.9	663.3	664.0	664.6	665.5
MQ220022	MQJ0976	Pinehurst Circle	Circular	18	675.2	672.7	673.1	673.6	675.3
MQ126017	MQL1060	Cedarburg Road	Box	36 x 48	665.6	662.1	663.0	664.0	665.2

MQ126018	MQL1393	Sherwood Drive	Arch	20 x 28	663.5	664.0	664.3	664.5	665.2
MQ126020	MQL3034	WCRR Tracks	Circular	42	676.9	674.0	677.1	677.4	677.8
MQ124006	MQN0850	St. James Lane	Arch	2 @ 29 x 42	677.9	669.9	670.1	670.4	671.0
MQ124012	MQN1690	Bobolink Lane	Circular	24	690.2	687.6	688.2	690.0	690.5
MQ113020	MQ02548	Ville Du Park Drive	Arch	15 x 21	678.8	675.4	675.4	675.5	675.7
MQ219050	MQP0420	Glenbrook Lane	Arch	2 @ 38 x 57	670.4	667.8	668.2	668.5	669.3
MQ124001	MQP2452	Bobolink Lane	Arch	47 x 71	684.0	679.5	680.2	680.9	684.1
MQ136075	MQQ0542	Le Grande Blvd	Arch	2 @ 24 x 35	655.4	652.9	653.3	653.8	655.3
MQ136076	MQQ1284	Le Mont Blvd	Arch	2 @ 29 x 42	660.8	658.1	658.4	658.7	659.7
MQ13699J	MQQ2584	Range Line Court	Circular	2 @ 24	677.4	675.9	676.4	677.1	678.0
MQ136038	MQQ4478	Donges Bay Road	Arch	20 x 28	721.6	721.6	721.8	722.0	722.3
MQ122030	MQR0615	Cedarburg Road	Box	108 x 144	660.1	659.5	659.9	660.3	660.8
MQ122035	MQR1072	WCRR Tracks	Box	2 @ 58.8 x 144	676.0	666.5	666.8	667.0	667.7
MQ122016	MQR1822	Buntrock Avenue	Bridge	66 x 138	681.9	675.3	675.7	676.1	677.1
MQ121059	MQR6048	Wauwatosa Road	Box	60 x 90	733.5	726.3	726.8	727.5	728.9
MQ122045	MQS0350	Main Street	Circular	48	665.3	661.9	662.2	662.4	663.8
MQ122038	MQS0774	WCRR Tracks	Bridge	18 x 168	677.0	673.1	673.3	673.4	674.9
MQ122046	MQS1130	Orchard Street	Circular	36	689.9	685.6	685.7	685.7	686.2
MQ122024	MQS1860	Buntrock Avenue	Circular	42	709.2	704.0	704.6	705.1	709.5
MQ122022	MQS1950	West Street	Arch	33 x 49	711.4	708.7	709.5	710.6	712.2
MQ113032	MQT1440	Freistadt Road	Box	55.2 x 114	665.4	659.0	659.5	660.7	661.6
MQ113036	MQT3448	Ville Du Parc Drive	Arch	3 @ different sizes	670.2	666.2	666.6	667.1	668.3
MQ113048	MQT6180	River Road	Ellipse	43 x 68	691.8	686.2	686.6	687.0	688.0
MQ218066	MQU0238	Shoreland Parkway Wes	Box	60 x 120	662.8	656.1	656.6	657.0	658.4
MQ218065	MQU0842	Fieldwood Road	Box	69.6 x 80.4	669.9	662.4	663.0	663.6	665.6
MQ113003	MQU1945	Yvonne Drive	Arch	2 @ 29 x 42	665.8	663.7	664.3	665.6	666.8
MQ112004	MQV0066	Highland Road	Arch	3 @ 47 x 71	669.3	663.7	664.3	665.6	667.0
MQ102002	MQV10084	Bonniwell Road	Circular	15	741.9	737.7	739.9	742.1	742.3
MQ101010	MQW1700	Riverland Drive	Box	60 x 84	678.3	676.2	676.9	677.5	678.4
MQ125081	MQY2936	Range Line Drive	Box	45.6 x 56.4	687.6	680.4	681.0	681.7	683.3
MQ230086	MQX0700	Mequon Road	Circular	2 @ 48	677.6	672.8	673.2	673.5	674.4
MQ101006	MQZ1042	Riverland Road	Box	36 x 72	688.0	677.4	677.6	677.8	678.4
MQ218061	MA0395	Fieldwood Road	Box	24 x 24	665.0	662.0	662.4	663.0	664.3
MQ113022	MA1785	Ville Du Parc Drive	Circular	12	684.0	682.1	683.3	684.0	684.3
MQ113021	MA1971	Woodland Drive	Arch	13 x 17	685.0	683.3	683.4	683.8	684.1
MQ220044	MC0000	I-43	Circular	2 @ 24	670.0	665.2	665.8	666.3	667.4
MQ220036	MC1252	Port Washington Road	Box	24 x 24	675.0	671.4	671.7	672.2	674.7
MQ113043	MQRR552	Freistadt Road	Box	24 x 36	676.0	665.6	666.5	667.8	671.9
MQ113019	MQTT700	Ville Du Parc Drive	Arch	18 x 24	683.2	679.2	679.5	679.7	679.8

Appendix
Culvert Capacity Analysis Results - Maximum Elevations
Ulao Creek Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Upstream Junction	Road	Shape	Size (in)	Estimated Top of Road Elevation (ft)	2-Year Elevation (ft)	10-Year Elevation (ft)	25-Year Elevation (ft)	100-Year Elevation (ft)
UL207021	UL01970	Private Drive off Bonniwell Road	Bridge	2 @ 72 x 72	665.6	660.0	661.3	662.5	664.5
UL206001	UL03144	Bonniwell Road	Bridge	102 x 360	668.0	660.2	661.4	662.6	664.7
UL206007	UL09408	Pioneer Road	Bridge	84 x480	674.7	666.3	667.1	667.8	669.4
UL206005	ULA0552	Bonniwell Road	Box	40.8 x 72	667.7	661.2	662.1	663.0	665.2
UL208013	ULA3730	Port Washington Road	Box	36 x 36	674.4	669.4	669.7	670.4	671.4
UL208019	ULA5270	I-43	Circular	2 @ 30	683.7	680.3	680.5	680.8	681.5
UL208021	ULA5650	Under Railroad	Box	60 x 72	691.3	681.6	681.9	682.4	683.4
UL208004	ULA5745	Lake Shore Drive	Circular	24	685.9	685.0	686.2	686.4	686.8
UL208012	ULB4205	Port Washington Road	Circular	2 @ 48	675.1	671.2	671.6	672.3	673.1
UL208018	ULB5991	I-43	Circular	36	681.3	678.4	678.7	678.9	679.8
UL208016	ULB6124	UPRR Tracks	Box	32.4 x 39.6	687.5	678.4	678.7	678.9	679.8
UL208001	ULB6279	Lake Shore Drive	Circular	36	687.2	682.3	682.7	683.1	685.5
UL208014	ULC1855	Port Washington Road	Box	36 x 36	666.6	661.8	662.2	663.0	665.2
UL208020	ULC3093	I-43	Circular	3 @ 30	669.7	666.7	666.9	667.2	668.0
UL208017	ULC3233	UPRR Tracks	Box	66 x 84	681.2	667.3	667.4	667.5	667.8
UL208005	ULC3325	Lake Shore Drive	Circular	2 @ 30	673.7	670.2	670.5	670.9	672.5
UL206006	ULD0552	Bonniwell Road	Arch	29 x 42	665.2	661.2	662.4	664.1	665.8
UL205018	ULD1260	Bonniwell Road	Box	36 x 48	671.5	664.3	665.2	665.8	666.7
UL205027	ULD3818	I-43	Circular	2 @ 36	670.2	666.4	667.0	667.6	668.3
UL205024	ULD4066	UPRR Tracks	Circular	48	676.4	667.1	668.2	669.0	669.9
UL205013	ULD7056	Lake Shore Drive	Circular	30	682.0	677.6	678.0	678.6	682.1
UL205012	ULE0892	Lake Shore Drive	Circular	18	682.0	679.2	679.8	682.1	682.3
UL205021	ULJ0858	Port Washington Road	Box	24 x 36	673.3	668.8	669.2	669.8	670.7
UL205029	ULJ2084	I-43	Circular	30	679.3	675.2	675.7	676.4	678.1
UL205025	ULJ2804	UPRR Tracks	Bridge	84 x 90	690.1	679.3	679.5	679.7	680.1
UL205026	ULR0078	I-43	Circular	2 @ 36	669.5	665.9	666.4	666.8	667.4
UL205023	ULR0318	UPRR Tracks	Circular	36	680.1	670.0	670.8	671.4	672.4
UL205002	ULR1580	Lake Shore Drive	Arch	29 x 42	685.9	683.3	684.0	686.0	686.7
UL217015	ULS0470	Highland Road	Circular	2 @ 36	699.8	672.8	673.2	673.9	675.5
UL217022	ULS0870	I-43	Circular	3 @ 36	680.3	673.5	674.5	675.1	676.0
UL217019	ULS0970	Utility Road	Circular	2 @ 36	685.1	673.5	674.5	675.2	676.2
UL217018	ULS1120	UPRR Tracks	Bridge	96 x 96	685.3	673.6	674.5	675.2	676.2
UL217006	ULS3815	Dandelion Lane	Circular	18	696.9	692.8	693.4	694.9	697.1

Appendix
Culvert Capacity Analysis Results - Maximum Flows
Fish Creek Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Road	Shape	Size (in.)	Nominal Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)
FS232090	Ravine Baye Road	Arch	47 x 71	25.6	213	271	328	426
FS232014	County Line Road	Arch	101 x 161	156	205	332	446	728
FS232023	I-43	Box	48 x 96	154	169	250	308	527
FS231015	Port Washington Road	Box	48 x 96	30.9	148	217	254	360
FS231001	County Line Road	Circular	36	8.4	11.8	17.1	23.5	39.5
FS231081	Donges Bay Road (inlet into existing detention basin)	Circular	18	8.1	13.5	97.4	98.6	75.0
FS233019	Lake Shore Drive	Circular	12	0.8	1.8	5.3	11.7	25.0
FS232046	Otto Road	Arch	2 @ 31 x 40	19.1	11.7	21.2	40.2	81.6
FS232051	Zedler Lane	Arch	2 @ 18 x 24	5.7	5.1	10.8	21.2	46.8
FS232016	Port Washington Road	Circular	2 @ different sizes	14.2	2.6	15.5	32.7	64.0
FS231003	County Line Road	Box	36 x 72	32.1	16.0	27.3	47.5	106
FS232024	Zedler Lane	Arch	47 x 71	22.0	28.3	51.7	71.3	109
FS232082	UPRR Tracks	Box	72 x 96	77.3	25.3	33.9	42.4	67.5
FS232067	Waterleaf Drive	Arch	5 @ different sizes	18.3	30.5	43.9	54.1	117.3
FS232066	Aster Lane	4 Arches, 1 Circular	5 @ different sizes	26.0	14.6	19.4	21.1	33.2
FS232062	Trillium Road	Arch	4 @ 20 x 28	12.3	13.0	19.1	23.4	35.5
FS232074	Donges Bay Road	Arch	2 @ 20 x 28	5.2	15.1	23.2	30.8	48.2
FS231080	Port Washington Road	Circular	2 @ 42	290	11.8	17.8	26.6	220

Appendix
Culvert Capacity Analysis Results - Maximum Flows
Pigeon Creek Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Road	Shape	Size (in.)	Nominal Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)
PG122042	WCRR Tracks	Bridge	98 x 576	2300	83.8	129	181	310
PG122044	Williamsburg Drive	Bridge	48 x 288	194	83.0	128	180	310
PG122029	Seminary Drive	Box	108 x 156	239	83.8	129	180	310
PG115004	Freistadt Road	Box	90 x 228	292	157.0	241	302	446
PG115028	WCRR Tracks	Bridge	120 x 720	1240	188.0	281	362	593
PG110003	Highland Road	Bridge	72 x 360	364	55.3	90.4	150	432
PG110011	WCRR Tracks	Bridge	48 x 336	229	48.5	71.4	112	318
PG109005	Wauwatosa Road	Box	48 x 90	58.8	2.2	3.3	4.1	40.5
PG109010	Highland Road	Circular	48	10.4	0.4	1.3	2.9	14.2
PG110006	Cedarburg Road	Ellipse	3 @ 38 x 60	67.5	26.9	45.3	75.9	221
PG110010	WCRR Spur	Circular	24	5.0	16.1	46.4	61.6	158
PG103013	Bonniwell Road	Box	48 x 72	42.8	29.2	46.4	61.7	158
PG103028	WCRR Tracks	Circular	48	22.6	42.7	50.4	54.8	88.7
PG103031	Concord Street	Circular	28	5.7	28.4	34.4	39.1	96.5
PG102012	Pioneer Road	Circular	27	6.6	28.5	34.4	39.6	96.1
PG109006	Wauwatosa Road	Box	3 @ 72 x 108	324	48.6	69.9	108	306
PG109002	Hawthorne Road	Circular	2 @ 48	38.6	48.6	70.0	108	306
PG109011	Hawthorne Road	Circular	2 @ different sizes	65.4	5.2	8.1	11.2	56.5
PG104001	Bonniwell Road	Arch	2 @ 55 x 73	77.6	6.2	7.1	14.9	148
PG103023	Wauwatosa Road	Circular	15	1.3	6.1	7.0	13.5	129
PG103002	Pioneer Road	Box	46.8 x 72	41.4	30.3	47.9	62.4	129
PG104002	Bonniwell Road	Arch	75 x 112	84.0	48.5	61.2	88.4	258
PG104003	Pioneer Road	Box	54 x 96	71.9	25.6	45.7	85.2	236
PG105005	Pioneer Road	Box	54 x 120	81.7	34.1	54.2	80.0	203
PG105004	Pioneer Road	Arch	79 x 117	91.9	36.2	56.9	81.0	204
PG105003	Pioneer Road	1 Circular, 1 Box	2 @ different sizes	50.1	1.4	6.4	23.0	69.6
PG105001	Granville Road	Circular	36	11.0	3.5	5.7	15.9	50.2
PG108015	Hawthorne Road	Circular	2 @ different sizes	22.9	12.3	17.7	21.6	59.3
PG105010	Bonniwell Road	Box	24 x 36	10.1	1.1	3.0	6.8	44.4
PG104011	Davis Road	Arch	20 x 28	3.9	1.3	1.8	2.2	4.7
PG105006	Davis Road	Arch	41 x 53	19.9	1.9	2.8	10.5	54.1
PG105002	Granville Road	Box	30 x 42	15.2	3.2	6.0	20.4	56.6

Appendix
Culvert Capacity Analysis Results - Maximum Flows
Mequon MU Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Road	Shape	Size (in.)	Nominal Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)	2-Year Overflow	10-Year Overflow	25-Year Overflow	100-Year Overflow
MU120007	Mequon Road	Box	75 x 80.4	82.4	8.2	26.7	84.7	197	0	0	0	0
MU116018	Freistadt Road	Bridge	55.2 x 204	158	2.6	5.8	18	88	0	0	0	0
MU120005	Farmdale Road	Box	31 x 40.8	15.5	1.5	2.3	2.7	30.1	0	0	0	0
MU120006	Farmdale Road	Box	44.4 x 48	26.4	0.7	3.4	11.0	30.4	0	0	0	0
MU117001	Freistadt Road	Box	24 x 36	10.2	3.8	6.0	15.9	50.7	0	0	0	0
MU129004	Donges Bay Road	Box	49.2 x 96	64.7	8.7	13.5	18.5	61.0	0	0	0	0
MU132043	Concord Drive	Arch	33 x 49	13.5	2.6	3.8	10.1	38.5	0	0	0	0
MU132049	Swan Road	Arch	47 x 71	29.6	2.8	4.3	10.1	38.7	0	0	0	0
MU133001	Donges Bay Road	Box	27.6 x 42	13.7	4.01	5.73	9.82	30	0	0	0	0

There is no overflow for MU culverts

Appendix
Culvert Capacity Analysis Results - Maximum Flows
Mequon MQ Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Road	Shape	Size (in.)	Nominal Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)
MQ135029	Cedarburg Road	Arch	2 @ 71 x 103	149	216	302	372	567
MQ135037	WCRR Tracks	Bridge	66 x 288	265	196	276	345	525
MQ135033	Baehr Road	Box	72 x 138	138	40	52	78	228
MQ133004	Wauwatosa Road	Circular	2 @ 60	69.4	1	1	11	93
MQ135003	Westfield Road	Circular	3 @ 24	28.4	32	37	40	48
MQ135035	Donges Bay Road	Circular	3 @ 30	24.0	13	19	23	38
MQ134006	Baehr Road	Arch	5 @ 41 x 53	97.0	216	329	408	627
MQ134012	Enterprise Drive	Arch	3 @ 47 x 71	263	44	71	95	185
MQ134009	Donges Bay Road	Arch	3 @ 47 x 71	76.8	49	77	102	191
MQ127034	Wauwatosa Road	Circular	3 @ 54	73.5	26	38	53	117
MQ127031	Wauwatosa Road	Circular	48	19.8	30	45	65	106
MQ133009	Wauwatosa Road	Circular	2 @ 30	13.6	43	65	97	169
MQ136050	Le Mont Blvd	Circular	72	51.0	6	11	20	42
MQ136061	Le Grande Blvd	Arch	41 x 53	19.4	16	26	56	138
MQ136042	Donges Bay Road	Circular	42	13.3	17	29	57	148
MQ219043	Ranch Road	Arch	2 @ 52 x 77	71.0	114	167	228	362
MQ219042	Hickory Lane	Arch	2 @ 52 x 77	71.0	114	167	242	389
MQ219045	Chestnut Road	Arch	3 @ different sizes	59.8	110	158	438	555
MQ219046	Glenbrook Lane	Arch	2 @ 43 x 64	45.4	80	118	152	258
MQ230085	Mequon Road	Circular	2 @ 48	39.6	57	84	114	199
MQ230039	Range Line Road	Arch	47 x 71	32.1	60	92	131	235
MQ219020	Country Lane	Circular	5 @ 48	100	35	62	86	152
MQ220037	Port Washington Road	Box	60 x 126	104	25	37	48	68
MQ220046	I-43	Circular	2 @ 36	22.8	25	32	43	64
MQ229064	Mequon Road	Box	48 x 120	77.0	34	55	83	159
MQ219003	Glen Oaks Lane	Box	48 x 48	25.1	28	37	47	69
MQ217012	Port Washington Road	Box	42 x 60	30.2	28	36	43	79
MQ217008	Corporate Parkway	Circular	3 @ 18	5.3	21	26	31	75
MQ217020	I-43	Circular	36	10.0	20	33	50	116
MQ217016	UPRR Tracks	Circular	30	8.2	15	28	48	98
MQ220040	UPRR Tracks	Circular	2 @ 48	62.6	-14	-22	-34	-62
MQ220017	Lake Shore Drive	Arch	20 x 28	3.9	2	8	14	49
MQ220018	Lake Shore Drive	Circular	15	0.1	1	4	5	7
MQ220022	Pinehurst Circle	Circular	18	2.3	1	3	6	12
MQ126017	Cedarburg Road	Box	36 x 48	20.4	29	57	80	100
MQ126018	Sherwood Drive	Arch	20 x 28	4.1	47	104	161	382
MQ126020	WCRR Tracks	Circular	42	16.6	90	135	174	261
MQ124006	St. James Lane	Arch	2 @ 29 x 42	18.6	6	10	18	39
MQ124012	Bobolink Lane	Circular	24	4.2	6	11	20	42
MQ113020	Ville Du Park Drive	Arch	15 x 21	1.8	0	0	1	1
MQ219050	Glenbrook Lane	Arch	2 @ 38 x 57	29.4	35	52	69	110
MQ124001	Bobolink Lane	Arch	47 x 71	28.7	47	73	104	181
MQ136075	Le Grande Blvd	Arch	2 @ 24 x 35	12.6	7	16	28	54
MQ136076	Le Mont Blvd	Arch	2 @ 29 x 42	19.2	12	20	29	67
MQ13699J	Range Line Court	Circular	2 @ 24	7.3	17	25	30	85
MQ136038	Donges Bay Road	Arch	20 x 28	3.8	18	30	47	95
MQ122030	Cedarburg Road	Box	108 x 144	207	82	120	156	273
MQ122035	WCRR Tracks	Box	2 @ 58.8 x 144	216	79	116	150	260
MQ122016	Buntrock Avenue	Bridge	66 x 138	116	84	119	152	260
MQ121059	Wauwatosa Road	Box	60 x 90	74.2	22	38	70	164
MQ122045	Main Street	Circular	48	147.0	38	55	66	147
MQ122038	WCRR Tracks	Bridge	18 x 168	39.2	38	55	66	149
MQ122046	Orchard Street	Circular	36	9.8	38	55	66	152
MQ122024	Buntrock Avenue	Circular	42	62.4	38	55	66	151
MQ122022	West Street	Arch	33 x 49	13.1	38	55	66	165
MQ113032	Freistadt Road	Box	55.2 x 114	87.2	15	37	107	182
MQ113036	Ville Du Parc Drive	Arch	3 @ different sizes	35.8	22	39	71	142
MQ113048	River Road	Ellipse	43 x 68	21.6	27	41	55	91
MQ218066	Shoreland Parkway West	Box	60 x 120	100	20	39	64	172
MQ218065	Fieldwood Road	Box	69.6 x 80.4	70.2	20	39	64	172
MQ113003	Yvonne Drive	Arch	2 @ 29 x 42	19.0	20	39	64	187
MQ112004	Highland Road	Arch	3 @ 47 x 71	166	16	28	52	134
MQ102002	Bonniwell Road	Circular	15	1.5	1	6	14	36
MQ101010	Riverland Drive	Box	60 x 84	69.0	0	8	24	61
MQ125081	Range Line Drive	Box	45.6 x 56.4	39.4	14	27	49	104
MQ230086	Mequon Road	Circular	2 @ 48	39.6	26	39	54	98
MQ101006	Riverland Road	Box	36 x 72	31.8	1	2	3	3
MQ218061	Fieldwood Road	Box	24 x 24	5.2	3	6	12	21
MQ113022	Ville Du Parc Drive	Circular	12	0.8	2	3	5	20
MQ113021	Woodland Drive	Arch	13 x 17	1.9	0	0	-2	-3
MQ220044	I-43	Circular	2 @ 24	25.0	36	41	45	53
MQ220036	Port Washington Road	Box	24 x 24	6.4	7	11	17	33
MQ113043	Freistadt Road	Box	24 x 36	9.9	9	19	37	69
MQ113019	Ville Du Parc Drive	Arch	18 x 24	3.2	1	6	14	32

Appendix
Culvert Capacity Analysis Results - Maximum Flows
Ulao Creek Watershed
City of Mequon
Stormwater Management Plan

Culvert ID	Road	Shape	Size (in.)	Nominal Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)
UL207021	Private Drive off Bonniwell Road	Bridge	2 @ 72 x 72	142	162	290	444	712
UL206001	Bonniwell Road	Bridge	102 x 360	735	174	326	522	991
UL206007	Pioneer Road	Bridge	84 x480	790	395	652	934	1710
UL206005	Bonniwell Road	Box	40.8 x 72	50.6	14.0	44.6	80.2	114
UL208013	Port Washington Road	Box	36 x 36	45.4	18.4	26.3	41.1	63.5
UL208019	I-43	Circular	2 @ 30	42.6	20.0	27.6	33.6	54.2
UL208021	Under Railroad	Box	60 x 72	94.2	19.9	30.8	47.5	93.0
UL208004	Lake Shore Drive	Circular	24	4.1	19.9	30.9	47.8	94.6
UL208012	Port Washington Road	Circular	2 @ 48	85.4	20.8	36.2	63.6	125
UL208018	I-43	Circular	36	45.9	16.7	24.3	31.5	49.5
UL208016	UPRR Tracks	Box	32.4 x 39.6	345	15.7	22.4	26.8	42.3
UL208001	Lake Shore Drive	Circular	36	17.3	16.5	23.6	30.9	54.4
UL208014	Port Washington Road	Box	36 x 36	43.0	9.1	16.6	27.7	53.7
UL208020	I-43	Circular	3 @ 30	50.4	21.0	30.9	42.3	75.3
UL208017	UPRR Tracks	Box	66 x 84	928	17.9	26.9	38.2	68.9
UL208005	Lake Shore Drive	Circular	2 @ 30	44.2	17.9	27.0	38.4	68.8
UL206006	Bonniwell Road	Arch (CM)	29 x 42	16.0	2.0	18.1	31.9	80.2
UL205018	Bonniwell Road	Box	36 x 48	54.2	1.8	17.5	32.9	63.8
UL205027	I-43	Circular	2 @ 36	46.2	1.0	10.2	24.2	48.8
UL205024	UPRR Tracks	Circular	48	34.7	1.4	14.5	31.0	57.0
UL205013	Lake Shore Drive	Circular	30	22.3	2.6	6.8	15.9	45.4
UL205012	Lake Shore Drive	Circular	18	6.7	3.1	6.9	13.7	30.9
UL205021	Port Washington Road	Box	24 x 36	9.8	3.9	8.5	17.6	32.1
UL205029	I-43	Circular	30	6.7	3.8	8.1	16.9	30.6
UL205025	UPRR Tracks	Bridge	84 x 90	630	3.4	8.5	18.8	48.1
UL205026	I-43	Circular	2 @ 36	40.0	2.9	11.1	20.8	40.6
UL205023	UPRR Tracks	Circular	36	10.6	2.6	10.8	20.4	39.5
UL205002	Lake Shore Drive	Arch (CM)	29 x 42	9.5	8.0	19.2	44.2	110
UL217015	Highland Road	Circular	2 @ 36	14.6	11.6	20.6	36.4	63.8
UL217022	I-43	Circular	3 @ 36	70.2	6.9	14.6	22.7	39.0
UL217019	Utility Road	Circular	2 @ 36	23.4	5.8	13.2	20.6	36.2
UL217018	UPRR Tracks	Bridge	96 x 96	671	5.8	13.2	20.6	35.7
UL217006	Dandelion Lane	Circular	18	2.1	1.0	4.0	8.7	16.8

Appendix
Culvert Capacity Analysis Results
Undersized Culverts
City of Mequon
Stormwater Management Plan

Culvert ID	Road	Shape	Size (in.)	Nominal Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)	Comments
FS232090	Ravine Baye Road	Arch	47 x 71	25.6	213	271	328	426	D
FS232014	County Line Road	Arch	101 x 161	156	205	332	446	728	D
FS231015	Port Washington Road	Box	48 x 96	30.9	148	217	254	298	A
FS231001	County Line Road	Circular	36	8.4	11.8	17.1	23.5	39.5	A
FS233019	Lake Shore Drive	Circular	12	0.8	1.8	5.3	7.6	7.6	
FS232046	Otto Road	Arch	2 @ 31 x 40	19.1	11.7	21.2	40.2	81.6	
FS232051	Zedler Lane	Arch	2 @ 18 x 24	5.7	5.1	10.8	21.2	25.4	
FS232024	Zedler Lane	Arch	47 x 71	22	28.3	51.7	71.3	109	
FS232067	Waterleaf Drive	Arch	9.6 x 33.6	1.0	1.9	2.5	3.0	3.3	crushed
F232067A	Waterleaf Drive	Arch	24 x 35	5.2	10.6	13.1	15.3	17.1	
F232067B	Waterleaf Drive	Arch	14.4 x 33.6	2.2	4.2	5.7	6.6	7.33	crushed
F232067C	Waterleaf Drive	Arch	12.0 x 33.6	1.6	3.1	4.1	4.8	5.3	crushed
F232067D	Waterleaf Drive	Circular	36	8.4	10.7	18.5	24.5	29	
MQ134006	Baehr Road	Arch	5 @ 41 x 53	97	216	329	408	515	A
MQ133009	Wauwatosa Road	Circular	2 @ 30	13.6	43.2	65	68.2	69.2	
MQ136042	Donges Bay Road	Circular	42	13.3	17.1	28.7	57.0	85.8	
MQ219043	Ranch Road	Arch	2 @ 52 x 77	71.0	114	167	228	362	A
MQ219042	Hickory Lane	Arch	2 @ 52 x 77	71.0	114	167	242	324	A
MQ219045	Chestnut Road	Arch	38 x 57	17.7	32.5	46.7	50.1	49.4	A
M219045A	Chestnut Road	Arch	43 x 64	23.0	42.2	60.7	65.1	64.2	A
M219045B	Chestnut Road	Arch	41 x 53	19.1	35	50.3	53.9	53.2	A
MQ219046	Glenbrook Lane	Arch	2 @ 43 x 64	45.4	80.4	118	152	204	A
MQ230085	Mequon Road	Circular	2 @ 48	39.6	56.6	84.4	114	173	A
MQ230039	Range Line Road	Arch	47 x 71	32.1	60.3	92	131	218	A
MQ219003	Glen Oaks Lane	Box	48 x 48	25.1	28.4	36.8	47	89.3	
MQ217008	Corporate Parkway	Circular	3 @ 18	5.25	21.3	25.7	30.9	35.7	
MQ126017	Cedarburg Road	Box	36 x 48	20.4	29.4	56.7	79.8	100	
MQ126018	Sherwood Drive	Arch	20 x 28	4.07	19.7	20.7	20.9	21.0	
MQ126020	WCRR Tracks	Circular	42	16.6	89.8	126	129	134	
MQ124012	Bobolink Lane	Circular	24	4.23	6.21	11.4	19.9	21.9	
MQ219050	Glenbrook Lane	Arch	2 @ 38 x 57	29.4	35.2	52.2	68.8	110	
MQ124001	Bobolink Lane	Arch	47 x 71	28.7	46.6	73.1	104	179	

Appendix
Culvert Capacity Analysis Results
Undersized Culverts
City of Mequon
Stormwater Management Plan

Culvert ID	Road	Shape	Size (in.)	Nominal Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)	Comments
MQ13699J	Range Line Court	Circular	2 @ 24	7.3	17.2	24.8	29.8	35.8	
MQ136038	Donges Bay Road	Arch	20 x 28	3.8	18.1	18.9	19.5	20.5	
MQ122045	Main Street	Circular	48	147	38	54.7	65.9	147	
MQ122022	West Street	Arch	33 x 49	13.1	38.4	54.9	65.9	80.0	D
MQ113048	River Road	Ellipse	43 x 68	21.6	27.1	40.7	55.4	90.5	
MQ113022	Ville Du Parc Drive	Circular	12	0.8	1.6	3.1	3.8	3.9	
PG110010	WCRR Spur	Circular	24	5.0	16.1	16.6	17.3	19.6	
PG103028	WCRR Tracks	Circular	48	22.6	42.7	50.4	54.8	88.7	
PG103031	Concord Street	Circular	28	5.7	20.5	21.0	21.5	21.7	
PG102012	Pioneer Road	Circular	27	6.6	28.5	34.4	35.7	37.9	D
PG103023	Wauwatosa Road	Circular	15	1.3	6.1	7.0	7.6	7.9	
UL207021	Private Drive off Bonniwell Road	Bridge	2 @ 72 x 72	142	162.2	290	444	712	
UL208004	Lake Shore Drive	Circular	24	4.1	19.9	23.9	24.7	25.1	
UL208001	Lake Shore Drive	Circular	36	17.3	16.5	23.6	30.9	54.4	
UL217015	Highland Road	Circular	2 @ 36	14.6	11.58	20.6	36.4	63.8	

Notes:
A = Problem addressed by Recommended Plan
D = Do not replace, would increase flooding in Thiensville or Bayside

Appendix
Culvert Capacity Analysis Results
Undersized Culverts
City of Mequon
Stormwater Management Plan

Priority	Culvert ID	Road	Shape	Size (in.)	Length (ft.)	Existing Condition Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)	Comments
1	MQ136038	Donges Bay Road	Arch	20 x 28	44	3.8	18.1	18.9	19.5	20.5	
2	MQ133009	Wauwatosa Road	Circular	2 @ 30	160	13.6	43.2	65	68.2	69.2	
3	MQ122045	Main Street	Circular	48	350	147	38	54.7	65.9	147	
4	PG103023	Wauwatosa Road	Circular	15	50	1.3	6.1	7.0	7.6	7.9	
5	MQ126017	Cedarburg Road	Box	36 x 48	60	20.4	29.4	56.7	79.8	100	
6	MQ136042	Donges Bay Road	Circular	42	75	13.3	17.1	28.7	57.0	85.8	
7	MQ126020	WCRR Tracks	Circular	42	34	16.6	89.8	126	129	134	
8	UL217015	Highland Road	Circular	2 @ 36	170	14.6	11.6	20.6	36.4	63.8	
9	PG103028	WCRR Tracks	Circular	48	28	22.6	42.7	50.4	54.8	88.7	
10	FS232024	Zedler Lane	Arch	47 x 71	92	22.0	28.3	51.7	71.3	109	
11	MQ124001	Bobolink Lane	Arch	47 x 71	52	28.7	46.6	73.1	104	179	
12	MQ219050	Glenbrook Lane	Arch	2 @ 38 x 57	120	29.4	35.2	52.2	68.8	110	
	FS232090	Ravine Baye Road	Arch	47 x 71	100	25.6	213	271	328	426	D
	FS232014	County Line Road	Arch	101 x 161	50	156	205	332	446	728	D
	FS231015	Port Washington Road	Box	48 x 96	140	30.9	148	217	254	298	A
	FS231001	County Line Road	Circular	36	110	8.4	11.8	17.1	23.5	39.5	A
	FS233019	Lake Shore Drive	Circular	12	100	0.8	1.8	5.3	7.6	7.6	
	FS232046	Otto Road	Arch	2 @ 31 x 40	67	19.1	11.7	21.2	40.2	81.6	
	FS232051	Zedler Lane	Arch	2 @ 18 x 24	40	5.7	5.1	10.8	21.2	25.4	
	FS232067	Waterleaf Drive	Arch	9.6 x 33.6	55	1.0	1.9	2.5	3.0	3.3	crushed
	F232067A	Waterleaf Drive	Arch	24 x 35	55	5.2	10.6	13.1	15.3	17.1	
	F232067B	Waterleaf Drive	Arch	14.4 x 33.6	55	2.2	4.2	5.7	6.6	7.33	crushed
	F232067C	Waterleaf Drive	Arch	12.0 x 33.6	55	1.6	3.1	4.1	4.8	5.3	crushed
	F232067D	Waterleaf Drive	Circular	36	55	8.4	10.7	18.5	24.5	29	
	MQ134006	Baehr Road	Arch	5 @ 41 x 53	44	97	216	329	408	515	A
	MQ219043	Ranch Road	Arch	2 @ 52 x 77	50	71.0	114	167	228	362	A
	MQ219042	Hickory Lane	Arch	2 @ 52 x 77	50	71.0	114	167	242	324	A
	MQ219045	Chestnut Road	Arch	38 x 57	50	17.7	32.5	46.7	50.1	49.4	A
	M219045A	Chestnut Road	Arch	43 x 64	50	23.0	42.2	60.7	65.1	64.2	A
	M219045B	Chestnut Road	Arch	41 x 53	50	19.1	35	50.3	53.9	53.2	A
	MQ219046	Glenbrook Lane	Arch	2 @ 43 x 64	55	45.4	80.4	118	152	204	A
	MQ230085	Mequon Road	Circular	2 @ 48	150	39.6	56.6	84.4	114	173	A
	MQ230039	Range Line Road	Arch	47 x 71	48	32.1	60.3	92	131	218	A
	MQ219003	Glen Oaks Lane	Box	48 x 48	42	25.1	28.4	36.8	47.0	89.3	
	MQ217008	Corporate Parkway	Circular	3 @ 18	76	5.25	21.3	25.7	30.9	35.7	
	MQ126018	Sherwood Drive	Arch	20 x 28	33	4.07	19.7	20.7	20.9	21.0	

Appendix
Culvert Capacity Analysis Results
Undersized Culverts
City of Mequon
Stormwater Management Plan

Priority	Culvert ID	Road	Shape	Size (in.)	Length (ft.)	Existing Condition Capacity (CFS)	2-Year Flow (CFS)	10-Year Flow (CFS)	25-Year Flow (CFS)	100-Year Flow (CFS)	Comments
	MQ124012	Bobolink Lane	Circular	24	40	4.23	6.21	11.4	19.9	21.9	
	MQ13699J	Range Line Court	Circular	2 @ 24	50	7.3	17.2	24.8	29.8	35.8	
	MQ122022	West Street	Arch	33 x 49	50	13.1	38.4	54.9	65.9	80.0	D
	MQ113048	River Road	Ellipse	43 x 68	132	21.6	27.1	40.7	55.4	90.5	
	MQ113022	Ville Du Parc Drive	Circular	12	40	0.8	1.6	3.1	3.8	3.9	
	PG110010	WCRR Spur	Circular	24	16	5.0	16.1	16.6	17.3	19.6	
	PG103031	Concord Street	Circular	28	50	5.7	20.5	21.0	21.5	21.7	
	PG102012	Pioneer Road	Circular	27	42	6.6	28.5	34.4	35.7	37.9	D
	UL207021	Private Drive off Bonniwell Road	Bridge	2 @ 72 x 72	20	142	162.2	290	444	712	
	UL208004	Lake Shore Drive	Circular	24	45	4.1	19.9	23.9	24.7	25.1	
	UL208001	Lake Shore Drive	Circular	36	55	17.3	16.5	23.6	30.9	54.4	

Notes: A = Problem addressed by Recommended Plan
D = Do not replace, would increase flooding in Thiensville or Bayside

Total Length 3355

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
30755	Agriculture			20.47	9211.50	17.60	0.20	0.20	0.20
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.65	187.20	0.73	0.36	0.10	0.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			21.12	9398.70	18.33	0.57	0.30	0.57
Pigeon Creek 30760	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			87.97	39586.50	75.65	0.88	0.88	0.88
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			4.76	975.80	0.91	0.61	0.27	0.38
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.43	699.84	2.72	1.36	0.36	1.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			95.16	41262.14	79.29	2.85	1.51	2.62
Pigeon Creek 30765	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			9.44	4248.00	8.12	0.09	0.09	0.09
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.96	276.48	1.08	0.54	0.14	0.54
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.40	4524.48	9.19	0.63	0.24	0.63
Pigeon Creek 30767	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			8.49	3820.50	7.30	0.08	0.08	0.08
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.65	187.20	0.73	0.36	0.10	0.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			9.14	4007.70	8.03	0.45	0.18	0.45
Pigeon Creek 30770	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			85.01	38254.50	73.11	0.85	0.85	0.85
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings: Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			86.65	38726.82	74.95	1.77	1.10	1.77
Pigeon Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
30810	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
30815	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
30820	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
30825	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
30830	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek 30835	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			20.82	9369.00	17.91	0.21	0.21	0.21
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.92	264.96	1.03	0.52	0.14	0.52
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			21.74	9633.96	18.94	0.72	0.35	0.72
Pigeon Creek 30840	Forest, Preservation			5.19	15.57	0.16	0.05	0.05	0.05
	Agriculture			8.49	3820.50	7.30	0.08	0.08	0.08
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			6.29	1289.45	1.21	0.81	0.35	0.50
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.96	276.48	1.08	0.54	0.14	0.54
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.10	3.30	0.03	0.01	0.01	0.01
	Subtotal			22.03	5405.30	9.77	1.49	0.64	1.19
Pigeon Creek 30860	Forest, Preservation			69.20	207.60	2.08	0.69	0.69	0.69
	Agriculture			75.06	33777.00	64.55	0.75	0.75	0.75
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.39	976.32	3.80	1.90	0.51	1.90
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			8.15	24.45	0.24	0.08	0.08	0.08
	Subtotal			155.80	34985.37	70.67	3.42	2.03	3.42
Pigeon Creek 30865	Forest, Preservation			2.47	7.41	0.07	0.02	0.02	0.02
	Agriculture			51.34	23103.00	44.15	0.51	0.51	0.51
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.89	256.32	1.00	0.50	0.13	0.50
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			2.88	8.64	0.09	0.03	0.03	0.03
	Subtotal			57.58	23375.37	45.31	1.07	0.70	1.07

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings: Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Pigeon Creek 30885	Forest, Preservation	6.34	19.02	0.19	0.06	0.06	0.06
	Agriculture	112.00	50400.00	96.32	1.12	1.12	1.12
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	2.08	599.04	2.33	1.16	0.31	1.16
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	6.34	19.02	0.19	0.06	0.06	0.06
	Subtotal	126.76	51037.08	99.03	2.41	1.56	2.41
West Border 1	Forest, Preservation	90.97	272.91	2.73	0.91	0.91	0.91
	Agriculture	418.39	188275.50	359.82	4.18	4.18	4.18
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	60.66	12435.30	11.65	7.76	3.40	4.85
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	6.15	1771.20	6.89	3.44	0.92	3.44
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	31.32	93.96	0.94	0.31	0.31	0.31
	Subtotal	607.49	202848.87	382.02	16.62	9.73	13.70
Mequon - MU 40100	Forest, Preservation	222.02	666.06	6.66	2.22	2.22	2.22
	Agriculture	420.17	189076.50	361.35	4.20	4.20	4.20
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	87.61	36883.81	157.70	16.12	7.01	95.49
	Low Density Residential	182.91	37496.55	35.12	23.41	10.24	14.63
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	30.78	8864.64	34.47	17.24	4.62	17.24
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	9.53	28.59	0.29	0.10	0.10	0.10
	Subtotal	953.02	273016.15	595.58	63.29	28.39	133.88
Mequon - MU 40200	Forest, Preservation	112.20	336.60	3.37	1.12	1.12	1.12
	Agriculture	134.89	60700.50	116.01	1.35	1.35	1.35
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	112.30	23021.50	21.56	14.37	6.29	8.98
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	3.74	1077.12	4.19	2.09	0.56	2.09
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	90.76	272.28	2.72	0.91	0.91	0.91
	Subtotal	453.89	85408.00	147.84	19.85	10.23	14.46
Mequon - MU 40205	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	47.58	21411.00	40.92	0.48	0.48	0.48
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings: Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.95	561.60	2.18	1.09	0.29	1.09
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	49.53	21972.60	43.10	1.57	0.77	1.57
Mequon - MU 40207	Forest, Preservation	15.08	45.24	0.45	0.15	0.15	0.15
	Agriculture	134.66	60597.00	115.81	1.35	1.35	1.35
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.06	305.28	1.19	0.59	0.16	0.59
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	150.80	60947.52	117.45	2.09	1.66	2.09
Mequon - MU 40210	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	11.85	5332.50	10.19	0.12	0.12	0.12
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	53.12	10889.60	10.20	6.80	2.97	4.25
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.43	411.84	1.60	0.80	0.21	0.80
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	66.40	16633.94	21.99	7.72	3.31	5.17
Mequon - MU 40215	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	11.59	5215.50	9.97	0.12	0.12	0.12
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	44.93	9210.65	8.63	5.75	2.52	3.59
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.43	411.84	1.60	0.80	0.21	0.80
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	57.95	14837.99	20.20	6.67	2.85	4.51
Mequon - MU 40300	Forest, Preservation	24.49	73.47	0.73	0.24	0.24	0.24
	Agriculture	34.17	15376.50	29.39	0.34	0.34	0.34
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	7.00	1435.00	1.34	0.90	0.39	0.56
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.82	236.16	0.92	0.46	0.12	0.46
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	3.50	10.50	0.11	0.04	0.04	0.04
	Subtotal	69.98	17131.63	32.49	1.98	1.14	1.64
Mequon - MU 40305	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	73.26	32967.00	63.00	0.73	0.73	0.73
	Park	0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			3.97	813.85	0.76	0.51	0.22	0.32
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.22	639.36	2.49	1.24	0.33	1.24
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			79.45	34420.21	66.25	2.48	1.29	2.29
Mequon - MU 40307	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			55.44	24948.00	47.68	0.55	0.55	0.55
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			6.38	1307.90	1.22	0.82	0.36	0.51
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.94	558.72	2.17	1.09	0.29	1.09
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			63.76	26814.62	51.08	2.46	1.20	2.15
Mequon - MU 40350	Forest, Preservation			62.83	188.49	1.88	0.63	0.63	0.63
	Agriculture			25.01	11254.50	21.51	0.25	0.25	0.25
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			25.01	5127.05	4.80	3.20	1.40	2.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.46	708.48	2.76	1.38	0.37	1.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			12.81	38.43	0.38	0.13	0.13	0.13
	Subtotal			128.12	17316.95	31.33	5.59	2.78	4.38
Mequon - MU 40410	Forest, Preservation			292.82	878.46	8.78	2.93	2.93	2.93
	Agriculture			334.78	150651.00	287.91	3.35	3.35	3.35
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			166.88	34210.40	32.04	21.36	9.35	13.35
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.07	884.16	3.44	1.72	0.46	1.72
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			41.98	125.94	1.26	0.42	0.42	0.42
	Subtotal			839.53	186749.96	333.43	29.78	16.50	21.77
Victory Center 70100	Forest, Preservation			23.15	69.45	0.69	0.23	0.23	0.23
	Agriculture			162.22	72999.00	139.51	1.62	1.62	1.62
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			22.04	4518.20	4.23	2.82	1.23	1.76
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.02	2021.76	7.86	3.93	1.05	3.93
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			23.83	71.49	0.71	0.24	0.24	0.24

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			238.26	79679.90	153.01	8.84	4.38	7.79
Victory Center 70020	Forest, Preservation			54.66	163.98	1.64	0.55	0.55	0.55
	Agriculture			104.66	47097.00	90.01	1.05	1.05	1.05
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			9.13	1871.65	1.75	1.17	0.51	0.73
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			5.12	1474.56	5.73	2.87	0.77	2.87
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.14	27.42	0.27	0.09	0.09	0.09
	Subtotal			182.71	50634.61	99.41	5.72	2.96	5.28
Ulao Creek 80100	Forest, Preservation			33.16	99.48	0.99	0.33	0.33	0.33
	Agriculture			51.92	23364.00	44.65	0.52	0.52	0.52
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			16.61	6992.81	29.90	3.06	1.33	18.10
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.28	944.64	3.67	1.84	0.49	1.84
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			11.78	35.34	0.35	0.12	0.12	0.12
	Subtotal			117.75	31621.27	79.70	5.90	2.83	20.95
Ulao Creek 80110	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			45.97	20686.50	39.53	0.46	0.46	0.46
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.06	305.28	1.19	0.59	0.16	0.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.23	15.69	0.16	0.05	0.05	0.05
	Subtotal			52.26	21007.47	40.88	1.11	0.67	1.11
Ulao Creek 80115	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			13.32	10682.64	23.44	61.01	6.66	27.71
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			13.32	10682.64	23.44	61.01	6.66	27.71
Ulao Creek 80120	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			37.84	17028.00	32.54	0.38	0.38	0.38
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.25	46.25	0.03	0.01	0.01	0.01
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			38.94	17319.05	33.53	0.86	0.52	0.86
Ulao Creek 80125	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			10.58	8485.16	18.62	48.46	5.29	22.01
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.58	8485.16	18.62	48.46	5.29	22.01
Ulao Creek 80127	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			6.42	2677.14	18.04	0.06	0.06	0.39
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			6.73	5397.46	11.84	30.82	3.37	14.00
	Arterial			0.31	89.28	0.35	0.17	0.05	0.17
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			13.46	8163.88	30.23	31.06	3.48	14.56
Ulao Creek 80130	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			44.72	18648.24	125.66	0.45	0.45	2.68
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.67	480.96	1.87	0.94	0.25	0.94
	Open Water			1.50	277.50	0.20	0.06	0.06	0.06
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			47.89	19406.70	127.73	1.44	0.76	3.68
Ulao Creek 80140	Forest, Preservation			30.38	91.14	0.91	0.30	0.30	0.30
	Agriculture			44.08	19836.00	37.91	0.44	0.44	0.44
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			30.39	12794.19	54.70	5.69	2.43	33.13
	Low Density Residential			43.27	8870.35	8.31	5.54	2.42	3.46
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.31	665.28	2.59	1.29	0.35	1.29
	Open Water			1.50	277.50	0.20	0.06	0.06	0.06
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			151.93	42534.46	104.61	13.23	6.01	38.68
Ulao Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
80150	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			78.58	33082.18	141.44	14.46	6.29	85.65
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.65	187.20	0.73	0.36	0.10	0.36
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			80.23	33454.38	142.30	14.86	6.42	86.06
Ulao Creek 80160	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			13.88	2845.40	2.66	1.78	0.78	1.11
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.54	443.52	1.72	0.86	0.23	0.86
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.42	3288.92	4.39	2.64	1.01	1.97
Ulao Creek 80162	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			47.23	21253.50	40.62	0.47	0.47	0.47
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			31.82	6523.10	6.11	4.07	1.78	2.55
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.43	411.84	1.60	0.80	0.21	0.80
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			81.48	28373.44	48.46	5.39	2.51	3.86
Ulao Creek 80163	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			14.50	11629.00	25.52	66.41	7.25	30.16
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			14.50	11629.00	25.52	66.41	7.25	30.16
Ulao Creek 80164	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			8.26	1693.30	1.59	1.06	0.46	0.66
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.41	118.08	0.46	0.23	0.06	0.23

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			8.67	1811.38	2.05	1.29	0.52	0.89
Ulao Creek 80165	Forest, Preservation			10.17	30.51	0.31	0.10	0.10	0.10
	Agriculture			48.76	21942.00	41.93	0.49	0.49	0.49
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			6.78	1389.90	1.30	0.87	0.38	0.54
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.08	599.04	2.33	1.16	0.31	1.16
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			67.79	23961.45	45.87	2.62	1.28	2.30
Ulao Creek 80200	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			64.84	29178.00	55.76	0.65	0.65	0.65
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.26	362.88	1.41	0.71	0.19	0.71
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			16.53	49.59	0.50	0.17	0.17	0.17
	Subtotal			82.63	29590.47	57.67	1.52	1.00	1.52
Ulao Creek 80201	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			7.13	5718.26	12.55	32.66	3.57	14.83
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			7.13	5718.26	12.55	32.66	3.57	14.83
Ulao Creek 80202	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			11.35	9102.70	19.98	51.98	5.68	23.61
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.35	9102.70	19.98	51.98	5.68	23.61
Ulao Creek 80203	Forest, Preservation			3.59	10.77	0.11	0.04	0.04	0.04
	Agriculture			63.13	28408.50	54.29	0.63	0.63	0.63
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			3.59	735.95	0.69	0.46	0.20	0.29

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.54	443.52	1.72	0.86	0.23	0.86
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			71.85	29598.74	56.81	1.99	1.10	1.82
Ulao Creek 80204	Forest, Preservation			5.80	17.40	0.17	0.06	0.06	0.06
	Agriculture			22.24	10008.00	19.13	0.22	0.22	0.22
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			27.05	5545.25	5.19	3.46	1.51	2.16
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.98	570.24	2.22	1.11	0.30	1.11
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			58.07	16325.89	26.84	4.89	2.13	3.59
Ulao Creek 80205	Forest, Preservation			15.46	46.38	0.46	0.15	0.15	0.15
	Agriculture			15.47	6961.50	13.30	0.15	0.15	0.15
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			20.04	4108.20	3.85	2.57	1.12	1.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.58	167.04	0.65	0.32	0.09	0.32
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			51.55	11283.12	18.27	3.20	1.52	2.24
Ulao Creek 80206	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			47.76	9790.80	9.17	6.11	2.67	3.82
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.75	216.00	0.84	0.42	0.11	0.42
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			48.51	10006.80	10.01	6.53	2.79	4.24
Ulao Creek 80207	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			24.25	10912.50	20.86	0.24	0.24	0.24
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			23.54	4825.70	4.52	3.01	1.32	1.88
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.72	207.36	0.81	0.40	0.11	0.40
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			48.51	15945.56	26.18	3.66	1.67	2.53

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Ulao Creek 80208	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	11.37	5116.50	9.78	0.11	0.11	0.11
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	28.13	5766.65	5.40	3.60	1.58	2.25
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.85	244.80	0.95	0.48	0.13	0.48
	Open Water	1.00	185.00	0.13	0.04	0.04	0.04
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	41.35	11312.95	16.26	4.23	1.86	2.88
Ulao Creek 80210	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	16.90	7605.00	14.53	0.17	0.17	0.17
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.79	227.52	0.88	0.44	0.12	0.44
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	17.69	7832.52	15.42	0.61	0.29	0.61
Ulao Creek 80220	Forest, Preservation	16.35	49.05	0.49	0.16	0.16	0.16
	Agriculture	10.55	4747.50	9.07	0.11	0.11	0.11
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.23	354.24	1.38	0.69	0.18	0.69
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	7.03	21.09	0.21	0.07	0.07	0.07
	Subtotal	35.16	5171.88	11.15	1.03	0.52	1.03
Ulao Creek 80222	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	29.60	6068.00	5.68	3.79	1.66	2.37
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.68	195.84	0.76	0.38	0.10	0.38
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	30.28	6263.84	6.44	4.17	1.76	2.75
Ulao Creek 80230	Forest, Preservation	18.34	55.02	0.55	0.18	0.18	0.18
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			3.32	2662.64	5.84	15.21	1.66	6.91
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.50	92.50	0.07	0.02	0.02	0.02
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			22.16	2810.16	6.46	15.41	1.86	7.11
Ulao Creek 80235	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			17.59	3605.95	3.38	2.25	0.99	1.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.89	256.32	1.00	0.50	0.13	0.50
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			18.48	3862.27	4.37	2.75	1.12	1.91
Ulao Creek 80300	Forest, Preservation			45.36	136.08	1.36	0.45	0.45	0.45
	Agriculture			39.50	17775.00	33.97	0.40	0.40	0.40
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.45	993.60	3.86	1.93	0.52	1.93
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			29.44	88.32	0.88	0.29	0.29	0.29
	Subtotal			117.75	18993.00	40.08	3.08	1.66	3.08
Ulao Creek 80310	Forest, Preservation			11.78	35.34	0.35	0.12	0.12	0.12
	Agriculture			93.01	41854.50	79.99	0.93	0.93	0.93
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			5.89	1207.45	1.13	0.75	0.33	0.47
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.19	342.72	1.33	0.67	0.18	0.67
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.88	17.64	0.18	0.06	0.06	0.06
	Subtotal			117.75	43457.65	82.98	2.53	1.62	2.24
Ulao Creek 80400	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80410	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings: Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80420	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80430	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80450	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80460	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
North 1	Forest, Preservation			12.70	38.10	0.38	0.13	0.13	0.13
	Agriculture			188.73	84928.50	162.31	1.89	1.89	1.89
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			24.80	10440.80	44.64	4.56	1.98	27.03
	Low Density Residential			25.40	5207.00	4.88	3.25	1.42	2.03
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.42	696.96	2.71	1.36	0.36	1.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			254.05	101311.36	214.92	11.18	5.78	32.43
Granville 60100	Forest, Preservation			10.53	31.59	0.32	0.11	0.11	0.11
	Agriculture			21.05	9472.50	18.10	0.21	0.21	0.21
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			20.72	8909.60	2.80	24.86	5.18	75.63
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.34	97.92	0.38	0.19	0.05	0.19
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			52.64	18511.61	21.60	25.37	5.55	76.13
Granville 60110	Forest, Preservation			15.00	45.00	0.45	0.15	0.15	0.15
	Agriculture			85.03	38263.50	73.13	0.85	0.85	0.85
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			100.03	38308.50	73.58	1.00	1.00	1.00
Granville 60120	Forest, Preservation			52.35	157.05	1.57	0.52	0.52	0.52
	Agriculture			28.19	12685.50	24.24	0.28	0.28	0.28
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			80.54	12842.55	25.81	0.81	0.81	0.81
Granville 60130	Forest, Preservation			51.80	155.40	1.55	0.52	0.52	0.52
	Agriculture			166.20	74790.00	142.93	1.66	1.66	1.66
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			38.98	16761.40	5.26	46.78	9.75	142.28
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.87	826.56	3.21	1.61	0.43	1.61
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			259.85	92533.36	152.96	50.56	12.36	146.06
Granville	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
60140	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Granville	Forest, Preservation			9.44	28.32	0.28	0.09	0.09	0.09
60200	Agriculture			75.02	33759.00	64.52	0.75	0.75	0.75
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.89	1120.32	4.36	2.18	0.58	2.18
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.44	28.32	0.28	0.09	0.09	0.09
	Subtotal			97.79	34935.96	69.44	3.12	1.52	3.12
Granville	Forest, Preservation			14.03	42.09	0.42	0.14	0.14	0.14
60300	Agriculture			158.15	71167.50	136.01	1.58	1.58	1.58
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.07	884.16	3.44	1.72	0.46	1.72
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			14.02	42.06	0.42	0.14	0.14	0.14
	Subtotal			189.27	72135.81	140.29	3.58	2.32	3.58
Granville	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
60400	Agriculture			13.66	6147.00	11.75	0.14	0.14	0.14
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			124.49	25520.45	23.90	15.93	6.97	9.96
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.84	529.92	2.06	1.03	0.28	1.03
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			139.99	32197.37	37.71	17.10	7.38	11.13
Granville	Forest, Preservation			69.95	209.85	2.10	0.70	0.70	0.70

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
64000	Agriculture			108.65	48892.50	93.44	1.09	1.09	1.09
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			9.99	4295.70	1.35	11.99	2.50	36.46
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.30	374.40	1.46	0.73	0.20	0.73
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.99	29.97	0.30	0.10	0.10	0.10
	Subtotal			199.88	53802.42	98.64	14.60	4.58	39.08
Granville	Forest, Preservation			3.76	11.28	0.11	0.04	0.04	0.04
65100	Agriculture			23.08	10386.00	19.85	0.23	0.23	0.23
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			6.15	2644.50	0.83	7.38	1.54	22.45
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.73	786.24	3.06	1.53	0.41	1.53
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.88	5.64	0.06	0.02	0.02	0.02
	Subtotal			37.60	13833.66	23.91	9.20	2.23	24.26
Granville	Forest, Preservation			53.02	159.06	1.59	0.53	0.53	0.53
65025	Agriculture			17.67	7951.50	15.20	0.18	0.18	0.18
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			61.86	12681.30	11.88	7.92	3.46	4.95
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			31.35	13480.50	4.23	37.62	7.84	114.43
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.00	1152.00	4.48	2.24	0.60	2.24
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			8.84	26.52	0.27	0.09	0.09	0.09
	Subtotal			176.74	35450.88	37.64	48.57	12.70	122.41
Granville	Forest, Preservation			12.68	38.04	0.38	0.13	0.13	0.13
65035	Agriculture			101.42	45639.00	87.22	1.01	1.01	1.01
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			69.19	14183.95	13.28	8.86	3.87	5.54
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			8.78	2528.64	9.83	4.92	1.32	4.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			61.48	184.44	1.84	0.61	0.61	0.61
	Subtotal			253.55	62574.07	112.56	15.53	6.95	12.21
Granville	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
65045	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Little Menomonee Creek 50010	Forest, Preservation			31.41	94.23	0.94	0.31	0.31	0.31
	Agriculture			83.44	37548.00	71.76	0.83	0.83	0.83
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			13.00	2665.00	2.50	1.66	0.73	1.04
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.15	619.20	2.41	1.20	0.32	1.20
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			130.00	40926.43	77.60	4.02	2.20	3.39
Little Menomonee Creek 50017	Forest, Preservation			7.63	0.00	0.23	0.08	0.08	0.08
	Agriculture			10.04	0.00	8.63	0.10	0.10	0.10
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.53	0.00	1.71	0.86	0.23	0.86
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			19.20	0.00	10.58	1.03	0.41	1.03
Little Menomonee Creek 50020	Forest, Preservation			9.25	27.75	0.28	0.09	0.09	0.09
	Agriculture			66.30	29835.00	57.02	0.66	0.66	0.66
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			102.23	20957.15	19.63	13.09	5.72	8.18
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.47	28.41	0.28	0.09	0.09	0.09
	Subtotal			189.30	51438.71	79.50	15.08	6.88	10.18
Little Menomonee Creek 50030	Forest, Preservation			72.60	217.80	2.18	0.73	0.73	0.73
	Agriculture			119.91	53959.50	103.12	1.20	1.20	1.20
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			35.62	7302.10	6.84	4.56	1.99	2.85
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.77	509.76	1.98	0.99	0.27	0.99
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			12.10	36.30	0.36	0.12	0.12	0.12
	Subtotal			242.00	62025.46	114.49	7.60	4.31	5.89
Little Menomonee Creek 50035	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

5/18/99

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Little Menomonee Creek 50036	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			11.29	2314.45	2.17	1.45	0.63	0.90
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.41	118.08	0.46	0.23	0.06	0.23
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.70	2432.53	2.63	1.67	0.69	1.13
Little Menomonee Creek 50040	Forest, Preservation			20.55	61.65	0.62	0.21	0.21	0.21
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			14.71	3015.55	2.82	1.88	0.82	1.18
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			1.69	1428.05	1.45	3.65	0.54	2.84
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.65	475.20	1.85	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			38.60	4980.45	6.74	6.66	1.82	5.15
Little Menomonee Creek 50045	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			25.35	11407.50	21.80	0.25	0.25	0.25
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			23.30	4776.50	4.47	2.98	1.30	1.86
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			50.70	16774.40	28.57	4.38	1.87	3.27
Little Menomonee Creek 50050	Forest, Preservation			35.70	107.10	1.07	0.36	0.36	0.36
	Agriculture			52.41	23584.50	45.07	0.52	0.52	0.52
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			53.36	10938.80	10.25	6.83	2.99	4.27
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			35.70	107.10	1.07	0.36	0.36	0.36
	Subtotal			178.40	35091.74	58.84	8.76	4.41	6.20

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Little Menomonee Creek 50055	Forest, Preservation			11.30	33.90	0.34	0.11	0.11	0.11
	Agriculture			99.96	44982.00	85.97	1.00	1.00	1.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			112.90	45488.22	88.14	2.03	1.36	2.03
Little Menomonee Creek 50057	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Little Menomonee Creek 50060	Forest, Preservation			2.70	8.10	0.08	0.03	0.03	0.03
	Agriculture			24.00	10800.00	20.64	0.24	0.24	0.24
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.40	403.20	1.57	0.78	0.21	0.78
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			28.10	11211.30	22.29	1.05	0.48	1.05
Little Menomonee Creek 50062	Forest, Preservation			5.10	15.30	0.15	0.05	0.05	0.05
	Agriculture			96.97	43636.50	83.39	0.97	0.97	0.97
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.73	786.24	3.06	1.53	0.41	1.53
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			104.80	44438.04	86.60	2.55	1.43	2.55
Little Menomonee Creek 50065	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			85.58	38511.00	73.60	0.86	0.86	0.86
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			21.84	4477.20	4.19	2.80	1.22	1.75
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.78	512.64	1.99	1.00	0.27	1.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.70	17.10	0.17	0.06	0.06	0.06
	Subtotal			114.90	43517.94	79.96	4.71	2.40	3.66
Little Menomonee Creek 50070	Forest, Preservation			20.18	60.54	0.61	0.20	0.20	0.20
	Agriculture			19.87	8941.50	17.09	0.20	0.20	0.20
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			42.10	9592.44	19.99	1.55	0.71	1.55
Little Menomonee Creek 50075	Forest, Preservation			25.91	77.73	0.78	0.26	0.26	0.26
	Agriculture			166.27	74821.50	142.99	1.66	1.66	1.66
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			38.86	7966.30	7.46	4.97	2.18	3.11
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.15	619.20	2.41	1.20	0.32	1.20
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			25.91	77.73	0.78	0.26	0.26	0.26
	Subtotal			259.10	83562.46	154.42	8.36	4.68	6.49
Little Menomonee Creek 50100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			7.76	3266.96	13.97	1.43	0.62	8.46
	Low Density Residential			23.08	4731.40	4.43	2.95	1.29	1.85
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.60	460.80	1.79	0.90	0.24	0.90
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			7.76	23.28	0.23	0.08	0.08	0.08
	Subtotal			40.20	8482.44	20.42	5.36	2.23	11.28
Little Menomonee Creek 50102	Forest, Preservation			9.79	29.37	0.29	0.10	0.10	0.10
	Agriculture			43.90	19755.00	37.75	0.44	0.44	0.44
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			12.58	2578.90	2.42	1.61	0.70	1.01
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			67.50	22717.51	41.84	2.84	1.43	2.23
Little Menomonee Creek 50105	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			46.21	20794.50	39.74	0.46	0.46	0.46
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.09	313.92	1.22	0.61	0.16	0.61
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	47.30	21108.42	40.96	1.07	0.63	1.07
Little Menomonee Creek 50107	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	10.95	2244.75	2.10	1.40	0.61	0.88
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.85	244.80	0.95	0.48	0.13	0.48
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	11.80	2489.55	3.05	1.88	0.74	1.35
Little Menomonee Creek 50200	Forest, Preservation	4.03	12.09	0.12	0.04	0.04	0.04
	Agriculture	8.53	3838.50	7.34	0.09	0.09	0.09
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.45	129.60	0.50	0.25	0.07	0.25
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.69	2.07	0.02	0.01	0.01	0.01
	Subtotal	13.70	3982.26	7.98	0.38	0.20	0.38
Little Menomonee Creek 50205	Forest, Preservation	39.62	118.86	1.19	0.40	0.40	0.40
	Agriculture	116.05	52222.50	99.80	1.16	1.16	1.16
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	39.70	8138.50	7.62	5.08	2.22	3.18
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.43	411.84	1.60	0.80	0.21	0.80
	Open Water	1.50	277.50	0.20	0.06	0.06	0.06
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	198.30	61169.20	110.41	7.50	4.05	5.59
Little Menomonee Creek 50207	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphotous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Little Menomonee Creek 50300	Forest, Preservation			7.07	21.21	0.21	0.07	0.07	0.07
	Agriculture			28.28	12726.00	24.32	0.28	0.28	0.28
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			21.20	4346.00	4.07	2.71	1.19	1.70
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.57	452.16	1.76	0.88	0.24	0.88
	Open Water			42.42	7847.70	5.51	1.70	1.70	1.70
	Wetland			40.86	122.58	1.23	0.41	0.41	0.41
	Subtotal			141.40	25515.65	37.10	6.05	3.88	5.03
Fish Creek 10010	Forest, Preservation			21.00	63.00	0.63	0.21	0.21	0.21
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			17.10	3505.50	3.28	2.19	0.96	1.37
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			38.10	3568.50	3.91	2.40	1.17	1.58
Fish Creek 10020	Forest, Preservation			14.53	43.59	0.44	0.15	0.15	0.15
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			72.65	14893.25	13.95	9.30	4.07	5.81
	Medium Density Residential			58.11	23825.10	21.85	14.88	6.51	9.30
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			145.29	38761.94	36.23	24.32	10.72	15.25
Fish Creek 10030	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			27.83	5705.15	5.34	3.56	1.56	2.23
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			27.83	5705.15	5.34	3.56	1.56	2.23
Fish Creek 10040	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			13.40	5587.80	37.65	0.13	0.13	0.80
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			31.40	6437.00	6.03	4.02	1.76	2.51
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			44.80	12024.80	43.68	4.15	1.89	3.32
Fish Creek 10050	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			14.10	5879.70	39.62	0.14	0.14	0.85
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			49.16	10077.80	9.44	6.29	2.75	3.93
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			7.10	5694.20	12.50	32.52	3.55	14.77
	Arterial			0.34	97.92	0.38	0.19	0.05	0.19
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			70.70	21749.62	61.94	39.14	6.49	19.74
Fish Creek 10060	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			108.83	91961.35	93.59	235.07	34.83	182.83
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			12.60	10105.20	22.18	57.71	6.30	26.21
	Arterial			4.17	1200.96	4.67	2.34	0.63	2.34
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			125.60	103267.51	120.44	295.12	41.75	211.38
Fish Creek 10070	Forest, Preservation			34.20	102.60	1.03	0.34	0.34	0.34
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			119.80	49956.60	336.64	1.20	1.20	7.19
	Institutional			12.69	5342.49	22.84	2.33	1.02	13.83
	Low Density Residential			119.80	24559.00	23.00	15.33	6.71	9.58
	Medium Density Residential			17.10	7011.00	6.43	4.38	1.92	2.74
	High Density Residential			16.74	9608.76	8.70	6.03	2.68	3.75
	Commercial			2.00	1690.00	1.72	4.32	0.64	3.36
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			17.10	13714.20	30.10	78.32	8.55	35.57
	Arterial			2.77	797.76	3.10	1.55	0.42	1.55
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			342.20	112782.41	433.56	113.80	23.46	77.91
Fish Creek 10100	Forest, Preservation			17.70	53.10	0.53	0.18	0.18	0.18
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			40.62	8327.10	7.80	5.20	2.27	3.25
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.68	195.84	0.76	0.38	0.10	0.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			59.00	8576.04	9.09	5.76	2.55	3.81
Fish Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
10110	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			15.15	3105.75	2.91	1.94	0.85	1.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.75	216.00	0.84	0.42	0.11	0.42
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.90	3321.75	3.75	2.36	0.96	1.63
Fish Creek 10120	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			67.45	13827.25	12.95	8.63	3.78	5.40
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.75	216.00	0.84	0.42	0.11	0.42
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			68.20	14043.25	13.79	9.05	3.89	5.82
Fish Creek 10130	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			50.18	10286.90	9.63	6.42	2.81	4.01
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.72	207.36	0.81	0.40	0.11	0.40
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			50.90	10494.26	10.44	6.83	2.92	4.42
Fish Creek 10140	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			38.14	7818.70	7.32	4.88	2.14	3.05
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.16	334.08	1.30	0.65	0.17	0.65
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			39.30	8152.78	8.62	5.53	2.31	3.70
Fish Creek 10200	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			12.70	5295.90	35.69	0.13	0.13	0.76
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			16.90	9700.60	8.79	6.08	2.70	3.79
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			11.11	8910.22	19.55	50.88	5.56	23.11
	Arterial			1.59	457.92	1.78	0.89	0.24	0.89

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			42.30	24364.64	65.81	57.99	8.62	28.55
Fish Creek 10210	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Fish Creek 10220	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			83.59	17135.95	16.05	10.70	4.68	6.69
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.41	118.08	0.46	0.23	0.06	0.23
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			84.00	17254.03	16.51	10.93	4.74	6.92
Fish Creek 10230	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			142.02	29114.10	27.27	18.18	7.95	11.36
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.48	1002.24	3.90	1.95	0.52	1.95
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			145.50	30116.34	31.17	20.13	8.48	13.31
Fish Creek 10300	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			14.80	6171.60	41.59	0.15	0.15	0.89
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			14.80	6171.60	41.59	0.15	0.15	0.89
Fish Creek 10310	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			34.29	7029.45	6.58	4.39	1.92	2.74

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.41	118.08	0.46	0.23	0.06	0.23
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			34.70	7147.53	7.04	4.62	1.98	2.97
Fish Creek 10320	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			59.99	12297.95	11.52	7.68	3.36	4.80
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.61	175.68	0.68	0.34	0.09	0.34
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			60.60	12473.63	12.20	8.02	3.45	5.14
Fish Creek 10330	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			115.62	23702.10	22.20	14.80	6.47	9.25
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			5.88	1693.44	6.59	3.29	0.88	3.29
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			121.50	25395.54	28.78	18.09	7.36	12.54
Fish Creek 10340	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			19.50	3997.50	3.74	2.50	1.09	1.56
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			19.50	8385.00	2.63	23.40	4.88	71.18
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			39.00	12382.50	6.38	25.90	5.97	72.74
Fish Creek 10400	Forest, Preservation			34.20	102.60	1.03	0.34	0.34	0.34
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			87.77	17992.85	16.85	11.23	4.92	7.02
	Medium Density Residential			13.70	5617.00	5.15	3.51	1.53	2.19
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			136.90	24066.69	24.41	15.77	6.98	10.24

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Fish Creek 10500	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			3.84	1601.28	10.79	0.04	0.04	0.23
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			60.28	12357.40	11.57	7.72	3.38	4.82
	Medium Density Residential			10.05	4120.50	3.78	2.57	1.13	1.61
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			76.40	18618.42	27.65	11.06	4.76	7.39
Fish Creek 10510	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			21.31	8971.51	38.36	3.92	1.70	23.23
	Low Density Residential			21.31	4368.55	4.09	2.73	1.19	1.70
	Medium Density Residential			40.63	16658.30	15.28	10.40	4.55	6.50
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.99	573.12	2.23	1.11	0.30	1.11
	Open Water			21.32	3944.20	2.77	0.85	0.85	0.85
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			106.56	34515.68	62.73	19.02	8.60	33.40
Fish Creek 11000	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Fish Creek 11010	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ 20110	Forest, Preservation			62.82	188.46	1.88	0.63	0.63	0.63
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			46.36	9503.80	8.90	5.93	2.60	3.71
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.92	264.96	1.03	0.52	0.14	0.52
	Open Water			2.90	536.50	0.38	0.12	0.12	0.12
	Wetland			2.90	8.70	0.09	0.03	0.03	0.03
	Subtotal			115.90	10502.42	12.28	7.22	3.51	5.00
Mequon - MQ 20120	Forest, Preservation			60.10	180.30	1.80	0.60	0.60	0.60
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			80.01	16402.05	15.36	10.24	4.48	6.40
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.64	760.32	2.96	1.48	0.40	1.48
	Open Water			7.51	1389.35	0.98	0.30	0.30	0.30
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			150.26	18732.02	21.10	12.62	5.78	8.78
Mequon - MQ 20130	Forest, Preservation			5.06	15.18	0.15	0.05	0.05	0.05
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			5.06	2110.02	14.22	0.05	0.05	0.30
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			86.01	15911.85	11.18	3.44	3.44	3.44
	Wetland			5.06	15.18	0.15	0.05	0.05	0.05
	Subtotal			101.19	18052.23	25.70	3.59	3.59	3.85
Mequon - MQ 20140	Forest, Preservation			132.98	398.94	3.99	1.33	1.33	1.33
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			14.95	6234.15	42.01	0.15	0.15	0.90
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			148.47	30436.35	28.51	19.00	8.31	11.88
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.55	734.40	2.86	1.43	0.38	1.43
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			298.95	37803.84	77.36	21.91	10.18	15.53
Mequon - MQ 20210	Forest, Preservation			154.73	464.19	4.64	1.55	1.55	1.55
	Agriculture			30.94	13923.00	26.61	0.31	0.31	0.31
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			244.38	50097.90	46.92	31.28	13.69	19.55
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			61.89	52297.05	53.23	133.68	19.80	103.98
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.73	1362.24	5.30	2.65	0.71	2.65
	Open Water			92.83	17173.55	12.07	3.71	3.71	3.71
	Wetland			30.94	92.82	0.93	0.31	0.31	0.31
	Subtotal			620.44	135410.75	149.69	173.49	40.08	132.05
Mequon - MQ 20220	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr)	Phosphorous (lb/yr)	Lead (lb/yr)	Copper (lb/yr)	Zinc (lb/yr)
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			26.30	5391.50	5.05	3.37	1.47	2.10
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.61	175.68	0.68	0.34	0.09	0.34
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			26.91	5567.18	5.73	3.71	1.56	2.45
Mequon - MQ 20300	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			127.64	53225.88	358.67	1.28	1.28	7.66
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.46	708.48	2.76	1.38	0.37	1.38
	Open Water			2.00	370.00	0.26	0.08	0.08	0.08
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			132.10	54304.36	361.68	2.73	1.73	9.12
Mequon - MQ 20310	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			79.70	16338.50	15.30	10.20	4.46	6.38
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.15	619.20	2.41	1.20	0.32	1.20
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			81.85	16957.70	17.71	11.41	4.79	7.58
Mequon - MQ 20315	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			2.62	1103.02	4.72	0.48	0.21	2.86
	Low Density Residential			29.35	6016.75	5.64	3.76	1.64	2.35
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.95	561.60	2.18	1.09	0.29	1.09
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			33.92	7681.37	12.54	5.33	2.15	6.30
Mequon - MQ 20410	Forest, Preservation			4.10	12.30	0.12	0.04	0.04	0.04
	Agriculture			4.10	1845.00	3.53	0.04	0.04	0.04
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			31.93	6545.65	6.13	4.09	1.79	2.55
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	 Sediment (lb./yr.)	 Phosphorous (lb./yr.)	 Lead (lb./yr.)	 Copper (lb./yr.)	 Zinc (lb./yr.)
	Subtotal			40.98	8647.76	10.73	4.65	2.00	3.11
Mequon - MQ 20430	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			1.92	808.32	3.46	0.35	0.15	2.09
	Low Density Residential			7.69	1576.45	1.48	0.98	0.43	0.62
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.12	322.56	1.25	0.63	0.17	0.63
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.73	2707.33	6.19	1.96	0.75	3.34
Mequon - MQ 20440	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			9.88	2025.40	1.90	1.26	0.55	0.79
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.51	146.88	0.57	0.29	0.08	0.29
	Open Water			1.15	212.75	0.15	0.05	0.05	0.05
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.54	2385.03	2.62	1.60	0.68	1.12
Mequon - MQ 20450	Forest, Preservation			7.33	21.99	0.22	0.07	0.07	0.07
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			124.03	25426.15	23.81	15.88	6.95	9.92
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			7.32	6185.40	6.30	15.81	2.34	12.30
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.48	138.24	0.54	0.27	0.07	0.27
	Open Water			7.32	1354.20	0.95	0.29	0.29	0.29
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			146.48	33125.98	31.82	32.32	9.73	22.85
Mequon - MQ 20455	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			23.44	9868.24	42.19	4.31	1.88	25.55
	Low Density Residential			210.12	43074.60	40.34	26.90	11.77	16.81
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.35	676.80	2.63	1.32	0.35	1.32
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			235.91	53619.64	85.17	32.52	13.99	43.68
Mequon - MQ 20460	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			48.19	9878.95	9.25	6.17	2.70	3.86
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			48.19	9878.95	9.25	6.17	2.70	3.86
Mequon - MQ 20465	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			59.63	12224.15	11.45	7.63	3.34	4.77
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.00	3.00	0.03	0.01	0.01	0.01
	Subtotal			60.63	12227.15	11.48	7.64	3.35	4.78
Mequon - MQ 21010	Forest, Preservation			12.59	37.77	0.38	0.13	0.13	0.13
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			4.19	1763.99	7.54	0.77	0.34	4.57
	Low Density Residential			65.98	13525.90	12.67	8.45	3.69	5.28
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.16	334.08	1.30	0.65	0.17	0.65
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			83.92	15661.74	21.89	9.99	4.33	10.62
Mequon - MQ 21020	Forest, Preservation			36.24	108.72	1.09	0.36	0.36	0.36
	Agriculture			9.06	4077.00	7.79	0.09	0.09	0.09
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			62.11	12732.55	11.93	7.95	3.48	4.97
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			34.93	29515.85	30.04	75.45	11.18	58.68
	Industrial			34.93	15019.90	4.72	41.92	8.73	127.49
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.93	1131.84	4.40	2.20	0.59	2.20
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			181.20	62585.86	59.96	127.97	24.43	193.80
Mequon - MQ 21030	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			78.54	35343.00	67.54	0.79	0.79	0.79
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			9.82	2013.10	1.89	1.26	0.55	0.79
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			9.82	8297.90	8.45	21.21	3.14	16.50
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.01	866.88	3.37	1.69	0.45	1.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			101.19	46520.88	81.25	24.94	4.93	19.75
Mequon - MQ	Forest, Preservation			27.23	81.69	0.82	0.27	0.27	0.27

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
21040	Agriculture			188.53	84838.50	162.14	1.89	1.89	1.89
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			27.23	5582.15	5.23	3.49	1.52	2.18
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			270.24	116203.20	36.48	324.29	67.56	986.38
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.23	1218.24	4.74	2.37	0.63	2.37
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			27.23	81.69	0.82	0.27	0.27	0.27
	Subtotal			544.69	208005.47	210.22	332.57	72.15	993.35
Mequon - MQ 21050	Forest, Preservation			16.25	48.75	0.49	0.16	0.16	0.16
	Agriculture			249.98	112491.00	214.98	2.50	2.50	2.50
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			32.50	6662.50	6.24	4.16	1.82	2.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			16.24	13722.80	13.97	35.08	5.20	27.28
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			9.98	2874.24	11.18	5.59	1.50	5.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			324.95	135799.29	246.85	47.49	11.18	38.13
Mequon - MQ 21055	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			93.48	42066.00	80.39	0.93	0.93	0.93
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			15.14	3103.70	2.91	1.94	0.85	1.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.36	391.68	1.52	0.76	0.20	0.76
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			109.98	45561.38	84.82	3.63	1.99	2.91
Mequon - MQ 21060	Forest, Preservation			27.66	82.98	0.83	0.28	0.28	0.28
	Agriculture			380.14	171063.00	326.92	3.80	3.80	3.80
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			27.66	5670.30	5.31	3.54	1.55	2.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			82.97	35677.10	11.20	99.56	20.74	302.84
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.07	2036.16	7.92	3.96	1.06	3.96
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			27.66	82.98	0.83	0.28	0.28	0.28
	Subtotal			553.16	214612.52	353.01	111.42	27.71	313.37
Mequon - MQ 21070	Forest, Preservation			19.93	59.79	0.60	0.20	0.20	0.20
	Agriculture			350.51	157729.50	301.44	3.51	3.51	3.51
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			3.98	1675.58	7.16	0.73	0.32	4.34
	Low Density Residential			19.93	4085.65	3.83	2.55	1.12	1.59
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.23	1218.24	4.74	2.37	0.63	2.37

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			398.58	164768.76	317.76	9.36	5.77	12.01
Mequon - MQ 21080	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ 21090	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ 22110	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			7.52	3384.00	6.47	0.08	0.08	0.08
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			119.02	24399.10	22.85	15.23	6.67	9.52
	Medium Density Residential			7.52	3083.20	2.83	1.93	0.84	1.20
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			14.44	12201.80	12.42	31.19	4.62	24.26
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.48	1290.24	5.02	2.51	0.67	2.51
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			152.98	44358.34	49.58	50.93	12.88	37.57
Mequon - MQ 22120	Forest, Preservation			10.58	31.74	0.32	0.11	0.11	0.11
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			42.30	8671.50	8.12	5.41	2.37	3.38
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			42.30	35743.50	36.38	91.37	13.54	71.06
	Industrial			115.34	49596.20	15.57	138.41	28.84	420.99
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			211.52	94227.94	60.52	235.34	44.89	495.58
Mequon - MQ 22200	Forest, Preservation			16.42	49.26	0.49	0.16	0.16	0.16
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			65.67	27647.07	118.21	12.08	5.25	71.58
	Low Density Residential			62.60	12833.00	12.02	8.01	3.51	5.01

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.07	884.16	3.44	1.72	0.46	1.72
	Open Water			16.42	3037.70	2.13	0.66	0.66	0.66
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			164.18	44451.19	136.29	22.64	10.04	79.13
Mequon - MQ 22201	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			5.53	2488.50	4.76	0.06	0.06	0.06
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			102.54	21020.70	19.69	13.13	5.74	8.20
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.43	699.84	2.72	1.36	0.36	1.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			110.50	24209.04	27.17	14.54	6.16	9.62
Mequon - MQ 22209	Forest, Preservation			2.60	7.80	0.08	0.03	0.03	0.03
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			43.17	8849.85	8.29	5.53	2.42	3.45
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			5.23	967.55	0.68	0.21	0.21	0.21
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			52.23	10179.44	10.42	6.45	2.84	4.38
Mequon - MQ 22210	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			14.81	6235.01	26.66	2.73	1.18	16.14
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			27.44	23186.80	23.60	59.27	8.78	46.10
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.10	2044.80	7.95	3.98	1.07	3.98
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			49.35	31466.61	58.21	65.97	11.03	66.22
Mequon - MQ 22223	Forest, Preservation			14.78	44.34	0.44	0.15	0.15	0.15
	Agriculture			192.11	86449.50	165.21	1.92	1.92	1.92
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			5.92	2492.32	10.66	1.09	0.47	6.45
	Low Density Residential			29.57	6061.85	5.68	3.78	1.66	2.37
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			41.29	34890.05	35.51	89.19	13.21	69.37
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			6.13	1765.44	6.87	3.43	0.92	3.43
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.92	17.76	0.18	0.06	0.06	0.06
	Subtotal			295.72	131721.26	224.54	99.62	18.39	83.75

Total Loadings columns: Area through Zinc.

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
				Total Loadings					
Mequon - MQ 22224	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			182.96	82332.00	157.35	1.83	1.83	1.83
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			10.60	2173.00	2.04	1.36	0.59	0.85
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			10.60	8957.00	9.12	22.90	3.39	17.81
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.85	2260.80	8.79	4.40	1.18	4.40
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			212.01	95722.80	177.29	30.48	6.99	24.88
Mequon - MQ 22225	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			34.64	15588.00	29.79	0.35	0.35	0.35
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			192.41	39444.05	36.94	24.63	10.77	15.39
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.86	1111.68	4.32	2.16	0.58	2.16
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			230.91	56143.73	71.06	27.14	11.70	17.90
Mequon - MQ 22250	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			9.03	4063.50	7.77	0.09	0.09	0.09
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			21.07	8870.47	37.93	3.88	1.69	22.97
	Low Density Residential			30.11	6172.55	5.78	3.85	1.69	2.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			60.21	19106.52	51.47	7.82	3.46	25.47
Mequon - MQ 22260	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			74.84	15342.20	14.37	9.58	4.19	5.99
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.31	377.28	1.47	0.73	0.20	0.73
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			4.01	12.03	0.12	0.04	0.04	0.04
	Subtotal			80.16	15731.51	15.96	10.35	4.43	6.76
Mequon - MQ 22265	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			25.66	5260.30	4.93	3.28	1.44	2.05
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.96	564.48	2.20	1.10	0.29	1.10
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			27.62	5824.78	7.12	4.38	1.73	3.15
Mequon - MQ 22268	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			15.22	6849.00	13.09	0.15	0.15	0.15
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			14.30	2931.50	2.75	1.83	0.80	1.14
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.86	535.68	2.08	1.04	0.28	1.04
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			31.38	10316.18	17.92	3.02	1.23	2.34
Mequon - MQ 22300	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			62.44	26037.48	175.46	0.62	0.62	3.75
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.35	1506.75	1.41	0.94	0.41	0.59
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			3.67	678.95	0.48	0.15	0.15	0.15
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			73.46	28223.18	177.34	1.71	1.18	4.48
Mequon - MQ 22302	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			6.20	2585.40	17.42	0.06	0.06	0.37
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			9.31	3817.10	3.50	2.38	1.04	1.49
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.51	6402.50	20.92	2.45	1.10	1.86
Mequon - MQ 22303	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			8.94	3727.98	25.12	0.09	0.09	0.54
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			13.40	5494.00	5.04	3.43	1.50	2.14
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			22.34	9221.98	30.16	3.52	1.59	2.68
Mequon - MQ 22304	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings: Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	15.29	3134.45	2.94	1.96	0.86	1.22
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	15.29	3134.45	2.94	1.96	0.86	1.22
Mequon - MQ 22305	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	24.51	10220.67	68.87	0.25	0.25	1.47
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	1.29	3.87	0.04	0.01	0.01	0.01
	Subtotal	25.80	10224.54	68.91	0.26	0.26	1.48
Mequon - MQ 22310	Forest, Preservation	6.15	18.45	0.18	0.06	0.06	0.06
	Agriculture	79.12	35604.00	68.04	0.79	0.79	0.79
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	36.07	7394.35	6.93	4.62	2.02	2.89
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.64	472.32	1.84	0.92	0.25	0.92
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	122.98	43489.12	76.99	6.39	3.12	4.66
Mequon - MQ 22312	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	14.77	6159.09	41.50	0.15	0.15	0.89
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	21.14	4333.70	4.06	2.71	1.18	1.69
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.02	293.76	1.14	0.57	0.15	0.57
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	36.93	10786.55	46.70	3.42	1.48	3.15
Mequon - MQ 22313	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	106.64	44468.88	299.66	1.07	1.07	6.40
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	45.33	9292.65	8.70	5.80	2.54	3.63
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.64	472.32	1.84	0.92	0.25	0.92
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings: Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal	153.61	54233.85	310.20	7.79	3.85	10.94
Mequon - MQ 22314	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	10.46	4361.82	29.39	0.10	0.10	0.63
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	10.46	4361.82	29.39	0.10	0.10	0.63
Mequon - MQ 22315	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	71.68	29890.56	201.42	0.72	0.72	4.30
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	87.89	18017.45	16.87	11.25	4.92	7.03
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.91	550.08	2.14	1.07	0.29	1.07
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	161.48	48458.09	220.43	13.04	5.93	12.40
Mequon - MQ 22316	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	16.75	6984.75	47.07	0.17	0.17	1.01
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	4.19	858.95	0.80	0.54	0.23	0.34
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	20.94	7843.70	47.87	0.70	0.40	1.34
Mequon - MQ 22317	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	5.77	2406.09	16.21	0.06	0.06	0.35
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	5.77	2406.09	16.21	0.06	0.06	0.35
Mequon - MQ 22318	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	5.50	2293.50	15.46	0.06	0.06	0.33
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	5.99	1227.95	1.15	0.77	0.34	0.48
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.50	92.50	0.07	0.02	0.02	0.02
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.99	3613.95	16.67	0.84	0.41	0.83
Mequon - MQ 22320	Forest, Preservation			9.30	27.90	0.28	0.09	0.09	0.09
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			3.18	1303.80	1.20	0.81	0.36	0.51
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.24	69.12	0.27	0.13	0.04	0.13
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			12.72	1400.82	1.74	1.04	0.49	0.74
Mequon - MQ 22350	Forest, Preservation			375.52	1126.56	11.27	3.76	3.76	3.76
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			233.85	47939.25	44.90	29.93	13.10	18.71
	Medium Density Residential			47.23	19364.30	17.76	12.09	5.29	7.56
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.64	1336.32	5.20	2.60	0.70	2.60
	Open Water			188.92	34950.20	24.56	7.56	7.56	7.56
	Wetland			94.46	283.38	2.83	0.94	0.94	0.94
	Subtotal			944.62	105000.01	106.51	56.88	31.34	41.12
Mequon - MQ 22400	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			36.76	16542.00	31.61	0.37	0.37	0.37
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			5.12	1049.60	0.98	0.66	0.29	0.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.77	509.76	1.98	0.99	0.27	0.99
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			2.31	6.93	0.07	0.02	0.02	0.02
	Subtotal			45.96	18108.29	34.65	2.04	0.94	1.79
Mequon - MQ 22410	Forest, Preservation			119.05	357.15	3.57	1.19	1.19	1.19
	Agriculture			384.64	173088.00	330.79	3.85	3.85	3.85
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			57.26	11738.30	10.99	7.33	3.21	4.58
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.54	1307.52	5.08	2.54	0.68	2.54
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			29.76	89.28	0.89	0.30	0.30	0.30
	Subtotal			595.25	186580.25	351.33	15.21	9.22	12.46
Mequon - MQ	Forest, Preservation			4.20	12.60	0.13	0.04	0.04	0.04

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
22505	Agriculture			8.01	3604.50	6.89	0.08	0.08	0.08
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			8.52	1746.60	1.64	1.09	0.48	0.68
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.58	167.04	0.65	0.32	0.09	0.32
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			21.31	5530.74	9.30	1.54	0.69	1.13
Mequon - MQ 22510	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			48.31	21739.50	41.55	0.48	0.48	0.48
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			2.67	547.35	0.51	0.34	0.15	0.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.32	668.16	2.60	1.30	0.35	1.30
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			53.30	22955.01	44.66	2.12	0.98	2.00
Mequon - MQ 22520	Forest, Preservation			8.63	25.89	0.26	0.09	0.09	0.09
	Agriculture			153.09	68890.50	131.66	1.53	1.53	1.53
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			8.63	1769.15	1.66	1.10	0.48	0.69
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.32	668.16	2.60	1.30	0.35	1.30
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			172.67	71353.70	136.17	4.02	2.45	3.61
Mequon - MQ 22600	Forest, Preservation			1.35	4.05	0.04	0.01	0.01	0.01
	Agriculture			36.23	16303.50	31.16	0.36	0.36	0.36
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			13.48	2763.40	2.59	1.73	0.75	1.08
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.50	432.00	1.68	0.84	0.23	0.84
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.34	4.02	0.04	0.01	0.01	0.01
	Subtotal			53.90	19506.97	35.51	2.95	1.37	2.31
Mequon - MQ 22602	Forest, Preservation			205.30	615.90	6.16	2.05	2.05	2.05
	Agriculture			168.35	75757.50	144.78	1.68	1.68	1.68
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			51.81	10621.05	9.95	6.63	2.90	4.14
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			12.95	7433.30	6.73	4.66	2.07	2.90
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.91	550.08	2.14	1.07	0.29	1.07

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Open Water			51.80	9583.00	6.73	2.07	2.07	2.07
	Wetland			25.90	77.70	0.78	0.26	0.26	0.26
	Subtotal			518.02	104638.53	177.27	18.43	11.33	14.18
Mequon - MQ 22605	Forest, Preservation			160.38	481.14	4.81	1.60	1.60	1.60
	Agriculture			239.86	107937.00	206.28	2.40	2.40	2.40
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			53.12	10889.60	10.20	6.80	2.97	4.25
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.05	302.40	1.18	0.59	0.16	0.59
	Open Water			26.73	4945.05	3.47	1.07	1.07	1.07
	Wetland			53.46	160.38	1.60	0.53	0.53	0.53
	Subtotal			534.60	124715.57	227.54	12.99	8.74	10.44
Mequon - MQ 22607	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ 22610	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			146.23	65803.50	125.76	1.46	1.46	1.46
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.67	768.96	2.99	1.50	0.40	1.50
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			148.90	66572.46	128.75	2.96	1.86	2.96
Mequon - MQ 22620	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ 22630	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			61.57	27706.50	52.95	0.62	0.62	0.62
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.02	293.76	1.14	0.57	0.15	0.57
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			62.59	28000.26	54.09	1.19	0.77	1.19
Mequon - MQ 27000	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			15.07	6781.50	12.96	0.15	0.15	0.15
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.07	6781.50	12.96	0.15	0.15	0.15
Mequon - MQ 27100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			17.71	7969.50	15.23	0.18	0.18	0.18
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			18.56	8214.30	16.18	0.65	0.30	0.65
Mequon - MQ 27110	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			12.91	5435.11	23.24	2.38	1.03	14.07
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.68	195.84	0.76	0.38	0.10	0.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			13.59	5630.95	24.00	2.76	1.13	14.45
Mequon - MQ 27115	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			12.98	5464.58	23.36	2.39	1.04	14.15
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			12.98	5464.58	23.36	2.39	1.04	14.15

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Mequon - MQ 27120	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			13.58	5717.18	24.44	2.50	1.09	14.80
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.72	207.36	0.81	0.40	0.11	0.40
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.75	2.25	0.02	0.01	0.01	0.01
	Subtotal			15.05	5926.79	25.27	2.91	1.20	15.21
Mequon - MQ 27125	Forest, Preservation			6.40	19.20	0.19	0.06	0.06	0.06
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			17.91	7540.11	32.24	3.30	1.43	19.52
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.28	3.84	0.04	0.01	0.01	0.01
	Subtotal			25.59	7563.15	32.47	3.37	1.51	19.60
Mequon - MQ 27130	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			10.68	8565.36	18.80	48.91	5.34	22.21
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.68	8565.36	18.80	48.91	5.34	22.21
Mequon - MQ 27140	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			69.94	14337.70	13.43	8.95	3.92	5.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.06	305.28	1.19	0.59	0.16	0.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.74	11.22	0.11	0.04	0.04	0.04
	Subtotal			74.74	14654.20	14.73	9.58	4.11	6.23
Mequon - MQ 27150	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			9.84	2017.20	1.89	1.26	0.55	0.79
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.37	394.56	1.53	0.77	0.21	0.77
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.21	2411.76	3.42	2.03	0.76	1.55
Mequon - MQ 27200	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			19.09	3913.45	3.67	2.44	1.07	1.53
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			4.58	2628.92	2.38	1.65	0.73	1.03
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.52	149.76	0.58	0.29	0.08	0.29
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			24.19	6692.13	6.63	4.38	1.88	2.84
Mequon - MQ 27250	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			6.46	2907.00	5.56	0.06	0.06	0.06
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			36.60	15408.60	65.88	6.73	2.93	39.89
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.13	325.44	1.27	0.63	0.17	0.63
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			44.19	18641.04	72.70	7.43	3.16	40.59
Mequon - MQ 28000	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			58.14	11918.70	11.16	7.44	3.26	4.65
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			60.19	12509.10	13.46	8.59	3.56	5.80
Mequon - MQ 28100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.12	1459.60	1.37	0.91	0.40	0.57
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			7.12	1459.60	1.37	0.91	0.40	0.57
Mequon - MQ 28150	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr)	Phosphorous (lb/yr)	Lead (lb/yr)	Copper (lb/yr)	Zinc (lb/yr)
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			49.35	10116.75	9.48	6.32	2.76	3.95
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.41	982.08	3.82	1.91	0.51	1.91
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			79.13	237.39	2.37	0.79	0.79	0.79
	Subtotal			131.89	11336.22	15.67	9.02	4.07	6.65
Mequon - MQ 28200	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			20.27	4155.35	3.89	2.59	1.14	1.62
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.09	313.92	1.22	0.61	0.16	0.61
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			21.36	4469.27	5.11	3.20	1.30	2.23
Mequon - MQ 28300	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			8.24	1689.20	1.58	1.05	0.46	0.66
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.38	109.44	0.43	0.21	0.06	0.21
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			8.62	1798.64	2.01	1.27	0.52	0.87
Mequon - MQ 28350	Forest, Preservation			30.73	92.19	0.92	0.31	0.31	0.31
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			3.14	643.70	0.60	0.40	0.18	0.25
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.48	138.24	0.54	0.27	0.07	0.27
	Open Water			1.80	333.00	0.23	0.07	0.07	0.07
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			36.15	1207.13	2.30	1.05	0.63	0.90
Mequon - MQ 28400	Forest, Preservation			25.97	77.91	0.78	0.26	0.26	0.26
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			17.32	3204.20	2.25	0.69	0.69	0.69
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			43.29	3282.11	3.03	0.95	0.95	0.95
Mequon - MQ 28450	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			67.96	57426.20	58.45	146.79	21.75	114.17
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.59	745.92	2.90	1.45	0.39	1.45
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			70.55	58172.12	61.35	148.24	22.14	115.62
Mequon - MQ 28475	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			33.17	6799.85	6.37	4.25	1.86	2.65
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			31.35	26490.75	26.96	67.72	10.03	52.67
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.29	659.52	2.56	1.28	0.34	1.28
	Open Water			16.70	3089.50	2.17	0.67	0.67	0.67
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			83.51	37039.62	38.07	73.91	12.90	57.27
Mequon - MQ 28480	Forest, Preservation			16.36	49.08	0.49	0.16	0.16	0.16
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			19.06	10940.44	9.91	6.86	3.05	4.27
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.79	227.52	0.88	0.44	0.12	0.44
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.91	5.73	0.06	0.02	0.02	0.02
	Subtotal			38.12	11222.77	11.34	7.49	3.35	4.89
Mequon - MQ 28500	Forest, Preservation			4.32	12.96	0.13	0.04	0.04	0.04
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			31.59	26693.55	27.17	68.23	10.11	53.07
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			6.49	19.47	0.19	0.06	0.06	0.06
	Subtotal			43.25	26970.78	28.44	68.82	10.34	53.66
Mequon - MQ 28550	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			231.93	47545.65	44.53	29.69	12.99	18.55
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.18	339.84	1.32	0.66	0.18	0.66
	Open Water			38.85	7187.25	5.05	1.55	1.55	1.55
	Wetland			38.85	116.55	1.17	0.39	0.39	0.39
	Subtotal			310.81	55189.29	52.07	32.29	15.11	21.16
Mequon - MQ 28575	Forest, Preservation			11.81	35.43	0.35	0.12	0.12	0.12
	Agriculture			5.06	2277.00	4.35	0.05	0.05	0.05
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			16.87	2312.43	4.71	0.17	0.17	0.17
Mequon - MQ 28600	Forest, Preservation			33.13	99.39	0.99	0.33	0.33	0.33
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			296.01	60682.05	56.83	37.89	16.58	23.68
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			3.35	2686.70	5.90	15.34	1.68	6.97
	Arterial			2.41	694.08	2.70	1.35	0.36	1.35
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			334.90	64162.22	66.42	54.91	18.94	32.33
Mequon - MQ 29000	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			110.75	22703.75	21.26	14.18	6.20	8.86
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.79	515.52	2.00	1.00	0.27	1.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			112.54	23219.27	23.27	15.18	6.47	9.86
Mequon - MQ 29100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			248.15	103478.55	697.30	2.48	2.48	14.89
	Institutional			72.85	30669.85	131.13	13.40	5.83	79.41
	Low Density Residential			169.14	34673.70	32.47	21.65	9.47	13.53
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			1.00	845.00	0.86	2.16	0.32	1.68
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			8.65	2491.20	9.69	4.84	1.30	4.84
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			499.79	172158.30	871.45	44.54	19.40	114.35
Mequon - MQ	Forest, Preservation			28.27	84.81	0.85	0.28	0.28	0.28

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
29150	Agriculture			28.26	12717.00	24.30	0.28	0.28	0.28
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			19.68	11296.32	10.23	7.08	3.15	4.41
	Commercial			115.60	97682.00	99.42	249.70	36.99	194.21
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			2.50	2005.00	4.40	11.45	1.25	5.20
	Arterial			2.46	708.48	2.76	1.38	0.37	1.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			196.77	124493.61	141.96	270.17	42.33	205.76
	TOTALS			**30,205**	**8,943,424**	**17,800**	**4,960**	**1,347**	**6,164**

Appendix E
City of Mequon - Stormwater Management Study
Unit Area Pollutant Loading Rates

Land Use Types	Unit Area Loading Rates				
	Sediment (lb./ac./yr.)	Phosphorous (lb./ac./yr.)	Lead (lb./ac./yr.)	Copper (lb./ac./yr.)	Zinc (lb./ac./yr.)
Forest, Preservation	3	0.03	0.010	0.010	0.010
New Low Density Res.	123	0.12	0.080	0.030	0.050
Park	417	2.81	0.010	0.010	0.060
Institutional / Business Park	421	1.80	0.184	0.080	1.090
Low Density Residential	205	0.19	0.128	0.056	0.080
Medium Density Residential	410	0.38	0.256	0.112	0.160
High Density Residential	574	0.52	0.360	0.160	0.224
Commercial	845	0.86	2.160	0.320	1.680
Industrial	430	0.14	1.200	0.250	3.650
Highway	802	1.76	4.580	0.500	2.080
Arterial	288	1.12	0.560	0.150	0.560
Open Water	185	0.13	0.040	0.040	0.040
Wetland	3	0.03	0.010	0.010	0.010

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Lake Michigan	Forest, Preservation			247.04	741.12	7.41	2.47	2.47	2.47
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			82.35	34339.95	231.40	0.82	0.82	4.94
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			445.01	91227.05	85.44	56.96	24.92	35.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			41.17	34788.65	35.41	88.93	13.17	69.17
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.89	2272.32	8.84	4.42	1.18	4.42
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			823.46	163369.09	368.50	153.60	42.57	116.60
Pigeon Creek 30010	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			23.59	9931.39	42.46	4.34	1.89	25.71
	Low Density Residential			22.06	4522.30	4.24	2.82	1.24	1.76
	Medium Density Residential			20.22	8290.20	7.60	5.18	2.26	3.24
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.54	155.52	0.60	0.30	0.08	0.30
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			67.41	23084.41	55.04	12.68	5.51	31.06
Pigeon Creek 30015	Forest, Preservation			3.40	10.20	0.10	0.03	0.03	0.03
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			26.70	11240.70	48.06	4.91	0.00	29.10
	Low Density Residential			33.50	6867.50	6.43	4.29	0.00	2.68
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.02	293.76	1.14	0.57	0.00	0.57
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.40	10.20	0.10	0.03	0.00	0.03
	Subtotal			68.02	18422.36	55.84	9.84	0.03	32.42
Pigeon Creek 30020	Forest, Preservation			34.00	102.00	1.02	0.34	0.34	0.34
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			84.16	17252.80	16.16	10.77	4.71	6.73
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			7.65	3289.50	1.03	9.18	1.91	27.92
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.70	489.60	1.90	0.95	0.26	0.95
	Open Water			21.25	3931.25	2.76	0.85	0.85	0.85
	Wetland			21.25	63.75	0.64	0.21	0.21	0.21
	Subtotal			170.01	25128.90	23.52	22.31	8.28	37.01
Pigeon Creek 30030	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			30.49	25764.05	26.22	65.86	9.76	51.22
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.88	541.44	2.11	1.05	0.28	1.05
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			32.37	26305.49	28.33	66.91	10.04	52.28
Pigeon Creek 30032	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.24	69.12	0.27	0.13	0.04	0.13
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.86	11.58	0.12	0.04	0.04	0.04
	Subtotal			4.10	80.70	0.38	0.17	0.07	0.17
Pigeon Creek 30034	Forest, Preservation			4.72	14.16	0.14	0.05	0.05	0.05
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.39	688.32	2.68	1.34	0.36	1.34
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.93	29.79	0.30	0.10	0.10	0.10

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			17.04	732.27	3.12	1.48	0.51	1.48
Pigeon Creek 30040	Forest, Preservation			4.86	14.58	0.15	0.05	0.05	0.05
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.54	443.52	1.72	0.86	0.23	0.86
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			26.03	78.09	0.78	0.26	0.26	0.26
	Subtotal			32.43	536.19	2.65	1.17	0.54	1.17
Pigeon Creek 30045	Forest, Preservation			44.92	134.76	1.35	0.45	0.45	0.45
	Agriculture			49.98	6147.54	6.00	4.00	1.50	2.50
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.26	362.88	1.41	0.71	0.19	0.71
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.06	15.18	0.15	0.05	0.05	0.05
	Subtotal			101.22	6660.36	8.91	5.20	2.19	3.70
Pigeon Creek 30046	Forest, Preservation			24.13	72.39	0.72	0.24	0.24	0.24
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.02	581.76	2.26	1.13	0.30	1.13
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			26.15	654.15	2.99	1.37	0.54	1.37
Pigeon Creek 30047	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			26.20	15038.80	13.62	9.43	4.19	5.87
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.49	717.12	2.79	1.39	0.37	1.39
	Open Water			12.30	2275.50	1.60	0.49	0.49	0.49
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			40.99	18031.42	18.01	11.32	5.06	7.76
Pigeon Creek 30048	Forest, Preservation			38.72	116.16	1.16	0.39	0.39	0.39
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Low Density Residential			4.74	971.70	0.91	0.61	0.27	0.38
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			2.37	1360.38	1.23	0.85	0.38	0.53
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			47.47	2920.56	5.14	2.77	1.28	2.22
Pigeon Creek 30050	Forest, Preservation			107.43	322.29	3.22	1.07	1.07	1.07
	Agriculture			124.18	15274.14	14.90	9.93	3.73	6.21
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			26.62	22493.90	22.89	57.50	8.52	44.72
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.93	843.84	3.28	1.64	0.44	1.64
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			13.81	41.43	0.41	0.14	0.14	0.14
	Subtotal			275.97	39160.60	44.84	70.33	13.94	53.82
Pigeon Creek 30060	Forest, Preservation			14.88	44.64	0.45	0.15	0.15	0.15
	Agriculture			20.47	2517.81	2.46	1.64	0.61	1.02
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.89	256.32	1.00	0.50	0.13	0.50
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.90	5.70	0.06	0.02	0.02	0.02
	Subtotal			38.14	2824.47	3.96	2.30	0.92	1.69
Pigeon Creek 30070	Forest, Preservation			10.59	31.77	0.32	0.11	0.11	0.11
	Agriculture			192.93	23730.39	23.15	15.43	5.79	9.65
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.48	1002.24	3.90	1.95	0.52	1.95
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			10.59	31.77	0.32	0.11	0.11	0.11
	Subtotal			217.59	24796.17	27.68	17.60	6.52	11.81
Pigeon Creek 30072	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			14.93	1836.39	1.79	1.19	0.45	0.75
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.43	411.84	1.60	0.80	0.21	0.80

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			16.36	2248.23	3.39	2.00	0.66	1.55
Pigeon Creek 30075	Forest, Preservation			73.57	220.71	2.21	0.74	0.74	0.74
	Agriculture			32.86	4041.78	3.94	2.63	0.99	1.64
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			16.48	3378.40	3.16	2.11	0.92	1.32
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.59	745.92	2.90	1.45	0.39	1.45
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			41.83	125.49	1.25	0.42	0.42	0.42
	Subtotal			167.33	8512.30	13.47	7.34	3.45	5.57
Pigeon Creek 30077	Forest, Preservation			13.27	39.81	0.40	0.13	0.13	0.13
	Agriculture			13.28	1633.44	1.59	1.06	0.40	0.66
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			26.55	1673.25	1.99	1.20	0.53	0.80
Pigeon Creek 30079	Forest, Preservation			26.29	78.87	0.79	0.26	0.26	0.26
	Agriculture			26.29	3233.67	3.15	2.10	0.79	1.31
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			5.84	1197.20	1.12	0.75	0.33	0.47
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			59.42	4694.74	5.19	3.15	1.42	2.08
Pigeon Creek 30100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			146.34	59999.40	55.02	37.46	16.39	23.41
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.20	1209.60	4.70	2.35	0.63	2.35
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			150.54	61209.00	59.73	39.82	17.02	25.77
Pigeon Creek 30110	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			51.34	21049.40	19.30	13.14	5.75	8.21
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.37	1258.56	4.89	2.45	0.66	2.45
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			55.71	22307.96	24.20	15.59	6.41	10.66
Pigeon Creek 30220	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			143.98	60615.58	259.16	26.49	11.52	156.94
	Low Density Residential			10.66	2185.30	2.05	1.36	0.60	0.85
	Medium Density Residential			53.32	21861.20	20.05	13.65	5.97	8.53
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.31	953.28	3.71	1.85	0.50	1.85
	Open Water			2.00	370.00	0.26	0.08	0.08	0.08
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			213.27	85985.36	285.23	43.44	18.66	168.26
Pigeon Creek 30225	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			30.89	6332.45	5.93	3.95	1.73	2.47
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.71	492.48	1.92	0.96	0.26	0.96
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			32.60	6824.93	7.85	4.91	1.99	3.43
Pigeon Creek 30230	Forest, Preservation			8.24	24.72	0.25	0.08	0.08	0.08
	Agriculture			24.68	3035.64	2.96	1.97	0.74	1.23
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			128.94	26432.70	24.76	16.50	7.22	10.32
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.66	766.08	2.98	1.49	0.40	1.49
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			164.52	30259.14	30.94	20.05	8.44	13.12
Pigeon Creek 30240	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			76.88	32058.96	216.03	0.77	0.77	4.61
	Institutional			7.57	3186.97	13.63	1.39	0.61	8.25
	Low Density Residential			68.14	13968.70	13.08	8.72	3.82	5.45
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.76	1082.88	4.21	2.11	0.56	2.11
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			156.35	50297.51	246.95	12.99	5.75	20.42
Pigeon Creek 30300	Forest, Preservation			20.04	60.12	0.60	0.20	0.20	0.20
	Agriculture			67.10	8253.30	8.05	5.37	2.01	3.36
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			100.23	20547.15	19.24	12.83	5.61	8.02
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.05	878.40	3.42	1.71	0.46	1.71
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			10.02	30.06	0.30	0.10	0.10	0.10
	Subtotal			200.44	29769.03	31.61	20.21	8.38	13.38
Pigeon Creek 30305	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			28.51	3506.73	3.42	2.28	0.86	1.43
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.46	420.48	1.64	0.82	0.22	0.82
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			29.97	3927.21	5.06	3.10	1.07	2.24
Pigeon Creek 30420	Forest, Preservation			54.24	162.72	1.63	0.54	0.54	0.54
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			138.28	57662.76	388.57	1.38	1.38	8.30
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			10.85	2224.25	2.08	1.39	0.61	0.87
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			10.84	4661.20	1.46	13.01	2.71	39.57
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.73	786.24	3.06	1.53	0.41	1.53
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			216.94	65497.17	396.80	17.85	5.65	50.80
Pigeon Creek 30430	Forest, Preservation			24.87	74.61	0.75	0.25	0.25	0.25
	Agriculture			54.24	6671.52	6.51	4.34	1.63	2.71
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.72	207.36	0.81	0.40	0.11	0.40
	Open Water			14.66	2712.10	1.91	0.59	0.59	0.59
	Wetland			5.00	15.00	0.15	0.05	0.05	0.05
	Subtotal			99.49	9680.59	10.12	5.63	2.62	4.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
Pigeon Creek 30440	Forest, Preservation			23.52	70.56	0.71	0.24	0.24	0.24
	Agriculture			30.19	3713.37	3.62	2.42	0.91	1.51
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			45.73	9374.65	8.78	5.85	2.56	3.66
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			47.03	39740.35	40.45	101.58	15.05	79.01
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.46	708.48	2.76	1.38	0.37	1.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			7.83	23.49	0.23	0.08	0.08	0.08
	Subtotal			156.76	53630.90	56.54	111.54	19.20	85.87
Pigeon Creek 30450	Forest, Preservation			17.13	51.39	0.51	0.17	0.17	0.17
	Agriculture			17.51	2153.73	2.10	1.40	0.53	0.88
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			23.22	4760.10	4.46	2.97	1.30	1.86
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			59.50	7437.54	8.91	5.46	2.24	3.82
Pigeon Creek 30460	Forest, Preservation			21.86	65.58	0.66	0.22	0.22	0.22
	Agriculture			75.57	9295.11	9.07	6.05	2.27	3.78
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			29.64	6076.20	5.69	3.79	1.66	2.37
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			14.94	12624.30	12.85	32.27	4.78	25.10
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.57	452.16	1.76	0.88	0.24	0.88
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			7.56	22.68	0.23	0.08	0.08	0.08
	Subtotal			151.14	28536.03	30.25	43.28	9.24	32.42
Pigeon Creek 30470	Forest, Preservation			25.56	76.68	0.77	0.26	0.26	0.26
	Agriculture			140.60	17293.80	16.87	11.25	4.22	7.03
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			49.82	10213.10	9.57	6.38	2.79	3.99
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			37.02	31281.90	31.84	79.96	11.85	62.19
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.63	757.44	2.95	1.47	0.39	1.47
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			255.63	59622.92	61.99	99.32	19.50	74.94
Pigeon Creek 30480	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			14.26	42.78	0.43	0.14	0.14	0.14
	Subtotal			14.26	42.78	0.43	0.14	0.14	0.14
Pigeon Creek 30485	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			17.20	3526.00	3.30	2.20	0.96	1.38
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			17.20	3526.00	3.30	2.20	0.96	1.38
Pigeon Creek 30490	Forest, Preservation			10.91	32.73	0.33	0.11	0.11	0.11
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			11.73	2404.65	2.25	1.50	0.66	0.94
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.82	236.16	0.92	0.46	0.12	0.46
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			23.46	2673.54	3.50	2.07	0.89	1.51
Pigeon Creek 30510	Forest, Preservation			2.68	8.04	0.08	0.03	0.03	0.03
	Agriculture			4.93	606.39	0.59	0.39	0.15	0.25
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.42	120.96	0.47	0.24	0.06	0.24
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			2.67	8.01	0.08	0.03	0.03	0.03
	Subtotal			10.70	743.40	1.22	0.68	0.26	0.54
Pigeon Creek 30520	Forest, Preservation			16.40	49.20	0.49	0.16	0.16	0.16
	Agriculture			34.69	4266.87	4.16	2.78	1.04	1.73
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			2.74	8.22	0.08	0.03	0.03	0.03

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			54.68	4569.09	5.69	3.44	1.36	2.40
Pigeon Creek 30530	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			26.93	5520.65	5.17	3.45	1.51	2.15
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.06	305.28	1.19	0.59	0.16	0.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			27.99	5825.93	6.36	4.04	1.67	2.75
Pigeon Creek 30535	Forest, Preservation			9.54	28.62	0.29	0.10	0.10	0.10
	Agriculture			39.11	4810.53	4.69	3.13	1.17	1.96
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.78	512.64	1.99	1.00	0.27	1.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			50.43	5351.79	6.97	4.22	1.54	3.05
Pigeon Creek 30540	Forest, Preservation			3.75	11.25	0.11	0.04	0.04	0.04
	Agriculture			63.71	7836.33	7.65	5.10	1.91	3.19
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			3.76	770.80	0.72	0.48	0.21	0.30
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.76	11.28	0.11	0.04	0.04	0.04
	Subtotal			74.98	8629.66	8.59	5.65	2.20	3.56
Pigeon Creek 30550	Forest, Preservation			20.17	60.51	0.61	0.20	0.20	0.20
	Agriculture			113.84	14002.32	13.66	9.11	3.42	5.69
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.25	648.00	2.52	1.26	0.34	1.26
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			136.26	14710.83	16.79	10.57	3.95	7.15
Pigeon Creek 30560	Forest, Preservation			19.57	58.71	0.59	0.20	0.20	0.20
	Agriculture			49.27	6060.21	5.91	3.94	1.48	2.46
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			28.73	5889.65	5.52	3.68	1.61	2.30

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.96	276.48	1.08	0.54	0.14	0.54
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			98.53	12285.05	13.09	8.35	3.43	5.50
Pigeon Creek 30570	Forest, Preservation			27.91	83.73	0.84	0.28	0.28	0.28
	Agriculture			70.73	8699.79	8.49	5.66	2.12	3.54
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			35.67	7312.35	6.85	4.57	2.00	2.85
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.15	619.20	2.41	1.20	0.32	1.20
	Open Water			3.00	555.00	0.39	0.12	0.12	0.12
	Wetland			4.18	12.54	0.13	0.04	0.04	0.04
	Subtotal			143.64	17282.61	19.10	11.87	4.88	8.04
Pigeon Creek 30580	Forest, Preservation			15.41	46.23	0.46	0.15	0.15	0.15
	Agriculture			57.77	7105.71	6.93	4.62	1.73	2.89
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.85	11.55	0.12	0.04	0.04	0.04
	Subtotal			77.03	7163.49	7.51	4.81	1.93	3.08
Pigeon Creek 30590	Forest, Preservation			25.72	77.16	0.77	0.26	0.26	0.26
	Agriculture			173.01	21280.23	20.76	13.84	5.19	8.65
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.06	305.28	1.19	0.59	0.16	0.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.00	15.00	0.15	0.05	0.05	0.05
	Subtotal			204.79	21677.67	22.87	14.74	5.66	9.55
Pigeon Creek 30600	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			52.65	10793.25	10.11	6.74	2.95	4.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			2.88	532.80	0.37	0.12	0.12	0.12

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
				Total Loadings					
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			57.58	11916.45	12.78	8.00	3.37	5.48
Pigeon Creek 30610	Forest, Preservation			19.22	57.66	0.58	0.19	0.19	0.19
	Agriculture			95.28	11719.44	11.43	7.62	2.86	4.76
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			6.41	1314.05	1.23	0.82	0.36	0.51
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.79	227.52	0.88	0.44	0.12	0.44
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			6.40	19.20	0.19	0.06	0.06	0.06
	Subtotal			128.10	13337.87	14.32	9.14	3.59	5.98
Pigeon Creek 30615	Forest, Preservation			10.19	30.57	0.31	0.10	0.10	0.10
	Agriculture			20.86	2565.78	2.50	1.67	0.63	1.04
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			27.97	5733.85	5.37	3.58	1.57	2.24
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.43	411.84	1.60	0.80	0.21	0.80
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			10.67	32.01	0.32	0.11	0.11	0.11
	Subtotal			71.12	8774.05	10.10	6.26	2.62	4.29
Pigeon Creek 30620	Forest, Preservation			4.25	12.75	0.13	0.04	0.04	0.04
	Agriculture			93.59	11511.57	11.23	7.49	2.81	4.68
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			11.32	2320.60	2.17	1.45	0.63	0.91
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.73	786.24	3.06	1.53	0.41	1.53
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.86	17.58	0.18	0.06	0.06	0.06
	Subtotal			117.75	14648.74	16.77	10.57	3.95	7.22
Pigeon Creek 30625	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			41.79	5140.17	5.01	3.34	1.25	2.09
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.44	1525.20	1.43	0.95	0.42	0.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.50	432.00	1.68	0.84	0.23	0.84
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			50.73	7097.37	8.12	5.14	1.90	3.52
Pigeon Creek 30630	Forest, Preservation			39.55	118.65	1.19	0.40	0.40	0.40
	Agriculture			67.26	8272.98	8.07	5.38	2.02	3.36
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.86	1111.68	4.32	2.16	0.58	2.16
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			27.67	83.01	0.83	0.28	0.28	0.28
	Subtotal			138.34	9586.32	14.41	8.21	3.27	6.20
Pigeon Creek 30635	Forest, Preservation			2.04	6.12	0.06	0.02	0.02	0.02
	Agriculture			13.79	1696.17	1.65	1.10	0.41	0.69
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.16	334.08	1.30	0.65	0.17	0.65
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			16.99	2036.37	3.02	1.77	0.61	1.36
Pigeon Creek 30710	Forest, Preservation			4.25	12.75	0.13	0.04	0.04	0.04
	Agriculture			42.55	5233.65	5.11	3.40	1.28	2.13
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			38.29	7849.45	7.35	4.90	2.14	3.06
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			85.09	13095.85	12.59	8.35	3.46	5.23
Pigeon Creek 30720	Forest, Preservation			5.66	16.98	0.17	0.06	0.06	0.06
	Agriculture			32.06	3943.38	3.85	2.56	0.96	1.60
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			37.72	3960.36	4.02	2.62	1.02	1.66
Pigeon Creek 30730	Forest, Preservation			8.06	24.18	0.24	0.08	0.08	0.08
	Agriculture			65.39	8042.97	7.85	5.23	1.96	3.27
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.80	1599.00	1.50	1.00	0.44	0.62
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Arterial			1.02	293.76	1.14	0.57	0.15	0.57
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			82.27	9959.91	10.73	6.88	2.63	4.55
Pigeon Creek 30740	Forest, Preservation			3.85	11.55	0.12	0.04	0.04	0.04
	Agriculture			30.15	3708.45	3.62	2.41	0.90	1.51
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			42.35	8681.75	8.13	5.42	2.37	3.39
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.65	187.20	0.73	0.36	0.10	0.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			77.00	12588.95	12.59	8.24	3.41	5.30
Pigeon Creek 30750	Forest, Preservation			40.60	121.80	1.22	0.41	0.41	0.41
	Agriculture			56.80	6986.40	6.82	4.54	1.70	2.84
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			81.20	16646.00	15.59	10.39	4.55	6.50
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.10	1180.80	4.59	2.30	0.62	2.30
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			20.30	60.90	0.61	0.20	0.20	0.20
	Subtotal			203.00	24995.90	28.83	17.84	7.48	12.24
Pigeon Creek 30755	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			20.47	2517.81	2.46	1.64	0.61	1.02
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.65	187.20	0.73	0.36	0.10	0.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			21.12	2705.01	3.18	2.00	0.71	1.39
Pigeon Creek 30760	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			87.97	10820.31	10.56	7.04	2.64	4.40
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			4.76	975.80	0.91	0.61	0.27	0.38
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.43	699.84	2.72	1.36	0.36	1.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			95.16	12495.95	14.19	9.01	3.27	6.14
Pigeon Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
30765	Agriculture			9.44	1161.12	1.13	0.76	0.28	0.47
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.96	276.48	1.08	0.54	0.14	0.54
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.40	1437.60	2.21	1.29	0.43	1.01
Pigeon Creek 30767	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			8.49	1044.27	1.02	0.68	0.25	0.42
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.65	187.20	0.73	0.36	0.10	0.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			9.14	1231.47	1.75	1.04	0.35	0.79
Pigeon Creek 30770	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			85.01	10456.23	10.20	6.80	2.55	4.25
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			86.65	10928.55	12.04	7.72	2.80	5.17
Pigeon Creek 30810	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek 30815	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek 30820	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek 30825	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek 30830	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Pigeon Creek 30835	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			20.82	2560.86	2.50	1.67	0.62	1.04
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.92	264.96	1.03	0.52	0.14	0.52
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			21.74	2825.82	3.53	2.18	0.76	1.56

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
						Total Loadings			
Pigeon Creek 30840	Forest, Preservation			5.19	15.57	0.16	0.05	0.05	0.05
	Agriculture			8.49	1044.27	1.02	0.68	0.25	0.42
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			6.29	1289.45	1.21	0.81	0.35	0.50
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.96	276.48	1.08	0.54	0.14	0.54
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.10	3.30	0.03	0.01	0.01	0.01
	Subtotal			22.03	2629.07	3.49	2.08	0.81	1.53
Pigeon Creek 30860	Forest, Preservation			69.20	207.60	2.08	0.69	0.69	0.69
	Agriculture			75.06	9232.38	9.01	6.00	2.25	3.75
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.39	976.32	3.80	1.90	0.51	1.90
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			8.15	24.45	0.24	0.08	0.08	0.08
	Subtotal			155.80	10440.75	15.12	8.68	3.53	6.42
Pigeon Creek 30865	Forest, Preservation			2.47	7.41	0.07	0.02	0.02	0.02
	Agriculture			51.34	6314.82	6.16	4.11	1.54	2.57
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.89	256.32	1.00	0.50	0.13	0.50
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			2.88	8.64	0.09	0.03	0.03	0.03
	Subtotal			57.58	6587.19	7.32	4.66	1.73	3.12
Pigeon Creek 30885	Forest, Preservation			6.34	19.02	0.19	0.06	0.06	0.06
	Agriculture			112.00	13776.00	13.44	8.96	3.36	5.60
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.08	599.04	2.33	1.16	0.31	1.16
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			6.34	19.02	0.19	0.06	0.06	0.06
	Subtotal			126.76	14413.08	16.15	10.25	3.80	6.89
West Border 1	Forest, Preservation			90.97	272.91	2.73	0.91	0.91	0.91
	Agriculture			418.39	51461.97	50.21	33.47	12.55	20.92
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			60.66	12435.30	11.65	7.76	3.40	4.85
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			6.15	1771.20	6.89	3.44	0.92	3.44
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			31.32	93.96	0.94	0.31	0.31	0.31
	Subtotal			607.49	66035.34	72.41	45.90	18.09	30.44
Mequon - MU 40100	Forest, Preservation			222.02	666.06	6.66	2.22	2.22	2.22
	Agriculture			134.27	16515.21	16.11	10.74	4.03	6.71
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			373.51	157247.71	672.32	68.73	29.88	407.13
	Low Density Residential			182.91	37496.55	35.12	23.41	10.24	14.63
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			30.78	8864.64	34.47	17.24	4.62	17.24
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.53	28.59	0.29	0.10	0.10	0.10
	Subtotal			953.02	220818.76	764.97	122.43	51.08	448.02
Mequon - MU 40200	Forest, Preservation			112.20	336.60	3.37	1.12	1.12	1.12
	Agriculture			89.51	11009.73	10.74	7.16	2.69	4.48
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			157.68	32324.40	30.27	20.18	8.83	12.61
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.74	1077.12	4.19	2.09	0.56	2.09
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			90.76	272.28	2.72	0.91	0.91	0.91
	Subtotal			453.89	45020.13	51.29	31.47	14.11	21.21
Mequon - MU 40205	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			47.58	5852.34	5.71	3.81	1.43	2.38
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.95	561.60	2.18	1.09	0.29	1.09
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			49.53	6413.94	7.89	4.90	1.72	3.47
Mequon - MU 40207	Forest, Preservation			15.08	45.24	0.45	0.15	0.15	0.15
	Agriculture			127.12	15635.76	15.25	10.17	3.81	6.36
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.54	1545.70	1.45	0.97	0.42	0.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.06	305.28	1.19	0.59	0.16	0.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			150.80	17531.98	18.34	11.88	4.55	7.70
Mequon - MU 40210	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			11.85	1457.55	1.42	0.95	0.36	0.59
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			53.12	10889.60	10.20	6.80	2.97	4.25
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.43	411.84	1.60	0.80	0.21	0.80
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			66.40	12758.99	13.22	8.55	3.54	5.64
Mequon - MU 40215	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			56.52	11586.60	10.85	7.23	3.17	4.52
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.43	411.84	1.60	0.80	0.21	0.80
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			57.95	11998.44	12.45	8.04	3.38	5.32
Mequon - MU 40300	Forest, Preservation			24.49	73.47	0.73	0.24	0.24	0.24
	Agriculture			34.17	4202.91	4.10	2.73	1.03	1.71
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.00	1435.00	1.34	0.90	0.39	0.56
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.82	236.16	0.92	0.46	0.12	0.46
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.50	10.50	0.11	0.04	0.04	0.04
	Subtotal			69.98	5958.04	7.20	4.37	1.82	3.01
Mequon - MU 40305	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			73.26	9010.98	8.79	5.86	2.20	3.66
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			3.97	813.85	0.76	0.51	0.22	0.32
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.22	639.36	2.49	1.24	0.33	1.24
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			79.45	10464.19	12.04	7.61	2.75	5.22
Mequon - MU 40307	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			29.92	3680.16	3.59	2.39	0.90	1.50
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Low Density Residential			31.90	6539.50	6.12	4.08	1.79	2.55
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.94	558.72	2.17	1.09	0.29	1.09
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			63.76	10778.38	11.89	7.56	2.98	5.13
Mequon - MU 40350	Forest, Preservation			62.83	188.49	1.88	0.63	0.63	0.63
	Agriculture			25.01	3076.23	3.00	2.00	0.75	1.25
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			25.01	5127.05	4.80	3.20	1.40	2.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.46	708.48	2.76	1.38	0.37	1.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			12.81	38.43	0.38	0.13	0.13	0.13
	Subtotal			128.12	9138.68	12.83	7.34	3.28	5.39
Mequon - MU 40410	Forest, Preservation			292.82	878.46	8.78	2.93	2.93	2.93
	Agriculture			334.78	41177.94	40.17	26.78	10.04	16.74
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			166.88	34210.40	32.04	21.36	9.35	13.35
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.07	884.16	3.44	1.72	0.46	1.72
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			41.98	125.94	1.26	0.42	0.42	0.42
	Subtotal			839.53	77276.90	85.70	53.21	23.20	35.16
Victory Center 70100	Forest, Preservation			23.15	69.45	0.69	0.23	0.23	0.23
	Agriculture			162.22	19953.06	19.47	12.98	4.87	8.11
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			22.04	4518.20	4.23	2.82	1.23	1.76
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.02	2021.76	7.86	3.93	1.05	3.93
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			23.83	71.49	0.71	0.24	0.24	0.24
	Subtotal			238.26	26633.96	32.97	20.20	7.62	14.28
Victory Center 70020	Forest, Preservation			54.66	163.98	1.64	0.55	0.55	0.55
	Agriculture			104.66	12873.18	12.56	8.37	3.14	5.23
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			9.13	1871.65	1.75	1.17	0.51	0.73
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			5.12	1474.56	5.73	2.87	0.77	2.87

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.14	27.42	0.27	0.09	0.09	0.09
	Subtotal			182.71	16410.79	21.96	13.05	5.06	9.47
Ulao Creek 80100	Forest, Preservation			33.16	99.48	0.99	0.33	0.33	0.33
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			16.61	6992.81	29.90	3.06	1.33	18.10
	Low Density Residential			51.92	10643.60	9.97	6.65	2.91	4.15
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.28	944.64	3.67	1.84	0.49	1.84
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			11.78	35.34	0.35	0.12	0.12	0.12
	Subtotal			117.75	18900.87	45.02	12.03	5.22	24.58
Ulao Creek 80110	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			12.00	1476.00	1.44	0.96	0.36	0.60
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			33.97	6963.85	6.52	4.35	1.90	2.72
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.06	305.28	1.19	0.59	0.16	0.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.23	15.69	0.16	0.05	0.05	0.05
	Subtotal			52.26	8760.82	9.31	5.95	2.47	3.96
Ulao Creek 80115	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			13.32	10682.64	23.44	61.01	6.66	27.71
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			13.32	10682.64	23.44	61.01	6.66	27.71
Ulao Creek 80120	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			37.84	7757.20	7.27	4.84	2.12	3.03
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.25	46.25	0.03	0.01	0.01	0.01
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			38.94	8048.25	8.25	5.33	2.26	3.51
Ulao Creek 80125	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			10.58	8485.16	18.62	48.46	5.29	22.01
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.58	8485.16	18.62	48.46	5.29	22.01
Ulao Creek 80127	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			6.42	2677.14	18.04	0.06	0.06	0.39
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			6.73	5397.46	11.84	30.82	3.37	14.00
	Arterial			0.31	89.28	0.35	0.17	0.05	0.17
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			13.46	8163.88	30.23	31.06	3.48	14.56
Ulao Creek 80130	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			44.72	18648.24	125.66	0.45	0.45	2.68
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.67	480.96	1.87	0.94	0.25	0.94
	Open Water			1.50	277.50	0.20	0.06	0.06	0.06
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			47.89	19406.70	127.73	1.44	0.76	3.68
Ulao Creek 80140	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			30.39	12794.19	54.70	5.59	2.43	33.13
	Low Density Residential			117.73	24134.65	22.60	15.07	6.59	9.42
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.31	665.28	2.59	1.29	0.35	1.29
	Open Water			1.50	277.50	0.20	0.06	0.06	0.06
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			151.93	37871.62	80.09	22.01	9.43	43.90
Ulao Creek 80150	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			78.58	33082.18	141.44	14.46	6.29	85.65
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.65	187.20	0.73	0.36	0.10	0.36
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			80.23	33454.38	142.30	14.86	6.42	86.06
Ulao Creek 80160	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			13.88	2845.40	2.66	1.78	0.78	1.11
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.54	443.52	1.72	0.86	0.23	0.86
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.42	3288.92	4.39	2.64	1.01	1.97
Ulao Creek 80162	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			79.05	16205.25	15.18	10.12	4.43	6.32
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.43	411.84	1.60	0.80	0.21	0.80
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			81.48	16802.09	16.91	10.96	4.68	7.16
Ulao Creek 80163	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			14.50	11629.00	25.52	66.41	7.25	30.16
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			14.50	11629.00	25.52	66.41	7.25	30.16
Ulao Creek 80164	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			8.26	1693.30	1.59	1.06	0.46	0.66
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.41	118.08	0.46	0.23	0.06	0.23
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			8.67	1811.38	2.05	1.29	0.52	0.89

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
Ulao Creek 80165	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			65.71	13470.55	12.62	8.41	3.68	5.26
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.08	599.04	2.33	1.16	0.31	1.16
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			67.79	14069.59	14.95	9.58	3.99	6.42
Ulao Creek 80200	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			64.84	7975.32	7.78	5.19	1.95	3.24
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.26	362.88	1.41	0.71	0.19	0.71
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			16.53	49.59	0.50	0.17	0.17	0.17
	Subtotal			82.63	8387.79	9.69	6.06	2.30	4.11
Ulao Creek 80201	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			7.13	5718.26	12.55	32.66	3.57	14.83
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			7.13	5718.26	12.55	32.66	3.57	14.83
Ulao Creek 80202	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			11.35	9102.70	19.98	51.98	5.68	23.61
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.35	9102.70	19.98	51.98	5.68	23.61
Ulao Creek 80203	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			70.31	14413.55	13.50	9.00	3.94	5.62
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
				Total Loadings					
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.54	443.52	1.72	0.86	0.23	0.86
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			71.85	14857.07	15.22	9.86	4.17	6.49
Ulao Creek 80204	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			55.09	11293.45	10.58	7.05	3.09	4.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.98	570.24	2.22	1.11	0.30	1.11
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			58.07	12048.69	12.92	8.20	3.42	5.56
Ulao Creek 80205	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			50.97	10448.85	9.79	6.52	2.85	4.08
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.58	167.04	0.65	0.32	0.09	0.32
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			51.55	10615.89	10.44	6.85	2.94	4.40
Ulao Creek 80206	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			47.76	9790.80	9.17	6.11	2.67	3.82
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.75	216.00	0.84	0.42	0.11	0.42
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			48.51	10006.80	10.01	6.53	2.79	4.24
Ulao Creek 80207	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			47.79	9796.95	9.18	6.12	2.68	3.82
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.72	207.36	0.81	0.40	0.11	0.40
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			48.51	10004.31	9.98	6.52	2.78	4.23
Ulao Creek 80208	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			39.50	8097.50	7.58	5.06	2.21	3.16
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			41.35	8527.30	8.67	5.57	2.38	3.68
Ulao Creek 80210	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			16.90	2078.70	2.03	1.35	0.51	0.85
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.79	227.52	0.88	0.44	0.12	0.44
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			17.69	2306.22	2.91	1.79	0.63	1.29
Ulao Creek 80220	Forest, Preservation			5.80	17.40	0.17	0.06	0.06	0.06
	Agriculture			10.55	1297.65	1.27	0.84	0.32	0.53
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			10.55	8914.75	9.07	22.79	3.38	17.72
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			7.03	21.09	0.21	0.07	0.07	0.07
	Subtotal			35.16	10605.13	12.10	24.45	4.01	19.07
Ulao Creek 80222	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			29.60	6068.00	5.68	3.79	1.66	2.37
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.68	195.84	0.76	0.38	0.10	0.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			30.28	6263.84	6.44	4.17	1.76	2.75
Ulao Creek 80230	Forest, Preservation			18.34	55.02	0.55	0.18	0.18	0.18
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			3.32	2662.64	5.84	15.21	1.66	6.91
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.50	92.50	0.07	0.02	0.02	0.02
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			22.16	2810.16	6.46	15.41	1.86	7.11
Ulao Creek 80235	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			17.59	3605.95	3.38	2.25	0.99	1.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.89	256.32	1.00	0.50	0.13	0.50
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			18.48	3862.27	4.37	2.75	1.12	1.91
Ulao Creek 80300	Forest, Preservation			45.36	136.08	1.36	0.45	0.45	0.45
	Agriculture			39.50	4858.50	4.74	3.16	1.19	1.98
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.45	993.60	3.86	1.93	0.52	1.93
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			29.44	88.32	0.88	0.29	0.29	0.29
	Subtotal			117.75	6076.50	10.85	5.84	2.45	4.66
Ulao Creek 80310	Forest, Preservation			11.78	35.34	0.35	0.12	0.12	0.12
	Agriculture			93.01	11440.23	11.16	7.44	2.79	4.65
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			5.89	1207.45	1.13	0.75	0.33	0.47
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.19	342.72	1.33	0.67	0.18	0.67
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.88	17.64	0.18	0.06	0.06	0.06
	Subtotal			117.75	13043.38	14.15	9.04	3.48	5.96
Ulao Creek 80400	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80410	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80420	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80430	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80450	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Ulao Creek 80460	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings Area (acres)	Sediment (lb/yr)	Phosphorous (lb/yr)	Lead (lb/yr)	Copper (lb/yr)	Zinc (lb/yr)
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
Not In Study Area	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00
North 1	Forest, Preservation	12.70	38.10	0.38	0.13	0.13	0.13
	Agriculture	188.73	23213.79	22.65	15.10	5.66	9.44
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	24.80	10440.80	44.64	4.56	1.98	27.03
	Low Density Residential	25.40	5207.00	4.88	3.25	1.42	2.03
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	2.42	696.96	2.71	1.36	0.36	1.36
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	254.05	39596.65	75.26	24.40	9.56	39.98
Granville 60100	Forest, Preservation	10.53	31.59	0.32	0.11	0.11	0.11
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	41.77	17961.10	5.64	50.12	10.44	152.46
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.34	97.92	0.38	0.19	0.05	0.19
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	52.64	18090.61	6.34	50.42	10.60	152.76
Granville 60110	Forest, Preservation	15.00	45.00	0.45	0.15	0.15	0.15
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	85.03	36562.90	11.48	102.04	21.26	310.36
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.03	36607.90	11.93	102.19	21.41	310.51
Granville 60120	Forest, Preservation	52.35	157.05	1.57	0.52	0.52	0.52
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	28.19	12121.70	3.81	33.83	7.05	102.89
	Highway	0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			80.54	12278.75	5.38	34.35	7.57	103.42
Granville	Forest, Preservation			51.80	155.40	1.55	0.52	0.52	0.52
60130	Agriculture			166.20	20442.60	19.94	13.30	4.99	8.31
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			38.98	16761.40	5.26	46.78	9.75	142.28
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.87	826.56	3.21	1.61	0.43	1.61
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			259.85	38185.96	29.97	62.20	15.68	152.71
Granville	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
60140	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Granville	Forest, Preservation			9.44	28.32	0.28	0.09	0.09	0.09
60200	Agriculture			75.02	9227.46	9.00	6.00	2.25	3.75
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.89	1120.32	4.36	2.18	0.58	2.18
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.44	28.32	0.28	0.09	0.09	0.09
	Subtotal			97.79	10404.42	13.93	8.37	3.02	6.12
Granville	Forest, Preservation			14.03	42.09	0.42	0.14	0.14	0.14
60300	Agriculture			158.15	19452.45	18.98	12.65	4.74	7.91
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.07	884.16	3.44	1.72	0.46	1.72
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			14.02	42.06	0.42	0.14	0.14	0.14
	Subtotal			189.27	20420.76	23.26	14.65	5.49	9.91
Granville	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
60400	Agriculture	13.66	1680.18	1.64	1.09	0.41	0.68
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	124.49	25520.45	23.90	15.93	6.97	9.96
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.84	529.92	2.06	1.03	0.28	1.03
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	139.99	27730.55	27.60	18.06	7.66	11.67
Granville 64000	Forest, Preservation	69.95	209.85	2.10	0.70	0.70	0.70
	Agriculture	29.66	3648.18	3.56	2.37	0.89	1.48
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	59.32	12160.60	11.39	7.59	3.32	4.75
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	29.66	12753.80	4.00	35.59	7.42	108.26
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.30	374.40	1.46	0.73	0.20	0.73
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	9.99	29.97	0.30	0.10	0.10	0.10
	Subtotal	199.88	29176.80	22.81	47.09	12.62	116.02
Granville 65100	Forest, Preservation	3.76	11.28	0.11	0.04	0.04	0.04
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	29.23	12568.90	3.95	35.08	7.31	106.69
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	2.73	786.24	3.06	1.53	0.41	1.53
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	1.88	5.64	0.06	0.02	0.02	0.02
	Subtotal	37.60	13372.06	7.17	36.66	7.77	108.27
Granville 65025	Forest, Preservation	53.02	159.06	1.59	0.53	0.53	0.53
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	61.86	12681.30	11.88	7.92	3.46	4.95
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	49.02	21078.60	6.62	58.82	12.26	178.92
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	4.00	1152.00	4.48	2.24	0.60	2.24
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	8.84	26.52	0.27	0.09	0.09	0.09
	Subtotal	176.74	35097.48	24.83	69.60	16.94	186.73
Granville 65035	Forest, Preservation	12.68	38.04	0.38	0.13	0.13	0.13
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	170.61	34975.05	32.76	21.84	9.55	13.65
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			8.78	2528.64	9.83	4.92	1.32	4.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			61.48	184.44	1.84	0.61	0.61	0.61
	Subtotal			253.55	37726.17	44.82	27.50	11.61	19.31
Granville 65045	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Little Menomonee Creek 50010	Forest, Preservation			31.41	94.23	0.94	0.31	0.31	0.31
	Agriculture			83.44	10263.12	10.01	6.68	2.50	4.17
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			13.00	2665.00	2.50	1.66	0.73	1.04
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.15	619.20	2.41	1.20	0.32	1.20
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			130.00	13641.55	15.86	9.86	3.87	6.73
Little Menomonee Creek 50017	Forest, Preservation			7.63	0.00	0.23	0.08	0.08	0.08
	Agriculture			10.04	0.00	1.20	0.80	0.30	0.50
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.53	0.00	1.71	0.86	0.23	0.86
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			19.20	0.00	3.15	1.74	0.61	1.44
Little Menomonee Creek 50020	Forest, Preservation			9.25	27.75	0.28	0.09	0.09	0.09
	Agriculture			66.30	8154.90	7.96	5.30	1.99	3.32
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			102.23	20957.15	19.63	13.09	5.72	8.18
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.47	28.41	0.28	0.09	0.09	0.09
	Subtotal			189.30	29758.61	30.44	19.72	8.21	12.83

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb/yr)	Phosphorous (lb/yr)	Lead (lb/yr)	Copper (lb/yr)	Zinc (lb/yr)
Little Menomonee Creek 50030	Forest, Preservation			72.60	217.80	2.18	0.73	0.73	0.73
	Agriculture			119.91	14748.93	14.39	9.59	3.60	6.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			35.62	7302.10	6.84	4.56	1.99	2.85
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.77	509.76	1.98	0.99	0.27	0.99
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			12.10	36.30	0.36	0.12	0.12	0.12
	Subtotal			242.00	22814.89	25.75	15.99	6.70	10.68
Little Menomonee Creek 50035	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Little Menomonee Creek 50036	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			11.29	2314.45	2.17	1.45	0.63	0.90
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.41	118.08	0.46	0.23	0.06	0.23
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.70	2432.53	2.63	1.67	0.69	1.13
Little Menomonee Creek 50040	Forest, Preservation			20.55	61.65	0.62	0.21	0.21	0.21
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			14.71	3015.55	2.82	1.88	0.82	1.18
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			1.69	1428.05	1.45	3.65	0.54	2.84
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.65	475.20	1.85	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			38.60	4980.45	6.74	6.66	1.82	5.15
Little Menomonee Creek 50045	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			2.54	312.42	0.30	0.20	0.08	0.13
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			46.11	9452.55	8.85	5.90	2.58	3.69
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			50.70	10355.37	11.45	7.25	2.97	4.96
Little Menomonee Creek 50050	Forest, Preservation			35.70	107.10	1.07	0.36	0.36	0.36
	Agriculture			52.41	6446.43	6.29	4.19	1.57	2.62
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			53.36	10938.80	10.25	6.83	2.99	4.27
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			35.70	107.10	1.07	0.36	0.36	0.36
	Subtotal			178.40	17953.67	20.05	12.43	5.46	8.29
Little Menomonee Creek 50055	Forest, Preservation			11.30	33.90	0.34	0.11	0.11	0.11
	Agriculture			99.96	12295.08	12.00	8.00	3.00	5.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			112.90	12801.30	14.17	9.03	3.36	6.03
Little Menomonee Creek 50057	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Little Menomonee Creek 50060	Forest, Preservation			2.70	8.10	0.08	0.03	0.03	0.03
	Agriculture			24.00	2952.00	2.88	1.92	0.72	1.20
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.40	403.20	1.57	0.78	0.21	0.78
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			28.10	3363.30	4.53	2.73	0.96	2.01
Little Menomonee Creek 50062	Forest, Preservation			5.10	15.30	0.15	0.05	0.05	0.05
	Agriculture			96.97	11927.31	11.64	7.76	2.91	4.85
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.73	786.24	3.06	1.53	0.41	1.53
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			104.80	12728.85	14.85	9.34	3.37	6.43
Little Menomonee Creek 50065	Forest, Preservation			5.70	17.10	0.17	0.06	0.06	0.06
	Agriculture			56.90	6998.70	6.83	4.55	1.71	2.85
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			44.82	9188.10	8.61	5.74	2.51	3.59
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.78	512.64	1.99	1.00	0.27	1.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.70	17.10	0.17	0.06	0.06	0.06
	Subtotal			114.90	16733.64	17.77	11.40	4.60	7.54
Little Menomonee Creek 50070	Forest, Preservation			20.18	60.54	0.61	0.20	0.20	0.20
	Agriculture			19.87	2444.01	2.38	1.59	0.60	0.99
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			42.10	3094.95	5.29	2.94	1.11	2.34
Little Menomonee Creek 50075	Forest, Preservation			25.91	77.73	0.78	0.26	0.26	0.26
	Agriculture			166.27	20451.21	19.95	13.30	4.99	8.31
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			38.86	7966.30	7.46	4.97	2.18	3.11
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.15	619.20	2.41	1.20	0.32	1.20
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			25.91	77.73	0.78	0.26	0.26	0.26
	Subtotal			259.10	29192.17	31.38	20.00	8.00	13.14
Little Menomonee Creek 50100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			7.76	3266.96	13.97	1.43	0.62	8.46

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Low Density Residential			23.08	4731.40	4.43	2.95	1.29	1.85
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.60	460.80	1.79	0.90	0.24	0.90
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			7.76	23.28	0.23	0.08	0.08	0.08
	Subtotal			40.20	8482.44	20.42	5.36	2.23	11.28
Little Menomonee Creek 50102	Forest, Preservation			9.79	29.37	0.29	0.10	0.10	0.10
	Agriculture			43.90	5399.70	5.27	3.51	1.32	2.20
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			12.58	2578.90	2.42	1.61	0.70	1.01
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			67.50	8362.21	9.35	5.91	2.30	3.99
Little Menomonee Creek 50105	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			46.21	9473.05	8.87	5.91	2.59	3.70
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.09	313.92	1.22	0.61	0.16	0.61
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			47.30	9786.97	10.09	6.53	2.75	4.31
Little Menomonee Creek 50107	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			10.95	2244.75	2.10	1.40	0.61	0.88
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.80	2489.55	3.05	1.88	0.74	1.35
Little Menomonee Creek 50200	Forest, Preservation			4.03	12.09	0.12	0.04	0.04	0.04
	Agriculture			8.53	1049.19	1.02	0.68	0.26	0.43
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.45	129.60	0.50	0.25	0.07	0.25

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.69	2.07	0.02	0.01	0.01	0.01
	Subtotal			13.70	1192.95	1.67	0.98	0.37	0.73
Little Menomonee Creek 50205	Forest, Preservation			39.62	118.86	1.19	0.40	0.40	0.40
	Agriculture			116.05	14274.15	13.93	9.28	3.48	5.80
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			39.70	8138.50	7.62	5.08	2.22	3.18
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.43	411.84	1.60	0.80	0.21	0.80
	Open Water			1.50	277.50	0.20	0.06	0.06	0.06
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			198.30	23220.85	24.53	15.62	6.38	10.24
Little Menomonee Creek 50207	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Little Menomonee Creek 50300	Forest, Preservation			7.07	21.21	0.21	0.07	0.07	0.07
	Agriculture			28.28	3478.44	3.39	2.26	0.85	1.41
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			21.20	4346.00	4.07	2.71	1.19	1.70
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.57	452.16	1.76	0.88	0.24	0.88
	Open Water			42.42	7847.70	5.51	1.70	1.70	1.70
	Wetland			40.86	122.58	1.23	0.41	0.41	0.41
	Subtotal			141.40	16268.09	16.17	8.03	4.45	6.17
Fish Creek 10010	Forest, Preservation			21.00	63.00	0.63	0.21	0.21	0.21
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			17.10	3505.50	3.28	2.19	0.96	1.37
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			38.10	3568.50	3.91	2.40	1.17	1.58
Fish Creek 10020	Forest, Preservation			14.53	43.59	0.44	0.15	0.15	0.15
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			72.65	14893.25	13.95	9.30	4.07	5.81
	Medium Density Residential			58.11	23825.10	21.85	14.88	6.51	9.30
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			145.29	38761.94	36.23	24.32	10.72	15.25
Fish Creek 10030	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			27.83	5705.15	5.34	3.56	1.56	2.23
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			27.83	5705.15	5.34	3.56	1.56	2.23
Fish Creek 10040	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			13.40	5587.80	37.65	0.13	0.13	0.80
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			31.40	6437.00	6.03	4.02	1.76	2.51
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			44.80	12024.80	43.68	4.15	1.89	3.32
Fish Creek 10050	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			14.10	5879.70	39.62	0.14	0.14	0.85
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			49.16	10077.80	9.44	6.29	2.75	3.93
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			7.10	5694.20	12.50	32.52	3.55	14.77
	Arterial			0.34	97.92	0.38	0.19	0.05	0.19
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			70.70	21749.62	61.94	39.14	6.49	19.74
Fish Creek 10060	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			108.83	91961.35	93.59	235.07	34.83	182.83
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2

City of Mequon - Stormwater Management Study

Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			12.60	10105.20	22.18	57.71	6.30	26.21
	Arterial			4.17	1200.96	4.67	2.34	0.63	2.34
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			125.60	103267.51	120.44	295.12	41.75	211.38
Fish Creek 10070	Forest, Preservation			34.20	102.60	1.03	0.34	0.34	0.34
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			119.80	49956.60	336.64	1.20	1.20	7.19
	Institutional			12.69	5342.49	22.84	2.33	1.02	13.83
	Low Density Residential			119.80	24559.00	23.00	15.33	6.71	9.58
	Medium Density Residential			17.10	7011.00	6.43	4.38	1.92	2.74
	High Density Residential			16.74	9608.76	8.70	6.03	2.68	3.75
	Commercial			2.00	1690.00	1.72	4.32	0.64	3.36
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			17.10	13714.20	30.10	78.32	8.55	35.57
	Arterial			2.77	797.76	3.10	1.55	0.42	1.55
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			342.20	112782.41	433.56	113.80	23.46	77.91
Fish Creek 10100	Forest, Preservation			17.70	53.10	0.53	0.18	0.18	0.18
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			40.62	8327.10	7.80	5.20	2.27	3.25
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.68	195.84	0.76	0.38	0.10	0.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			59.00	8576.04	9.09	5.76	2.55	3.81
Fish Creek 10110	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			15.15	3105.75	2.91	1.94	0.85	1.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.75	216.00	0.84	0.42	0.11	0.42
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.90	3321.75	3.75	2.36	0.96	1.63
Fish Creek 10120	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			67.45	13827.25	12.95	8.63	3.78	5.40
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.75	216.00	0.84	0.42	0.11	0.42
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			68.20	14043.25	13.79	9.05	3.89	5.82

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Fish Creek 10130	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			50.18	10286.90	9.63	6.42	2.81	4.01
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.72	207.36	0.81	0.40	0.11	0.40
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			50.90	10494.26	10.44	6.83	2.92	4.42
Fish Creek 10140	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			38.14	7818.70	7.32	4.88	2.14	3.05
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.16	334.08	1.30	0.65	0.17	0.65
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			39.30	8152.78	8.62	5.53	2.31	3.70
Fish Creek 10200	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			12.70	5295.90	35.69	0.13	0.13	0.76
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			16.90	9700.60	8.79	6.08	2.70	3.79
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			11.11	8910.22	19.55	50.88	5.56	23.11
	Arterial			1.59	457.92	1.78	0.89	0.24	0.89
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			42.30	24364.64	65.81	57.99	8.62	28.55
Fish Creek 10210	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Fish Creek 10220	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			83.59	17135.95	16.05	10.70	4.68	6.69
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.41	118.08	0.46	0.23	0.06	0.23
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			84.00	17254.03	16.51	10.93	4.74	6.92
Fish Creek 10230	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			142.02	29114.10	27.27	18.18	7.95	11.36
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.48	1002.24	3.90	1.95	0.52	1.95
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			145.50	30116.34	31.17	20.13	8.48	13.31
Fish Creek 10300	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			14.80	6171.60	41.59	0.15	0.15	0.89
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			14.80	6171.60	41.59	0.15	0.15	0.89
Fish Creek 10310	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			34.29	7029.45	6.58	4.39	1.92	2.74
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.41	118.08	0.46	0.23	0.06	0.23
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			34.70	7147.53	7.04	4.62	1.98	2.97
Fish Creek 10320	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			59.99	12297.95	11.52	7.68	3.36	4.80
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.61	175.68	0.68	0.34	0.09	0.34
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			60.60	12473.63	12.20	8.02	3.45	5.14
Fish Creek 10330	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			115.62	23702.10	22.20	14.80	6.47	9.25
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			5.88	1693.44	6.59	3.29	0.88	3.29
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			121.50	25395.54	28.78	18.09	7.36	12.54
Fish Creek 10340	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			19.50	3997.50	3.74	2.50	1.09	1.56
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			19.50	8385.00	2.63	23.40	4.88	71.18
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			39.00	12382.50	6.38	25.90	5.97	72.74
Fish Creek 10400	Forest, Preservation			34.20	102.60	1.03	0.34	0.34	0.34
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			87.77	17992.85	16.85	11.23	4.92	7.02
	Medium Density Residential			13.70	5617.00	5.15	3.51	1.53	2.19
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			136.90	24066.69	24.41	15.77	6.98	10.24
Fish Creek 10500	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			3.84	1601.28	10.79	0.04	0.04	0.23
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			60.28	12357.40	11.57	7.72	3.38	4.82
	Medium Density Residential			10.05	4120.50	3.78	2.57	1.13	1.61
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			76.40	18618.42	27.65	11.06	4.76	7.39
Fish Creek 10510	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			21.31	8971.51	38.36	3.92	1.70	23.23
	Low Density Residential			21.31	4368.55	4.09	2.73	1.19	1.70

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			40.63	16658.30	15.28	10.40	4.55	6.50
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.99	573.12	2.23	1.11	0.30	1.11
	Open Water			21.32	3944.20	2.77	0.85	0.85	0.85
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			106.56	34515.68	62.73	19.02	8.60	33.40
Fish Creek 11000	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Fish Creek 11010	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ 20110	Forest, Preservation			62.82	188.46	1.88	0.63	0.63	0.63
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			46.36	9503.80	8.90	5.93	2.60	3.71
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.92	264.96	1.03	0.52	0.14	0.52
	Open Water			2.90	536.50	0.38	0.12	0.12	0.12
	Wetland			2.90	8.70	0.09	0.03	0.03	0.03
	Subtotal			115.90	10502.42	12.28	7.22	3.51	5.00
Mequon - MQ 20120	Forest, Preservation			60.10	180.30	1.80	0.60	0.60	0.60
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			80.01	16402.05	15.36	10.24	4.48	6.40
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.64	760.32	2.96	1.48	0.40	1.48
	Open Water			7.51	1389.35	0.98	0.30	0.30	0.30

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			150.26	18732.02	21.10	12.62	5.78	8.78
Mequon - MQ 20130	Forest, Preservation			5.06	15.18	0.15	0.05	0.05	0.05
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			5.06	2110.02	14.22	0.05	0.05	0.30
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			86.01	15911.85	11.18	3.44	3.44	3.44
	Wetland			5.06	15.18	0.15	0.05	0.05	0.05
	Subtotal			101.19	18052.23	25.70	3.59	3.59	3.85
Mequon - MQ 20140	Forest, Preservation			132.98	398.94	3.99	1.33	1.33	1.33
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			14.95	6234.15	42.01	0.15	0.15	0.90
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			148.47	30436.35	28.51	19.00	8.31	11.88
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.55	734.40	2.86	1.43	0.38	1.43
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			298.95	37803.84	77.36	21.91	10.18	15.53
Mequon - MQ 20210	Forest, Preservation			154.73	464.19	4.64	1.55	1.55	1.55
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			275.32	56440.60	52.86	35.24	15.42	22.03
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			61.89	52297.05	53.23	133.68	19.80	103.98
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.73	1362.24	5.30	2.65	0.71	2.65
	Open Water			92.83	17173.55	12.07	3.71	3.71	3.71
	Wetland			30.94	92.82	0.93	0.31	0.31	0.31
	Subtotal			620.44	127830.45	129.02	177.14	41.50	134.22
Mequon - MQ 20220	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			26.30	5391.50	5.05	3.37	1.47	2.10
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.61	175.68	0.68	0.34	0.09	0.34
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			26.91	5567.18	5.73	3.71	1.56	2.45
Mequon - MQ 20300	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			127.64	53225.88	358.67	1.28	1.28	7.66

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.46	708.48	2.76	1.38	0.37	1.38
	Open Water			2.00	370.00	0.26	0.08	0.08	0.08
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			132.10	54304.36	361.68	2.73	1.73	9.12
Mequon - MQ 20310	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			79.70	16338.50	15.30	10.20	4.46	6.38
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.15	619.20	2.41	1.20	0.32	1.20
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			81.85	16957.70	17.71	11.41	4.79	7.58
Mequon - MQ 20315	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			2.62	1103.02	4.72	0.48	0.21	2.86
	Low Density Residential			29.35	6016.75	5.64	3.76	1.64	2.35
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.95	561.60	2.18	1.09	0.29	1.09
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			33.92	7681.37	12.54	5.33	2.15	6.30
Mequon - MQ 20410	Forest, Preservation			4.10	12.30	0.12	0.04	0.04	0.04
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			36.03	7386.15	6.92	4.61	2.02	2.88
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			40.98	7643.25	7.99	5.13	2.19	3.40
Mequon - MQ 20430	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			1.92	808.32	3.46	0.35	0.15	2.09
	Low Density Residential			7.69	1576.45	1.48	0.98	0.43	0.62
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Arterial			1.12	322.56	1.25	0.63	0.17	0.63
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.73	2707.33	6.19	1.96	0.75	3.34
Mequon - MQ	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
20440	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			9.88	2025.40	1.90	1.26	0.55	0.79
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.51	146.88	0.57	0.29	0.08	0.29
	Open Water			1.15	212.75	0.15	0.05	0.05	0.05
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.54	2385.03	2.62	1.60	0.68	1.12
Mequon - MQ	Forest, Preservation			7.33	21.99	0.22	0.07	0.07	0.07
20450	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			124.03	25426.15	23.81	15.88	6.95	9.92
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			7.32	6185.40	6.30	15.81	2.34	12.30
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.48	138.24	0.54	0.27	0.07	0.27
	Open Water			7.32	1354.20	0.95	0.29	0.29	0.29
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			146.48	33125.98	31.82	32.32	9.73	22.85
Mequon - MQ	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
20455	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			23.44	9868.24	42.19	4.31	1.88	25.55
	Low Density Residential			210.12	43074.60	40.34	26.90	11.77	16.81
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.35	676.80	2.63	1.32	0.35	1.32
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			235.91	53619.64	85.17	32.52	13.99	43.68
Mequon - MQ	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
20460	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			48.19	9878.95	9.25	6.17	2.70	3.86
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			48.19	9878.95	9.25	6.17	2.70	3.86
Mequon - MQ	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
20465	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			59.63	12224.15	11.45	7.63	3.34	4.77
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.00	3.00	0.03	0.01	0.01	0.01
	Subtotal			60.63	12227.15	11.48	7.64	3.35	4.78
Mequon - MQ 21010	Forest, Preservation			12.59	37.77	0.38	0.13	0.13	0.13
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			4.19	1763.99	7.54	0.77	0.34	4.57
	Low Density Residential			65.98	13525.90	12.67	8.45	3.69	5.28
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.16	334.08	1.30	0.65	0.17	0.65
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			83.92	15661.74	21.89	9.99	4.33	10.62
Mequon - MQ 21020	Forest, Preservation			36.24	108.72	1.09	0.36	0.36	0.36
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			62.11	12732.55	11.93	7.95	3.48	4.97
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			34.93	29515.85	30.04	75.45	11.18	58.68
	Industrial			43.99	18915.70	5.94	52.79	11.00	160.56
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.93	1131.84	4.40	2.20	0.59	2.20
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			181.20	62404.66	53.39	138.75	26.61	226.78
Mequon - MQ 21030	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			88.36	18113.80	16.97	11.31	4.95	7.07
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			9.82	8297.90	8.45	21.21	3.14	16.50
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.01	866.88	3.37	1.69	0.45	1.69
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			101.19	27278.58	28.78	34.21	8.54	25.25
Mequon - MQ 21040	Forest, Preservation			27.23	81.69	0.82	0.27	0.27	0.27
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			90.07	18464.35	17.29	11.53	5.04	7.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			125.69	106208.05	108.09	271.49	40.22	211.16

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Industrial			270.24	116203.20	36.48	324.29	67.56	986.38
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.23	1218.24	4.74	2.37	0.63	2.37
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			27.23	81.69	0.82	0.27	0.27	0.27
	Subtotal			544.69	242257.22	168.24	610.22	114.00	1207.65
Mequon - MQ 21050	Forest, Preservation			16.25	48.75	0.49	0.16	0.16	0.16
	Agriculture			184.98	22752.54	22.20	14.80	5.55	9.25
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			97.50	19987.50	18.72	12.48	5.46	7.80
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			16.24	13722.80	13.97	35.08	5.20	27.28
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			9.98	2874.24	11.18	5.59	1.50	5.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			324.95	59385.83	66.55	68.11	17.87	50.08
Mequon - MQ 21055	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			21.99	2704.77	2.64	1.76	0.66	1.10
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			59.78	12254.90	11.48	7.65	3.35	4.78
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			26.85	11545.50	3.62	32.22	6.71	98.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.36	391.68	1.52	0.76	0.20	0.76
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			109.98	26896.85	19.26	42.39	10.92	104.65
Mequon - MQ 21060	Forest, Preservation			27.66	82.98	0.83	0.28	0.28	0.28
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			217.72	44632.60	41.80	27.87	12.19	17.42
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			273.05	117411.50	36.86	327.66	68.26	996.63
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.07	2036.16	7.92	3.96	1.06	3.96
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			27.66	82.98	0.83	0.28	0.28	0.28
	Subtotal			553.16	164246.22	88.24	360.04	82.07	1018.56
Mequon - MQ 21070	Forest, Preservation			3.99	11.97	0.12	0.04	0.04	0.04
	Agriculture			314.63	38699.49	37.76	25.17	9.44	15.73
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			7.97	3355.37	14.35	1.47	0.64	8.69
	Low Density Residential			67.76	13890.80	13.01	8.67	3.79	5.42
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.23	1218.24	4.74	2.37	0.63	2.37
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			398.58	57175.87	69.97	37.72	14.55	32.25

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Mequon - MQ	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
21080	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
21090	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
22110	Agriculture			7.52	924.96	0.90	0.60	0.23	0.38
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			119.02	24399.10	22.85	15.23	6.67	9.52
	Medium Density Residential			7.52	3083.20	2.83	1.93	0.84	1.20
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			14.44	12201.80	12.42	31.19	4.62	24.26
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.48	1290.24	5.02	2.51	0.67	2.51
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			152.98	41899.30	44.02	51.46	13.03	37.87
Mequon - MQ	Forest, Preservation			10.58	31.74	0.32	0.11	0.11	0.11
22120	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			42.30	8671.50	8.12	5.41	2.37	3.38
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			42.30	35743.50	36.38	91.37	13.54	71.06
	Industrial			115.34	49596.20	15.57	138.41	28.84	420.99
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			211.52	94227.94	60.52	235.34	44.89	495.58
Mequon - MQ	Forest, Preservation			16.42	49.26	0.49	0.16	0.16	0.16
22200	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			65.67	27647.07	118.21	12.08	5.25	71.58
	Low Density Residential			62.60	12833.00	12.02	8.01	3.51	5.01
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.07	884.16	3.44	1.72	0.46	1.72
	Open Water			16.42	3037.70	2.13	0.66	0.66	0.66
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			164.18	44451.19	136.29	22.64	10.04	79.13
Mequon - MQ 22201	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			5.53	680.19	0.66	0.44	0.17	0.28
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			102.54	21020.70	19.69	13.13	5.74	8.20
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.43	699.84	2.72	1.36	0.36	1.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			110.50	22400.73	23.07	14.93	6.27	9.84
Mequon - MQ 22209	Forest, Preservation			2.60	7.80	0.08	0.03	0.03	0.03
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			43.17	8849.85	8.29	5.53	2.42	3.45
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.23	354.24	1.38	0.69	0.18	0.69
	Open Water			5.23	967.55	0.68	0.21	0.21	0.21
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			52.23	10179.44	10.42	6.45	2.84	4.38
Mequon - MQ 22210	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			14.81	6235.01	26.66	2.73	1.18	16.14
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			27.44	23186.80	23.60	59.27	8.78	46.10
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.10	2044.80	7.95	3.98	1.07	3.98
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			49.35	31466.61	58.21	65.97	11.03	66.22
Mequon - MQ 22223	Forest, Preservation			14.78	44.34	0.44	0.15	0.15	0.15
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			5.92	2492.32	10.66	1.09	0.47	6.45
	Low Density Residential			177.40	36367.00	34.06	22.71	9.93	14.19
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			85.57	72306.65	73.59	184.83	27.38	143.76
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			6.13	1765.44	6.87	3.43	0.92	3.43
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.92	17.76	0.18	0.06	0.06	0.06

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			295.72	112993.51	125.79	212.27	38.92	168.04
Mequon - MQ 22224	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			182.96	37506.80	35.13	23.42	10.25	14.64
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			21.20	17914.00	18.23	45.79	6.78	35.62
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.85	2260.80	8.79	4.40	1.18	4.40
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			212.01	57681.60	62.15	73.61	18.21	54.65
Mequon - MQ 22225	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			227.05	46545.25	43.59	29.06	12.71	18.16
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.86	1111.68	4.32	2.16	0.58	2.16
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			230.91	47656.93	47.92	31.22	13.29	20.33
Mequon - MQ 22250	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			30.10	12672.10	54.18	5.54	2.41	32.81
	Low Density Residential			30.11	6172.55	5.78	3.85	1.69	2.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			60.21	18844.65	59.96	9.39	4.09	35.22
Mequon - MQ 22260	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			74.84	15342.20	14.37	9.58	4.19	5.99
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.31	377.28	1.47	0.73	0.20	0.73
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			4.01	12.03	0.12	0.04	0.04	0.04
	Subtotal			80.16	15731.51	15.96	10.35	4.43	6.76
Mequon - MQ 22265	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Low Density Residential			25.66	5260.30	4.93	3.28	1.44	2.05
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.96	564.48	2.20	1.10	0.29	1.10
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			27.62	5824.78	7.12	4.38	1.73	3.15
Mequon - MQ 22268	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			15.22	1872.06	1.83	1.22	0.46	0.76
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			14.30	2931.50	2.75	1.83	0.80	1.14
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.86	535.68	2.08	1.04	0.28	1.04
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			31.38	5339.24	6.66	4.09	1.54	2.95
Mequon - MQ 22300	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			62.44	26037.48	175.46	0.62	0.62	3.75
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.35	1506.75	1.41	0.94	0.41	0.59
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			3.67	678.95	0.48	0.15	0.15	0.15
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			73.46	28223.18	177.34	1.71	1.18	4.48
Mequon - MQ 22302	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			6.20	2585.40	17.42	0.06	0.06	0.37
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			9.31	3817.10	3.50	2.38	1.04	1.49
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.51	6402.50	20.92	2.45	1.10	1.86
Mequon - MQ 22303	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			8.94	3727.98	25.12	0.09	0.09	0.54
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			13.40	5494.00	5.04	3.43	1.50	2.14
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
				Total Loadings					
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			22.34	9221.98	30.16	3.52	1.59	2.68
Mequon - MQ 22304	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			15.29	3134.45	2.94	1.96	0.86	1.22
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.29	3134.45	2.94	1.96	0.86	1.22
Mequon - MQ 22305	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			24.51	10220.67	68.87	0.25	0.25	1.47
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.29	3.87	0.04	0.01	0.01	0.01
	Subtotal			25.80	10224.54	68.91	0.26	0.26	1.48
Mequon - MQ 22310	Forest, Preservation			6.15	18.45	0.18	0.06	0.06	0.06
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			92.59	18980.95	17.78	11.85	5.19	7.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			22.60	19097.00	19.44	48.82	7.23	37.97
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			122.98	38568.72	39.23	61.65	12.72	46.36
Mequon - MQ 22312	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			14.77	6159.09	41.50	0.15	0.15	0.89
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			21.14	4333.70	4.06	2.71	1.18	1.69
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.02	293.76	1.14	0.57	0.15	0.57
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			36.93	10786.55	46.70	3.42	1.48	3.15
Mequon - MQ 22313	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Park			106.64	44468.88	299.66	1.07	1.07	6.40
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			45.33	9292.65	8.70	5.80	2.54	3.63
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			153.61	54233.85	310.20	7.79	3.85	10.94
Mequon - MQ 22314	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			10.46	4361.82	29.39	0.10	0.10	0.63
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.46	4361.82	29.39	0.10	0.10	0.63
Mequon - MQ 22315	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			71.68	29890.56	201.42	0.72	0.72	4.30
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			87.89	18017.45	16.87	11.25	4.92	7.03
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.91	550.08	2.14	1.07	0.29	1.07
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			161.48	48458.09	220.43	13.04	5.93	12.40
Mequon - MQ 22316	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			16.75	6984.75	47.07	0.17	0.17	1.01
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			4.19	858.95	0.80	0.54	0.23	0.34
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			20.94	7843.70	47.87	0.70	0.40	1.34
Mequon - MQ 22317	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			5.77	2406.09	16.21	0.06	0.06	0.35
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			5.77	2406.09	16.21	0.06	0.06	0.35
Mequon - MQ 22318	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			5.50	2293.50	15.46	0.06	0.06	0.33
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			5.99	1227.95	1.15	0.77	0.34	0.48
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.50	92.50	0.07	0.02	0.02	0.02
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.99	3613.95	16.67	0.84	0.41	0.83
Mequon - MQ 22320	Forest, Preservation			9.30	27.90	0.28	0.09	0.09	0.09
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			3.18	1303.80	1.20	0.81	0.36	0.51
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.24	69.12	0.27	0.13	0.04	0.13
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			12.72	1400.82	1.74	1.04	0.49	0.74
Mequon - MQ 22350	Forest, Preservation			375.52	1126.56	11.27	3.76	3.76	3.76
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			233.85	47939.25	44.90	29.93	13.10	18.71
	Medium Density Residential			47.23	19364.30	17.76	12.09	5.29	7.56
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.64	1336.32	5.20	2.60	0.70	2.60
	Open Water			188.92	34950.20	24.56	7.56	7.56	7.56
	Wetland			94.46	283.38	2.83	0.94	0.94	0.94
	Subtotal			944.62	105000.01	106.51	56.88	31.34	41.12
Mequon - MQ 22400	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			36.76	4521.48	4.41	2.94	1.10	1.84
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			5.12	1049.60	0.98	0.66	0.29	0.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.77	509.76	1.98	0.99	0.27	0.99
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			2.31	6.93	0.07	0.02	0.02	0.02
	Subtotal			45.96	6087.77	7.45	4.61	1.68	3.26

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
Mequon - MQ 22410	Forest, Preservation			119.05	357.15	3.57	1.19	1.19	1.19
	Agriculture			178.58	21965.34	21.43	14.29	5.36	8.93
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			263.32	53980.60	50.56	33.70	14.75	21.07
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.54	1307.52	5.08	2.54	0.68	2.54
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			29.76	89.28	0.89	0.30	0.30	0.30
	Subtotal			595.25	77699.89	81.54	52.02	22.27	34.03
Mequon - MQ 22505	Forest, Preservation			4.20	12.60	0.13	0.04	0.04	0.04
	Agriculture			8.01	985.23	0.96	0.64	0.24	0.40
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			8.52	1746.60	1.64	1.09	0.48	0.68
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.58	167.04	0.65	0.32	0.09	0.32
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			21.31	2911.47	3.37	2.10	0.85	1.45
Mequon - MQ 22510	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			48.31	5942.13	5.80	3.86	1.45	2.42
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			2.67	547.35	0.51	0.34	0.15	0.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.32	668.16	2.60	1.30	0.35	1.30
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			53.30	7157.64	8.91	5.51	1.95	3.93
Mequon - MQ 22520	Forest, Preservation			8.63	25.89	0.26	0.09	0.09	0.09
	Agriculture			153.09	18830.07	18.37	12.25	4.59	7.65
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			8.63	1769.15	1.66	1.10	0.48	0.69
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.32	668.16	2.60	1.30	0.35	1.30
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			172.67	21293.27	22.89	14.74	5.51	9.73
Mequon - MQ 22600	Forest, Preservation			1.35	4.05	0.04	0.01	0.01	0.01
	Agriculture			36.23	4456.29	4.35	2.90	1.09	1.81
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			13.48	2763.40	2.59	1.73	0.75	1.08
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.50	432.00	1.68	0.84	0.23	0.84
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.34	4.02	0.04	0.01	0.01	0.01
	Subtotal			53.90	7659.76	8.70	5.49	2.09	3.76
Mequon - MQ 22602	Forest, Preservation			205.30	615.90	6.16	2.05	2.05	2.05
	Agriculture			51.80	6371.40	6.22	4.14	1.55	2.59
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			168.36	34513.80	32.33	21.55	9.43	13.47
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			12.95	7433.30	6.73	4.66	2.07	2.90
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.91	550.08	2.14	1.07	0.29	1.07
	Open Water			51.80	9583.00	6.73	2.07	2.07	2.07
	Wetland			25.90	77.70	0.78	0.26	0.26	0.26
	Subtotal			518.02	59145.18	61.08	35.81	17.72	24.41
Mequon - MQ 22605	Forest, Preservation			160.38	481.14	4.81	1.60	1.60	1.60
	Agriculture			239.86	29502.78	28.78	19.19	7.20	11.99
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			53.12	10889.60	10.20	6.80	2.97	4.25
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.05	302.40	1.18	0.59	0.16	0.59
	Open Water			26.73	4945.05	3.47	1.07	1.07	1.07
	Wetland			53.46	160.38	1.60	0.53	0.53	0.53
	Subtotal			534.60	46281.35	50.05	29.78	13.54	20.04
Mequon - MQ 22607	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ 22610	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			146.23	17986.29	17.55	11.70	4.39	7.31
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.67	768.96	2.99	1.50	0.40	1.50
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			148.90	18755.25	20.54	13.19	4.79	8.81
Mequon - MQ 22620	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
Not in Study Area	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			0.00	0.00	0.00	0.00	0.00	0.00
Mequon - MQ 22630	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			61.57	7573.11	7.39	4.93	1.85	3.08
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.02	293.76	1.14	0.57	0.15	0.57
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			62.59	7866.87	8.53	5.50	2.00	3.65
Mequon - MQ 27000	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			15.07	3089.35	2.89	1.93	0.84	1.21
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			15.07	3089.35	2.89	1.93	0.84	1.21
Mequon - MQ 27100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.08	1451.40	1.36	0.91	0.40	0.57
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			10.63	8982.35	9.14	22.96	3.40	17.86
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			18.56	10678.55	11.45	24.34	3.93	18.90
Mequon - MQ 27110	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			12.91	5435.11	23.24	2.38	1.03	14.07
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.68	195.84	0.76	0.38	0.10	0.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			13.59	5630.95	24.00	2.76	1.13	14.45
Mequon - MQ 27115	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			12.98	5464.58	23.36	2.39	1.04	14.15
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			12.98	5464.58	23.36	2.39	1.04	14.15
Mequon - MQ 27120	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			13.58	5717.18	24.44	2.50	1.09	14.80
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.72	207.36	0.81	0.40	0.11	0.40
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.75	2.25	0.02	0.01	0.01	0.01
	Subtotal			15.05	5926.79	25.27	2.91	1.20	15.21
Mequon - MQ 27125	Forest, Preservation			6.40	19.20	0.19	0.06	0.06	0.06
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			17.91	7540.11	32.24	3.30	1.43	19.52
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.28	3.84	0.04	0.01	0.01	0.01
	Subtotal			25.59	7563.15	32.47	3.37	1.51	19.60
Mequon - MQ 27130	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			10.68	8565.36	18.80	48.91	5.34	22.21
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			10.68	8565.36	18.80	48.91	5.34	22.21
Mequon - MQ 27140	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			69.94	14337.70	13.43	8.95	3.92	5.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.06	305.28	1.19	0.59	0.16	0.59
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.74	11.22	0.11	0.04	0.04	0.04
	Subtotal			74.74	14654.20	14.73	9.58	4.11	6.23
Mequon - MQ 27150	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			9.84	2017.20	1.89	1.26	0.55	0.79
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.37	394.56	1.53	0.77	0.21	0.77
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			11.21	2411.76	3.42	2.03	0.76	1.55
Mequon - MQ 27200	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			19.09	3913.45	3.67	2.44	1.07	1.53
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			4.58	2628.92	2.38	1.65	0.73	1.03
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.52	149.76	0.58	0.29	0.08	0.29
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			24.19	6692.13	6.63	4.38	1.88	2.84
Mequon - MQ 27250	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			36.60	15408.60	65.88	6.73	2.93	39.89
	Low Density Residential			6.46	1324.30	1.24	0.83	0.36	0.52
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.13	325.44	1.27	0.63	0.17	0.63
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			44.19	17058.34	68.39	8.19	3.46	41.04
Mequon - MQ 28000	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			58.14	11918.70	11.16	7.44	3.26	4.65
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.05	590.40	2.30	1.15	0.31	1.15
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			60.19	12509.10	13.46	8.59	3.56	5.80
Mequon - MQ 28100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.12	1459.60	1.37	0.91	0.40	0.57
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			7.12	1459.60	1.37	0.91	0.40	0.57
Mequon - MQ 28150	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			49.35	10116.75	9.48	6.32	2.76	3.95
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.41	982.08	3.82	1.91	0.51	1.91
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			79.13	237.39	2.37	0.79	0.79	0.79
	Subtotal			131.89	11336.22	15.67	9.02	4.07	6.65
Mequon - MQ 28200	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			20.27	4155.35	3.89	2.59	1.14	1.62
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.09	313.92	1.22	0.61	0.16	0.61
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			21.36	4469.27	5.11	3.20	1.30	2.23
Mequon - MQ 28300	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			8.24	1689.20	1.58	1.05	0.46	0.66
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Arterial			0.38	109.44	0.43	0.21	0.06	0.21
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			8.62	1798.64	2.01	1.27	0.52	0.87
Mequon - MQ 28350	Forest, Preservation			16.27	48.81	0.49	0.16	0.16	0.16
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			17.60	3608.00	3.38	2.25	0.99	1.41
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.48	138.24	0.54	0.27	0.07	0.27
	Open Water			1.80	333.00	0.23	0.07	0.07	0.07
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			36.15	4128.05	4.64	2.76	1.29	1.91
Mequon - MQ 28400	Forest, Preservation			25.97	77.91	0.78	0.26	0.26	0.26
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			17.32	3204.20	2.25	0.69	0.69	0.69
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			43.29	3282.11	3.03	0.95	0.95	0.95
Mequon - MQ 28450	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			67.96	57426.20	58.45	146.79	21.75	114.17
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.59	745.92	2.90	1.45	0.39	1.45
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			70.55	58172.12	61.35	148.24	22.14	115.62
Mequon - MQ 28475	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			33.17	6799.85	6.37	4.25	1.86	2.65
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			31.35	26490.75	26.96	67.72	10.03	52.67
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.29	659.52	2.56	1.28	0.34	1.28
	Open Water			16.70	3089.50	2.17	0.67	0.67	0.67
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			83.51	37039.62	38.07	73.91	12.90	57.27
Mequon - MQ	Forest, Preservation			16.36	49.08	0.49	0.16	0.16	0.16

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
28480	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			19.06	10940.44	9.91	6.86	3.05	4.27
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.79	227.52	0.88	0.44	0.12	0.44
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.91	5.73	0.06	0.02	0.02	0.02
	Subtotal			38.12	11222.77	11.34	7.49	3.35	4.89
Mequon - MQ	Forest, Preservation			4.32	12.96	0.13	0.04	0.04	0.04
28500	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			31.59	26693.55	27.17	68.23	10.11	53.07
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.85	244.80	0.95	0.48	0.13	0.48
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			6.49	19.47	0.19	0.06	0.06	0.06
	Subtotal			43.25	26970.78	28.44	68.82	10.34	53.66
Mequon - MQ	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
28550	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			231.93	47545.65	44.53	29.69	12.99	18.55
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.18	339.84	1.32	0.66	0.18	0.66
	Open Water			38.85	7187.25	5.05	1.55	1.55	1.55
	Wetland			38.85	116.55	1.17	0.39	0.39	0.39
	Subtotal			310.81	55189.29	52.07	32.29	15.11	21.16
Mequon - MQ	Forest, Preservation			11.81	35.43	0.35	0.12	0.12	0.12
28575	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			5.06	1037.30	0.97	0.65	0.28	0.40
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			16.87	1072.73	1.33	0.77	0.40	0.52
Mequon - MQ	Forest, Preservation			33.13	99.39	0.99	0.33	0.33	0.33
28600	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			296.01	60682.05	56.83	37.89	16.58	23.68
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-2
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			3.35	2686.70	5.90	15.34	1.68	6.97
	Arterial			2.41	694.08	2.70	1.35	0.36	1.35
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			334.90	64162.22	66.42	54.91	18.94	32.33
Mequon - MQ 29000	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			110.75	22703.75	21.26	14.18	6.20	8.86
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.79	515.52	2.00	1.00	0.27	1.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			112.54	23219.27	23.27	15.18	6.47	9.86
Mequon - MQ 29100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			248.15	103478.55	697.30	2.48	2.48	14.89
	Institutional			72.85	30669.85	131.13	13.40	5.83	79.41
	Low Density Residential			169.14	34673.70	32.47	21.65	9.47	13.53
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			1.00	845.00	0.86	2.16	0.32	1.68
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			8.65	2491.20	9.69	4.84	1.30	4.84
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			499.79	172158.30	871.45	44.54	19.40	114.35
Mequon - MQ 29150	Forest, Preservation			28.27	84.81	0.85	0.28	0.28	0.28
	Agriculture			28.26	3475.98	3.39	2.26	0.85	1.41
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			19.68	11296.32	10.23	7.08	3.15	4.41
	Commercial			115.60	97682.00	99.42	249.70	36.99	194.21
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			2.50	2005.00	4.40	11.45	1.25	5.20
	Arterial			2.46	708.48	2.76	1.38	0.37	1.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			196.77	115252.59	121.04	272.15	42.89	206.89
	TOTALS			**30,205**	**6,046,082**	**10,722**	**6,819**	**1,805**	**8,870**

Water Quality Adjustments - Future Conditions 2020 - 25% New Low Density + Construction							
Drainage Area			**Sediment**	**Phosphor**	**Lead**	**Copper**	**Zinc**
Pigeon Creek	New LDR (acres)	2558					
"-75% New LDR	-1918.5		-235975.5	-211.035	-153.48	-57.555	-95.925
"+75% Ag-Const.	1889.5		850275	1624.97	18.895	18.895	18.895
"+Const.	29		44076	16.2	0.7	1.7	2.2
	Total Adjustment		658,376	1,430.14	-133.89	-36.96	-74.83
Mequon - MU	New LDR (acres)	907					
"-75% New LDR	-680.25		-83670.75	-74.8275	-54.42	-20.4075	-34.0125
"+75% Ag-Const.	667.25		300262.5	573.835	6.6725	6.6725	6.6725
"+Const.	13		19251	7.1	0.3	0.7	1
	Total Adjustment		235,843	506.11	-47.45	-13.04	-26.34
Victory Center	New LDR (acres)	267					
"-75% New LDR	-200.25		-24630.75	-22.0275	-16.02	-6.0075	-10.0125
"+75% Ag-Const.	197.25		88762.5	169.635	1.9725	1.9725	1.9725
"+Const.	3		4003	1.5	0.1	0.2	0.2
	Total Adjustment		68,135	149.11	-13.95	-3.84	-7.84
Ulao Creek	New LDR (acres)	237					
"-75% New LDR	-177.75		-21863.25	-19.5525	-14.22	-5.3325	-8.8875
"+75% Ag- Const.	170.75		76837.5	146.845	1.7075	1.7075	1.7075
"+Const.	7		10695	3.9	0.2	0.4	0.5
	Total Adjustment		65,669	131.19	-12.31	-3.23	-6.68
Granville	New LDR (acres)	443					
"-75% New LDR	-332.25		-40866.75	-36.5475	-26.58	-9.9675	-16.6125
"+75% Ag-Const.	324.25		145912.5	278.855	3.2425	3.2425	3.2425
"+Const.	8		11972	4.4	0.2	0.5	0.6
	Total Adjustment		117,018	246.71	-23.14	-6.23	-12.77
Little Menomone	New LDR (acres)	995.5					
"-75% New LDR	-746.625		-91834.88	-82.12875	-59.73	-22.39875	-37.33125
"+75% Ag-Const.	735.625		331031.3	632.6375	7.35625	7.35625	7.35625
"+Const.	11		16396	6	0.2	0.6	0.8
	Total Adjustment		255,592	556.51	-52.17	-14.44	-29.18
West	New LDR (acres)	418.5					
"-75% New LDR	-313.875		-38606.63	-34.52625	-25.11	-9.41625	-15.69375
"+75% Ag-Const.	309.875		139443.8	266.4925	3.09875	3.09875	3.09875
"+Const.	4		6276	2.3	0.1	0.2	0.3
	Total Adjustment		107,113	234.27	-21.91	-6.12	-12.30
North	New LDR (acres)	189					
"-75% New LDR	-141.75		-17435.25	-15.5925	-11.34	-4.2525	-7.0875
"+75% Ag-Const.	139.75		62887.5	120.185	1.3975	1.3975	1.3975
"+Const.	2		2831	1	0	0.1	0.1
	Total Adjustment		48,283	105.59	-9.94	-2.76	-5.59

Meqoun - MQ	New LDR (acres)	1539					
"-75% New LDR	-1154.25		-141972.8	-126.9675	-92.34	-34.6275	-57.7125
"+75% Ag-Const.	1121.25		504562.5	964.275	11.2125	11.2125	11.2125
"+Const.	33		49461	18.1	0.7	1.9	2.5
	Total Adjustment		412,051	855.41	-80.43	-21.52	-44.00

Appendix E
City of Mequon - Stormwater Management Study
Unit Area Pollutant Loading Rates

Land Use Types	Unit Area Loading Rates				
	Sediment (lb./ac./yr.)	Phosphorous (lb./ac./yr.)	Lead (lb./ac./yr.)	Copper (lb./ac./yr.)	Zinc (lb./ac./yr.)
Forest, Preservation	3	0.03	0.010	0.010	0.010
Agriculture	450	0.86	0.010	0.010	0.010
Park	417	2.81	0.010	0.010	0.060
Institutional	421	1.80	0.184	0.080	1.090
Low Density Residential	205	0.19	0.128	0.056	0.080
Medium Density Residential	410	0.38	0.256	0.112	0.160
High Density Residential	574	0.52	0.360	0.160	0.224
Commercial	845	0.86	2.160	0.320	1.680
Industrial	430	0.14	1.200	0.250	3.650
Highway	802	1.76	4.580	0.500	2.080
Arterial	288	1.12	0.560	0.150	0.560
Open Water	185	0.13	0.040	0.040	0.040
Wetland	3	0.03	0.010	0.010	0.010

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Lake Michigan	Forest, Preservation			247.04	741.12	7.41	2.47	2.47	2.47
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			82.35	34339.95	231.40	0.82	0.82	4.94
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			445.01	91227.05	85.44	56.96	24.92	35.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			41.17	34788.65	35.41	88.93	13.17	69.17
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			7.89	2272.32	8.84	4.42	1.18	4.42
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			823.46	163369.09	368.50	153.60	42.57	116.60
Pigeon Creek 30010	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			23.59	9931.39	42.46	4.34	1.89	25.71
	Low Density Residential			22.06	4522.30	4.24	2.82	1.24	1.76
	Medium Density Residential			20.22	8290.20	7.60	5.18	2.26	3.24
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.54	155.52	0.60	0.30	0.08	0.30
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			67.41	23084.41	55.04	12.68	5.51	31.06
Pigeon Creek 30015	Forest, Preservation			3.40	10.20	0.10	0.03	0.03	0.03
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			26.70	11240.70	48.06	4.91	0.00	29.10
	Low Density Residential			33.50	6867.50	6.43	4.29	0.00	2.68
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings					
				Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.02	293.76	1.14	0.57	0.00	0.57
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.40	10.20	0.10	0.03	0.00	0.03
	Subtotal			68.02	18422.36	55.84	9.84	0.03	32.42
Pigeon Creek 30020	Forest, Preservation			34.00	102.00	1.02	0.34	0.34	0.34
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			84.16	17252.80	16.16	10.77	4.71	6.73
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			7.65	3289.50	1.03	9.18	1.91	27.92
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.70	489.60	1.90	0.95	0.26	0.95
	Open Water			21.25	3931.25	2.76	0.85	0.85	0.85
	Wetland			21.25	63.75	0.64	0.21	0.21	0.21
	Subtotal			170.01	25128.90	23.52	22.31	8.28	37.01
Pigeon Creek 30030	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			30.49	25764.05	26.22	65.86	9.76	51.22
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.88	541.44	2.11	1.05	0.28	1.05
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			32.37	26305.49	28.33	66.91	10.04	52.28
Pigeon Creek 30032	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.24	69.12	0.27	0.13	0.04	0.13
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.86	11.58	0.12	0.04	0.04	0.04
	Subtotal			4.10	80.70	0.38	0.17	0.07	0.17
Pigeon Creek 30034	Forest, Preservation			4.72	14.16	0.14	0.05	0.05	0.05
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.39	688.32	2.68	1.34	0.36	1.34
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			9.93	29.79	0.30	0.10	0.10	0.10
	Subtotal			17.04	732.27	3.12	1.48	0.51	1.48
Pigeon Creek 30040	Forest, Preservation			4.86	14.58	0.15	0.05	0.05	0.05
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.54	443.52	1.72	0.86	0.23	0.86
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			26.03	78.09	0.78	0.26	0.26	0.26
	Subtotal			32.43	536.19	2.65	1.17	0.54	1.17
Pigeon Creek 30045	Forest, Preservation			44.92	134.76	1.35	0.45	0.45	0.45
	Agriculture			49.98	22491.00	42.98	0.50	0.50	0.50
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.26	362.88	1.41	0.71	0.19	0.71
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			5.06	15.18	0.15	0.05	0.05	0.05
	Subtotal			101.22	23003.82	45.89	1.71	1.19	1.71
Pigeon Creek 30046	Forest, Preservation			24.13	72.39	0.72	0.24	0.24	0.24
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.02	581.76	2.26	1.13	0.30	1.13
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			26.15	654.15	2.99	1.37	0.54	1.37
Pigeon Creek 30047	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			26.20	15038.80	13.62	9.43	4.19	5.87
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.49	717.12	2.79	1.39	0.37	1.39
	Open Water			12.30	2275.50	1.60	0.49	0.49	0.49
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			40.99	18031.42	18.01	11.32	5.06	7.76
Pigeon Creek 30048	Forest, Preservation			43.46	130.38	1.30	0.43	0.43	0.43
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			2.37	485.85	0.46	0.30	0.13	0.19
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Subtotal			47.47	1088.55	3.60	1.66	0.81	1.54
Pigeon Creek 30050	Forest, Preservation			107.43	322.29	3.22	1.07	1.07	1.07
	Agriculture			124.18	55881.00	106.79	1.24	1.24	1.24
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			26.62	22493.90	22.89	57.50	8.52	44.72
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.93	843.84	3.28	1.64	0.44	1.64
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			13.81	41.43	0.41	0.14	0.14	0.14
	Subtotal			275.97	79767.46	136.74	61.63	11.45	48.86
Pigeon Creek 30060	Forest, Preservation			14.88	44.64	0.45	0.15	0.15	0.15
	Agriculture			20.47	9211.50	17.60	0.20	0.20	0.20
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.89	256.32	1.00	0.50	0.13	0.50
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			1.90	5.70	0.06	0.02	0.02	0.02
	Subtotal			38.14	9518.16	19.10	0.87	0.51	0.87
Pigeon Creek 30070	Forest, Preservation			10.59	31.77	0.32	0.11	0.11	0.11
	Agriculture			192.93	86818.50	165.92	1.93	1.93	1.93
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.48	1002.24	3.90	1.95	0.52	1.95
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			10.59	31.77	0.32	0.11	0.11	0.11
	Subtotal			217.59	87884.28	170.45	4.09	2.66	4.09
Pigeon Creek 30072	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			14.93	6718.50	12.84	0.15	0.15	0.15
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.43	411.84	1.60	0.80	0.21	0.80
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			16.36	7130.34	14.44	0.95	0.36	0.95
Pigeon Creek 30075	Forest, Preservation			73.57	220.71	2.21	0.74	0.74	0.74
	Agriculture			32.86	14787.00	28.26	0.33	0.33	0.33
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			16.48	3378.40	3.16	2.11	0.92	1.32
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.59	745.92	2.90	1.45	0.39	1.45
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			41.83	125.49	1.25	0.42	0.42	0.42
	Subtotal			167.33	19257.52	37.79	5.04	2.79	4.25
Pigeon Creek 30077	Forest, Preservation			13.27	39.81	0.40	0.13	0.13	0.13
	Agriculture			13.28	5976.00	11.42	0.13	0.13	0.13
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			26.55	6015.81	11.82	0.27	0.27	0.27
Pigeon Creek 30079	Forest, Preservation			26.29	78.87	0.79	0.26	0.26	0.26
	Agriculture			26.29	11830.50	22.61	0.26	0.26	0.26
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			5.84	1197.20	1.12	0.75	0.33	0.47
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			1.00	185.00	0.13	0.04	0.04	0.04
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			59.42	13291.57	24.65	1.31	0.89	1.03
Pigeon Creek 30100	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			146.34	59999.40	55.02	37.46	16.39	23.41
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.20	1209.60	4.70	2.35	0.63	2.35
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			150.54	61209.00	59.73	39.82	17.02	25.77
Pigeon Creek 30110	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			51.34	21049.40	19.30	13.14	5.75	8.21
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.37	1258.56	4.89	2.45	0.66	2.45
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			55.71	22307.96	24.20	15.59	6.41	10.66
Pigeon Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
30220	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			143.98	60615.58	259.16	26.49	11.52	156.94
	Low Density Residential			10.66	2185.30	2.05	1.36	0.60	0.85
	Medium Density Residential			53.32	21861.20	20.05	13.65	5.97	8.53
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.31	953.28	3.71	1.85	0.50	1.85
	Open Water			2.00	370.00	0.26	0.08	0.08	0.08
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			213.27	85985.36	285.23	43.44	18.66	168.26
Pigeon Creek 30225	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			30.89	13900.50	26.57	0.31	0.31	0.31
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.71	492.48	1.92	0.96	0.26	0.96
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			32.60	14392.98	28.48	1.27	0.57	1.27
Pigeon Creek 30230	Forest, Preservation			80.93	242.79	2.43	0.81	0.81	0.81
	Agriculture			80.93	36418.50	69.60	0.81	0.81	0.81
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.66	766.08	2.98	1.49	0.40	1.49
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			164.52	37427.37	75.01	3.11	2.02	3.11
Pigeon Creek 30240	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			76.88	32058.96	216.03	0.77	0.77	4.61
	Institutional			7.57	3186.97	13.63	1.39	0.61	8.25
	Low Density Residential			68.14	13968.70	13.08	8.72	3.82	5.45
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.76	1082.88	4.21	2.11	0.56	2.11
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			156.35	50297.51	246.95	12.99	5.75	20.42
Pigeon Creek 30300	Forest, Preservation			20.04	60.12	0.60	0.20	0.20	0.20
	Agriculture			147.28	66276.00	126.66	1.47	1.47	1.47
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			20.05	4110.25	3.85	2.57	1.12	1.60
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			3.05	878.40	3.42	1.71	0.46	1.71

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			10.02	30.06	0.30	0.10	0.10	0.10
	Subtotal			200.44	71354.83	134.83	6.05	3.35	5.09
Pigeon Creek 30305	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			28.51	12829.50	24.52	0.29	0.29	0.29
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.46	420.48	1.64	0.82	0.22	0.82
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			29.97	13249.98	26.15	1.10	0.50	1.10
Pigeon Creek 30420	Forest, Preservation			54.24	162.72	1.63	0.54	0.54	0.54
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			138.28	57662.76	388.57	1.38	1.38	8.30
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			10.85	2224.25	2.08	1.39	0.61	0.87
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			10.84	4661.20	1.46	13.01	2.71	39.57
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.73	786.24	3.06	1.53	0.41	1.53
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			216.94	65497.17	396.80	17.85	5.65	50.80
Pigeon Creek 30430	Forest, Preservation			24.87	74.61	0.75	0.25	0.25	0.25
	Agriculture			54.24	24408.00	46.65	0.54	0.54	0.54
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.72	207.36	0.81	0.40	0.11	0.40
	Open Water			14.66	2712.10	1.91	0.59	0.59	0.59
	Wetland			5.00	15.00	0.15	0.05	0.05	0.05
	Subtotal			99.49	27417.07	50.25	1.83	1.54	1.83
Pigeon Creek 30440	Forest, Preservation			39.20	117.60	1.18	0.39	0.39	0.39
	Agriculture			30.19	13585.50	25.96	0.30	0.30	0.30
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			30.05	6160.25	5.77	3.85	1.68	2.40
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			47.03	39740.35	40.45	101.58	15.05	79.01
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.46	708.48	2.76	1.38	0.37	1.38
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			7.83	23.49	0.23	0.08	0.08	0.08
	Subtotal			156.76	60335.67	76.34	107.58	17.87	83.56
Pigeon Creek 30450	Forest, Preservation			17.13	51.39	0.51	0.17	0.17	0.17
	Agriculture			17.51	7879.50	15.06	0.18	0.18	0.18
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			23.22	4760.10	4.46	2.97	1.30	1.86

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.64	472.32	1.84	0.92	0.25	0.92
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			59.50	13163.31	21.87	4.24	1.89	3.12
Pigeon Creek 30460	Forest, Preservation			21.86	65.58	0.66	0.22	0.22	0.22
	Agriculture			75.57	34006.50	64.99	0.76	0.76	0.76
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			29.64	6076.20	5.69	3.79	1.66	2.37
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			14.94	12624.30	12.85	32.27	4.78	25.10
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.57	452.16	1.76	0.88	0.24	0.88
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			7.56	22.68	0.23	0.08	0.08	0.08
	Subtotal			151.14	53247.42	86.17	37.99	7.73	29.40
Pigeon Creek 30470	Forest, Preservation			25.56	76.68	0.77	0.26	0.26	0.26
	Agriculture			140.60	63270.00	120.92	1.41	1.41	1.41
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			49.82	10213.10	9.57	6.38	2.79	3.99
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			37.02	31281.90	31.84	79.96	11.85	62.19
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.63	757.44	2.95	1.47	0.39	1.47
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			255.63	105599.12	166.03	89.47	16.69	69.31
Pigeon Creek 30480	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			14.26	42.78	0.43	0.14	0.14	0.14
	Subtotal			14.26	42.78	0.43	0.14	0.14	0.14
Pigeon Creek 30485	Forest, Preservation			17.20	51.60	0.52	0.17	0.17	0.17
	Agriculture			0.00	0.00	0.00	0.00	0.00	0.00
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			17.20	51.60	0.52	0.17	0.17	0.17

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Pigeon Creek 30490	Forest, Preservation	10.91	32.73	0.33	0.11	0.11	0.11
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	11.73	2404.65	2.25	1.50	0.66	0.94
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.82	236.16	0.92	0.46	0.12	0.46
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	23.46	2673.54	3.50	2.07	0.89	1.51
Pigeon Creek 30510	Forest, Preservation	2.68	8.04	0.08	0.03	0.03	0.03
	Agriculture	4.93	2218.50	4.24	0.05	0.05	0.05
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.42	120.96	0.47	0.24	0.06	0.24
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	2.67	8.01	0.08	0.03	0.03	0.03
	Subtotal	10.70	2355.51	4.87	0.34	0.17	0.34
Pigeon Creek 30520	Forest, Preservation	16.40	49.20	0.49	0.16	0.16	0.16
	Agriculture	34.69	15610.50	29.83	0.35	0.35	0.35
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.85	244.80	0.95	0.48	0.13	0.48
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	2.74	8.22	0.08	0.03	0.03	0.03
	Subtotal	54.68	15912.72	31.36	1.01	0.67	1.01
Pigeon Creek 30530	Forest, Preservation	13.46	40.38	0.40	0.13	0.13	0.13
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	13.47	2761.35	2.59	1.72	0.75	1.08
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	1.06	305.28	1.19	0.59	0.16	0.59
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	27.99	3107.01	4.18	2.45	1.05	1.81
Pigeon Creek 30535	Forest, Preservation	9.54	28.62	0.29	0.10	0.10	0.10
	Agriculture	39.11	17599.50	33.63	0.39	0.39	0.39
	Park	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb/yr.)	Phosphorous (lb/yr.)	Lead (lb/yr.)	Copper (lb/yr.)	Zinc (lb/yr.)
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.78	512.64	1.99	1.00	0.27	1.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			50.43	18140.76	35.91	1.48	0.75	1.48
Pigeon Creek 30540	Forest, Preservation			3.75	11.25	0.11	0.04	0.04	0.04
	Agriculture			63.71	28669.50	54.79	0.64	0.64	0.64
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			3.76	770.80	0.72	0.48	0.21	0.30
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			3.76	11.28	0.11	0.04	0.04	0.04
	Subtotal			74.98	29462.83	55.74	1.19	0.92	1.01
Pigeon Creek 30550	Forest, Preservation			20.17	60.51	0.61	0.20	0.20	0.20
	Agriculture			113.84	51228.00	97.90	1.14	1.14	1.14
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.25	648.00	2.52	1.26	0.34	1.26
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			136.26	51936.51	101.03	2.60	1.68	2.60
Pigeon Creek 30560	Forest, Preservation			19.57	58.71	0.59	0.20	0.20	0.20
	Agriculture			49.27	22171.50	42.37	0.49	0.49	0.49
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			28.73	5889.65	5.52	3.68	1.61	2.30
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.96	276.48	1.08	0.54	0.14	0.54
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			98.53	28396.34	49.55	4.90	2.44	3.52
Pigeon Creek 30570	Forest, Preservation			27.91	83.73	0.84	0.28	0.28	0.28
	Agriculture			70.73	31828.50	60.83	0.71	0.71	0.71
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			35.67	7312.35	6.85	4.57	2.00	2.85
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			2.15	619.20	2.41	1.20	0.32	1.20
	Open Water			3.00	555.00	0.39	0.12	0.12	0.12
	Wetland			4.18	12.54	0.13	0.04	0.04	0.04
	Subtotal			143.64	40411.32	71.44	6.92	3.47	5.21
Pigeon Creek 30580	Forest, Preservation			15.41	46.23	0.46	0.15	0.15	0.15
	Agriculture			57.77	25996.50	49.68	0.58	0.58	0.58
	Park			0.00	0.00	0.00	0.00	0.00	0.00

Table E-1
City of Mequon - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses			Total Loadings Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			85.09	27009.70	44.07	5.37	2.61	3.53
Pigeon Creek 30720	Forest, Preservation			5.66	16.98	0.17	0.06	0.06	0.06
	Agriculture			32.06	14427.00	27.57	0.32	0.32	0.32
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.00	0.00	0.00	0.00	0.00	0.00
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			37.72	14443.98	27.74	0.38	0.38	0.38
Pigeon Creek 30730	Forest, Preservation			8.06	24.18	0.24	0.08	0.08	0.08
	Agriculture			65.39	29425.50	56.24	0.65	0.65	0.65
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			7.80	1599.00	1.50	1.00	0.44	0.62
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			1.02	293.76	1.14	0.57	0.15	0.57
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			82.27	31342.44	59.12	2.30	1.32	1.93
Pigeon Creek 30740	Forest, Preservation			3.85	11.55	0.12	0.04	0.04	0.04
	Agriculture			30.15	13567.50	25.93	0.30	0.30	0.30
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			42.35	8681.75	8.13	5.42	2.37	3.39
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			0.65	187.20	0.73	0.36	0.10	0.36
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal			77.00	22448.00	34.90	6.12	2.81	4.09
Pigeon Creek 30750	Forest, Preservation			40.60	121.80	1.22	0.41	0.41	0.41
	Agriculture			127.85	57532.50	109.95	1.28	1.28	1.28
	Park			0.00	0.00	0.00	0.00	0.00	0.00
	Institutional			0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential			10.15	2080.75	1.95	1.30	0.57	0.81
	Medium Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential			0.00	0.00	0.00	0.00	0.00	0.00
	Commercial			0.00	0.00	0.00	0.00	0.00	0.00
	Industrial			0.00	0.00	0.00	0.00	0.00	0.00
	Highway			0.00	0.00	0.00	0.00	0.00	0.00
	Arterial			4.10	1180.80	4.59	2.30	0.62	2.30
	Open Water			0.00	0.00	0.00	0.00	0.00	0.00
	Wetland			20.30	60.90	0.61	0.20	0.20	0.20
	Subtotal			203.00	60976.75	118.32	5.48	3.07	5.00
Pigeon Creek	Forest, Preservation			0.00	0.00	0.00	0.00	0.00	0.00

OZAUKEE COUNTY LAND CONSERVATION DEPARTMENT
P.O. Box 994, Port Washington, Wisconsin 53074-0994
(414) 284-8270 or 238-8270 FAX (414) 284-8100

TRANSMITTAL

TO: Thomas Chapman/CDM DATE: May 5, 1997

FROM: Gary Gundrum
Ozaukee LCD

RE: Streambank Inventory Data

THE ENCLOSED ITEMS ARE:

- _X_ For your information
- ___ For your approval
- ___ For your comment

Remarks:

Hi Tom,

Enclosed are aerial photos for that part of the Milwaukee River that flows through the City of Mequon. The photos are colored coded according to the following information.

Blue - Original inventory identifying bank erosion problems. Inventory goes from Pioneer Road to County Line Road.

Red - Original inventory identifying bank erosion problems on intermittent streams.

Pink - Follow-up inventory conducted in summer of 1996 identifying most serious bank erosion problems. This inventory goes from Pioneer Road to Villa Grove Park in section 24.

Yellow - Signed cost share agreements through the Milwaukee River Watershed Program.

MRS	46	MQ	14	12000												0.0				
MRS	46	MQ	15	2800												0.0				
MRS	46	MQ	16	14760												0.0				
MRS	46	MQ	17	1680	45	L	705	9	21	24	NE	E	200	3	0.07		RD	N	200	200
MRS	46	MQ	18	5600												0.0				
MRS	46	MQ	19	6000	46	R	705	9	21	24	NW	E	200	2	0.07	1.4	RD	N	200	200
					47	L	705	9	21	24	NW	E	200	2.5	0.07	1.8	RD	N	200	200
					48	R	705	9	21	24	NW	E	400	2.5	0.07	3.5	RD	N	400	400
					49	R	705	9	21	23	NE	E	150	2.5	0.07	1.3	RD	N	150	150
					50	L	705	9	21	23	NE	E	1400	2.5	0.07	12.3	RD	N	1400	1400
					51	R	705	9	21	23	NE	E	125	3.5	0.1	2.2	RD	N	125	125
					52	R	705	9	21	23	NE	E	3000	2	0.07	21.0	RD	N	3000	3000
					53	L	705	9	21	23	NE	E	800	2.5	0.07	7.0	RD	N	800	800
					54	L	705	9	21	23	NE	E	600	3.5	0.07	7.4	RD	N	600	600
MRS	46	MQ	20	1000	55	B	705	9	21	23	NW	E	400	3	0.07	4.2	RD	N	400	400
MRS	46	MQ	21	6800	56	R	705	9	21	23	NW	E	600	2.5	0.07	5.3	RD	N	600	600
					56	L	705	9	21	23	NW	E	1800	2.5	0.07	15.8	RD	N	1800	1800
					57	R	705	9	21	23	SW	T	600	3	0.07	6.3	RD	N	600	600
					58	L	516	9	21	26	NW	E	760	3	0.07	8.0	CP	N	760	760
					59	L	516	9	21	26	NW	E	600	2	0.07	4.2	WT	N	600	600
					59	R	705	9	21	26	NW	E	600	2	0.07	4.2		N	600	600
					60	R	705	9	21	26	NW	E	60	2.5	0.07	0.5	RD	N	600	600
MRS	46	MQ	22	2680												0.0				
MRS	46	MQ	23	4600	61	R	705	9	21	26	SE	E	400	2.5	0.07	3.5	RD	N	400	400
					62	B	705	9	21	35	NE	E	1440	1.5	0.07	7.6	RD	N	1440	1440
					63	R	705	9	21	35	NE	E	25	3.5	0.1	0.4	WD	N	25	25
					64	R	705	9	21	35	NE	E	400	400	2.5	0.1	RD	N	400	400
MRS	46	MQ	24	27640	1	B	705	9	21	27	SW	E	130	2	0.07	0.9	CP	N	130	130
MRS	46	MQ	25	16410												0.0				
MRS	46	MQ	26	4000												0.0				
MRS	46	MQ	27	4600	65	L	705	9	21	35	NE	E	600	3	0.07	6.3	RD	N	600	600
					66	L	705	9	21	36	SW	E	225	1.5	0.07	1.2	RD	N	225	225
					67	L	705	9	21	36	SW	E	800	2	0.07	5.6	RD	N	800	800
					68	L	705	9	21	36	SW	E	1100	6	0.07	23.1	GR	N		1100
					69	L	705	9	21	36	SW	E	800	2	0.07	5.6	RD	N		800
					67	R	705	9	21	36	SW	E	800	2	0.07	5.6	CP	N	800	800
					68	R	705	9	21	36	SW	E	900	3	0.07	9.5	WD	N	900	900
MRS	46	MQ	28	5080												0.0				
MRS	46	MQ	29	5800	1	B	705	9	21	22	SE	E	100	3	0.07	1.1	WD	N	100	100
MRS	46	MQ	30	8600	44	R	705	9	21	13	SE	E	280	3	0.1	4.2	GR	N	280	280
MRS	46	MQ	1	10120	18	L	86	9	21	1	NE	E	400	3	0.1	6.0	GR	N	400	400
MRS	46	GF	1	2000	79	L	705	10	21	13	NE	E	600	2	0.07	4.2	WD	N	600	600
					79	R	705	10	21	13	NE	E	450	3	0.07	4.7	WD	N	450	450
MRS	46	GF	3	4760												0.0				
MRS	46	GF	4	6800	81	B	705	10	21	13	SE	E	1800	2.5	0.07	15.8	RD	N	1800	1800
					82	L	705	10	21	24	NE	E	850	2	0.07	6.0	RD	N	850	850
					82	R	705	10	21	24	NE	E	200	2	0.07	1.4	WD	N	200	200
					83	R	705	10	21	24	NE	E	475	1	0.07	1.7	PK	N	475	475
MRS	46	GF	5	3200												0.0				
MRS	46	GF	6	1720	1	L	705	10	21	25	NE	E	250	4.5	0.07	3.9	WD	N	250	250

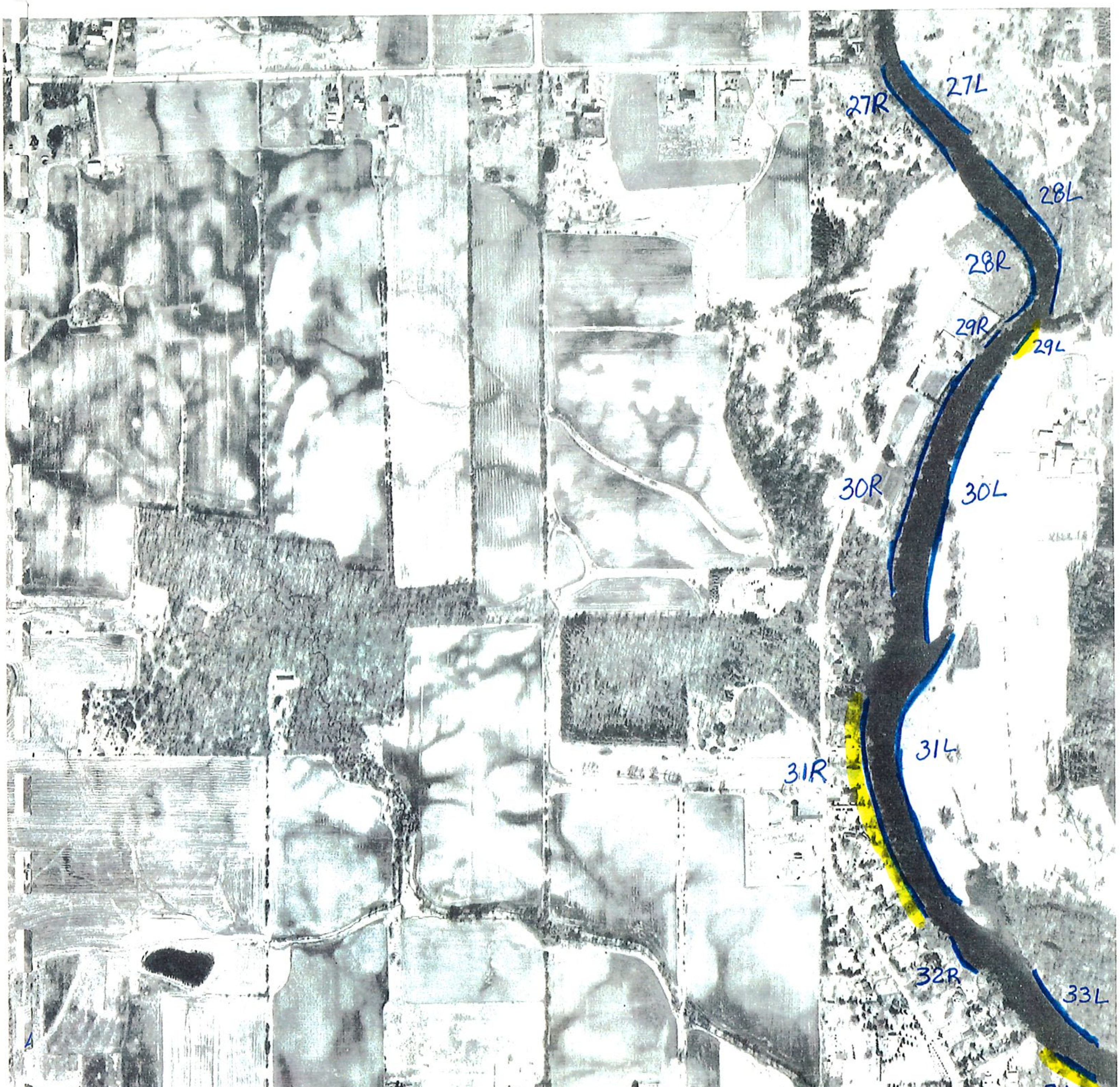
27	R	705	10	21	36	SE	S	520	2	0.1	5.2	RD	N	520	520
12	R	725	10	~~21~~ 22	31	SW	E	160	5	0.3	12.0	CP	N	160	160
13	L	725	10	~~21~~ 22	31	SW	S	100	6	0.3	9.0	CP	N	100	100

14,100

STREAM NAME	CY CD	SUB-WTR SHED	SEG. NO	FT. INV.	SITE NO.	L, R, B	I.D. No.	TN	R	S	1/4	E, T, S	LENGTH (FEET)	HEIGHT (FEET)	LAT. REC (FT/YR)	TONS PER YR	ADJ. LAND USE	CTL ACCS (Y, N)	MF (FT)	NS (FT)	MR (FT)
					14	L	725	10	21	31	SW	S	150	6	0.3	13.5	CP	N		150	150
					15	R	705	9	22	6	NW	E	400	3	0.1	6.0	GR	N		400	400
					16	L	717	9	22	6	NW	S	450	5.5	0.3	37.1	GR	N		450	450
					28	L	705	9	22	6	NW	E	600	4	0.07	8.4	GR	N		600	600
					29	R	705	9	22	6	NW	E	320	3	0.1	4.8	GR	N		320	320
					30	R	705	9	22	6	NW	E	200	3	0.07	2.1	RD	N		200	200
					31	L	705	9	22	6	NW	E	100	4	0.3	6.0	RD	N		100	100
					17	L	86	9	21	1	NE	E	200	4.5	0.1	4.5	GR	N			200
					18	~~R~~ B	705	9	21	1	NE	E	~~400~~ 800	3	0.1	6.0	RD	N		400	400
MRS	46	MQ	2	5080	19	R	705	9	21	1	NE	E	60	3.5	0.1	1.1	RD	N			60
					19	L	86	9	21	1	NE	E	200	3.5	0.1	3.5	WD				200
					20	L	86	9	21	1	SE	S	150	5	0.3	11.3	WD	N		150	150
					20	R	705	9	21	1	SE	E	80	4	0.3	4.8	RD	N		80	80
					21	R	705	9	21	1	SE	E	60	4	0.1	1.2	RD	N		60	60
					22	R	95	9	21	1	SE	E	200	3	0.1	3.0	CP	N		200	200
					23	L	86	9	21	1	SE	E	200	3	0.1	3.0	WD	N		200	200
					23	R	95	9	21	1	SE	S	100	5	0.3	7.5	CP	N		100	100
				pink	24	R	95	9	22	6	SW	E	200	4	0.07		WD	N		200	200
					24	L	705	9	22	6	SW	E	400	4	0.1	8.0	WD	N		400	400
					25	L	590	9	21	1	SE	E	500	3.5	0.1	8.8	WD	N		500	500
					25	R	95	9	21	1	SE	S	450	4	0.3	27.0	CP	N		450	450
					26	R	95	9	21	1	SE	E	100	3	0.1	1.5	WT	N		100	100
MRS	46	MQ	3	2600	1	L	296	9	21	1	NW	E	40	4	0.1	0.8	PA	Y	40	40	
					2	B	296	9	21	1	NW	E	120	3	0.1	1.8	PA	Y	400	400	
MRS	46	MQ	4	6880	1	B	95	9	21	1	SE	E	1600	4	0.3	96.0	WT	N		1600	1600
MRS	46	MQ	5	2000	27	R	672	9	21	12	NE	S	100	2.5	0.1	1.3	RD	N		100	100
					27	L	590	9	21	12	NE	E	150	3	0.1	2.3	WD	N		150	150
					28	R	705	9	21	12	NE	S	500	3.5	0.3	26.3	CP	N		500	500
MRS	46	MQ	6	5200	29	L	391	9	21	12	NE	E	150	3	0.1	2.3	CP	N		150	150
					30	L	391	9	21	12	NE	E	1200	3.5	0.3	63.0	CP	N		1200	1200
					30	R	705	9	21	12	NE	E	1200	3.5	0.1	21.0	CP	N		1200	1200
				purple	31	L	391	9	21	12	SE	E	1200	3.5	0.3	63.0	GR	N		1200	1200
					31	R	705	9	21	12	SE	S	900	4	0.3	54.0	RD	N			900
					32	R	705	9	21	12	SE	E	100	1	0.1	0.5	RD	N		100	100
					33	L	391	9	21	12	SE	E	350	3	0.07	3.7	WD	N		350	350
					34	R	705	9	21	12	SE	E	600	4.5	0.1	13.5	RD	N		600	600
MRS	46	MQ	7	1400	35	L	705	9	22	18	NW	E	200	3	0.07	2.1	RD	N		200	200
MRS	46	MQ	8	13720												0.0					
MRS	46	MQ	9	5800	36	R	638	9	22	18	NW	S	1000	4.5	0.1	22.5	RD	N		1000	1000
					37	L	705	9	22	18	SE	E	80	3	0.1	1.2	RD	N		80	80
					38	R	638	9	22	18	SE	E	800	3.5	0.1	14.0	WT	N		800	800
					38	L	705	9	22	18	SE	E	200	2.5	0.07	1.8	RD	N		200	200
				aqua	39	L	705	9	22	18	SW	S	800	3.5	0.3	42.0	WT	N		800	800
					40	R	638	9	22	18	SW	E	400	3	0.1	6.0	WD	N		400	400
					41	L	705	9	22	18	SW	E	600	2.5	0.1	7.5	WD	N		600	600
					42	R	71	9	22	18	SW	S	1200	3	0.1	18.0	WD	N		1200	1200
MRS	46	MQ	10	2800	43	R	705	9	21	13	SE	E	400	3	0.07	4.2	RD	N		400	400
MRS	46	MQ	11	1800												0.0					
MRS	46	MQ	12	1600												0.0					
MRS	46	MQ	13	2400												0.0					

J N, SECTION 1, T. 9 N., R. 21 E. Source: SEWRPC. PHOTOG: SPRING 1990 SCALE: 1" = 66

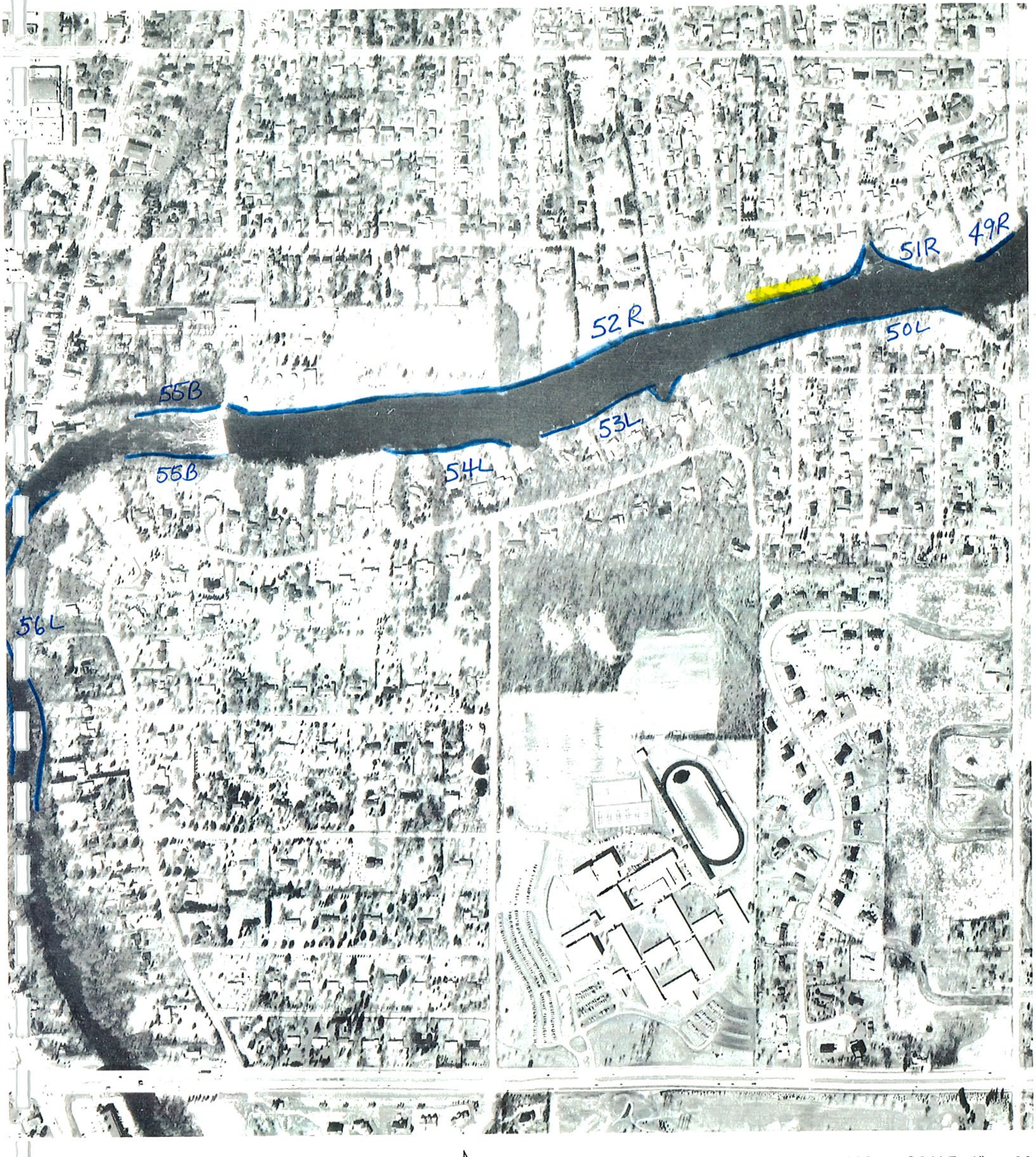
J JN, SECTION 6, T. 9 N., R. 22 E. N Source: SEWRPC. PHOTOG: SPRING 1990 SCALE: 1" = 66(



J JN, SECTION 12, T. 9 N., R. 21 E. *Source: SEWRPC.* PHOTOG: SPRING 1990 SCALE: 1" = 66

J[illegible]N, SECTION 13, T. 9 N., R. 21 E. *Source: SEWRPC.* PHOTOG: SPRING 1990 SCALE: 1" = 66[illegible]

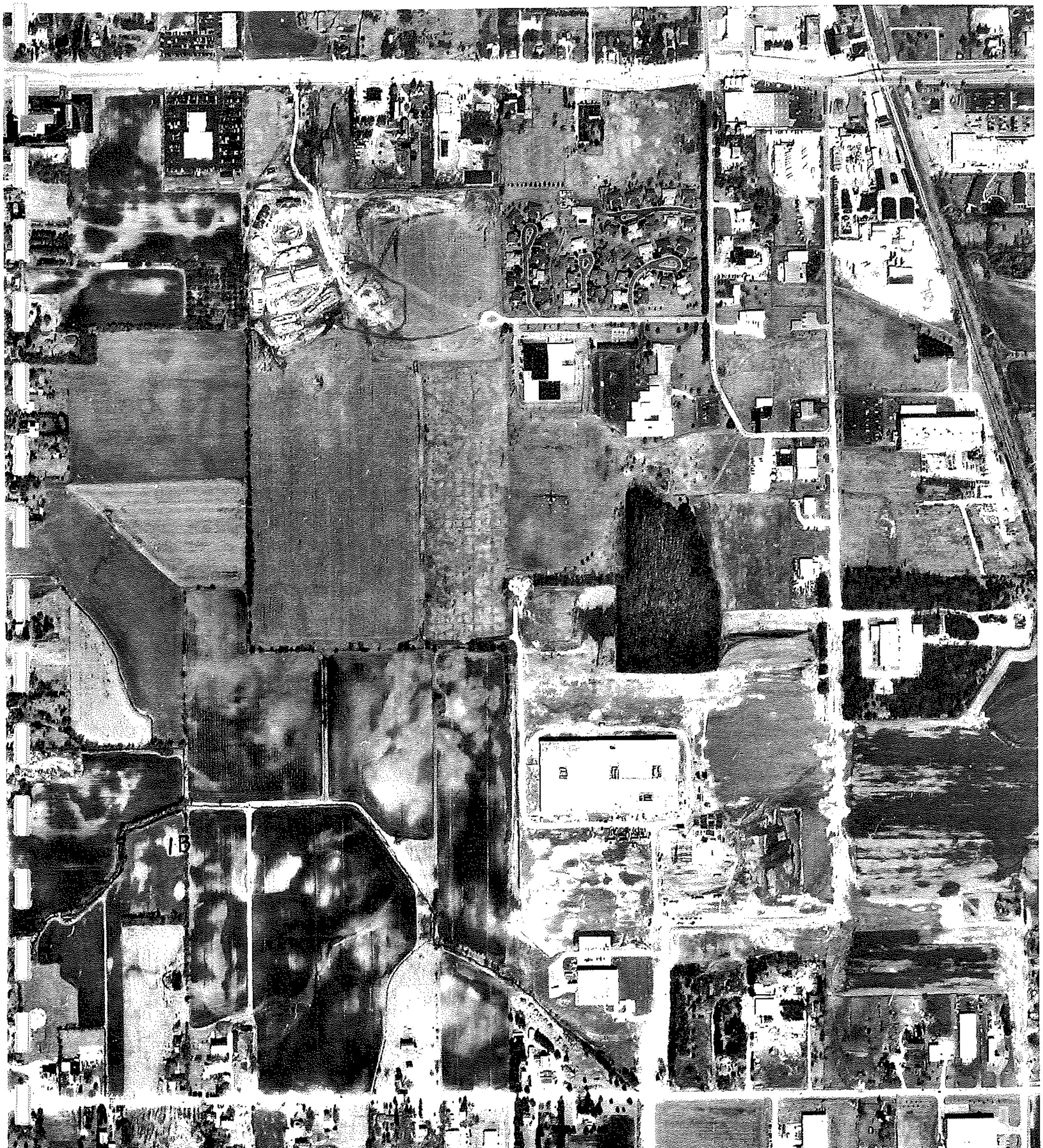
U N, SECTION 24, T. 9 N., R. 21 E. Source: SEWRPC. PHOTOG: SPRING 1990 SCALE: 1" = 66



J N, SECTION 23, T. 9 N., R. 21 E. Source: SEWRPC. PHOTOG: SPRING 1990 SCALE: 1" = 66

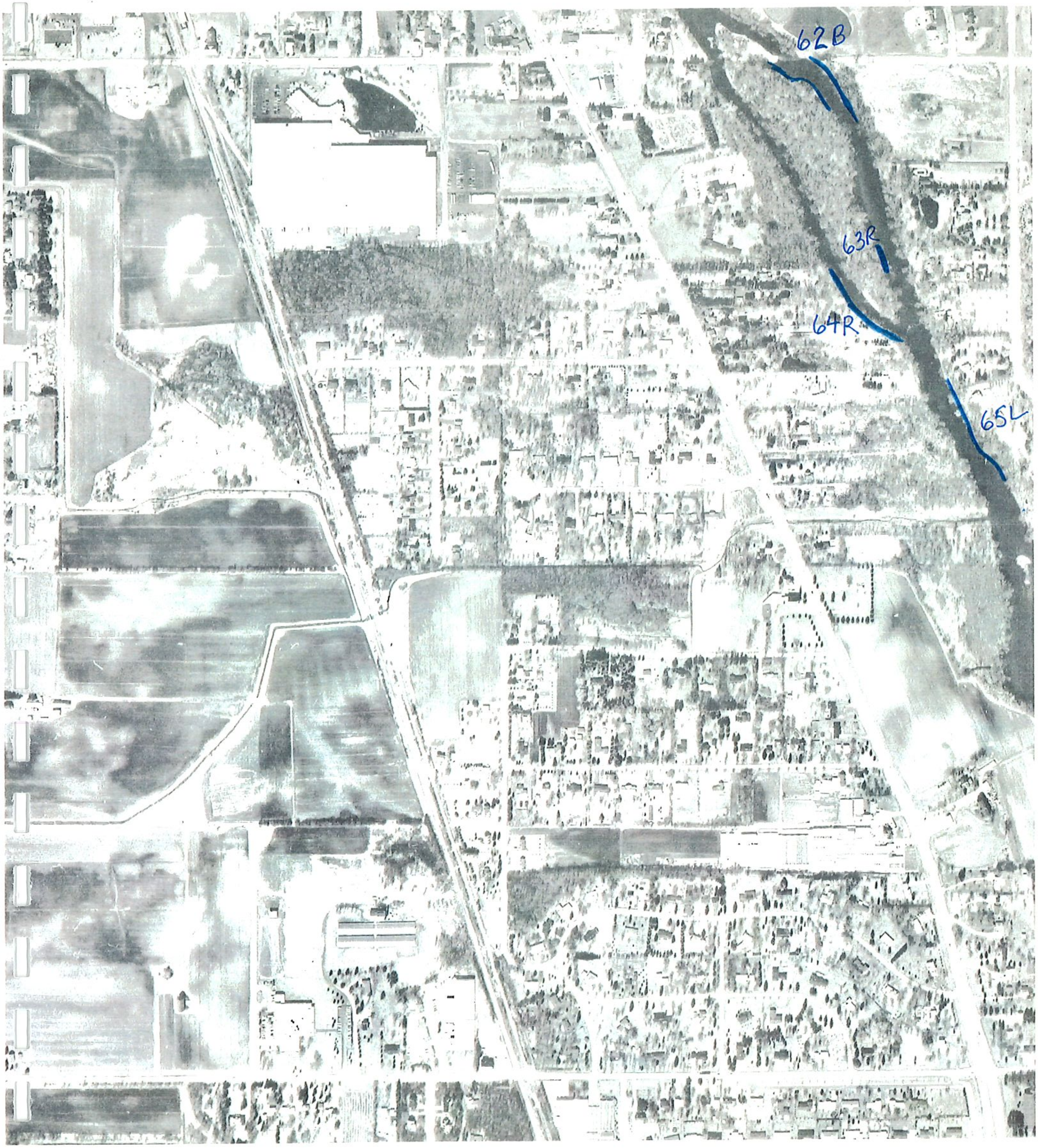
J N, SECTION 22, T. 9 N., R. 21 E. N *Source: SEWRPC.* PHOTOG: SPRING 1990 SCALE: 1" = 66

J N, SECTION 26, T. 9 N., R. 21 E. N Source: SEWRPC. PHOTOG: SPRING 1990 SCALE: 1" = 66



J(N, SECTION 27, T. 9 N., R. 21 E. N *Source: SEWRPC.* PHOTOG: SPRING 1990 SCALE: 1" = 66(

J[illegible]N, SECTION 36, T. 9 N., R. 21 E. *Source: SEWRPC.* PHOTOG: SPRING 1990 SCALE: 1" = 66[illegible]



J N, SECTION 35, T. 9 N., R. 21 E. N Source: SEWRPC. PHOTOG: SPRING 1990 SCALE: 1" = 66

VILLAGE OF THIENSVILLE

RESOLUTION NO. 1999-07

A RESOLUTION ADOPTING THE
STORMWATER MANAGEMENT MASTER PLAN
INCLUDING THE ADDENDUM

WHEREAS, the Village of Thiensville has completed a Stormwater Management Master Plan in conjunction with the City of Mequon; and

WHEREAS, the letter from the Village Administrator to the City of Mequon dated February 17, 1999 and the City Engineer to Mr. Tom Chapman of Camp Dresser & McKee, Inc. dated February 24, 1999 shall be included as an addendum to the Stormwater Management Master Plan.

NOW, THEREFORE BE IT RESOLVED that the Village Board of the Village of Thiensville adopts the Stormwater Management Master Plan including the addendum.

PASSED AND ADOPTED by the Village Board of the Village of Thiensville, County of Ozaukee, State of Wisconsin on this 19th day of April, 1999.

Donald A. Molyneux, Village President

John R. Gibbons, Village Clerk

Village of Thiensville

250 Elm Street • Thiensville, Wisconsin 53092-1602
Telephone 242-3720 • Fax 242-4743

February 17, 1999

Mr. William J. Hoppe, P.E.
City Engineer
City of Mequon
11333 N. Cedarburg Road, 60W
P.O. Box 538
Mequon, WI 53092

RE: Village of Thiensville Public Comment
Storm Water Management Master Plan

Dear Mr. Hoppe:

As discussed at the January 4, 1999 meeting with Village Engineer Michael F. Campbell, the Village of Thiensville would like to make the following comments on the Storm Water Management Master Plan for the City of Mequon and the Village of Thiensville as part of the public record. We also request that this letter and attachments be included as an addenda to the report and be referenced in an Executive Summary of the report or other appropriate placeholder in the final report.

The comments are arranged by subwatershed identification code as follows:

MQ-5 The dry detention basin, located on seminary property should be listed as costing $200,000 instead of $880,000, on Table 7-12 per the City of Mequon cost estimate on Page 7-7 of the report. It should also be left in the recommended plan at a cost of $200,000 for further consideration (Table 8-6).

In addition, Preliminary Engineering of the site should include a review of the ponds in the Westchester Lakes area. There may be the opportunity for more detention by restricting the channel outlet of the upper pond.

PG-1 The option to use the quarry as recommended in the March 1986 Pigeon Creek Drainage Study was dropped in the recommended plan due to a general comment regarding ground water pollution. This alternate should be left in the recommended plan to be pursued through preliminary engineering. It would provide a cost-effective method of storage and further analysis may show groundwater pollution potential levels are not impacted over present day conditions.

PG-2 The selected alternative on Page 8-3 and Table 8-6 should be changed to reflect a recent conceptual agreement with MATC for the construction of a new detention basin north of the Village as described in the attached correspondence. This new alternative will eliminate the need for downstream storm sewer improvements, although estimated construction costs would be similar.

The cost for on-site systems in the Thiensville Business District in Table 7-12 ($8,400) should be corrected to match Table 8-6 ($84,000).

Please contact our office with any questions regarding this matter.

Sincerely,

Dianne S. Robertson

Dianne S. Robertson
Village Administrator

Cc: Thomas W Chapman, P.E., CDM
Michael F. Campbell, Ruekert & Mielke, Inc.
Lee Szymborski, City Administrator
File

Ruekert | Mielke

Professional Engineers
& Registered Land Surveyors since 1946

December 18, 1998

Ms. Nina Jo Look, Phd.
Associate Dean
Mr. Steven J. Stoeger-Moore
Campus Operations Manager
MATC, North Campus
5555 W. Highland Road
Mequon, WI 53092-1199

RE: Potential MATC Storage Basin Area

Dear Ms. Look and Mr. Moore:

Thank you for meeting with Ms. Robertson and Mr. Molyneux of the Village of Thiensville and myself regarding the potential use or expansion of existing lands used to store and control excessive storm water run-off.

As we discussed, the Village experienced flooding during the June 1997 storm event that was caused when storm flows exceeded the capacity of the Thiensville storm drainage system. Flows from the Mequon area are routed through the MATC property as shown on the attached map through the wet retention Pond A and through the dry detention Basin B located on MATC property, then south through three 36 inch diameter culverts under Cairdel Lane into dry detention Basin C in Thiensville. In the 1997 event, the storm flows flooded the area around Cairdel Lane and filled up and overtopped detention Basin C which then flooded downstream houses.

Basin A is the existing detention/retention basin near the MATC parking lot that has (4) 18 inch diameter culverts as an outlet.

Basin B is a large natural low area that has been enhanced by a berm with (3) 18 inch culverts as an outlet.

Basin C is the manmade detention basin at Laurel Lane in Thiensville that has a single 33 inch x 48 inch culvert outlet.

The estimated storage volume in acre-feet of each are as follows:

Basin	Volume (ac-Ft)
A	5.7
B	41.6
C	13.5

W239 N1812 ROCKWOOD DRIVE
WAUKESHA, WISCONSIN 53188-1113
(414) 542-5733
FAX (414) 542-5631

An acre-foot is equivalent to the volume of water over one acre one foot deep. For example, 5 ac-ft is equal to five acres of land one foot deep or one acre of land five feet deep.

As a solution to the flooding problem, we have looked at the potential for additional storage in the area. Basin A has limited potential due to the elevation of a pumping station next to the pond, which must be protected from flooding. Basin B could provide additional storage by raising the berm height one foot. This would result in an additional 14 acre feet of storage. Basin C can not be enlarged or the berm height raised due to the elevations of the buildings surrounding it. A fourth basin, Basin D, could be created as shown on the map by extending a 2 to 5 foot high berm along the south property line of MATC and tying it back into the natural terrain. This basin has the potential for 33 additional acre feet and could be designed either as a wet retention pond or a dry detention basin that would completely empty following a storm. The following table summarizes the results.

Basin	Existing Volume (Ac-Ft)	Potential Volume (Ac-Ft)	Comments
A	5.7	5.7	
B	41.6	55.9	Raise Berm
C	13.5	13.5	
D	--	33.0	Create Berm
	60.8 Ac-Ft	108.1 Ac-Ft	

We have not yet performed the detailed hydraulic analysis that would be required to determine the effect that the potential additional storage would have on the flood flows. However, it appears that Pond B or Pond D could add significant storage which would provide more protection to the Mequon residents on Cairdel Lane and to the downstream Thiensville residents.

In conclusion, this preliminary analysis shows that additional storage could be created on MATC lands to mitigate flooding of both Mequon and Thiensville residents. The Village would request that you present this information to the MATC Board of Directors and ask if they would partner with the communities in creating this storage. The City of Mequon has indicated a staff level support of the concept and has offered earth fill to construct berms and Thiensville in conjunction with Mequon has indicated that they would support the construction so that there would be no cost to MATC other than the use of its land.

Ruekert | Mielke

Professional Engineers
& Registered Land Surveyors since 1946

Please follow-up with the college to see if it would agree in concept with this proposal. If you need additional information or would like to meet again to discuss these findings, please contact our office.

Very truly yours,

RUEKERT & MIELKE, INC.

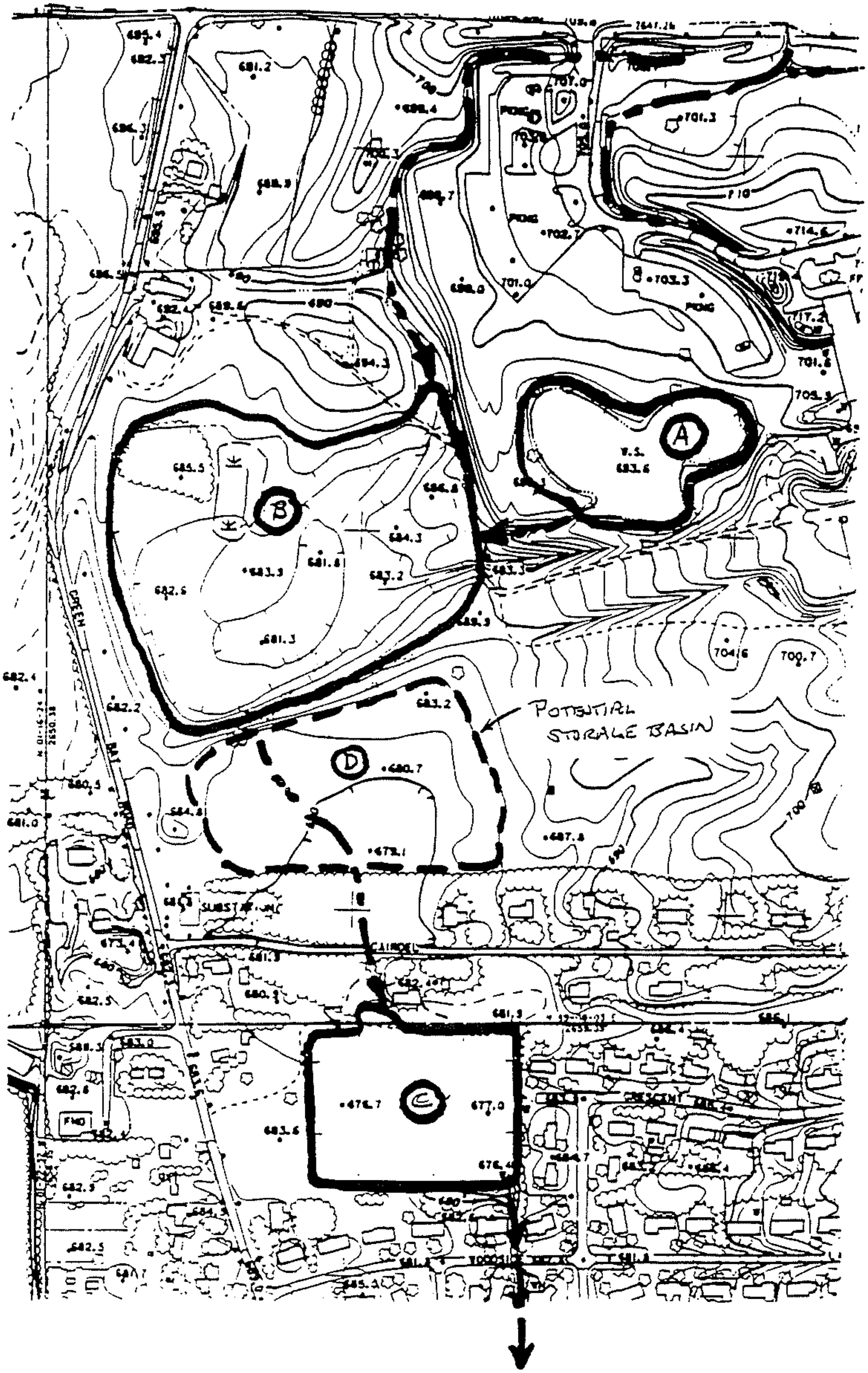
Michael F. Campbell, P.E.

MFC/sjd

r:\client\21\2100980.100\corres\matc-19981218-potential storage basin area.doc

cc: Donald Molyneux, Village of Thiensville, President
Dianne Robertson, Village of Thiensville, Administrator
Bill Hoppe, City of Mequon, Engineer
File

W239 N1812 ROCKWOOD DRIVE
WAUKESHA, WISCONSIN 53188-1113
(414) 542-5733
FAX (414) 542-5631


A
B
C
D
POTENTIAL STORAGE BASIN
W.S.
683.6
SUBSTATION
CRESCENT

Ruekert | Mielke

Professional Engineers
& Registered Land Surveyors since 1946

October 29, 1998

Ms. Dianne S. Robertson
Village Administrator
Village of Thiensville
250 Elm Street
Thiensville WI 53092

RE: MATC Storage Basin Area

Dear Dianne:

As discussed, we have calculated the potential storage area on the MATC school property upstream of the Laurel Drive detention basin in Thiensville. There are three detention/retention basins that were considered as shown on the attached map.

Basin A is the existing detention/retention basin near the MATC parking lot that has (4) 18 inch diameter culverts as an outlet.

Basin B is a large natural low area that per the topographic maps appears to have no piped outlet except for natural overflow of it banks.

Basin C is the manmade detention basin at Laurel Lane in Thiensville that has a single 33"x48" culvert outlet that was overtopped in the June 1997 flood.

The estimated storage volumes of each are as follows:

Basin	Volume (Ac-Ft)
A	5.7
B	41.6
C	13.5

Storm runoff from the MATC area either flows through both Basins A and B or just Basin B before heading south under Cairdel Lane via three large culverts to Basin C in Thiensville.

Basin B which is three times larger than the MATC parking lot detention basin may have a great potential for storage depending upon the outlet configuration. Field work should be performed to confirm that there is no existing piped outlet from the natural basin. At present, it is planted with corn which would be flooded out if there was no pipe outlet, which doesn't make sense.

Bill Hoppe, City Engineer for Mequon, said that he will check the City records for drainage computations that might have been prepared for the culverts under Cairdel Lane and/or the MATC drainage basin.

W239 N1812 ROCKWOOD DRIVE
WAUKESHA, WISCONSIN 53188-1113
(414) 542-5733
FAX (414) 542-5631

Ruekert | Mielke

Professional Engineers
& Registered Land Surveyors since 1946

When that information is received and field work confirms if the natural Basin B has a piped outlet, we can complete out preliminary analysis.

Please contact our office with any questions regarding this matter.

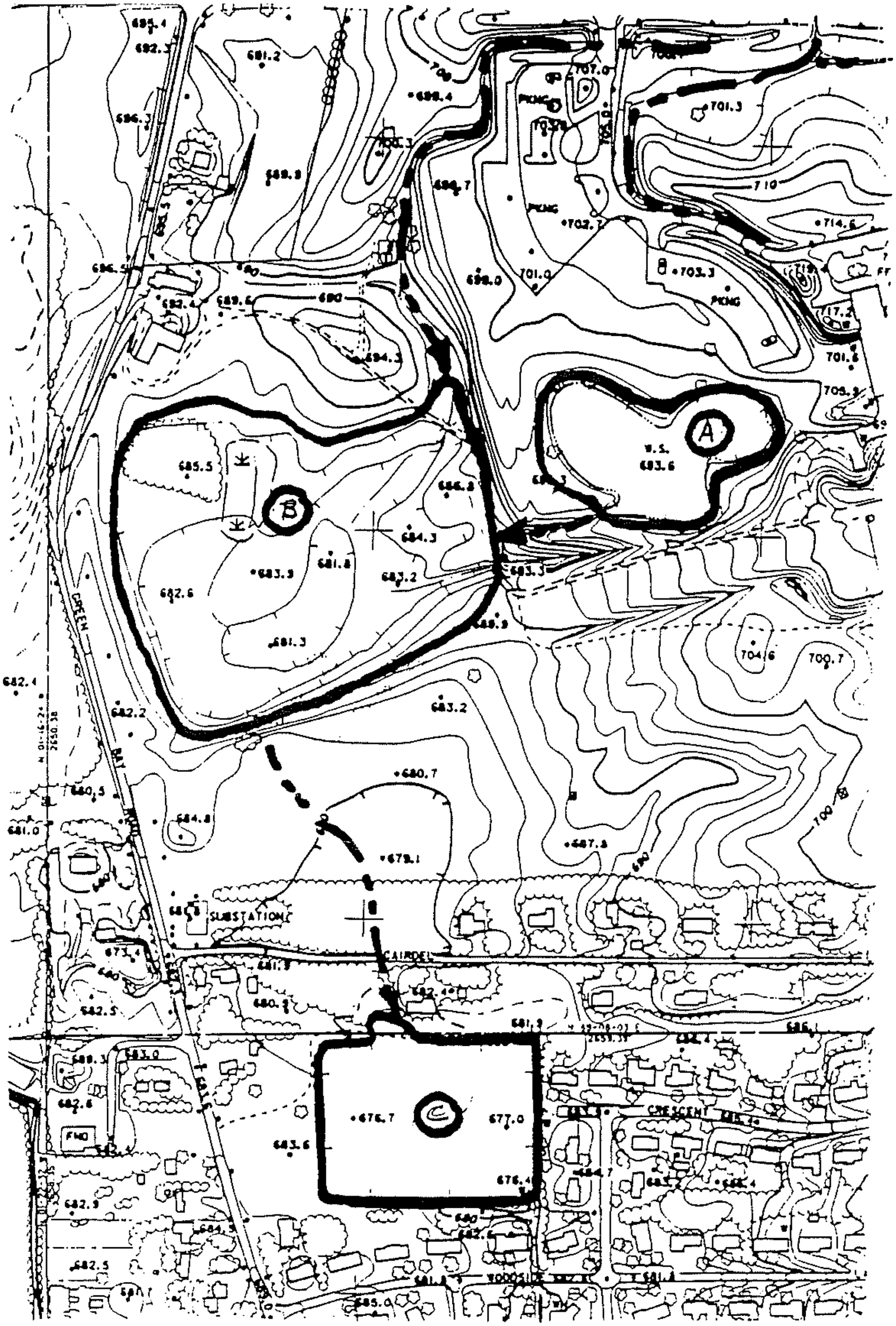
Very truly yours,

RUEKERT & MIELKE, INC.

Michael F. Campbell, P.E.

MFC/sjd
21-00980.100
\\lan1\rmdata\client\21\2100980.100\corres\robertson-19981029-matc storage area.doc
cc: Bill Hoppe, City Engineer, City of Mequon
File

W239 N1812 ROCKWOOD DRIVE
WAUKESHA, WISCONSIN 53188-1113
(414) 542-5733
FAX (414) 542-5631


A
W.S.
683.6
B
C
PKNG
SUBSTATION
CAIRDEL
CRESCENT
GREEN
BAY
685.5
684.3
683.3
681.8
683.2
682.6
681.3
683.2
680.7
679.1
676.7
677.0
683.6
701.3
714.6
703.3
704.6
700.7
710
700
FMD

City of Mequon
11333 N. Cedarburg Road, 60W
Mequon, Wisconsin 53092-1930
(414) 242-3100 F:(414) 242-9655

RECEIVED
VILLAGE OF THIENSVILLE

ENGINEERING

February 24, 1999

Mr. Tom Chapman, Project Manager
Camp Dresser & McKee Inc.
312 East Wisconsin Avenue
Suite 500
Milwaukee, WI 53202

Subject: Village of Thiensville Public Comment on Stormwater Management Master Plan

Dear Tom:

You notice on the letter I received from the Village of Thiensville dated February 17, 1999 that you are info copied. I wish to confirm as we discussed at our meeting with Mike Campbell on January 4, 1999 that the attached letter and documents are to be added into the Stormwater Management Master Plan as an addendum. Should you have any questions, comments or concerns, please do not hesitate to contact me.

Respectfully,

William J. Hoppe, P.E.
City Engineer

Attachment

C: Mayor Nuernberg
Mequon City Administrator
Thiensville Village Administrator
Mike Campbell, Ruekert & Mielke
Project File

224-CDM/cn

MILWAUKEE CAMPUS
700 West State Street
Milwaukee, Wisconsin 53233-1443
414-297-6357
414-297-7723 (FAX)

Milwaukee Area Technical College **matc**

Lester C. Ingram
Vice President, Administrative Services

MILWAUKEE CAMPUS
700 West State Street
Milwaukee, Wisconsin 53233-1443
414-297-6600

NORTH CAMPUS
5555 West Highland Road
Mequon, Wisconsin 53092-1199
414-238-2200

SOUTH CAMPUS
6665 South Howell Avenue
Oak Creek, Wisconsin 53154-1196
414-571-4500

WEST CAMPUS
1200 South 71st Street
West Allis, Wisconsin 53214-3110
414-456-5500

February 8, 1999

Mr. Donald A. Molyneux, Village President
Village of Thiensville
250 Elm Street
Thiensville, WI 53092

RE: Potential MATC North Campus Storm Water Storage Basin Area

Dear Mr. Molyneux:

I am writing in response to the letter dated December 18, 1998 written by your consulting engineer, Michael D. Campbell, P.E. of Reukert & Mielke, to Dr. Nina Jo Look, North Campus Team Leader, and Mr. Steven Stoeger-Moore, North Campus Operations Manager. Please be advised that the concept outlined in Mr. Campbell's letter regarding the creation of an additional storm water storage basin on our property is conceptually agreeable to the MATC administration.

Our current plans for several decades to come would appear to be largely unaffected by Mr. Campbell's proposal. However, we must preserve our rights and interests for the subject area with respect to long range matters. In order to address the interests of both parties, I would suggest a license agreement (or similar document) for the subject area with a term of 20 years and compensation of $1.00 per year, subject to renewal pending any future development plans. I would think that the initial term of 20 years would be adequate to justify initial investments by your village, yet preserve our rights and allow us to address future long range mission initiatives.

I also noted that the City of Mequon (a secondary beneficiary of the proposal) has offered to provide earth fill needed for the construction of berms. Please be advised that we, too, can make available excess earth fill that is currently found in unwanted berms to the east of our primary buildings. This fill would be available at no cost, other than for restoring the grass cover in the excavated area.

Please feel free to pursue the details of this proposal with our North Campus staff (Dr. Look and Mr. Stoeger-Moore). If it is appropriate for us to meet at a future date, that can be arranged as well. In the meantime, please do not hesitate to contact me at (414) 297-6357. If I am unavailable, our Director of Construction Services, Alan L. Evinrude, is also familiar with this matter and can be reached at (414) 297-6763.

Sincerely,

Lester C. Ingram, Vice President
Administrative Services

LCI:ale

cc: Dianne Robertson, Village of Thiensville, Administrator
Bill Hoppe, City of Mequon, Engineer
Michael F. Campbell, Reukert & Mielke
Dr. Nina Jo Look, MATC North Campus Team Leader
Mr. Steven Stoeger-Moore, MATC North Campus Operations Manager
Alan L. Evinrude, Director- MATC Construction Services

(01599LTE.DOC)