City of Appleton

100 North Appleton Street
Appleton, WI 54911-4799
www.appleton.org

Meeting Agenda - Final

Utilities Committee

Tuesday, July 26, 2022 | **4:30 PM** | **Council Chambers, 6th Floor**

1. Call meeting to order

2. Roll call of membership

3. Approval of minutes from previous meeting

22-0931 Approval of the July 12, 2022 Utilities Committee Meeting Minutes.

Attachments: July 12, 2022 Utilities Committee Meeting Minutes.pdf

4. Public Hearings/Appearances

22-0932 Chuck Boehm, P.E., Director of Client Services with Brown and Caldwell, presentation of the Citywide Stormwater Management Plant Update.

Attachments: July 26 2022 SWMP presentation.pdf
Appleton SWMP Final Report_Combined_NoFigs_20220303.pdf
AppendixA-Figures.pdf

5. Action Items

22-0933 Request to approve Lead and Galvanized Steel Water Service Replacement Program Eligibility and Participation Policy.

Attachments: Attachment - Utilities Committee - 07-26-22 - Eligibility Policy for Private Lead S

6. Information Items

22-0934 Monthly Reports for April, May, and June 2022:
-Wastewater Treatment Plant Synopsis and Receiving Station Revenue Report
-Water Treatment Facility Synopsis
-Water Distribution and Meter Team Monthly Report - June

Attachments: 2022 Qtr 2 Wastewater Treatment Plant Synopsis.pdf
2022 Qtr 2 Water Plant Synopsis.pdf
Water Main Breaks - June 2022.pdf

7. Adjournment

Notice is hereby given that a quorum of the Common Council may be present during this meeting, although no Council action will be taken.

Reasonable Accommodations for Persons with Disabilities will be made upon Request and if Feasible.

For questions on the agenda, contact Chris Shaw at 920-832-5945 or Danielle Block at 920-832-6474.

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Meeting Minutes - Final
Utilities Committee

Tuesday, July 12, 2022 | **4:30 PM** | **Council Chambers, 6th Floor**

1. Call meeting to order

Chairperson Meltzer called the Utilities Committee meeting to order at 4:30 p.m.

2. Roll call of membership

Present: 3 - Meltzer, Doran and Schultz

Excused: 2 - Firkus and Jones

3. Approval of minutes from previous meeting

22-0860 Approval of the June 7, 2022 Utilities Committee Meeting Minutes.

Attachments: June 7, 2022 Utilities Committee Meeting Minutes.pdf

This Minutes were approved.

Aye: 3 - Meltzer, Doran and Schultz

Excused: 2 - Firkus and Jones

4. Public Hearings/Appearances

5. Action Items

22-0858 Award Unit N-22 Spot Repairs, Protruding Tap & Mineral Deposit Removal to Northern Pipe, Inc. in an amount not to exceed $120,000.

Attachments: Attachment -Utilities Committee - 07-12-22 - Award of Contract N-22.pdf

Schultz moved, seconded by Doran, that the Report Action Item be recommended for approval. Roll Call. Motion carried by the following vote:

Aye: 3 - Meltzer, Doran and Schultz

Excused: 2 - Firkus and Jones

22-0859 Award Lawe Street Force Main Replacement Design Services contract to McMahon Associates, Inc. in an amount not to exceed $100,000.

Attachments: Attachment -Utilities Committee - 07-12-22 - Lawe Street Force Main Design Services.pdf

Schultz moved, seconded by Doran, that the Report Action Item be recommended for approval. Roll Call. Motion carried by the following vote:

Aye: 3 - Meltzer, Doran and Schultz

Excused: 2 - Firkus and Jones

6. Information Items

22-0628 Discuss WDNR Stormwater Permit Appendices A and C.

Attachments: 2022 MS4 Permit Appendices A and C.pdf
2019 WPDES-WI-S050075-03.pdf

This item was discussed.

22-0861 Monthly Reports for May 2022:
- Water Distribution and Meter Team Monthly Report

Attachments: Water Main Breaks - May 2022.pdf

The report was reviewed.

7. Adjournment

Schultz moved, seconded by Doran, that the Utilities Committee meeting be adjourned at 4:58 p.m.. Roll Call. Motion carried by the following vote:

Aye: 3 - Meltzer, Doran and Schultz

Absent: 2 - Firkus and Jones

Citywide Stormwater Management Plan

July 26, 2022

Lower Fox River Basin TMDL

Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay

Brown, Calumet, Outagamie, and Winnebago Counties, Wisconsin

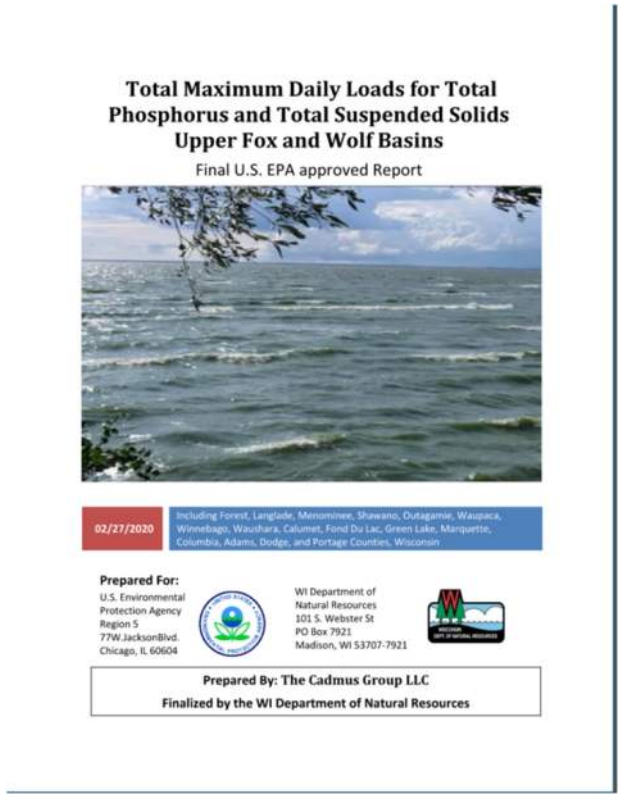
March 2012

Prepared for:

Wisconsin Department of Natural Resources | Oneida Tribe of Indians of Wisconsin | U.S. Environmental Protection Agency

Prepared by:
CADMUS

Upper Fox and Wolf River Basins TMDL



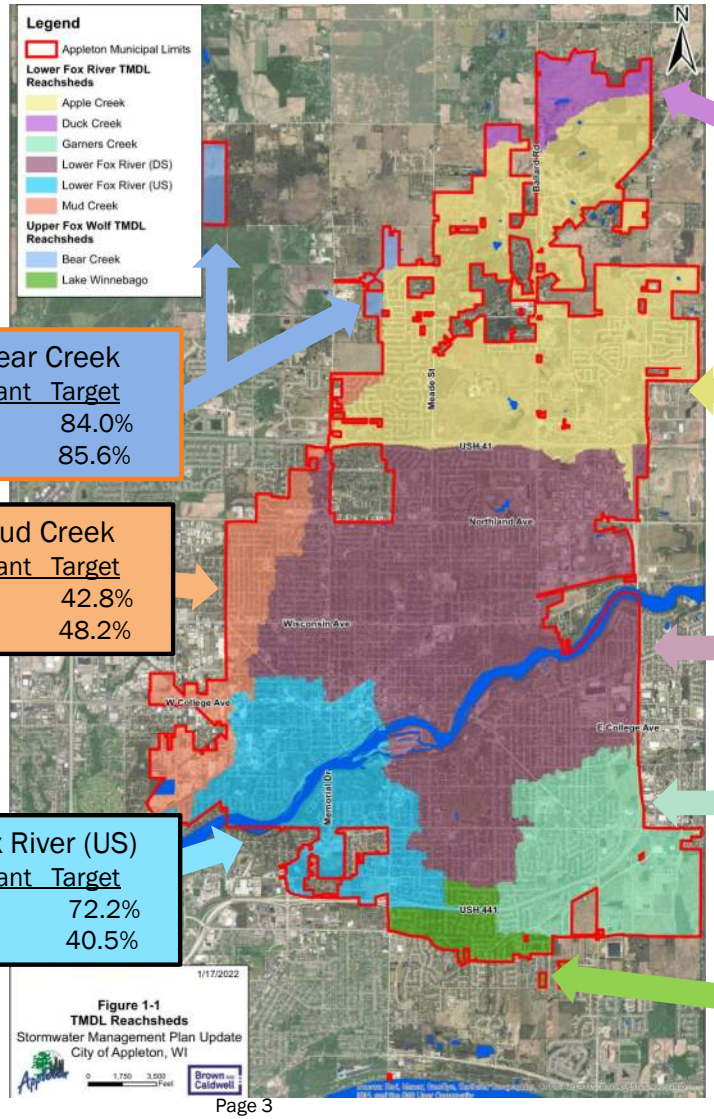
A TMDL sets “acceptable pollution loads” for each watershed

TMDL Reachsheds and Target Reductions

Update to 2014 Plan

Lower Fox River
- Duck Creek
- Apple Creek
- Mud Creek
- Fox River (US)
- Fox River (DS)
- Garners Creek

13,707 acres



Bear Creek

Pollutant	Target
TSS	84.0%
TP	85.6%

Mud Creek

Pollutant	Target
TSS	42.8%
TP	48.2%

Fox River (US)

Pollutant	Target
TSS	72.2%
TP	40.5%

Duck Creek

Pollutant	Target
TSS	52.0%
TP	40.5%

Apple Creek

Pollutant	Target
TSS	52.0%
TP	40.5%

Fox River (DS)

Pollutant	Target
TSS	72.2%
TP	40.5%

Garners Creek

Pollutant	Target
TSS	59.9%
TP	68.6%

Lake Winnebago

Pollutant	Target
TSS	20.0%
TP	85.6%

NEW for 2022 Plan

Upper Fox-Wolf River
- Bear Creek
- Lake Winnebago

565 acres

Stormwater Pollution Control “Tool Box”

“Proven Practices” with WDNR Standards

Street Cleaning

Grass Swales

Wet Detention

HSD’s (Catch Basins)

Bioretention

Water Quality Trading / Adaptive Management

Stormwater Pollution Control "Tool Box"

"Newer/Emerging Practices" with WDNR Standards

Porous Pavement

Proprietary Filters

Leaf Management

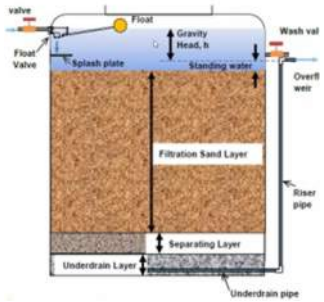
Table 2.
Total Suspended Solids (TSS) and Total Phosphorus (TP) Loan Reduction Requirements

Watershed	New Development, Redevelopment 5 acres or larger and Infill		Redevelopment less than 5 acres and Transportation Facility Redevelopment	
	TSS	TP	TSS	TP
Apple Creek	80.0%	40.5%	52.0%	40.5%
Duck Creek	80.0%	40.5%	52.0%	40.5%
Mud Creek	80.0%	48.2%	42.8%	48.2%
Garners Creek	80.0%	68.6%	59.9%	68.6%
Fox River	80.0%	40.5%	72.2%	40.5%
Bear Creek	84.0%	85.6%	84.0%	85.6%
Lake Winnebago	80.0%	85.6%	40.0%	85.6%

Ordinance Changes

Stormwater Pollution Control “Tool Box”

Practices With No Current WDNR Standards



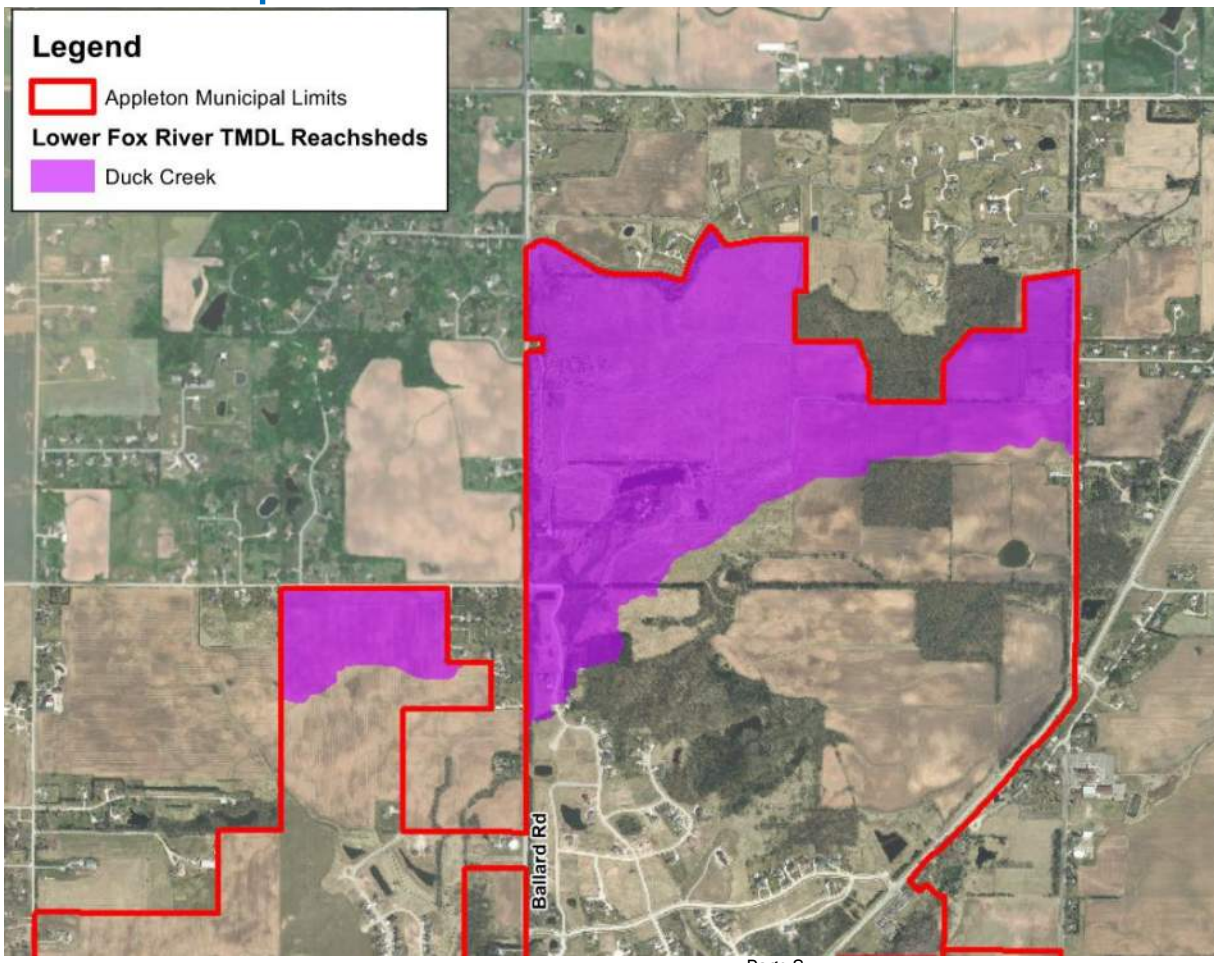
Sand Filter With Additives (e.g. Iron/Slag)

Enhanced Wet Detention (Coagulant Addition)

Common Citywide Implementation Plan Elements

Citywide Plan Elements	Implementation Year(s)	Cost
Post-Construction Ordinance Implementation	2022	$0
Complete Regional WinSLAMM Models	2022	$63,000
SWU Multi-family Billing System Updates	2026	$100,000
Complete Leaf Management Program Implementation (Capital costs and CEA Payments)	2022-2026	$2,200,000
Municipal Services Building Expansion (Ph 1)	2026	$2,000,000
SWU Commercial/Industrial Billing System Updates	2028	$100,000
Conduct Detailed Leaf Collection Analysis	2028	$35,000
Expand Street Cleaning to all High Efficiency Equipment	2030	$810,000
Municipal Services Building Expansion (Ph 2)	2031	$2,300,000
Citywide Plan Update	2031	$200,000
Total		**$7,808,000**

Duck Creek
- In Compliance



Individual Implementation Plan Elements

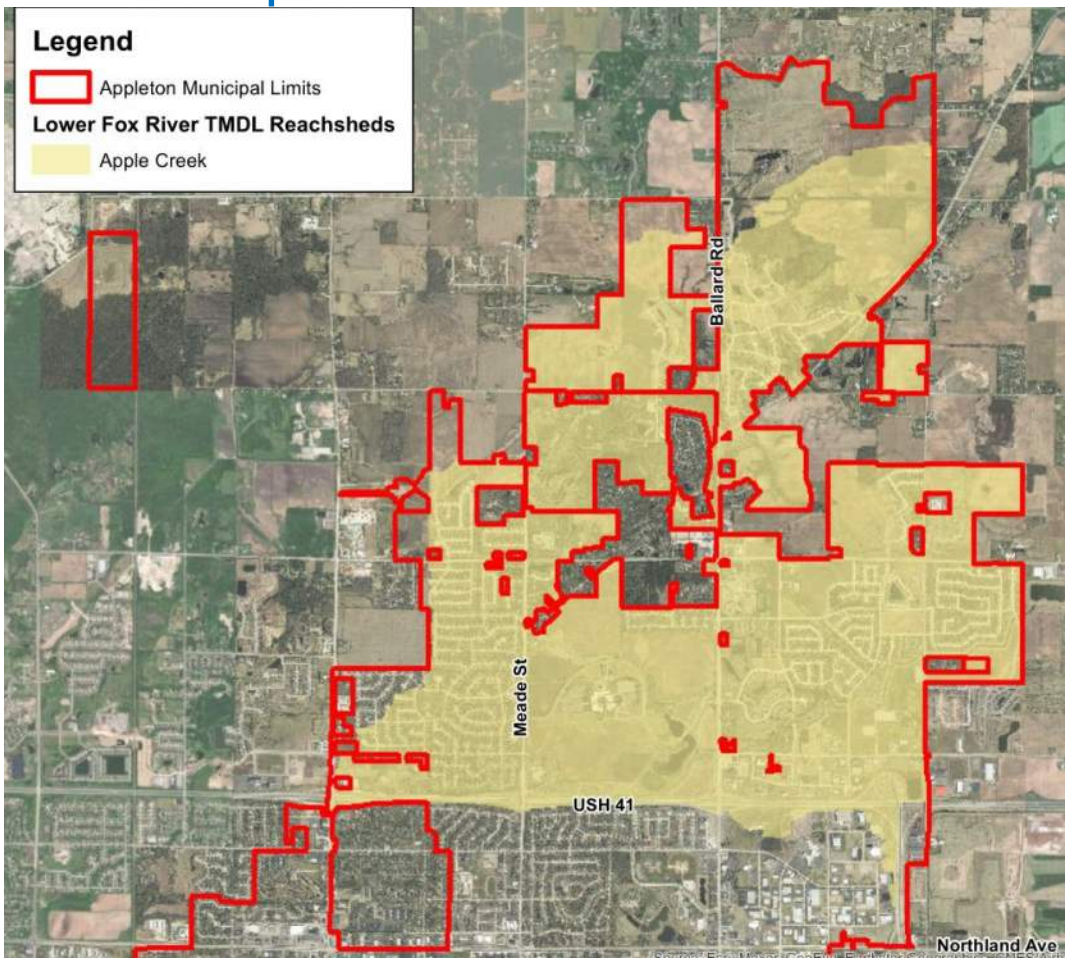
1. None

Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	N/A	N/A	$0
Total	**N/A**	**N/A**	**$0**

Duck Creek

Pollutant	Target	Existing	Future
TSS	52.0%	73.7%	74.4%
TP	40.5%	48.5%	48.9%

Apple Creek
- In Compliance



Individual Implementation Plan Elements

1. None

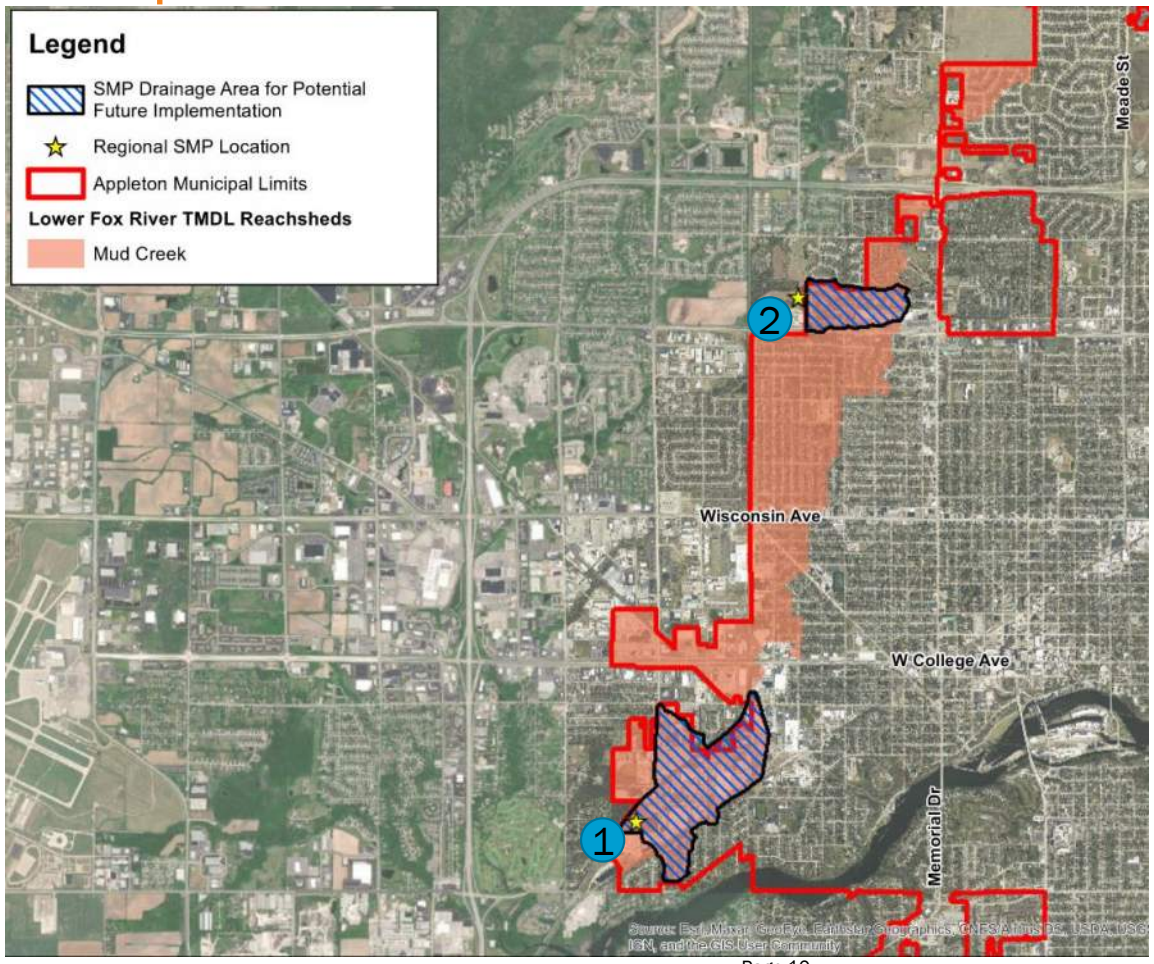
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	N/A	N/A	$0
Total	**N/A**	**N/A**	**$0**

Apple Creek

Pollutant	Target	Existing	Future
TSS	52.0%	69.7%	53.6%
TP	40.5%	48.3%	41.2%

Mud Creek

- Requires Additional TSS and TP Control



Individual Implementation Plan Elements

1. RGL Warehouse Pond (2023-2027)
2. Hillock Court Pond (2034-2038)
3. 7 HSDs (various years – not shown on figure)

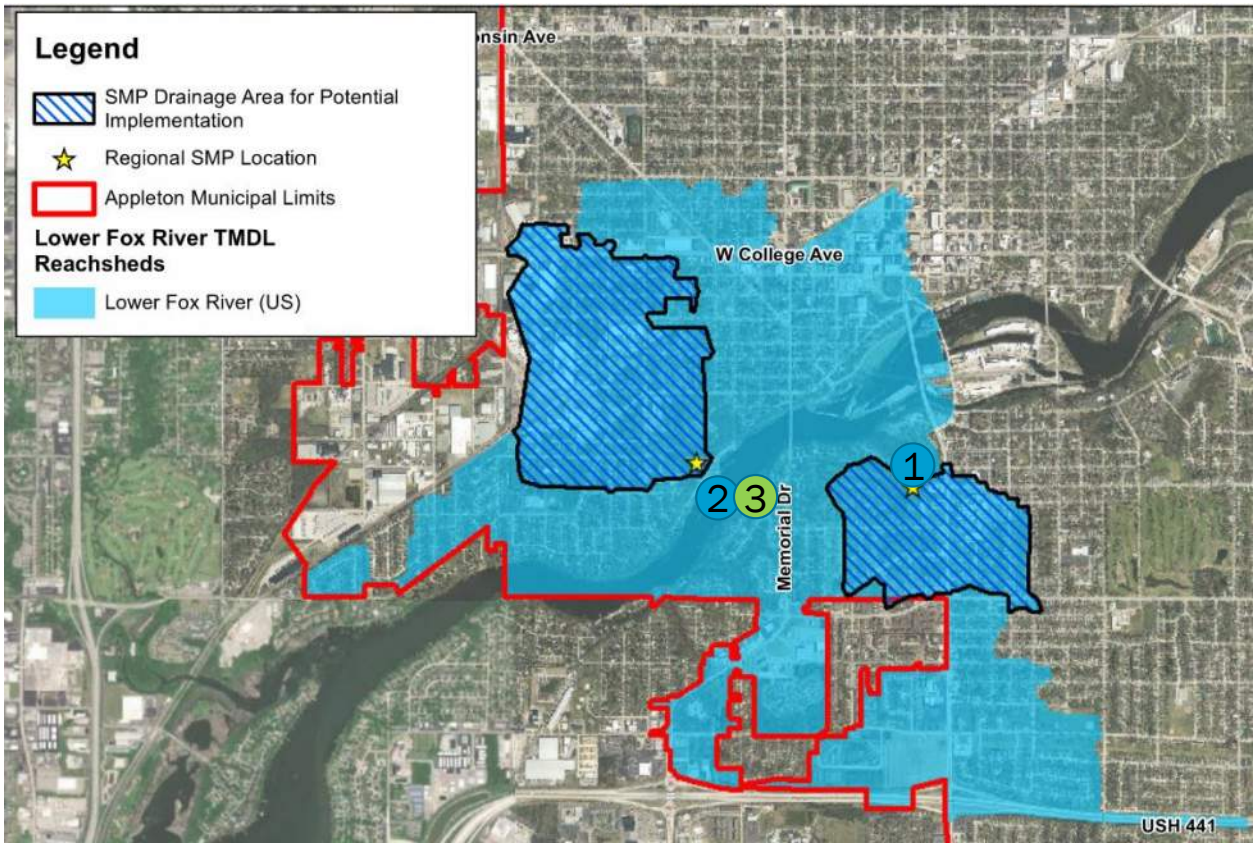
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	46	129.7	$8,060,790
2	7.5	36.5	$5,425,891
3	0.7	1.1	$175,000
Total	**54.2**	**167.3**	**$13,661,681**

Mud Creek

Pollutant	Target	Existing	Future
TSS	42.8%	28.6%	48.1%
TP	48.2%	20.8%	48.5%

Lower Fox River (Upstream)

- Requires Additional TSS and TP Control



Individual Implementation Plan Elements

1. Riverview Gardens Pond (2029-2033)
2. Pierce Park Pond (2039-2043)
3. Pierce Park Enhanced TP (2064-2068)
4. 20 HSDs (various years)

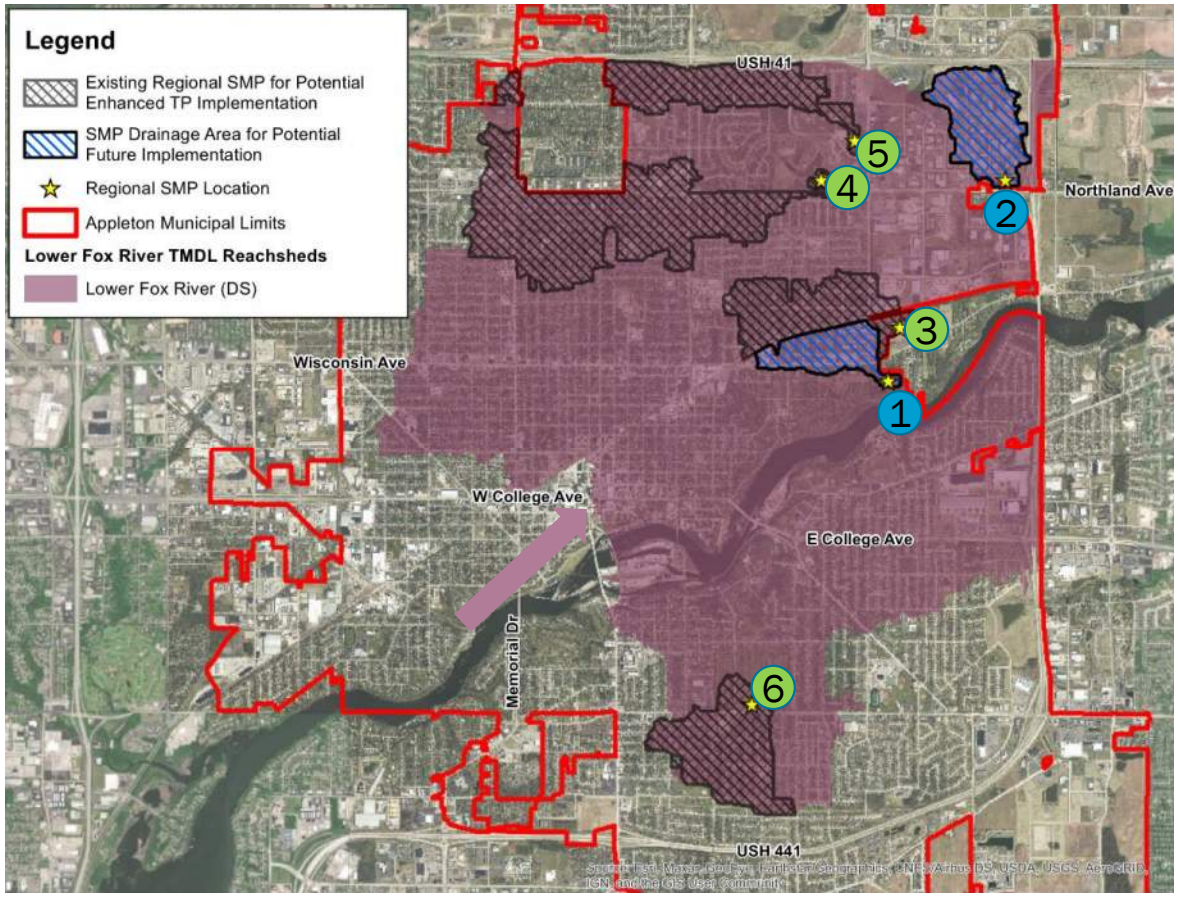
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	13.4	65.5	$1,172,371
2	24.2	93.5	$2,396,381
3	24.2	146	$3,457,883
4	1.4	3.8	$500,000
Total	**63.2**	**308.8**	**$7,526,635**

Lower Fox River (US)

Pollutant	Target	Existing	Future
TSS	72.2%	25.3%	73.3%
TP	40.5%	15.4%	41.7%

Lower Fox River (Downstream)

- Requires Additional TSS and TP Control



Individual Implementation Plan Elements

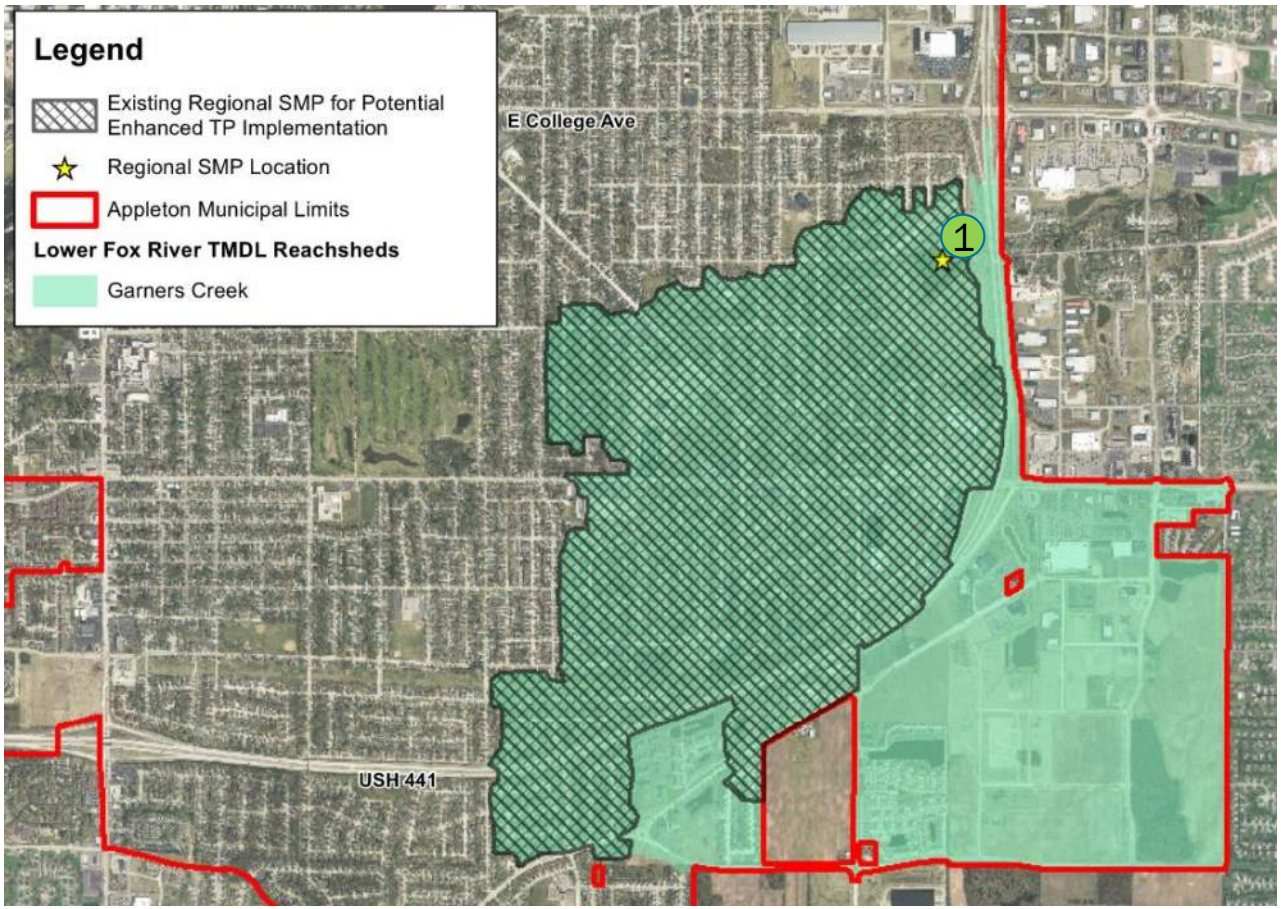
1. Wisconsin Avenue Pond (2044-2048)
2. Winslow Avenue Pond (2049-2053)
3. Leona Street Pond Enhanced TP (2059-2063)
4. MPPS Pond Enhanced TP (2069-2073)
5. MPPNE Pond Enhanced TP (2074-2078)
6. Reid GCS Pond Enhanced TP (2079-2083)
7. 57 HSDs (various years)

Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	13.6	56.7	$4,626,484
2	25.0	75.3	$6,164,580
3	2.8	44.0	$2,982,447
4	10.5	154.0	$4,008,291
5	3.2	58.0	$4,646,473
6	1.7	52.0	$5,387,056
7	8.4	16.5	$1,425,000
Total	**65.2**	**456.5**	**$29,240,330**

Lower Fox River (DS)

Pollutant	Target	Existing	Future
TSS	72.2%	36.0%	77.8%
TP	40.5%	23.5%	46.3%

Garners Creek
- Meets TSS, Requires Additional TP Control



Individual Implementation Plan Elements

1. Kensington Pond Enhanced TP (2054-2058)
2. Purchase Floc Dredge Equipment (2059)

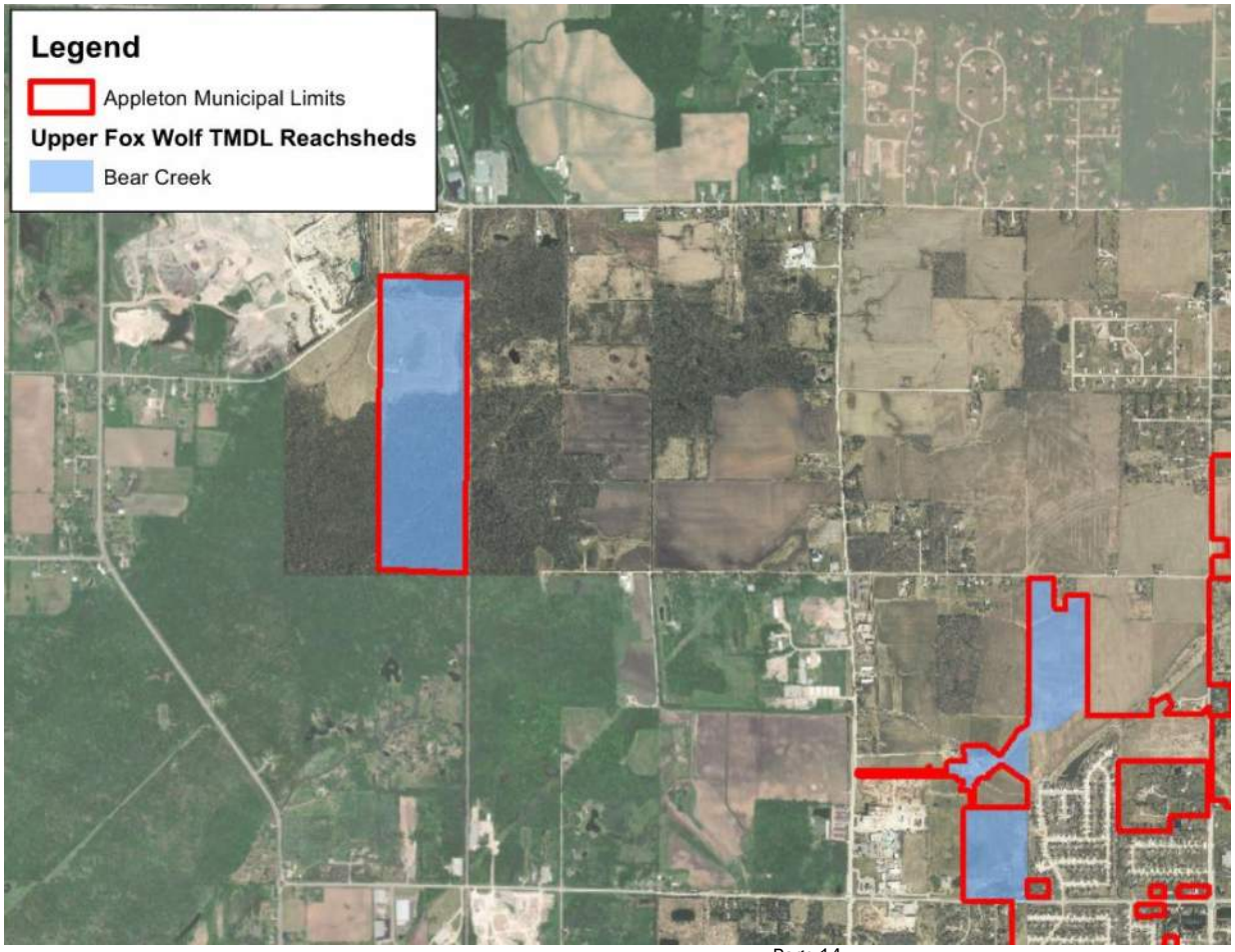
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	11	181	$2,572,840
2	N/A	N/A	$703,500
Total	**11**	**181**	**$3,276,340**

Garners Creek

Pollutant	Target	Existing	Future
TSS	59.9%	75.9%	61.9%
TP	68.6%	56.0%	69.0%

Bear Creek (New Planning Area)

- Requires Additional TSS and TP Control



Individual Implementation Plan Elements

- None Currently Identified
- New Planning Area in Upper Fox-Wolf TMDL
- Potential TSS and TP reductions possible for swales/filter strips at old City landfill area – will evaluate at next plan update
- Will move toward compliance as area develops
- Achieving 85.6% TP Reduction Target is limited by available/cost-effective technology

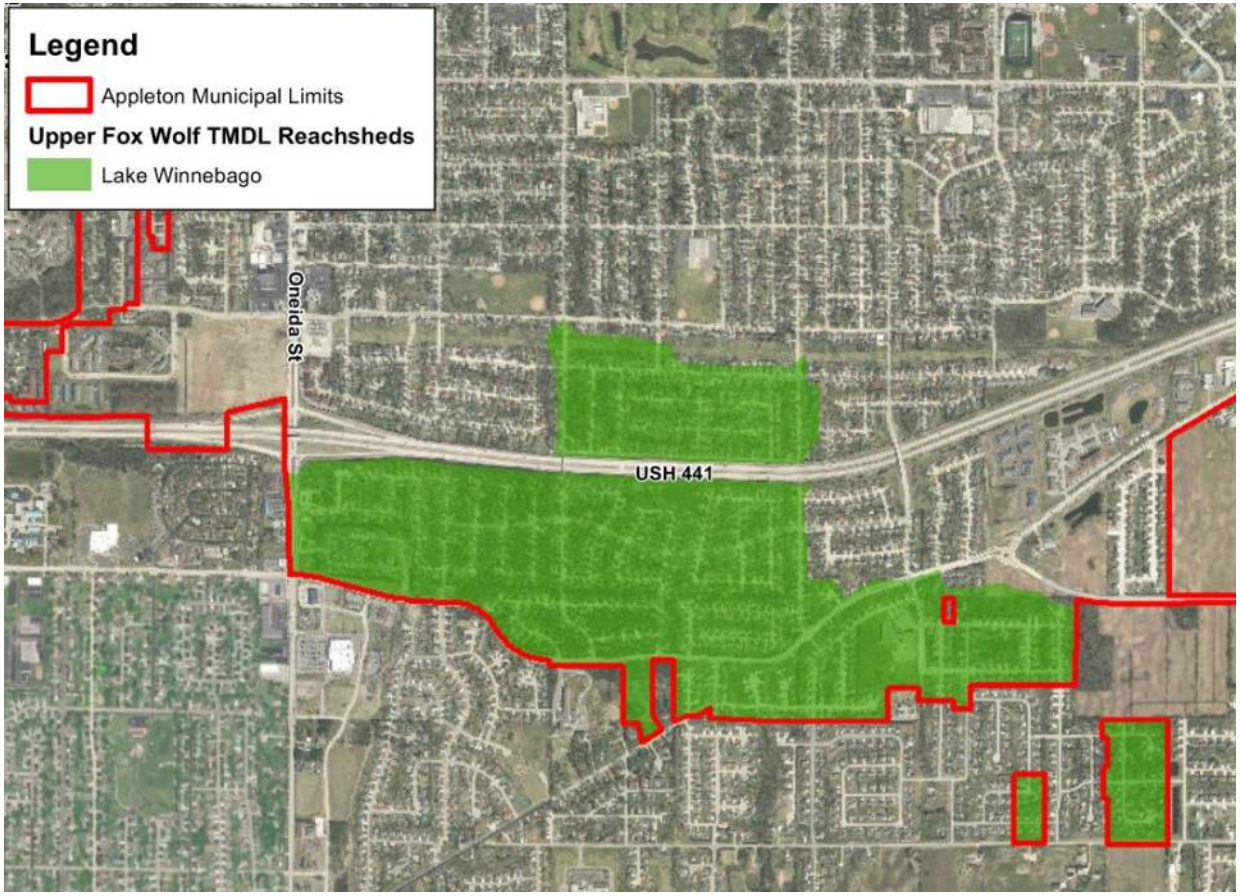
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
N/A	N/A	N/A	$0
Total			**$0**

Bear Creek

Pollutant	Target	Existing	Future
TSS	84.0%	25.8%	25.8%
TP	85.6%	11.4%	11.4%

Lake Winnebago (New Planning Area)

- Meets TSS, Requires Additional TP Control



Individual Implementation Plan Elements

1. 11 HSDs (various years)

- New Planning Area in Upper Fox-Wolf TMDL
- Achieving 85.6% TP Reduction Target is limited by cost-effective technology

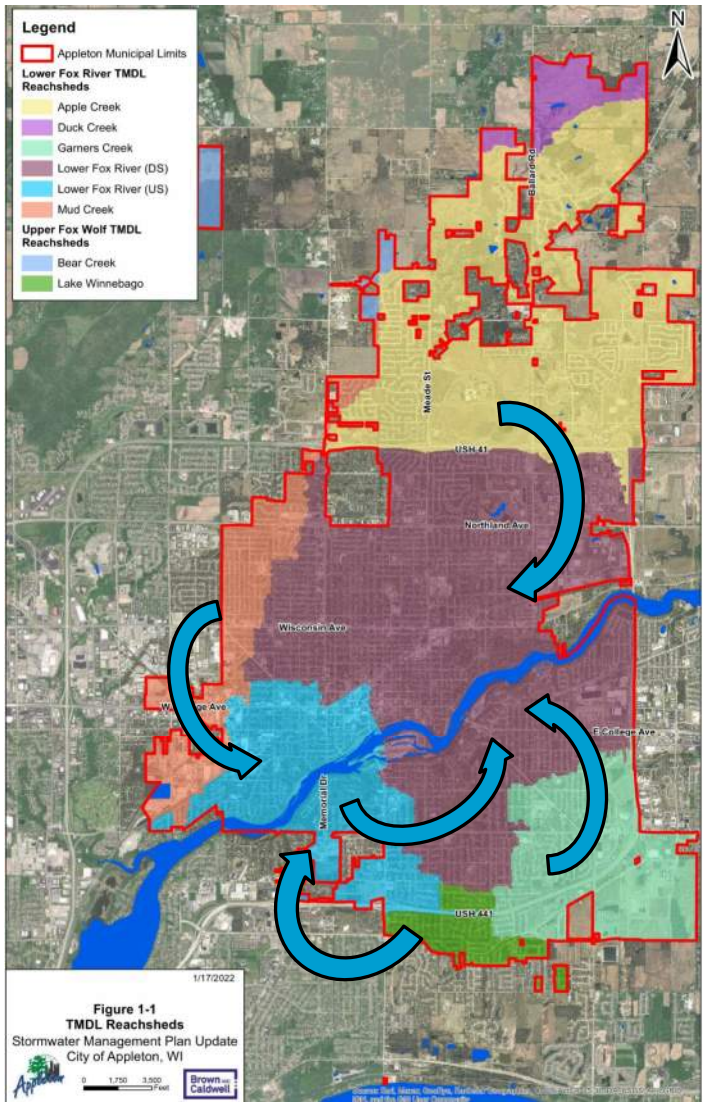
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	0.5	2.5	$275,000
Total			**$275,000**

Lake Winnebago

Pollutant	Target	Existing	Future
TSS	20.0%	22.4%	22.1%
TP	85.6%	15.3%	23.1%

Internal Trading

Reachsheds with Existing (or Future) TSS and/or TP in Excess of TMDL Targets Can be Applied (Traded) to Downstream Reachsheds



Lower Fox River (US)

Pollutant	Target	Existing	w/o Trading	w/ Trading
TSS	72.2%	25.3%	68.5%	73.3%
TP	40.5%	15.4%	46.5%	41.7%

Lower Fox River (DS)

Pollutant	Target	Existing	w/o Trading	w/ Trading
TSS	72.2%	36.0%	57.7%	77.8%
TP	40.5%	23.5%	40.1%	46.3%

2014 vs 2020 Results Comparison

TMDL Reachshed Targets and Reductions vs 2014 and 2020 Study Results								
	Total Suspended Solids				Total Phosphorus			
Reachshed	TMDL Target TSS Load Reduction %	2014 With Controls TSS Reduction %	2020 With Controls TSS Reduction %	2020 Plan Future Conditions TSS Reduction %	TMDL Target TP Load Reduction %	2014 With Controls TP Reduction %	2020 With Controls TP Reduction %	2020 Plan Future Conditions TP Reduction %
Lower Fox River TMDL								
Apple Creek	52.0%	79.6%	69.7%	53.6%	40.5%	59.6%	48.3%	41.2%
Duck Creek	52.0%	69.2%	73.7%	74.4%	40.5%	43.8%	48.5%	48.9%
Garners Creek	59.9%	78.0%	75.9%	61.9%	68.6%	58.7%	56.0%	69.0%
Lower Fox River Mainstem (DS)	72.2%	29.3%	36.0%	77.8%	40.5%	20.3%	23.5%	46.3%
Lower Fox River Mainstem (US)	72.2%	17.8%	25.3%	73.3%	40.5%	11.4%	15.4%	41.7%
Mud Creek	42.8%	21.3%	28.6%	48.1%	48.2%	13.8%	20.8%	48.5%
Upper Fox-Wolf TMDL								
Bear Creek	84.0%	32.3%	25.8%	25.8%	85.6%	26.8%	11.4%	11.4%
Lake Winnebago	20.0%		22.4%	22.1%	85.6%		15.3%	23.1%


Questions and Discussion

City of Appleton
Stormwater Quality Management Plan

Prepared for
City of Appleton
Appleton, WI
March, 2022

250 East Wisconsin Avenue, Suite 1600
Milwaukee, WI 53202-4203
T: 414.273.8800

Table of Contents

List of Figures in Appendix A

List of Tables

List of Abbreviations

2014 Plan	2014 City of Appleton Citywide Stormwater Management Plan
2020 Plan	2020 City of Appleton Stormwater Quality Management Plan
ac	acre
ADT	average daily traffic
AIS	Aquatic Invasive Species
BRRTS	Bureau for Remediation and Redevelopment Tracking System
CEA	Central Equipment Agency
City	City of Appleton
DPW	Department of Public Works
EPA	United States Environmental Protection Agency
FWWA	Fox-Wolf Watershed Alliance
GIS	Geographical Information System
GO	general obligation
HSD	hydrodynamic separation devices
IDDE	illicit discharge detection and elimination
MDRNA	Medium Density Residential No Alleys
MEP	maximum extent practicable
MS4	Municipal Separate Storm Sewer System
MSB	Municipal Services Building
NEWSC	Northeast Wisconsin Stormwater Consortium
NHI	Natural Heritage Inventory
NPS	nonpoint source
NRCS	Natural Resource Conservation Service
SCM	Stormwater Control Measure (term used interchangeably with “SMP”)
SMP	Stormwater Management Practice (term used interchangeably with “SCM”)
SWMP	Stormwater Management Plan
TMDL	total maximum daily load
TP	total phosphorus
TSS	total suspended solids
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
wastewater utility	City of Appleton’s Wastewater Utility
WDNR	Wisconsin Department of Natural Resources
WinSLAMM	Windows Source Loading and Management Model
WisDOT	Wisconsin Department of Transportation
WLA	waste load allocation
WPDES	Wisconsin Pollutant Discharge Elimination System
WQBEL	water quality-based effluent limitations
yr	year

Throughout this document the terms “WPDES permit”, “Stormwater Permit”, and “MS4 permit” are used interchangeably to refer to the Wisconsin Department of Natural Resources (WDNR) General Permit to Discharge Under the Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-S050075-3. This general permit regulates all discharge from the Municipal Separate Storm Sewer System (MS4) owned and operated by the City of Appleton.

Executive Summary

Introduction and Purpose of this Plan

The City of Appleton's (City) stormwater discharge quality is regulated under a Wisconsin Department of Natural Resources (WDNR) Municipal Separate Storm Sewer System (MS4) permit. The permit was originally issued in 2006 and was most recently reissued in 2019 (WI-S050075-3). The permit requires the City to conduct various stormwater management program elements geared towards reducing stormwater pollution from its existing storm sewer system. Further details on the MS4 permit and regulatory drivers can be found in Section 1.

Stormwater quality management planning allows the City to assess compliance with specific numeric requirements of the permit and to identify implementation measures to move towards full compliance. Specifically, the City is obligated to move towards meeting total maximum daily load (TMDL), total suspended solids (TSS), and total phosphorus (TP) requirements for areas of the City that discharge within the six reachsheds (waterway drainage areas) of the Lower Fox River Basin and Lower Green Bay TMDL (which was the focus of the City's 2014 Stormwater Management Plan) and the two reachsheds of the Upper Fox and Wolf River basin TMDL (approved by EPA February 2020). Section 2 provides more information on the reachsheds and the project setting.

The purpose of this plan is to use computer modeling following WDNR guidance and provide the information required by DNR to:

1. Update the "no controls" (unmanaged) pollutant load from all applicable areas of the City
2. Update the "with controls" (current managed) pollutant load
3. Evaluate and consider potential stormwater management practices (SMPs) that the City could implement to further improve stormwater discharge quality
4. Develop an implementation plan that identifies specific practices, the timing of those practices, and their impact on moving towards compliance with the TMDL reduction targets
5. Meet the requirements of the WPDES permit WI-S050075-03

Stormwater Management Plan Analysis Methodology

This study recalculated the no controls stormwater pollutant loads throughout the City using the WinSLAMM (Source Loading and Management Model for Windows) computer model, representing runoff conditions as if it was completely unmanaged by the City. Next, the impact of existing stormwater management measures on discharge stormwater quality was calculated throughout the City.

Management measures evaluated include street cleaning, grass swales, regional stormwater management practices (SMPs), and non-regional SMPs. Results are managed on a reachshed basis to allow comparison to the TMDL reductions identified in the respective TMDL studies. Details on the no controls and with controls evaluations are in Section 3.

Following the no controls and with controls analyses, a variety of potential stormwater management measures were evaluated. These include:

- Enhancements to the existing street cleaning and leaf collection programs
- Construction of additional regional SMPs
- Augmenting existing or future SMPs with coagulant treatment systems to improve settling and increase nutrient removal

- Consideration of the impact of new development and redevelopment on progress towards meeting TMDL reduction goals, including how ordinance changes could be impactful
- Potential to use water quality pollutant trading with the City's wastewater utility, other partners and within the City's reachsheds
- Review of new and other technologies

Alternative stormwater practices evaluated are detailed in Section 4.

Summary of Results and Conclusions

Current Progress Towards TMDL Compliance

The results of the analysis can be seen in Table ES1 which includes information on the results from the 2014 study and this study in comparison to the various TMDL reduction targets (bold text indicates that TMDL reachshed reduction targets are met or exceeded).

Table ES-1. TMDL Reachshed Targets and Reductions vs 2014 and 2020 Study Results

Reachshed	TMDL Target TSS Load Reduction %	2014 With Controls TSS Reduction %	2020 With Controls TSS Reduction %	TMDL Target TP Load Reduction %	2014 With Controls TP Reduction %	2020 With Controls TP Reduction %
Lower Fox River TMDL						
Apple Creek	52%	**79.6%**	**69.7%**	40.5%	**59.6%**	**48.3%**
Duck Creek	52%	**69.2%**	**73.7%**	40.5%	**43.8%**	**48.5%**
Garners Creek	60%	**78.0%**	**75.9%**	68.6%	58.7%	56.0%
Lower Fox River Mainstem (DS)	72%	29.3%	36.0%	40.5%	20.3%	23.5%
Lower Fox River Mainstem (US)	72%	17.8%	25.3%	40.5%	11.4%	15.4%
Mud Creek	43%	21.3%	28.6%	48.2%	13.8%	20.8%
Upper Fox-Wolf TMDL						
Bear Creek	84%	32.3%	25.8%	85.6%	26.8%	11.4%
Lake Winnebago	20%		**22.4%**	85.6%		15.3%

Comparing the 2014 and 2020 reductions to the TMDL reduction goals results in the following observations:

- The 2014 study did not include TSS and TP reductions for Bear Creek and Lake Winnebago individually.
- The City meets TSS reduction goals in four of the eight reachsheds and TP reduction goals in two of the eight reachsheds with this analysis, which is similar to 2014.
- TSS and TP reductions improved in four of the six Lower Fox River TMDL reachsheds.
- Garners Creek TSS and TP reductions decreased slightly due to changes in land use and minor reduction in Coop Road Pond and Kensington Pond regional SMP treatment efficiency based on WinSLAMM models developed in this study rather than applying TSS reduction rule-of-thumb treatment efficiency based on wet detention pond surface area.
- Apple Creek TSS and TP reductions decreased due to changes in land use and annexation of areas, including Plamann Park, which have few current stormwater treatment practices.

Implementation Plan for TMDL Compliance

Following the evaluation of potential practices, Brown and Caldwell and City staff worked together to select components for implementation. The implementation plan includes a mix of items that provide measurable improvement towards meeting the TMDL goals, such as new wet detention ponds and purchasing additional high efficiency street sweepers. It also includes some that do not provide numeric improvement but are instrumental in continuing the success of the City's overall plan, such as updating stormwater utility billing information and expanding the municipal services building to accommodate new stormwater related equipment. Full implementation plan tables are located in Appendix D and Section 6 provides details on the selected components.

One plan element that was identified to help move towards compliance, particularly in some of the oldest and more densely developed areas of the City, is the modification of the City's post-construction stormwater management ordinance. The ordinance updates include requiring new development and redevelopment sites to meet the TMDL reduction numeric standards if they are higher than what is currently required by the ordinance (based on state-wide standards). This is discussed further in Section 5.

Significant capital projects are generally timed to occur every 5 years (such as planning and constructing a new wet detention pond) to coincide with the MS4 permit cycles. The implementation plan extends into the year 2140, which is primarily tied to the redevelopment component. The plan suggests that the City will be in compliance with TSS and TP TMDL reduction targets for all six of the Lower Fox TMDL reachsheds at the end of 2140 and with TSS reduction targets for Lake Winnebago. However, the implementation plan does not show that the TP target for Lake Winnebago and both the TSS and TP targets for Bear Creek can be met by the end of 2140.

Section 1

Introduction

The City of Appleton's (City) stormwater discharge quality is regulated under a Wisconsin Department of Natural Resources (WDNR) issued Municipal Separate Storm Sewer System (MS4) permit. The permit was originally issued in 2006 and was most recently reissued in 2019 (WI-S050075-3). The permit requires the City to conduct various stormwater management programs including reduction of stormwater pollution from its existing storm sewer system. See Section 1.3 for a discussion on several important revisions contained in this most recent permit.

In 2005, the City completed a Citywide Stormwater Management Plan to evaluate stormwater discharge quality on a citywide basis. That plan was updated in 2008 to assess compliance with NR151.13 Developed Urban Area Performance Standard for total suspended solids (TSS). Details of the performance standard are included in Section 1.1 of this report. The 2008 Plan indicated that the City had met and exceeded the required 20 percent TSS reduction.

The plan was updated again in 2014, following the WDNR publication of the "Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay" (Lower Fox TMDL), which was approved by the United States Environmental Protection Agency (EPA) in March 2012. The "City of Appleton Citywide Stormwater Management Plan", AECOM October 2014 (2014 SWMP) assessed both compliance with NR151.13 performance standards and the individual water quality reduction targets that were set by the Lower Fox TMDL on a reachshed basis. The 2014 Plan reported the following:

- On a citywide basis, TSS was reduced by 38 percent and was in compliance with the NR151.13 requirement.
- Total phosphorus (TP) was reduced by 28 percent (which does not have a specific reduction target under NR151.13).
- The City was in compliance with TSS reductions for three of the six TMDL reachsheds (Apple Creek, Duck Creek, Garners Creek) and with TP reductions for two of the six reachsheds (Apple Creek, Duck Creek).

This stormwater management plan builds upon the information generated during the 2014 Plan, updates models based on changes in development conditions (soils, land use, city limits, additional stormwater management practices [SMPs], etc.), and evaluates additional SMPs that could assist the City with continuing to move towards compliance with all TMDL pollutant targets. Stormwater pollution analyses were conducted with a focus on compliance with the Lower Fox TMDL, and the "Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids Upper Fox and Wolf Basins" (Upper Fox/Wolf TMDL) study that was approved by EPA in February 2020. This report is partially funded by a WDNR Urban Non-point Source & Storm Water (UNPS&SW) Program Planning Grant. The remaining funding is provided for through the City of Appleton's Stormwater Utility.

The full TMDL reports can be found on the WDNR's website at https://dnr.wi.gov/topic/tmdls/. This plan fulfills the TMDL stormwater planning requirements for the City located in Appendix A and Appendix C of the MS4 Permit. The methodology, analytical approach, and the results are described in subsequent sections of this document.

1.1 NR151 Developed Urban Area Performance Standard for Pollution Reduction.

The Developed Urban Area Performance Standard (NR 151.13) for MS4 permit holders has been in place since October 2004, when the Administrative Code NR151 Runoff Management requirements were promulgated by the WDNR. This standard requires municipalities with MS4 permits to reduce pollution from areas within the City that were developed as of October 2004. When this standard was first put in place, the City was required to meet TSS pollution reductions from a no controls condition of 20 percent by March 31, 2008, and 40 percent by March 31, 2013. These control levels were applied to the City as a whole.

Under state budget bill 2011 Wisconsin Act 32, two provisions were passed which directly impacted the Developed Urban Area Performance Standard.

- The March 31, 2013 deadline regarding the 40 percent TSS reduction requirement from existing urban areas was removed. The requirement to meet the 20 percent TSS reduction is still in force, as are all performance standards addressing new land development and land redevelopment.
- A second provision of 2011 Wisconsin Act 32 identified that where a permitted municipality had achieved a reduction above the 20 percent TSS performance standard, all structural best management practices in place on July 1, 2011, must be maintained to the maximum extent practicable.

As noted previously, the pollution reduction analysis conducted under the 2014 Plan found that the City was achieving a 38 percent reduction in TSS (from a no controls condition). This means that the City complies with the current NR 151.13 requirement, and the City must continue to maintain the existing management measures. Maintenance of existing practices is covered in the City's Pollution Prevention Plan covering permit section 2.6.

Because the City meets the NR 151.13 pollution reduction targets, the remaining portions of the plan will focus on TMDL compliance, and policies and procedures applicable to the WDNR's TMDL guidance.

1.2 TMDL Program and Pollution Reduction Targets

The Lower Fox TMDL and Upper Fox/Wolf TMDL reports establish Wasteload Allocations (WLAs) and associated pollution reduction requirements for TSS and TP for each reachshed in the City of Appleton. A "reachshed" is the watershed (drainage area) to an identified segment of a stream, river, or other water body as defined in the TMDL document.

In 2012, the Lower Fox TMDL study established pollution reduction goals (TSS and TP) for each of the six reachsheds that receive discharge from the MS4. In 2020, the Upper Fox/Wolf TMDL study established TSS and TP targets for the remaining two reachsheds in the city. Reachsheds and their corresponding reductions are found in Table 1-1 and can be seen graphically in Figure 1-1 located in Appendix A.

The two TMDL studies present the required reductions somewhat differently. The Upper Fox/Wolf TMDL presents pollution reduction requirements for a reach as "Local", "Downstream", and "Total" reductions from baseline loads. For example, in Table 5 of Appendix H of the Upper Fox/Wolf TMDL report, the Bear Creek TMDL reach (TMDL Subbasin 52 in the Upper Fox/Wolf TMDL report) has a "Local" reduction of 51 percent, "Downstream" reduction of 32 percent, and corresponding "Total" reduction of 83 percent for TP allocated to the City of Appleton, all expressed as reductions from baseline loads. (The importance of the word baseline will be addressed in a subsequent paragraph.) The intent of this breakdown is to explain the amount of stormwater pollution reduction that is needed

to reduce the impairment of the "local" waterway (in this example Bear Creek), and pollutant reductions must be made within the drainage area to Bear Creek (direct drainage subbasin or from an upstream drainage area). The remaining 32 percent can be found from anywhere within the drainage area for Lake Winnebago to meet more stringent downstream reduction requirements. For the purpose of this study, it is assumed that the City must meet the "Total" reduction requirement for each reachshed and only those are presented in this report.

The Lower Fox TMDL did not express reductions in the same manner as the Upper Fox/Wolf TMDL report. The information is not expressed in terms of "Local" and "Downstream" but only the total reduction from baseline that is required. Information on each reachshed is presented in Section 6 of the Lower Fox River TMDL report document.

Furthermore, the required reductions reported in each of the two studies are represented as reductions from baseline conditions. This is not the same as the no controls conditions that are customarily used in citywide water quality studies in Wisconsin and described in WDNR guidance documents. The two studies were required to assume that the NR151 reductions of 20 percent for TSS (and a corresponding 15 percent for TP) were being met by the municipalities. (See page 57 of the Upper Fox/Wolf TMDL report for a more detailed description and reasoning.) This means that the actual reduction requirements from baseline are higher than those listed in tables in the TMDL reports. For example, in the Apple Creek reachshed, the Lower Fox TMDL report (table on page 54) identifies a reduction of 40 percent from baseline loads of TSS is required from the Appleton MS4. In this case, the baseline assumes a 20 percent reduction in TSS has already been achieved, so to calculate the reduction from no controls, the equation is: 20% + (0.80 * 40%) = 52%.

Using the prior example of Bear Creek in the Upper Fox/Wolf TMDL report, an 83 percent reduction in TP is required from baseline loads from the Appleton MS4. In this case, the baseline assumes a 15 percent reduction in TP has already been achieved, so to calculate the reduction from no controls, the equation is: 15% + (0.85 * 83%) = 85.55% (say 85.6 percent when rounded).

The pollution reduction targets in Table 1-1 are based on a no controls condition which is consistent with the way NR 151 pollution reduction levels are established. The various receiving waters are described further in Section 2.3.

It should further be noted that the 85.6 percent TP reduction goal established for the two Upper Fox/Wolf TMDL reachsheds is very challenging. The phosphorus found in urban stormwater is generally comprised of approximately 80 percent particulate phosphorus and 20 percent soluble phosphorus. Many of the common stormwater management measures mainly remove the particulate forms of a pollutant and have less impact on the soluble form. Thus, even if 100 percent of the particulate form of phosphorus is removed from all sources of stormwater, that would represent, at the most, approximately an 80 percent reduction in TP—still short of the required reduction. To achieve the higher TMDL TP Reductions, both the particulate and soluble forms of phosphorus will need to be addressed.

Table 1-1. TMDL Reaches Corresponding Reduction Requirements [1]				
TMDL Reach	TMDL Report Identified TSS Reduction [1]	City Required TSS Reduction [1]	TMDL Report Identified TP Reduction [1]	City Required TP Reduction [1]
Lower Fox TMDL Reachsheds				
Apple Creek	40%	52.0%	30%	40.5%
Duck Creek	40%	52.0%	30%	40.5%
Garners Creek	49.9%	59.9%	63.1%	68.6%
Lower Fox River Mainstem (DS)	65.2%	72.2%	30%	40.5%
Lower Fox River Mainstem (US)	65.2%	72.2%	30%	40.5%
Mud Creek	28.5%	42.8%	39%	48.2%
Upper Fox/Wolf TMDL Reachsheds				
Bear Creek	80%	84.0%	83%	85.6%
Lake Winnebago	0%	20.0%	83%	85.6%

[1] *Sources: "Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids Upper Fox and Wolf Basins" and "Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay". See Section 1.2 for difference between TMDL Report and City Required TMDL reductions.*

1.3 Revisions to the MS4 Permit

The current WDNR General Permit to Discharge Under the Wisconsin Pollutant Discharge Elimination System, WPDES Permit No. WI-S050075-3 (commonly referred to as the MS4 Permit) was effective May 1, 2019. The MS4 Permit regulates stormwater quality from the City's stormwater system and defines compliance requirements and schedules for meeting the TMDLs pollution reduction goals.

Important TMDL requirements that impact the City relative to Lower Fox TMDL areas are described in the MS4 Permit's "Appendix A: MS4 Permittees Subject to a TMDL Approved Prior to May 1, 2014 including Applicable Updates". Because the City is not currently in compliance with TMDL reductions for all reachsheds in the Lower Fox TMDL, the City will need to follow the most suitable path to compliance based on options outlined in "A.5 Compliance Over Multiple Permit Terms", as well as adhere to "A.6 Reporting Requirements".

Additional requirements that impact the City relative to Upper Fox/Wolf TMDL areas are described in the MS4 Permit's "Appendix C: MS4 Permittees Subject to a TMDL Approved After May 1, 2019". Because the City is not currently in compliance with TMDL reductions for all reachsheds in the Upper Fox/Wolf TMDL, the City will need to follow section "C.4. TMDL Implementation Plan", as well as adhere to "C.5. Annual Reporting"

The full WPDES General Permit with the referenced appendices is in Appendix E

This Plan was prepared to meet applicable requirements of both appendices to the extent practicable.

Section 2

Project Setting

2.1 Overview

The City of Appleton is in northeastern Wisconsin, with land areas primarily in Outagamie County but with portions in Calumet and Winnebago Counties. The City is situated on the Fox River and is known as one of the "Fox Cities". The US Census Bureau reported a 2010 population of 72,623 for the City, and the 2018 estimate was 74,526 and is expected to have continued to grow. The 2020 municipal boundary encompassed over 25 square miles.

2.2 Defining the Project Area – Excluded Areas

The project area for compliance with the Upper Fox/Wolf and Lower Fox TMDLs involves analyzing all urban developed land as of the date of this study. For this purpose, the land use, drainage, and management conditions, as defined on the data files provided by the City, are considered current conditions. These files reflect conditions as of approximately July 2020.

A WDNR policy memo "TMDL Guidance for MS4 Permits: Planning, Implementation, and Modeling Guidance" (document number 3800-2014-04) issued October 2014, and recertified September 16, 2019, clarified how municipalities should conduct their TMDL analysis. The document describes areas that are required for inclusion in a study and areas that are optional for inclusion (typically referred to as excluded areas). This policy memo can be found on the WDNR's website along with other MS4 modeling guidance documents at:

https://dnr.wi.gov/topic/stormwater/standards/ms4_modeling.html.

The areas excluded from this TMDL analysis are identified as follows:

- Agricultural areas that are not discharging to an existing or imminently implemented stormwater control measure (SCM), except under limited circumstances where the agricultural area is tributary to an implemented SCM, but development has been stalled for a prolonged period of time, or the developer has deviated from the approved plan.
- Lands within the Wisconsin Department of Transportation (WisDOT) right-of-way that are operated and maintained by WisDOT (see Appendix B for Memorandum of Agreement between WisDOT and City of Appleton for the USH10/STH 441 area).
- Major open water features–specifically the Fox River. Minor water features are included within their surrounding land use category.
- Riparian areas with direct discharge to a receiving water (not discharging to the City's MS4). A list of parcels with excluded riparian areas is located in Appendix B.
- Industrial areas permitted under NR 216 and not discharging to an existing City SCM). A list of parcels with excluded industrial areas is located in Appendix B.

The City has Memorandums of Understanding with Calumet and Outagamie Counties that identify responsibilities of the respective entities for road rights-of-way within the City of Appleton. Those agreements identify the responsibility of the City for storm sewer maintenance and street sweeping, and, thereby, the pollutant loadings and credits for SCMs fall on the City. There are no agreements in place or needed with Winnebago County. County Agreements can be found in Appendix B.

There are no current agreements in place with neighboring municipalities that identify limits of individual responsibilities for the City of Appleton or the adjoining municipality. Therefore, it is assumed that roadways that fall within the municipal limits of the City of Appleton are under the jurisdiction and responsibility of the City of Appleton for maintenance and associated pollutant loadings. Figure B-1 located in Appendix B, shows streets along the boundary areas of the City limits of the City of Appleton. This figure was shared with a representative from McMahon who is an engineer for many of the adjacent municipalities and agreed with this approach.

Table 2-1 lists components of the 2,261 acres excluded from the pollution loading analysis and not subject to the MS4 Permit requirements. Figure 2-1 in Appendix A displays the locations of the excluded areas.

Table 2-1. Areas Excluded from the Pollution Loading Analysis

Exclusion Type	Excluded Area (ac)
Agricultural	1,101
WisDOT	404
Open Water	396
Riparian	292
Permitted Industrial Sites	67
Totals	**2,261**

Note: in some limited instances, an area may be eligible for exclusion under multiple conditions but is only listed once in Table 2-1.

2.3 TMDL Reaches and Reachsheds

Land area within the City of Appleton drains to one of seven impaired waters, either directly or indirectly, through tributaries via storm sewers or open channels. Impaired waters are often broken up into multiple segments (reaches) to better describe and categorize differing conditions within the waterway. Land area that drains to these impaired waters are referred to as subbasins or reachsheds.

These water resources are briefly described in the following sections. The descriptions were obtained from WDNR's "Explore Wisconsin's Waters" (http://dnr.wi.gov/water/default.aspx) and "Impaired Waters Search" (https://dnr.wi.gov/water/impairedSearch.aspx) tools on the WDNR website. Figure 1-1 in Appendix A displays the TMDL reachshed drainage areas within the City of Appleton.

2.3.1 Lower Fox TMDL

Six impaired water reachsheds (Apple Creek, Duck Creek, Lower Fox River Mainstem Upstream, Lower Fox River Mainstem Downstream, Garners Creek, and Mud Creek) were evaluated as part of the "Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay" (Lower Fox TMDL) approved by the EPA in March 2012. The City of Appleton drains directly to two reaches of the Fox River, one upstream of the "Middle Appleton Dam", located at river mile 32.18 near South Olde Oneida Street (Fox River Upstream) and one downstream of the "Middle Appleton Dam" (Fox River Downstream). While the TMDL reduction targets for both reaches were the same in the Lower Fox TMDL, they are presented in this report separately if they need to be addressed individually in the future.

Apple Creek

Apple Creek is a tributary to the Fox River downstream reach and joins the Fox River downstream of Wrightstown (upstream of DePere). Apple Creek impairments include elevated water temperature and degraded habitat due to TP and TSS. Upstream portions of Apple Creek and several tributaries originate or pass through the northern area of the City of Appleton. Most of the City north of Highway 41 drains to Apple Creek and constitutes the second largest collection of land area in this study. Land use is a mix of residential, commercial, institutional, industrial, and park/open spaces with some remaining agricultural areas.

Duck Creek

Duck Creek roughly parallels the downstream reaches of the Fox River and enters Lower Green Bay to the northwest of where the Fox River enters the bay. Duck Creek is impaired with degraded habitat and low dissolved oxygen due to TSS and TP. A small area on the northern most tip of the City is tributary to Duck Creek and is largely undeveloped and agricultural lands that are developing into primarily residential areas.

Garners Creek

Garners Creek is a tributary to the downstream reach of the Fox River. The upstream portion of Garners Creek originates in the southeastern area of the City and continues east until it joins the Fox River near Kaukauna. Impairments include a degraded biological community and habitat caused by elevated TP and TSS pollutants. Southeast areas of the City are tributary to Garners Creek and contains a mix of residential, commercial, and industrial areas, much of which is newer development, and runoff is treated through several large regional stormwater management practices (SMPs).

Lower Fox River Mainstem Downstream

The downstream reach of the Fox River mainstem starts at the Middle Appleton Dam and continues to the DePere dam. Impairments of this reach include low dissolved oxygen as a result of elevated TP. Approximately 40 percent of the City drainage area is tributary to this reach of the Fox River. It contains some of the oldest areas of the City, as well as newer growth areas, and is a mix of industrial, commercial, residential, and institutional land uses.

Lower Fox River Mainstem Upstream

The upstream reach of the Fox River mainstem originates at the Lake Winnebago outlet at Neenah/Menasha and continues to the Middle Appleton Dam. Impairments in this reach include low dissolved oxygen due to elevated TP. Southeastern areas of the City that drain to this portion of the Fox River contain a mix of residential, industrial, and commercial land uses from some of the older areas of the City.

Mud Creek

Mud Creek is a tributary water to the upstream reach of the Fox River. Mud Creek is located to the west of the City of Appleton and enters the Fox River upstream of the City limits. Mud Creek is impaired for degraded habitat due to TSS and TP but chronic and acute aquatic toxicity was also cited due to chlorides. A portion of the western edge of the City drains to Mud Creek and contains a mix of land uses including industrial, commercial, and residential areas.

2.3.2 Upper Fox/Wolf TMDL

Two of the impaired water reachsheds (Bear Creek and Lake Winnebago) were recently evaluated as part of the "Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids Upper Fox and Wolf Basins" (Upper Fox/Wolf TMDL) study that was approved by the EPA in February 2020.

Bear Creek

Bear Creek (TMDL subbasin 52 in the Upper Fox/Wolf TMDL) is an 18-mile-long tributary to the Wolf River. Impairments vary depending on the specific segment of the waterway but include degraded biological community, degraded habitat, and high phosphorus levels due to TSS and TP. A small area in the northwest portion of the City, including the landfill and developing residential land uses from agricultural areas, are tributary to this waterway.

Lake Winnebago

Lake Winnebago (TMDL subbasin 72 in the Upper Fox/Wolf TMDL) covers approximately 206 square miles and is the largest natural lake in Wisconsin. The primary inlet to the lake is the Fox River at Oshkosh, and its outlet is the Fox River at Neenah/Menasha upstream of the City of Appleton. The lake level is controlled via locks and dam at Neenah/Menasha. The lake is listed by the WDNR with numerous impairments including low dissolved oxygen, eutrophication, turbidity, and excess algal growth from pollutants that include TSS and TP. Some of the southernmost areas of the City (primarily residential land uses) drain to the lake through storm sewers and swales/ditches, passing through municipalities to the south of the city, prior to discharging at the north end of Lake Winnebago.

2.4 Land Use and Municipal Limits

2.4.1 General Background

The type and distribution of land use has a major impact on the hydrology and urban stormwater pollution within a watershed. The volume and rate of stormwater runoff increases as the percentage of impervious surfaces (streets, parking lots, roofs, etc.) in an area increases. In turn, the amount of impervious surface is related to land use. As development occurs, the impervious area generally increases significantly. Land use also plays an important role in determining the types and amounts of pollutants that are carried by runoff.

Highly urbanized commercial and industrial areas generally contain a high percentage of impervious area and generate high amounts of pollutants. These pollutants include sediment (TSS), nutrients (TP), bacteria, metals, and toxic substances. Less intensive development, such as low to medium density residential lands, contains a lower amount of impervious area and generates lower levels of TSS and TP.

2.4.2 Data Sources and Methods

To create the land use for the TMDL analysis, current (2020) parcel data was reviewed to determine the designated land use by parcel. That land use designation was then compared to the 2014 WinSLAMM land use designation and a 2017 aerial photograph of the City. The WinSLAMM designated land use was reviewed with City staff and adjusted based on staff knowledge of the City and modified for areas that are approved for development or in permitting or anticipated near term approval for development.

The City municipal limits were also modified as needed based on near term annexations of various parcels. In cases where development is anticipated to be imminent (generally within the timeframe of this study—2020/2021), the future condition land use was used in the analysis. In a few cases where development has been halted for several years or the developer is not following the original development plan, those land areas were left in an undeveloped or agricultural land use condition depending on the situation and will be adjusted in the future. The entire study area includes approximately 16,532 acres. After removing the 2,261 acres of excluded areas as noted in Section 2.2, the resulting analyzed area for this study is approximately 14,271 acres as shown by land use in Table 2-2.

Table 2-2. TMDL Categorized WinSLAMM Land Use

WinSLAMM Land Use	Area (ac)	Area (% of total)
Cemetery	120	1%
Commercial		
Commercial Downtown	117	1%
Office Park	570	4%
Shopping Center	480	3%
Strip Commercial	456	3%
Industrial		
Light Industrial	1,212	8%
Medium Industrial	145	1%
Institutional		
Hospital	63	0%
Institutional	504	4%
Schools	467	3%
Parks and Open Space		
Golf Course	116	1%
Open Space, Undeveloped	1,202	8%
Parks	696	5%
Railroad	91	1%
Residential		
Duplex	178	1%
Low Density Residential	740	5%
Medium Density Residential	5,197	36%
High Density Residential	1,244	9%
Multifamily Residential	658	5%
Mobile Home	14	0%
Totals	**14,271**	**100%**

The land use categories were selected to represent the best match to the definitions used by WinSLAMM and WDNR criteria for modeling. Figure 2-2 in Appendix A shows the WinSLAMM land uses for this study.

2.5 Precipitation

Precipitation data is another parameter that is used in WinSLAMM. When modeling stormwater pollution loadings, cumulative runoff, and pollution loads from the more frequent "normal" rain events (in the range of 0.25-inch to 1.5-inch rains) are more important than the pollution from the less frequent "larger" rain events. This is because the more frequent events generate the majority of the volume of urban stormwater runoff in any given year; therefore, modeling simulations are performed with rainfall records for a representative time period.

Current guidance from the WDNR stipulates that rainfall records for a specific five-year period should be used. Rainfall input files were developed by the USGS for several locations throughout the State of Wisconsin. The WDNR specifies that the file developed for a location closest to the project area be used in the analysis and also specifies what five-year period is to be used. Thus, the Green Bay five-year rainfall file for rain events between 1968 and 1972 was used for the stormwater pollution modeling in Appleton.

2.6 Soils

Soil properties influence the volume and rate of runoff generated from rainfall events. Soils that allow rainfall to freely drain into the ground (sandy soils) will result in lower runoff rates and volumes. Soils that restrict the infiltration of rainfall into the ground (clayey soils) will cause higher runoff rates and volumes. The United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) classifies soils based on their runoff potential into Hydrologic Groups A, B, C, or D. Soils in Hydrologic Group A have a high infiltration capacity and low runoff potential (generally sandy or gravelly soils). Group D soils have a low infiltration capacity and a high runoff potential (generally soils with high clay content).

The soils characteristics are occasionally updated by the USDA/NRCS. For this plan, the soils data was downloaded from the USDA/NRCS website in February 2020, and the soils files, dated September 14, 2019, were used. According to the NRCS Soil Survey, the project area consists of mostly Group C soils. There is a mixture of the other soils found in the remaining areas of the City. NRCS Soil Survey information shows that these soils exhibit a wide range of properties and infiltration ability. The NRCS Soil Surveys were developed to summarize soil characteristics. Actual soil conditions for a specific location can vary from the general (mapped) condition. Table 2-3 summarizes the extent of soil hydrologic groups within the project area. Figure 2-3 in Appendix A displays the distribution of NRCS hydrologic groups within the City.

Table 2-3. USDA/NRCS Soil Hydrologic Groups and WinSLAMM Designation for Project Area

Soil Hydrologic Group (USDA/NRCS)	WinSLAMM Soil Texture Designation	Project Area Coverage (ac)	Project Area Coverage (% of Total)
A	Sandy	774	5%
B	Silty	218	2%
C or D	Clayey	13,279	93%
Totals		**14,271**	**100%**

Section 3

Stormwater Pollution Analysis

Urban stormwater pollution is made up of many contaminants including sediment, nutrients, metals, organic compounds, and pathogens. Stormwater pollution can have significant negative impacts on receiving waters. The assessment of stormwater pollution through a modeling approach is the core of this Plan. The City has been issued, and is required to follow, a municipal stormwater discharge permit (MS4 Permit) which regulates stormwater pollution from the City's stormwater conveyance system. As previously discussed in Section 1.1, the City already meets the NR 151.13 TSS control requirements for TSS (see Section 4.2.1 on page 4-3 of the of the 2014 Plan for more details).

This study describes the stormwater pollution conditions in the City of Appleton with a focus on TSS and TP management in order to meet the Upper Fox/Wolf and Lower Fox TMDLs reduction targets for the City (see Table 1-1).

3.1 Methodology

To analyze TMDL stormwater pollution loads for the City's urban areas, a computer simulation model, WinSLAMM, Version 10.4.1, was used. WinSLAMM was originally developed by the WDNR and is now licensed by PV & Associates (see www.winslamm.com for more information). WinSLAMM is the most commonly used model in Wisconsin to assess urban stormwater pollution loads and SCM pollution reduction performance. The WDNR has established specific guidance for application of the model to assess pollution management related to TMDL targets by MS4s.

The project area, as described in Section 2.2, was determined based on WDNR guidelines to meet the compliance requirements of the Upper Fox/Wolf and Lower Fox TMDLs. In keeping with the WDNR guidelines for conducting these analyses and defining the "no stormwater control measure" or no controls condition a variety of steps were conducted as described in the following paragraphs.

A geographical information system (GIS) database was created or modified from the 2014 Plan containing information pertaining to stormwater pollution in the City. Information in the database includes:

- Soil Hydrologic Group and WinSLAMM soil texture designation
- Land use, as of approximately July 2020
- Street Drainage type (curb and gutter or grass swale)
- Stormwater Permitted entities within the municipal boundary (regulated industrial properties, WisDOT right-of-ways)
- Existing grass swales meeting WDNR requirements
- Existing street cleaning schedule
- Existing structural SCMs that are under the City's jurisdiction
- The municipal boundary as of July 2020 (and with pending annexations as noted previously)

WinSLAMM requires input files that describe characteristics of the soil, land cover, drainage system, and precipitation, and other factors of the project area. The model uses a five-year rainfall record to calculate runoff and pollution loads. As previously described, the 1968 to 1972 rainfall data for the City of Green Bay was used for this application.

WinSLAMM also requires support files. The United States Geological Survey (USGS) and WDNR developed versions of these files for use in Wisconsin. The files are based on extensive field monitoring and calibration. The latest versions of these WinSLAMM files were obtained from the USGS and used for this project.

The files used are:

- WisReg –Green Bay Five Year Rainfall.ran (1968 – 1972)
- WI_GEO03.ppdx
- WI_SL06 Dec06.rsvx
- V10.1 WI_AVG01.pscx
- WI_Res and Other Urban Dec06.std
- WI_Com Inst Indust Dec06.std
- Freeway Dec06.std

WinSLAMM was run, and pollution loads were calculated for each land use and reachshed for the TMDL analyzed areas. The pollutants analyzed for this project were TSS and TP.

3.2 Results: No controls Conditions

3.2.1 TMDL Reachshed Loads

To understand compliance with the Upper Fox/Wolf and Lower Fox TMDL pollution loading reductions for TSS and TP for each reachshed within the City (see Section 1.2 and Table 1-1 of this report), the pollution loads for each reachshed need to be calculated under a no controls condition. This is a theoretical condition of the amount of annual pollutant loading that would come from the City if there were no SCMs removing pollutants from stormwater runoff. The loadings are calculated using the WinSLAMM model based on the various combinations of land uses and soils for drainage areas in each reachshed that are included in the analysis. For the no controls condition, the entire analyzed area of the City (14,271 acres) is assumed to have curb and gutters because swales are considered to be a treatment practice. The resulting no controls load are listed in Table 3-1.

Table 3-1. No Controls Pollutant Loading Results

Reachshed	Total Area (ac)	TSS Load (tons/year)	TP Load (lbs/year)
Lower Fox TMDL Reachsheds			
Apple Creek	3,388	332.3	2,277.2
Duck Creek	57	3.8	33.7
Garners Creek	1,576	236.7	1,280.0
Lower Fox River Mainstem (DS)	5,966	830.6	5,015.6
Lower Fox River Mainstem (US)	1,664	229.1	1390.5
Mud Creek	1,055	164.7	868.0
Totals	**13,707**		
Upper Fox/Wolf TMDL Reachsheds			
Bear Creek	137	4.6	46.9
Lake Winnebago	427	47.2	346.6
Totals	**565**		

The total area analyzed in this study has increased by about 10 percent from the 2014 Plan. TSS and TP no controls loads have increased by 10 percent and 8 percent, respectively, when compared to the 2014 Plan. The increases in pollutant loadings seem reasonable and relatively proportional to the change in study area due to the expansion of the municipal limits and developed area in the City.

3.2.2 Impact of Soils Changes on No Controls Reachshed Loadings

As noted previously in Section 2.6, the NRCS periodically updates the soil survey information. The City was interested in understanding how these soil survey changes may be impacting no controls and "with-controls" (existing management) conditions results. To evaluate this for the no controls condition, the 2014 municipal limits were used as the boundary condition of this analysis and intersected with 2020 reachsheds, land use, excluded areas, and 2014 and 2019 soils information. The WinSLAMM model database was then compared to these data sets to model and compare no controls TSS and TP loads between 2014 and 2020 soils datasets.

The results of the analysis show that, in most cases, changes in NRCS soil types that occurred between the 2014 Plan and the 2020 Plan had very limited impact on pollutant loading to the no controls results. Impact on a citywide basis was minor reductions in no controls loads of about -0.1 percent for TSS and -0.2 percent for TP. Six of the eight reachsheds had no change in TSS load, with the other two having minor decreases in TSS load. Three of the eight reachsheds had no change in TP load, two reachsheds (Apple Creek and Garners Creek) had minor increases in TP load (0.2 percent and 0.1 percent, respectively) and three (Lower Fox River (DS), Lower Fox River (US) and Mud Creek) saw decreases of -0.3 percent, -0.9 percent, and -0.7 percent, respectively. A table ("Comparison of Impact of NRCS Soils Changes on Pollutant Loadings by TMDL Basin [Reachshed]) and figure (Figure B-2) showing the soils that changed between 2014 and 2020, with their 2020 soil type, is in Appendix B – Supplemental Project Information.

3.3 Existing Management Conditions With Controls Analysis

Following completion of the no controls conditions analysis to identify the amount of TSS and TP loads available within the project limits, the City's existing stormwater management practices (SMPs), sometimes referred to as stormwater control measures (SCMs) were evaluated. This evaluation is intended to compare how much progress the City has made towards achieving the TMDL goals for each of the various reachsheds in the City.

The following SMP categories are presented in the following sections:

- Street cleaning
- Grass swales
- Regional SMPs
- Non-regional SMPs

3.3.1 Street Cleaning

The City of Appleton, like other communities, has had a street cleaning program in place for many years, primarily for the aesthetic benefits of having clean and safe streets. Over time the program has expanded from conventional street cleaners to include high efficiency street cleaners which do a better job of removing the finer material that is more impactful to our water resources.

The City's current street cleaning schedule and approach was discussed with City of Appleton Department of Public Works (DPW) Operations and Engineering staff during a meeting on March 24, 2020. The City continues to maintain street cleaning efforts in three different zones: (1) commercial downtown zone; (2) main arterials and industrial areas; and (3) other remaining areas of the City.

Table 3-2 contains information on the various street cleaning zones including: scheduled cleaning frequency, equipment/sweeper type used, parking controls and cleaning season. Figure 3-1 in Appendix A displays the various street cleaning zones in the City as described in Table 3-2.

Table 3-2. Street Cleaning Program Details

Zone	Cleaning Frequency	Equipment	Parking Controls	Cleaning Season
Commercial Downtown	Twice per week, daily during special events	50% high efficiency, 50% mechanical	No overnight parking allowed 2am-5am, sweeping done during those hours	Mid-March to December 1st, weather permitting (snow is hauled from this area)
Main Arterials and Industrial Areas	Approximately every 10 days (target is weekly)	100% high efficiency	No parking allowed on mains; collectors and arterials partial parking allowed; industrial areas parking is allowed	Mid-March to December 1st
Other Areas of the City*	Every 3 weeks for areas without regional SMPs, Every 6 weeks for areas with regional SMPs	33% high efficiency, 67% mechanical	No overnight parking allowed 2am-5am, sweeping generally done during those hours	First week of April to December 1st

**Note: The closed City landfill does not have an associated roadway system that receives any street cleaning, so no practice is applied there.*

Currently, the City owns the following street cleaning equipment:

- 2 – Elgin Pelican NP (2012 and 2015 vintage) mechanical broom cleaners
- 1 – TYMCO 500x (2019) regenerative air street cleaner
- 1 – Elgin MX-16 (2011) dual purpose vacuum street cleaner and vac-all machine

Street cleaning equipment was reported to operate at approximately 4 miles per hour for high efficiency and mechanical cleaners. WinSLAMM street cleaning parameters for parking density and parking controls used in the water quality modeling were also confirmed with City Staff during the March 24 meeting and are listed by land use as shown in Appendix B ("WinSLAMM Street Cleaning Parameters"). Parking control details are also discussed in Table 3-2. According to City Staff, parking controls and/or street cleaning scheduled times are adequate to allow good curb access.

In 2019, the City removed approximately 3,940 cubic yards of street cleaning debris (per Appleton 2020 Budget, 2019 and 2020 target removal is 4,000 cubic yards), covering over 8,050 broom (curb) miles, estimated to weigh 1,188 tons. Costs for 2019 included $45,159 for landfill tipping fees, equipment replacement and operational costs of $252,762, and labor of $121,602 for a total cost of $419,523. Using these values, it costs the City approximately $353 per ton of material removed and disposed of, or $52 per broom/curb mile swept.

Applying the WinSLAMM model and the various zones of street cleaning, the impact of the City's street cleaning program to reduce TSS and TP loads on each reachshed are shown on Table 3-3. This equates to $1,329/ton of TSS removed annually using the WinSLAMM reductions and current city costs.

Table 3-3. Street Cleaning Program Pollutant Load Reduction Results					
Reachshed	Total Treated Area (ac)	TSS Load Reduction (tons/year)	TSS Reduction % (Compared to no controls total load)	TP Load Reduction (lbs/year)	TP Reduction % (Compared to no controls total load)
Lower Fox TMDL Reachsheds					
Apple Creek	3,388	60.3	18.1%	248.3	10.9%
Duck Creek	57	0.7	18.2%	3.2	9.5%
Garners Creek	1,576	39.1	16.5%	142.7	11.2%
Lower Fox River Mainstem (DS)	5,966	139.3	16.8%	539.2	10.7%
Lower Fox River Mainstem (US)	1,664	40.1	17.5%	157.3	11.3%
Mud Creek	1,055	25.5	15.5%	91.7	10.6%
Totals	**13,707**				
Upper Fox/Wolf TMDL Reachsheds					
Bear Creek	137	0.3	7.1%	1.3	2.8%
Lake Winnebago	427	806	18.2%	38.4	11.1%
Totals	**565**				

It is important to note that the number of tons of material removed from City streets as presented in the Appleton 2020 Budget document cannot be directly compared to water quality modeling estimated reductions of material. This is because the WinSLAMM model uses the "NURP" sediment file for the analysis which does not include particles larger than 800 microns, while the street cleaner collects material that can be much greater in size and includes the weight of moisture. That means model results for the amount of sediment removed by street cleaners associated with stormwater quality modeling will not match the actual amount of material collected by street cleaners that needs to be managed.

The majority of the City of Appleton (99 percent) is treated by the City's street cleaning program. The reason for the difference in total treated area in Table 3-3 compared to the total available area in Table 3-1 is that the City's closed landfill, located in Bear Creek, does not have any streets associated with it that are swept by the City.

3.3.2 Grass Swales

The City maintains small portions of its stormwater conveyance system as grassed swales. These engineered swales treat stormwater through filtration and infiltration of runoff.

The 2014 SWMP included eight areas containing grass swales that were identified as 1-A through 8-A and categorized by geographic area, and with similar soil and land use compositions. Each of the swales were evaluated in 2012 following the WDNR's "Process to Assess and Model Grass Swales" to develop field infiltration rates based on double-ring infiltrometer testing. The results of that effort were confirmed with WDNR Staff (Sarah Zareczny). Supporting documentation from the infiltration testing was provided in Appendix C of the 2014 SWMP. Additional swale areas were also identified but were noted as planned areas to be converted to urban roadway sections and were not included as water quality features in the 2014 SWMP analysis.

As part of this study, those same eight swale areas were discussed and reviewed with City Staff. No changes to the mapped swale in areas 1-A through 8-A were identified. Any swales that were no longer in place correlated to areas that were identified as being planned to be converted to urban sections, such as Edgewood Drive (CTH JJ) from Ballard to 600 feet east of Lightning Drive which was urbanized in 2017.

Additionally, BC did a cursory review of the swale areas to WDNR wetland inventory mapping to check if any swales were identified in a delineated natural wetland area. In conducting this analysis, BC found a small number of swale segments identified in the 2014 SWMP that were in delineated wetlands or did not exhibit the desired swale characteristics (e.g., did not convey low flows). These swale segments were removed from this analysis prior to modeling. Aside from these changes, the same swale treatment areas and infiltration rates used in the 2014 SWMP were used in this SWMP. The location of the swales and their corresponding treatment tributary areas are shown on Figure 3-2 in Appendix A.

Analyzing the water quality treatment benefits provided by grassed swale areas is not done in the same manner as some other SMPs where loads are based on application through treatment using scaled standard land use files. The nature of swales requires that individual models be developed for the swale treatment areas—much like individual models are developed for regional wet detention ponds—to accurately predict treatment efficiencies. Furthermore, for areas where grassed swales are tributary to a regional wet detention facility, the swales are modeled with the wet detention pond in series to provide the most accurate representation of the combined treatment practices. Based on this analysis, a total of 323 acres in the City are treated by swales as shown in Table 3-4 which identifies the TSS and TP reductions for each swale area, by reachshed. Only reachsheds that have analyzed swales are shown in the table.

Table 3-4. Grass Swale Pollutant Load Reduction Results

Reachshed	Swale ID(s) in Reachshed	Total Treated Area (ac)	TSS Load Reduction (tons/year)	TSS Reduction % (Compared to no controls total load)	TP Load Reduction (lbs/year)	TP Reduction % (Compared to no controls total load)
Lower Fox TMDL Reachsheds						
Apple Creek	4-A, 5-A, 6-A, 7-A, 8-A	242	19.3	5.8%	118.0	5.2%
Lower Fox River (DS)	1-A, 3-A	22	2.0	0.2%	13.5	0.3%
Mud Creek	3-A	39	5.7	3.4%	23.0	2.7%
Upper Fox/Wolf TMDL Reachsheds						
Lake Winnebago	2-A	20	2.0	3%	15.1	3%

3.3.3 Regional SMPs

Regional wet detention pond SMPs that have been designed and constructed to treat stormwater from developed (and developing) areas are a major part of improving stormwater quality in the City of Appleton. The 2014 SWMP identified 39 public and private regional wet detention ponds that were in place at the time.

In the past, some water quality ponds were sized and constructed based on WDNR guidance and a rule-of-thumb drainage area to surface area methodology. However, the real effectiveness is much more variable based on land use, outlet structure, and other factors. For this reason, the WDNR no longer finds using a rule-of-thumb approach sufficient evidence of the actual efficiency of a practice.

A WinSLAMM model must be created that represents the pond to establish the allowable pollutant removal efficiency and for the WDNR to accept that reachshed reduction goals have been achieved.

As part of this SWMP, existing WinSLAMM models that were available in the City's files were collected to develop a repository of existing models. Of the 39 ponds identified in the 2014 SWMP, four existing WinSLAMM models were located by City Staff. Those models were run and the TSS and TP results were used in this study. Figure 3-3 in Appendix A shows the tributary drainage area and approximate location of the facility based on the placement of the facility ID on the figure.

Because it was anticipated that not all of the previously identified ponds would have existing models available to verify pollutant reductions, this project included development of at least 10 WinSLAMM models to supplement those that were available. The City prioritized model development efforts in Apple Creek, Mud Creek, and Garners Creek reachsheds, as they were the closest to complying with their respective TMDL target reductions. The TSS and TP results from a total of 11 newly created models were generated and used for this study.

This leaves a gap of 24 models that still need to be created or requested from consultants or developers to complete the model repository for the 39 ponds discussed in the 2014 SWMP, although the City may not develop a model for the Crossing Meadow/MCN (pond 13) since it was not designed to WDNR wet detention pond standards. The remaining models will be developed as scheduled in the Implementation Plan of this report, to complete the backup information necessary to document the effectiveness of the City's regional SMPs. In the interim, this SWMP will utilize the TSS and TP removal effectiveness of the remaining 24 regional SMPs as reported in the 2014 SWMP. Differences in SMP effectiveness will be captured in the next Citywide SWMP update.

In addition to the 39 SMPs identified in the 2014 SWMP, the following 12 new regional wet detention ponds have since been designed and/or constructed in the City:

- Northland Pond
- Leona Pond
- Oneida/Highway 441 Pond
- Cotter Pond
- JJ/Lighting Pond
- North Edgewood Estates Pond
- Apple Ridge Subdivision (3 Ponds)
- Spartan Drive (3 Ponds)

Models for each of these new facilities were provided by the City, and the TSS and TP reductions reported by the models were used for this study. The details of these new facilities can also be found in Table 3-5B in Appendix B. Table 3-5 lists TSS and TP removals associated with regional SMPs by TMDL reachshed. Almost 41 percent of the area analyzed in this study is treated by regional SMPs. No regional SMPs are located in the Lake Winnebago reachshed.

Table 3-5. Regional SMP Pollutant Load Reduction Results						
Reachshed	Total Treated Area (ac)	Percent of Total Reachshed Area	TSS Load Reduction (tons/year)	TSS Reduction % (Compared to no controls total load)	TP Load Reduction (lbs/year)	TP Reduction % (Compared to no controls total load)
Lower Fox TMDL						
Apple Creek	2,556	75.4%	217.0	65.3%	1,026.9	45.1%
Duck Creek	15	26.3%	0.9	23.5%	5.2	15.5%
Garners Creek	1,540	97.7%	178.8	75.5%	714.4	55.8%
Lower Fox River Mainstem (DS)	1,587	26.6%	178.5	21.5%	717.5	14.3%
Lower Fox River Mainstem (US)	146	8.7%	12.2	5.3%	43.3	3.1%
Mud Creek	171	16.2%	15.5	9.4%	72.8	8.4%
Totals	**6,015**					
Upper Fox/Wolf TMDL						
Bear Creek	10	7.3%	1.1	23.8%	5.0	10.6%
Lake Winnebago	-	-	-	-	-	-
Totals	**10**					

The Regional SMP List contained in Table 3-5B in Appendix B lists the facility number, name, ownership (public or private), year constructed, TSS and TP removal efficiencies by reachshed, and if a WinSLAMM model is available. The City of Appleton is responsible for maintenance of regional SMPs that are designated as public and have maintenance agreements in place to ensure appropriate maintenance for SMPs that are identified as private.

3.3.4 Impact of Soils Changes on Regional SMP Load Reductions

As noted previously in Section 2.6, the NRCS periodically updates the soil survey information. The City was interested in understanding how these soil survey changes may be impacting no controls and with controls (existing management) conditions results. As stated in Section 3.2.2, the impact of soils changes on the no controls results on a citywide basis was a very minor reduction of about -0.1 percent for TSS and -0.2 percent for TP, with the greatest change on any individual reachshed being less than 1.0 percent.

To evaluate if there are impacts to individual regional SMPs, the soils maps created under Task 2 was compared against the drainage areas of the existing regional ponds to see if these SMPs are impacted by the soil changes. The Kensington facility appeared to have the largest soils data changes and had an available WinSLAMM model. That model was run with both old and new soils information to evaluate the impact of soils changes. The comparison indicated that soil changes had very little impact on results, with TSS reductions increasing by 0.01 percent and TP reductions increasing by 0.04 percent.

3.3.5 Non-Regional SMPs

Non-regional SMPs include biofilters, hydrodynamic separation devices (HSDs), catch basins, small water quality ponds, and filtering devices. SMP treatment areas can range from less than an acre to multiple acres. Non-regional SMPs are typically private; however, some SMPs, particularly HSDs, are public. The 2014 SWMP identified 82 non-regional SMPs as noted in Appendix E of that report. The information for the non-regional SMPs in the 2014 SWMP (drainage area, pollution reduction percentages) were generally utilized for this study unless a known change in condition warranted a different approach. No non-regional SMPs are located in the Upper Fox/Wolf reachsheds at this time.

Private Non-Regional SMPs

During the scoping of the UNPS grant, it was estimated that 54 new private, non-regional SMPs had been installed since the 2014 SWMP analysis. These were suggested to include 20 biofilters, 16 ponds, 15 HSDs/up-flow filters, and 3 artificial turf areas. These new SMPs were identified by reviewing Stormwater Permit Logs for Site Plan Reviews that typically included the development or project name, the SMPs that were installed, TSS loads and reductions, and, in some instances, TP loads and reductions. The 2014 SWMP list of non-regional SMPs was expanded to include available information on the new identified sites and incorporated into a non-regional SMP tracking spreadsheet.

In most cases, additional information needed to be provided by the City to support the analysis. This usually included recovering the project narrative and site map from project archives to aid in verifying the treatment area. In some cases, where the SMP data was not tracked in Stormwater Permit Logs, additional details on the type of SMP(s), and corresponding TSS and TP loads and reductions needed to be identified. WinSLAMM input and output data, and, in a few instances, available model files were provided.

This was an extensive effort by the City to research project files to identify, and then provide details to BC for use and application in this SWMP. Once the details of a site were provided, the tracking spreadsheet was updated with treatment area and other information as available, including adding references to what sections/pages of the project file the information was obtained from.

If TP loads and reductions were not available as part of the original project file, typical rules of thumb to estimate TP reductions based on TSS reductions were employed. The treatment site was also compared to the site development parcel(s) and, if necessary, the percentage reduction for TSS and TP loadings were reduced on a total area basis to not overestimate pollutant reductions for the site. The adjustment in treatment reduction for the development was applied in lieu of creating individual SMP treatment (tributary) areas and breaking up individual parcels due to the inefficiency of this exercise.

The resulting spreadsheet was then available for use in applying non-regional SMPs, treating a total of 735 acres, with TSS and TP reductions summarized by reachshed as shown on Table 3-6. The tracking spreadsheet was summarized to create the detailed Non-Regional SMP List contained in Table 3-6B in Appendix B. That table itemizes the SMP ID number, site name, ownership (public or private), TSS, and TP removal efficiencies by reachshed. The City is responsible for maintenance of non-regional SMPs that are designated as public and have maintenance agreements in place to ensure appropriate maintenance for SMPs that are identified as private. Figure 3-4 in Appendix A displays the geographic location of the various non-regional SMPs with their corresponding SMP ID and associated site development parcel.

Because it was anticipated that not all of the non-regional SMP information could be located to verify pollutant reductions, the scope of work for this project included evaluation of at least 54 SMPs installed since the prior study. During the course of this non-regional SMP analysis, 82 SMPs were identified, evaluated, and incorporated. The TSS and TP reductions were geographically tied to their respective parcels and used for this study. SMP information that could not be confirmed during this study will be evaluated in future years as scheduled in the Implementation Plan of this report, to document the effectiveness of the City's non-regional SMPs. In the interim, non-regional SMPs that could not be researched and documented as described above are not included in the resulting TSS and TP reductions.

Public Non-Regional SMPs

The 2014 SWMP included some public non-regional SMPs. Since that study, the City has installed additional non-regional SMPs, primarily HSDs. These HSDs were identified in individual basin studies completed after the 2004 City-wide Stormwater Management Plan. The grant application scope estimated approximately 12 public HSDs have been installed since the 2014 SWMP. For this study, the City provided their HSD tracking spreadsheet that gave the location of HSDs throughout the City. The City supplied GIS information and design drawings that identified the details (size, depth, location) of the HSDs. 20 HSDs were identified in this process, 10 of which were researched to find adequate supporting information and/or modeled.

The remaining 10 HSDs will be researched over the next several years as scheduled in the Implementation Plan of this report, to document the effectiveness of the City's public HSDs. In the interim, HSDs that could not be documented as noted above are not included in the resulting TSS and TP reductions. The public non-regional HSDs evaluated in this study are also included in the Non-Regional SMP List contained in Table 3-6B in Appendix B. Since the City has geographic and drainage area associated with the HSDs that were not verified during this study, they are included in the Appendix B table, but lack TSS and TP reduction information, which will be completed and incorporated into future updates.

Table 3-6. Non-Regional SMP Pollutant Load Reduction Results

Reachshed	Total Treated Area (ac)	TSS Load Reduction (tons/year)	TSS Reduction % (Compared to no controls total load)	TP Load Reduction (lbs/year)	TP Reduction % (Compared to no controls total load)
Lower Fox TMDL Reachsheds					
Apple Creek	30	3.1	0.9%	12.8	0.6%
Duck Creek	31	1.8	47.6%	10.7	31.7%
Lower Fox River Mainstem (DS)	370	26.6	3.2%	87.2	1.7%
Lower Fox River Mainstem (US)	211	14.7	6.4%	48.5	3.5%
Mud Creek	93	8.3	5.0%	21.2	2.4%
Totals	**733**				

3.3.6 Results: With Controls Analysis

Following the individual analyses for street cleaning, grass swales, regional SMPs, and non-regional SMPs as presented in previous sections of this report, the treatment practices were combined to evaluate their current collective impact on improving water quality. The most effective practice was applied to each land area to avoid double counting where multiple practices treat the same drainage area. Reachshed totals are therefore not equal to the sum of the individual treatment practices presented in prior tables. The results are shown, sorted by reachshed and TMDL study area for TSS and TP in Table 3-7 and Table 3-8 respectively.

The resulting TSS reductions for Lower Fox River TMDL reachsheds indicate that the City has met the TMDL reduction targets for three of the six reachsheds. The Lower Fox River Mainstem reachsheds which contain some of the oldest development in the City have improved from the prior study. Changes from the previous study are due to a number of factors, including land use revisions, refinements to SMP drainage basin delineations and/or pollutant reduction effectiveness, annexations and construction of additional SMPs.

Upper Fox/Wolf TMDL reachshed results are mixed, with the City meeting the TSS reduction for the Lake Winnebago reachshed, but not Bear Creek.

Table 3-7. With Controls TSS Reduction Results

Reachshed	Total Area (ac)	No Controls TSS Load (tons/year)	With Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With Controls TSS Reduction % (Compared to no controls total load)	Is TSS Load Reduction Target Met?
Lower Fox TMDL						
Apple Creek	3,388	332.3	231.8	52%	**69.7%**	**Yes**
Duck Creek	57	3.8	2.8	52%	**73.7%**	**Yes**
Garners Creek	1,576	236.7	179.7	60%	**75.9%**	**Yes**
Lower Fox River Mainstem (DS)	5,966	830.6	298.7	72%	36.0%	No
Lower Fox River Mainstem (US)	1,664	229.1	57.9	72%	25.3%	No
Mud Creek	1,055	164.7	47.1	43%	28.6%	No
Totals	**13,707**					
Upper Fox/Wolf TMDL						
Bear Creek	137	4.6	1.2	84%	25.8%	No
Lake Winnebago	427	47.2	10.6	20%	**22.4%**	**Yes**
Totals	**565**					

Table 3-8. With Controls TP Reduction Results						
Reachshed	Total Area (ac)	No Controls TP Load (lbs/year)	With Controls TP Load Reduction (lbs/year)	TMDL Target TP Load Reduction %	With Controls TP Reduction % (Compared to no controls total load)	Is TP Load Reduction Target Met?
Lower Fox TMDL						
Apple Creek	3,388	2,277.2	1,099.3	40.5%	**48.3%**	**Yes**
Duck Creek	57	33.7	16.4	40.5%	**48.5%**	**Yes**
Garners Creek	1,576	1,280.0	717.3	68.6%	56.0%	No
Lower Fox River Mainstem (DS)	5,966	5,015.6	1,179.9	40.5%	23.5%	No
Lower Fox River Mainstem (US)	1,664	1,390.5	213.9	40.5%	15.4%	No
Mud Creek	1,055	868.0	180.1	48.2%	20.8%	No
Totals	**13,707**					
Upper Fox/Wolf TMDL						
Bear Creek	137	46.9	5.4	85.6%	11.4%	No
Lake Winnebago	427	346.6	52.9	85.6%	15.3%	No
Totals	**565**					

The resulting TP reductions for Lower Fox River TMDL reachsheds indicate that the City has met the TMDL reduction targets for two of the six reachsheds. The Lower Fox River Mainstem reachsheds which contain some of the oldest development in the City have improved from the prior study. The City has not met TP reduction targets for either of the two Upper Fox/Wolf TMDL reachsheds, which are the most aggressive reduction targets in the City.

Section 4

Alternative Stormwater Management Practices Evaluation

The with controls analysis, documented in Section 3 of this report, indicated that while the City's stormwater management program continues to make strides towards achieving compliance with TMDL reachshed loading targets—including meeting TSS goals in 4 of 8 reachsheds and TP goals in 2 of 8 reachsheds—more is needed to move towards compliance. To help the City understand potential avenues for implementation of additional stormwater management practices, nine different practices or approaches towards compliance are discussed in this study, as listed in Table 4-1 and presented in the following sections.

Table 4-1. Alternative Stormwater Practices/Approaches Reviewed

Alternative Practice/Approach Reviewed	Comments
Street Cleaning Modifications	Common practice with proven technology, model quantifiable performance of low to moderate TSS and TP reductions
Bulk Leaf Collection Modifications	Newer evaluated approach, evolving WDNR model guidance, less quantifiable performance, provides TP reduction credit only
Regional Stormwater Management Practices	Regional SMPs serve more than one parcel and are typically wet detention ponds or underground water quality facilities. These are common practice with proven technology with some of the highest TSS and TP reductions, WDNR standard, model quantifiable performance
Enhanced Settling for Phosphorus Removal	Implemented practice in southern areas of US as part of wet detention treatment, minimal WDNR guidance, lab quantifiable performance, targets increased TP reductions
Hydrodynamic Separation Devices	Common practice with proven technology, WDNR model guidance, model quantifiable performance, low to moderate TSS and TP reductions
Non-regional Stormwater Management Practices	Non-regional SMPs treat one parcel and the specific practice and resulting effectiveness will vary, typically employ common practices with proven technology, WDNR model guidance, model quantifiable performance
Redevelopment Impacts	No specific practice, ordinance driven, model quantifiable performance based on theoretical impact of ordinance requirement changes and potential redevelopment
Pollutant Trading	Emerging practice, WDNR guidance, model or lab quantifiable performance
Technological Changes for Pollutant Removal	Emerging technologies, WDNR guidance (typically), model quantifiable performance (typically)

4.1 Street Cleaning

The City of Appleton conducts a street cleaning program as presented in Section 3.3.1. Street cleaning is a citywide source control option to reduce stormwater runoff pollutant discharges before they enter waterways or other treatment practices. Two potential modifications to the City's current program were evaluated and discussed with the City Public Works Operations and Engineering staff on March 16, 2021, and further reviewed with staff on September 8, 2021. Components of the potential program modifications and results of the water quality analyses are presented in the following sections.

4.1.1 Street Cleaning Alternative 1 – Equipment Upgrades

The first alternative considered maintains the current street cleaning schedule but would utilize all high efficiency (vacuum or regenerative air) type sweepers. This would require the purchase of two new high efficiency sweepers. The City would retain conventional sweeping equipment since they are still occasionally needed to pick up larger debris and can be used when temperatures are below freezing. Purchase and maintenance of new equipment is generally considered to be more acceptable than adding to the City labor forces. While it was noted by staff that there are fewer individuals currently trained to operate this style of sweeper, it was assumed that there would be no significant direct labor cost associated with this alternative. The results of this analysis are shown by reachshed for TSS and TP reductions in Table 4-2 and Table 4-3, respectively.

Additional space must be allocated for the new equipment in the Municipal Services Building (MSB) which is currently in the planning phase of an expansion. The stormwater program would budget for the following costs: purchase of the new equipment, annual allocations for equipment replacement (through Central Equipment Agency (CEA) payments), increased maintenance, and a cost share of the MSB expansion project. Costs associated with the MSB expansion will be tracked separately from the practices shown in the implementation plan.

4.1.2 Street Cleaning Alternative 2 – Intensive Spring-Cleaning Program

The second alternative considered would follow the WDNR's intensive spring-cleaning approach (weekly sweeping for the first six weeks of the program in spring) then return to the City's current schedule. All elements of the program are also assumed to utilize high efficiency cleaning equipment. This would require the purchase of two new high efficiency sweepers and contract labor for street cleaning that cannot be conducted by current City staff during normal business hours, or to compensate City staff on an overtime basis. To evaluate the additional cost associated with this change in program, it was assumed that three full weeks of contract street cleaning would need to be acquired. City staff suggested that each week of street cleaning required approximately 160 hours. The results of this analysis are shown by reachshed for TSS and TP in Table 4-2 and Table 4-3, respectively. The costs of overtime for City staff are estimated to be similar.

Table 4-2. Street Cleaning Alternatives – TSS Reductions

Reachshed	Total Treated Area (ac)	No Controls TSS Load (tons/year)	With Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With Controls TSS Reduction % (Compared to no controls total load)	Is TSS Load Reduction Target Met?	Alt 1 – Current Schedule but with all High Efficiency Street Cleaners				Alt 2- Intense Spring Street Cleaning (6-weeks) then return to schedule, all with High Efficiency Equipment			
							Load Reduction (tons/year)	Load Reduction %	Incremental Load Reduction (tons/year)	Incremental Load Reduction %	Load Reduction (tons/year)	Load Reduction %	Incremental Load Reduction (tons/year)	Incremental Load Reduction %
Lower Fox TMDL														
Apple Creek	3,388	332.3	231.8	52.0%	69.7%	Yes	233.0	70.1%	1.24	0.4%	233.8	70.3%	1.96	0.6%
Duck Creek	57	3.8	2.8	52.0%	73.7%	Yes	2.8	74.4%	0.02	0.6%	2.8	74.7%	0.04	0.9%
Garners Creek	1,576	236.7	179.7	59.9%	75.9%	Yes	179.7	75.9%	0.02	0.0%	179.7	75.9%	0.03	0.0%
Lower Fox River Mainstem (DS)	5,966	830.6	298.7	72.2%	36.0%	No	306.8	36.9%	8.11	1.0%	312.6	37.6%	13.88	1.7%
Lower Fox River Mainstem (US)	1,664	229.1	57.9	72.2%	25.3%	No	59.0	25.7%	1.05	0.5%	60.7	26.5%	2.80	1.2%
Mud Creek	1,055	164.7	47.1	42.8%	28.6%	No	48.7	29.5%	1.61	1.0%	49.5	30.1%	2.49	1.5%
Upper Fox/Wolf TMDL														
Bear Creek	137	4.6	1.2	84.0%	25.8%	No	1.2	26.2%	0.02	0.4%	1.2	26.4%	0.03	0.6%
Lake Winnebago	427	47.2	10.6	20.0%	22.4%	Yes	12.2	25.8%	1.59	3.4%	12.9	27.4%	2.36	5.0%

Note: If TSS Load reduction target is already being met, additional TSS reduction gained from implementing this practice can be internally tradable to downstream reachsheds.

Table 4-3. Street Cleaning Alternatives – TP Reductions

Reachshed	Total Treated Area (ac)	No Controls TP Load (lbs/year)	With Controls TP Load Reduction (lbs/year)	TMDL Target TP Load Reduction %	With Controls TP Reduction % (Compared to no controls total load)	Is TP Load Reduction Target Met?	Alt 1 – Current Schedule but with all High Efficiency Street Cleaners				Alt 2- Intense Spring Street Cleaning (6-weeks) then return to schedule, all with High Efficiency Equipment			
							Load Reduction (lbs/year)	Load Reduction %	Incremental Load Reduction (lbs/year)	Incremental Load Reduction %	Load Reduction (lbs/year)	Load Reduction %	Incremental Load Reduction (lbs/year)	Incremental Load Reduction %
Lower Fox TMDL														
Apple Creek	3,388	2,277.2	1,099.3	40.5%	48.3%	Yes	1104.8	48.5%	5.50	0.2%	1107.9	48.6%	8.53	0.4%
Duck Creek	57	33.7	16.4	40.5%	48.5%	Yes	16.5	48.9%	0.11	0.3%	16.5	49.0%	0.16	0.5%
Garners Creek	1,576	1,280.0	717.3	68.6%	56.0%	No	717.3	56.0%	0.07	0.0%	717.4	56.0%	0.11	0.0%
Lower Fox River Mainstem (DS)	5,966	5,015.6	1,179.9	40.5%	23.5%	No	1231.3	24.5%	51.42	1.0%	1256.9	25.1%	77.07	1.5%
Lower Fox River Mainstem (US)	1,664	1,390.5	213.9	40.5%	15.4	No	229.5	16.5%	15.60	1.1%	237.0	17.0%	23.16	1.7%
Mud Creek	1,055	868.0	180.1	48.2%	20.8%	No	187.3	21.6%	7.19	0.8%	191.1	22.0%	10.94	1.3%
Upper Fox/Wolf TMDL														
Bear Creek	137	46.9	5.4	85.6%	11.4%	No	5.4	11.6%	0.08	0.2%	5.5	11.7%	0.12	0.3%
Lake Winnebago	427	346.6	52.9	85.6%	15.3%	No	60.2	17.4%	7.30	2.1%	63.8	18.4%	10.86	3.1%

Note: If TP Load reduction target is already being met, additional TP reduction gained from implementing this practice can be internally tradable to downstream reachsheds.

4.1.3 Street Cleaning Program Modification Considerations and Costs

For Alternative 1, the City estimated that each new high efficiency sweeper would cost approximately $310,000 for the initial purchase and other related equipment. The City estimated annual maintenance costs of $38,000 and annual CEA payments of $44,796 per sweeper. Estimated costs assume a street sweeper life of 10 years and a 3 percent inflation rate. A total annual cost of $238,256 (in 2021 dollars) was estimated to implement Alternative 1 over the first 10-years of the program. That results in a cost effectiveness of $18,122 per ton per year of TSS and $2,803 per pound per year of TP.

For Alternative 2, the same costs from Alternative 1 were assumed, plus the addition of three weeks of contract cleaning (160 hours/week) at a cost of $149.50/hour. The rate is based on an estimate provided to the City by a contract sweeping operation and includes labor and contractor provided high efficiency street cleaning device with debris dropped off by the contractor at existing designated drop off sites and material management by the City. This results in a contract sweeping cost of $73,913/year based on the quote provided on February 8, 2020 and adding three percent inflation. Using the above information, a total annual cost of $312,169 was estimated to implement Alternative 2. That results in a cost effectiveness of $13,695 per ton per year of TSS and $2,450 per pound per year of TP. This is slightly more efficient than Alternative 1; however, there are concerns that the contract sweeping pricing could increase more aggressively since only a single provider is currently quoting this service.

The costs presented (cost assumptions and details are also presented in Appendix B) may be higher in early years as compared to future years of the program as the initial years assume payments to cover the initial cost to purchase the sweepers and to also collect funds (CEA payments) to replace the sweepers in the future on a pay-as-you-go approach. However, there may also be an allocation of the MSB cost in the future that could impact the future cost effectiveness.

As noted in Section 3.3.1, the current cost for the street cleaning program equates to $1,329/ton of TSS removed annually using the WinSLAMM reductions. The increased cost per ton of TSS and pound of TP over existing levels is reasonable given the incremental improvement in the alternatives. The City of Appleton is open to potential changes in the current street cleaning program, but it is not expected that changes would be made for 5-years or more.

Because the program is more effective in certain reachsheds due to the mix of existing SMPs and other conditions, the City may want to focus on program expansion in reachsheds that are not currently meeting TMDL targets or in reachsheds where implementation could provide internal trade credits to downstream reachsheds not meeting TMDL targets. However, even implementation in areas with large numbers of existing practices can be useful to remove pollutants before they enter those practices, extending the time between future maintenance/dredging efforts.

4.2 Leaf Management

The City of Appleton operates a bulk leaf collection program as a service to the public which also provides a stormwater quality benefit. The WDNR has recognized that there may be beneficial changes in municipal leaf management programs that can reduce phosphorus discharges to waters of the state. Based on research conducted by the WDNR and USGS, the WDNR developed guidance (“Interim Municipal Phosphorus Reduction Credit for Leaf Management Programs”, effective March 2018) to provide criteria for numeric credit for leaf collection programs. Research is continuing and the WDNR is considering expanded credit under additional conditions. The existing City of Appleton bulk leaf management program was evaluated and compared against the WDNR guidance. The program is summarized in the following sections and further details are available in Appendix B.

4.2.1 Existing City Bulk Leaf Management Program

The existing City leaf collection program currently starts six weeks before the Friday preceding the Wisconsin nine-day deer gun hunting season, placing the start near the beginning of October. Leaves are collected throughout the City three to four times per year. Currently, like many communities, the City asks residents to rake their leaves in the fall into the gutter of the roadway for pickup by the City. Residents are also allowed to place other bulk materials (e.g., sticks, garden debris) out for pickup at the same time. The City has four single-axle dump trucks with modified leaf pushers/rakes that collect leaves into large piles which are then picked up by front end loaders with a clamshell bucket that loads the leaves into trucks for disposal. The City has invested significant time and effort to develop a working relationship with area farmers who receive the leaves which are used as mulch/fertilizer in their farming operations. The streets are swept with a conventional street cleaner following bulk pickup.

The City receives no specific stormwater quality credit or reduction for their current leaf collection program. The WDNR has developed a guidance document that allows a municipality to take credit for a bulk leaf collection program that meets the criteria and land use (medium density residential) as outlined in their 2018 guidance. The WDNR is also considering a second level of allowable credit based on tree canopy and high-efficiency street cleaner use, as outlined by the WDNR in presentations provided in 2020, but are not currently available in final guidance format. Future research may allow credit in additional land use areas or applications but are not considered in this discussion. The City can only take credit for increased numeric stormwater pollution reduction as allowed under WDNR guidance when the conditions outlined in the guidance are met by the City. Non-numeric credit can be taken for other land uses that are not currently outlined for numeric credit and can be a component of the City's implementation plan and evidence of working towards TMDL pollutant reduction goals. The current and potential WDNR leaf collection program modification options and the City's evaluation of potential changes are discussed in the following sections.

4.2.2 Bulk Leaf Management Program Modification Considerations and Costs

Two potential WDNR leaf collection program modification options were discussed with City staff at a meeting on January 19, 2021, and further evaluated for potential applicability based on how the current and potential future state of leaf management in the City compare to the WDNR criteria.

The evaluation identified areas in the City that appeared to match up well with the 2018 WDNR guidance for land use, tree size and spacing, that allowed a 17 percent reduction in TP loadings for medium density residential areas. It did not appear that the new pending guidance for expanded reductions would be applicable to the City for various reasons. To comply with the guidance, the City would be required to make programmatic changes in their leaf management program, purchase and store new equipment, and educate the public on how the program would change.

Based on the WDNR criteria, there are a total of approximately 749 acres of medium density residential land use with no alleys (MDRNA) along public curb and gutter streets and not draining to an existing SMP beyond street cleaning (e.g., a regional detention facility) that are applicable to this practice as shown in Figure 4-1 in Appendix A. A summary of land use area, incremental TP reduction by sweeper zone and reachshed is shown in Table 4-4. It is important to note that the existing and potential TP reductions shown are only for the eligible treated areas based on current WDNR guidance and do not represent reductions to an entire sweeper zone or reachshed.

The program implementation is anticipated to take place over a period of 4 years. It is desired to implement the program by selecting one north and one south zone each year to add to the program. The highest load reducing zones were selected first to maximize the impact of implementing the program, which was agreed to at the September 8, 2021 meeting with DPW Operations and Engineering staff. Actual implementation of the program is subject to revision, if needed, as there is a recognition that a public educational component is needed to make this change. Extra time may be needed to allow for a pivot by DPW staff and, more importantly, provide the public the opportunity to understand what these changes will mean to them. Table 4-5 displays the suggested implementation plan by year, sweeper zones, and the impact by reachshed. TP reduction credit varies by reachshed and collectively result in over 30 lbs/year of TP reduction at full implementation based on an analysis and current WDNR guidance.

The City has identified an initial capital cost of $2,197,500 over 5 years. To estimate the cost of implementing this program, a 4-year phased implementation was assumed. Two of the eight sweeper zones were incorporated into the program in each of the four years. The street cleaning zones were based on 2018 mapped street cleaning zones as provided by the City, with minor modifications to fit the project area limits of this study and are also shown on Figure 4-1 in Appendix A.

The estimated annual cost to implement the program, including annualizing initial capital equipment costs based on life of each unit and annual CEA payment (see Appendix B for more details), is $559,570. Similar to the discussion presented for street cleaning, future annualized costs may go down because the amount shown includes the cost to pay off the initial equipment purchase and future CEA payments. However, it does not include any potential future MSB expansion cost allocations. Based on the total of 30.45 pounds of TP reduced annually at full implementation, the cost in 2021 dollars to implement this program is $18,377 per pound. As WDNR guidance expands to include other types of land uses or credits and the City further investigates the impact of this program, the cost per pound is anticipated to be reduced.

Table 4-4. Potential Leaf Management Total Phosphorus Load Reduction Results

Sweeper Zone	TMDL Reachshed	Total Treated Area (ac)	No Controls TP Load (lbs/year)	Existing TP Load (lbs/year)	Existing TP Reduction % (compared to no controls total load)	Potential TP Reduction Increase Due to Leaf Collection (lbs/year)	Potential TP Reduction % Increase Due to Leaf Collection
North1	Apple Creek	0.6	0.47	0.40	15.0%	0.01	2.0%
	Bear Creek	0.3	0.27	0.23	16.7%	0.00	0.3%
	Lower Fox River (DS)	24.7	20.17	17.81	11.7%	1.07	5.3%
	Mud Creek	3.5	2.89	2.56	11.3%	0.16	5.7%
North2	Lower Fox River (DS)	96.3	78.94	69.67	11.7%	4.15	5.3%
North3	Lower Fox River (DS)	114.7	93.97	82.72	12.0%	4.72	5.0%
North4	Lower Fox River (DS)	56.4	46.23	40.37	12.7%	1.99	4.3%
	Lower Fox River (US)	13.2	10.79	9.56	11.4%	0.61	5.6%
	Mud Creek	9.0	7.41	6.43	13.3%	0.28	3.7%
South1	Lake Winnebago	169.1	138.68	122.75	11.5%	7.64	5.5%
	Lower Fox River (DS)	0.0	0.00	0.00	11.3%	0.00	5.7%
	Lower Fox River (US)	3.6	2.96	2.58	12.9%	0.12	4.1%
South 2	Lower Fox River (DS)	48.2	39.51	34.48	12.7%	1.69	4.3%
	Lower Fox River (US)	18.1	14.86	12.76	14.1%	0.42	2.9%
South3	Garners Creek	0.1	0.07	0.06	11.3%	0.00	5.7%
	Lower Fox River (DS)	110.2	90.26	79.42	12.0%	4.51	5.0%
South4	Lower Fox River (US)	78.2	64.05	56.13	12.4%	2.97	4.6%
	Mud Creek	2.4	1.94	1.72	11.4%	0.11	5.6%

Note: areas showing 0.00 Potential TP reduction in column 7 are due to small, treated areas and rounding in the table.

Table 4-5.Potential Leaf Management TP Reductions By Implementation Year

Implementation Year	Sweeper Zones Implemented	Lower Fox TMDL Reachsheds						Upper Fox/Wolf TMDL Reachsheds	
		Apple Creek TP Reductions (lbs/year)	Duck Creek TP Reductions (lbs/year)	Garners Creek TP Reductions (lbs/year)	Lower Fox DS TP Reductions (lbs/year)	Lower Fox US TP Reductions (lbs/year)	Mud Creek TP Reductions (lbs/year)	Bear Creek TP Reductions (lbs/year)	Lake Winnebago TP Reductions (lbs/year)
Year 1	North 3 and South 1				4.72	0.10			7.66
Year 2	North 2 and South 3			0.00	8.65				
Year 3	North 4 and South 4				1.99	3.57	0.39		
Year 4	North 1 and South 2	0.01			2.76	0.42	0.16	0.00	0.00
Totals:		**0.01**	**0.00**	**0.00**	**18.12**	**4.10**	**0.55**	**0.00**	**7.66**

4.3 Regional Stormwater Management Practices (SMPs)

The City of Appleton currently has 51 regional SMPs treating stormwater discharges from over 42 percent of the area analyzed in this study, scattered across the City as presented in Section 3.3.3 of this report. The City has successfully used this technique to reduce stormwater pollutant discharges and will continue to evaluate locations of potential future practices; however, finding locations to put regional detention where there is not already existing development or where hydraulics work well is challenging.

4.3.1 Regional SMP Alternatives

As part of this study, 10 locations for potential new regional SMPs were identified with City Staff for evaluation. An eleventh site also evolved associated with the former City water utility lagoons, now a part of the RGL Logistics site. This potential pond location is a sub-area of the Everett Street potential regional practice and information is based on the "Leonard Street Basin Study (AECOM 2010). A summary of the facilities by reachshed is included in Table 4-6 Potential Regional Stormwater Management Practices.

These 11 areas are shown on Figure 4-2 in Appendix A. The locations are largely traditional surface detention ponds, but since open space is becoming more challenging to find, some locations considered would require storm sewer relays or would be placed in underground water quality wet detention treatment vaults to preserve ground surface use as parking or to serve other needs. With these increasingly challenging situations also comes increasing costs.

Table 4-6. Potential Regional Stormwater Management Practices

TMDL Reachshed	Proposed Regional Practice # and Name	Drainage Area (ac)	TSS Reduction (tons/year)	TSS Reduction (%)	TP Reduction (lbs/year)	TP Reduction (%)
LFR Downstream	1-Bellaire Court	691	45.6	44.3%	209.0	33.1%
	4-Kensington UG Storage	145	21.7	80.1%	80.2	60.4%
	5-Meade & Wisconsin UG Storage	393	33.8	67.2%	171.4	49.8%
	6-Northland/441[1]	2,401	172.6	72.6%	744.0	48.8%
	9-Winslow Ave	153	25.0	74.4%	75.3	56.3%
	10-Wisconsin Ave	102	13.6	82.0%	56.7	63.1%
	Reachshed Totals[2]	**3,885.8**	**287.3**		**1,261.3**	
LFR Upstream	7-Pierce Park	343	24.2	45.0%	93.5	33.2%
	8-Riverview Gardens	198	13.4	59.0%	65.5	43.9%
	Reachshed Totals	**540.2**	**37.6**		**159.0**	
Mud Creek	2-Everett Street[3]	249	33.6	61.8%	96.6	43.7%
	3-Hillock Court	76	7.5	79.3%	36.5	59.8%
	11-RGL-Lagoons	232	46.0	92.3%	129.7	67.8%
	Reachshed Totals[2]	**324.9**	**41.1**		**133.1**	

[1] *Reductions do not include pollutants removed by upstream regional SMPs*

[2] *Totals do not include potential Winslow Ave or RGL-Lagoons sites due to overlapping drainage areas*

[3] *Reductions do not include pollutants removed by upstream Cotter Pond regional SMP*

After further review and discussion with the City, the following six sites were included in the Implementation Plan: #3-Hillock Court; #7 Pierce Park; #8 Riverview Gardens; #9 Winslow Avenue; #10 Wisconsin Avenue and #11 RGL-Lagoons site. The City has written to the landowners to obtain feedback of their interest to potentially place SMPs on their property. Additional investigations are necessary prior to further consideration of these regional SMPs (see individual narratives in Appendix B). Any location that the City schedules for potential implementation will have a preliminary engineering phase to further detail the facility followed by final design and construction.

4.3.2 Regional SMP Cost Considerations

Cost estimates were developed for the six remaining sites of interest. Table 4-7 summarizes the six facilities with annualized cost information for comparison. Further details on the cost estimates including capital cost to construct the facility, land acquisition cost, annual maintenance cost (annual pond maintenance cost graph), and future dredging cost are included in Appendix B.

The Leona Street Pond was constructed during this current permit. Future potential regional SMP projects and timing are identified in the implementation plan of this report, including the anticipated project selected for construction during the next permit period.

Table 4-7. Wet Detention Alternative Cost Analysis

Pond Name (Reachshed)	Pond Analyzed Drainage Basin (ac)	TSS Reduction (tons/year)	TSS Reduction (%)	TP Reduction (lbs/year)	TP Reduction (%)	Total Annualized Cost	Annual Cost per Ton of TSS Removed	Annual Cost per Pound of TP Removed
3 - Hillock Court (Mud Creek)	76	7.5	79.3%	36.5	59.8%	$155,048	$20,673	$4,248
7 - Pierce Park (Lower Fox River [US])	343	24.2	45.0%	93.5	33.2%	$85,451	$3,531	$914
8 - Riverview Gardens (Lower Fox River [US])	198	13.4	59.0%	65.5	43.9%	$61,865	$4,617	$945
9 - Winslow Avenue (Lower Fox River [DS])	153	25	74.4%	75.3	56.3%	$133,524	$5,341	$1,773
10 - Wisconsin Avenue (Lower Fox River [DS])	102	13.6	82.0%	56.7	63.1%	$136,491	$10,036	$2,407
11 – RGL-Lagoons (Mud Creek)	232	46.0	92.3%	129.7	67.8%	$452,340	$9,844	$3,487

4.4 Enhanced Settling for Phosphorus Removal

Conventional stormwater treatment ponds trap particulate pollutants when stormwater is held for a period of time and allowed to settle out. The amount of particulate pollutants that are trapped depends on several factors, including the residence time of the pond, the density of the particles, and water temperature. For TP, a stormwater pond generally traps only the particulate form of phosphorus, and most of the dissolved form is not retained. The dissolved form of phosphorus can account for 50 percent or more of the TP load in stormwater.

A method to increase the phosphorus trapping efficiency of stormwater ponds is to use coagulants. Aluminum-based coagulants have been shown to enhance removal of both particulate and dissolved phosphorus by causing flocculation. Coagulant treatment of stormwater was first used in the southeast United States in the late 1980's. Typical systems for coagulant treatment of stormwater consists of the following:

1. A coagulant injection system to add a coagulant, in the proper dose, to raw stormwater
2. A rapid mixing chamber to achieve thorough and complete mixing of the coagulant with the stormwater
3. A pond to settle and trap the flocculant
4. Discharge of treated runoff from the settling pond

The treatment system generally is housed in a small building with power, pumps, instrumentation, and storage tanks for the coagulant.

Before implementing a coagulant treatment system, pilot testing of a basin's stormwater runoff with various coagulant compounds in different concentrations is conducted to determine the optimum treatment. Testing has shown that TP reductions in stormwater of 85 to 95 percent can be achieved. This is in comparison to the conventional stormwater pond TP treatment reductions of 40 to 60 percent. To be conservative, a TP reduction of 85 percent will be assumed for pollutant removal and cost effectiveness analyses.

4.4.1 Enhanced Settling Alternatives and Cost Estimates

The use of coagulants to enhance treatment has been considered by the City of Appleton in the past. The prior stormwater plan identified potential locations where this practice could be applied and estimated associated costs to implement the design. In that plan, a capital cost was estimated using an average cost per pound of TP removed of $5,000, regardless of the amount of TP removed or other factors. Upon further review, this may not be the best approach at estimating cost since there are significant equipment needs and other fixed costs with some operation and maintenance components somewhat scalable to size.

The Leona Street and Northland Avenue wet detention basin preliminary engineering designs conducted a more detailed evaluation of this practice during the design of those facilities. Those two preliminary engineering design analyses had very similar capital costs of around $450,000 after factoring in testing, design, and contingencies. However, further evaluation and a review of other studies, such as the City of Madison's Starkweather Creek project, suggest that costs are likely higher. Project components were compared and updated with new unit prices which suggest an initial capital cost of $914,300 per facility may be more accurate.

The Leona Street stormwater facility was constructed with a deeper sediment storage area and potential future location of buildings, sanitary, and water service lines were incorporated into the design layout in preparation for future addition of a coagulant treatment system. A preliminary engineering study is required to identify site specific implementation challenges and update individual cost estimates.

The actual cost of each facility will vary due to the site-specific conditions and required sizing of equipment and a more detailed preliminary engineering evaluation would be necessary in addition to specific inflow and coagulant pilot testing to determine the needs of the site. Furthermore, based on the design for floc removal currently under consideration, the City will need to purchase a remote dredge to remove the floc from facilities for discharge to the sanitary sewer system. The dredge cost is estimated at $250,000 and can be used for any and all facilities constructed by the City.

Annual maintenance costs were also estimated for the Leona Street and Northland Avenue coagulant systems. The annual maintenance cost estimate was also updated based on the Starkweather Creek (City of Madison) analysis for base operation and maintenance (O&M) components, such as routine site inspections, water quality monitoring, coagulant usage and floc disposal.

Using this information, the potential coagulant retrofit list of ponds from the 2014 study was updated and the new costs are shown in Table 4-8. The prior stormwater management plan estimated a cost range per annualized incremental pound of TP between $317 and $7,283. Using the updated capital and annual operation and maintenance cost estimating approach results in a cost range per annualized incremental pound of TP between $1,183 and $72,366. The wide range is due to a number of factors including current pond removal efficiencies and the adjustment in how costs are calculated, indicating that some ponds appear to be potentially much more (or less) efficient on a cost per pound basis. The highest cost per pound of TP is associated with the Mud Creek South Pond and is due to the small drainage area and pollutant reductions associated with that facility, suggesting that it may not be practical to consider that location. That facility was also the high outlier in the 2014 study. Removing that facility creates a much tighter range to between $1,183 and $4,220 per pound of TP annually.

A variety of factors have held the City back from implementing this practice, including requirements for monitoring system performance (due to lack of WDNR guidance and inability to model the practice) and the associated cost of implementation coupled with the uncertainty of results and TP reduction credit. It appears that the WDNR is in the process of putting together a committee to evaluate this treatment practice and is likely therefore to publish guidance that would be helpful to the City of Appleton and others considering this technology on the expectations and efforts required.

Additionally, the City of Appleton wastewater utility has concerns on the impact of discharged floc to their system operation and will want to know if there is any particular timing required for discharge of the material based on other plant operations and loads so they stay within their permit limits. Pilot testing, including bench scale testing of floc on wastewater processes will likely be needed. Once site specific evaluations are completed, the cost estimate should be updated in consultation with wastewater staff to confirm how their discharge cost structure will be applied.

Table 4-8. Enhanced Settling (Coagulant Treatment) Alternatives Cost Analysis

Reachshed	Pond Name	Drainage Area (ac)	Base TP Load with No Controls (lbs/year)	Existing Pond TP Reduction Efficiency	Existing TP Remaining Load with Wet Pond (lbs/year)	Incremental TP Reduction with Coagulant Treatment (lbs/year)	Remaining TP Load With Coagulant Treatment (lbs/year)	Coagulant System Capital Cost	(A) Annualized Capital Cost	(B) Base Annual Operation and Maintenance Costs	(C) Variable Annual Maintenance Cost	(D) Total Annualized Cost (A+B+C)	Annualized Cost/Pound of Incremental TP Removed
Garners Creek	Kensington	911	727	60.2%	290	181	109	$914,300	$33,630	$35,000	$195,891	$264,521	$1,464
Lower Fox River (DS)	Conkey	153	132	55.4%	59	39	20	$914,300	$33,630	$35,000	$32,807	$101,437	$2,601
	Leona St	196	166	58.5%	69	44	25	$914,300	$33,630	$35,000	$42,133	$110,763	$2,520
	MPPNE	220	176	52.0%	84	58	26	$914,300	$33,630	$35,000	$47,255	$115,885	$1,999
	MPPS	529	457	51.3%	223	154	69	$914,300	$33,630	$35,000	$113,695	$182,325	$1,183
	Pershing	104	84	55.5%	38	25	13	$914,300	$33,630	$35,000	$22,333	$90,963	$3,653
	Reid GC E	162	132	56.0%	58	38	20	$914,300	$33,630	$35,000	$34,757	$103,387	$2,705
	Reid GC S	225	181	56.0%	79	52	27	$914,300	$33,630	$35,000	$48,276	$116,906	$2,233
Lower Fox River (DS) Totals								**$6,400,100**	**$235,410**	**$245,000**	**$341,257**	**$821,667**	**$2,002**
Lower Fox River (US)	Pierce Park	343	282	33.2%	188	146	42	$914,300	$33,630	$35,000	$73,745	$142,375	$976
	Schindler 441 Pond	146	98	44.1%	55	40	15	$914,300	$33,630	$35,000	$31,342	$99,972	$2,480
Lower Fox River (US) Totals								**$1,828,600**	**$67,260**	**$70,000**	**$105,087**	**$242,347**	**$1,302**
Mud Creek	Crossing Meadow	40	33	16.9%	27	22	5	$914,300	$33,630	$35,000	$8,671	$77,301	$3,448
	Mud Creek S	6	5	66.2%	2	1	1	$914,300	$33,630	$35,000	$1,337	$69,967	$72,366
	Northland Ave	115	96	61.9%	36	22	14	$914,300	$33,630	$35,000	$24,700	$93,330	$4,220
	RGL Lagoons Pond	232	191	67.8%	61	33	29	$914,300	$33,630	$35,000	$49,923	$118,553	$3,613
Mud Creek Totals								**$3,657,200**	**$134,520**	**$140,000**	**$84,631**	**$359,151**	**$4,586**

Assumptions:

(1) Coagulant Treatment Assumes increases TP to 85% for each individual wet detention pond receiving treatment (regardless of initial efficiency or overall size)

(2) Annualized Capital Cost assumes 100-year life on structural and pipe related items, 35-year life on controls and other equipment (roughly a 60-40 split of all cost items), and 3% inflation.

(3) Annualized Capital does not include cost of ~$250,000 for remote operated dredge required to remove floc from ponds. That is separate implementation plan line item. Impact of adding into annualized cost is approx. 5% increase in annualized cost/pound of incremental TP removed (assuming 3% inflation and 35-year equipment life which may be aggressive).

(4) Base Annual O&M cost for weekly site visits and supplies allowance is $35,000 per site regardless of size. Variable Annual O&M cost based on chemical cost, floc removal/disposal and energy usage of $215/acre of drainage area.

4.5 Hydrodynamic Separation Devices

Hydrodynamic separation devices (HSDs) are devices with sumps (catch basins, oversized manholes, proprietary devices, etc.) that generally treat smaller drainage basins in more heavily urbanized areas that are not conducive to larger SMP facilities. The City has included the evaluation of these types of devices in many prior studies and maintains a list of potential HSD locations.

4.5.1 HSD Alternatives

Potential HSD locations for future implementation are shown on Figure 4-3 with their associated drainage areas. Drainage areas were not generally reviewed or modified from the prior study. The identified HSDs are based on the prior inventory of potential structures and was updated to remove those that have been installed since the last Citywide SWMP update.

The HSDs are categorized into two types, those that do not drain to a regional SMP and those that do. The reason for the distinction is because the City would not be able to take TSS or TP credit for HSDs that drain to an existing regional practice because they would not provide a measurable further improvement in water quality. However there still may be other reasons for the City to implement those HSDs, especially if they can extend the time period between dredging of the facility and aid in materials management.

The expected TSS reduction efficiency for each potential HSD from the prior study was used for this analysis; HSDs were not re-modeled to verify TSS or TP reductions. The expected reductions were also compared with the existing reductions obtained by street cleaning alone. HSDs were assumed to provide at least 10 percent TSS reduction above the reductions achieved by street cleaning. A more thorough analysis is needed to provide better estimation on the added TSS and TP removal efficiency associated with HSDs. Initially, this would include a broader WinSLAMM analysis of various potential HSD installations to determine if a reasonable correlation can be made between TSS and TP reductions under various situations and if the WDNR would agree to using that correlation, or if they will require that each HSD be modeled.

Table 4-9 contains a summary of potential HSDs by reachshed for those that are not tributary to a regional facility. Upcoming street projects through 2026 were reviewed by intersecting the limits of the roadway projects and potential HSDs that could be implemented as part of these projects. Those HSDs are presented for potential installation in the implementation plan. Appendix B contains assumptions related to annual maintenance and two tables with a detailed listing of each individual HSD by reachshed for the two aforementioned categories.

Table 4-9. Summary of HSDs Not Tributary to a Regional SMP

TMDL Reachshed	Number of HSDs Identified	Drainage Area (ac)	No Controls TSS Load (tons/year)	Existing TSS Removed (tons/year)	Estimated HSD Incremental TSS Reduction (tons/year)	Estimated Reachshed TSS Impact (Reduction) if All Identified HSDs are Implemented	No Controls TP Load (lbs/year)	Existing TP Removed (lbs/year)	Estimated HSD Incremental TP Reduction (lbs/year)	Estimated Reachshed TP Impact (Reduction) if All Identified HSDs are Implemented
Lake Winnebago	11	43.10	4.41	0.83	0.54	0.87%	33.77	3.81	2.49	0.54%
Lower Fox River (DS)	57	580.78	83.68	17.89	8.42	1.01%	503.67	67.45	16.46	0.33%
Lower Fox River (US)	20	94.87	13.41	2.32	1.37	0.64%	82.44	9.08	3.77	0.29%
Mud Creek	7	36.99	7.04	1.46	0.70	0.43%	30.95	4.41	1.14	0.13%

4.5.2 HSD Cost Estimates

Because these practices are typically installed at the time of a road reconstruction project, only the capital cost of the HSD structure itself was used in the cost analysis. Further, because the recommended size associated with each HSD was not included in the 2014 study analysis and is not available without reviewing each of the original studies, a standard HSD size of 96-inches in diameter was assumed. A capital cost per HSD of $25,000 was assumed based on review of X-19 and Y-20 City project bids and construction pricing.

Also, while each device is unique in the individual actual maintenance requirements, no attempt was made to develop an individual maintenance cost by device due to location or HSD size. A new average annual maintenance cost of $775 per device was estimated based on discussion with City staff from a review of labor and equipment cost associated with what was felt to be a typical cleaning operation.

Cost information is also shown with cost effectiveness per incremental ton of TSS or pound of TP in the detailed tables in Appendix B. Annualized cost effectiveness ranges from a low of about $2,500 to almost $100,000 per ton of TSS with an average of about $23,500. Annualized cost effectiveness ranges from a low of about $1,800 to almost $31,000 per pound of TP, with an average of about $9,000. The cost effectiveness range is quite variable depending on the specific HSD and may factor into the City's consideration for future implementation.

4.6 Non-regional SMPs

There are over a hundred small, non-regional SMPs located across the City, many of which were included in this study and described in Section 3.3.5. While less impactful than larger, regional facilities, these smaller SMPs can nevertheless help the City get closer to compliance with TMDL standards.

In the prior study, the City evaluated the use and implementation of biofilters and porous pavement for potential application on smaller private (or public) property locations. Site specific examples were evaluated and then extrapolated Citywide to determine a potential impact and associated cost with a broad implementation. The analysis identified up to $6 million in annualized costs for small practices to be installed throughout multiple areas in Mud Creek and the Lower Fox River (Upstream and Downstream) reachsheds without achieving TMDL compliance. An exercise of that nature on a citywide scale becomes more academic and requires numerous assumptions that cannot accurately represent the potential uniqueness of each individual circumstance, such as direction of drainage and ability to locate the desired practice; understanding of real impact on a facility's operation and ability to incorporate a treatment practice; cost of land or easement; and other factors. Additionally, in 2015-2016, the City constructed porous pavement in a parking lot and on a street. The installations used paver blocks adjacent to concrete pavement and curb and gutter, over open graded stone galleries. Settlement of the paver blocks created significant challenges for snowplow operations.

For these reasons, while it is assumed that smaller facilities of this type may continue to be installed over time and should be considered as part of the City's long-term implementation plan in some manner, it is unlikely that the City would try to take on a program to implement private property practices on a citywide scale. The City has attempted to, and will continue to consider, partnering with a private entity to implement or expand a facility on private property when opportunities present themselves. Modifying the City's post-construction stormwater management ordinance is another way to accomplish the objective to address smaller individual developed areas as they redevelop and would put the bulk of the effort to do so on the owner/developer.

4.6.1 Non-regional SMP Sites Evaluation

Part of the scope of this study included evaluating five locations to continue to advance the City's understanding on the impact and potential effectiveness of these smaller practices. Sites were located in reachsheds not currently meeting TMDL reduction requirements: the upstream and downstream Lower Fox River reachsheds and the Mud Creek reachshed. The locations of the five sites within the reachsheds are shown on Figure 4-4 in Appendix A. The sites were selected because they all have large parking areas that would both produce a larger pollutant load, but also could likely be configured to incorporate an SMP. Different types of SMPs were also evaluated for these sites, including rain gardens, biofilters, porous pavement and catch basins. Devices were sized to fit within each site's local constraints and to meet WDNR guidance for each facility where necessary/possible. Figures 4-5 through 4-9 in Appendix A depict the area treated, and location of identified potential treatment device(s). The SMPs were modeled in WinSLAMM to determine their TSS and TP removal efficiencies for their site and their impact on TSS and TP reductions for the reachshed as a whole, as summarized on Table 4-10.

Table 4-10. Non-Regional Potential SMP Evaluation									
Site Number	Reachshed	Site Address	SMP Type	Sitewide TSS Reduction (tons/year)	Sitewide TSS % Reduction	Reachshed-Wide TSS Reduction (%)	Sitewide TP Reduction (lbs/year)	Sitewide TP % Reduction	Reachshed-Wide TP Reduction (%)
1	Lower Fox River (US)	200 E Washington	Biofilter	0.26	79.5%	0.12%	0.85	64.3%	0.07%
			Porous Pavement	0.30	89.5%	0.14%	0.95	86.4%	0.07%
2	Lower Fox River (DS)	825 E Wisconsin	Biofilter	0.23	85.7%	0.03%	1.18	69.5%	0.02%
			Stormfilter	0.19	70.1%	0.02%	0.88	52.1%	0.02%
			Sand Filter	0.22	80.0%	0.03%	0.97	57.4%	0.02%
3	Mud Creek	W 4th Street	Catchbasins	0.07	22.0%	0.04%	0.22	20.6%	0.03%
			Porous Pavement	0.17	52.4%	0.10%	0.55	50.9%	0.06%
4	Lower Fox River (US)	116 N Linwood	Rain Gardens	0.32	89.2%	0.15%	1.47	89.0%	0.11%
5	Lower Fox River (US)	N Superior Street	Porous Pavement	1.21	89.3%	0.57%	3.86	86.0%	0.30%

4.6.2 National Program Examples

An additional scope item included researching national programs for what other locations are doing to make progress with stormwater quality management. During the research for this effort, a number of observations were made:

1. There is no universal best approach to implementing stormwater management measures for water quality improvement
2. Some programs include practices such as planting of additional trees that state benefits that appear contrary to some recent research on the impact of trees on nutrient loadings in an urban environment during the fall
3. Green infrastructure (GI) seems to be a fairly common theme (EPA and other have programs and documents on the benefits of green infrastructure), yet there are many examples of failed GI installations, usually due to improper or unaccomplished maintenance
4. Other TMDLs are seeking to mitigate chlorides, biochemical oxygen demand (BOD), bacteria, thermal discharges, and other pollutants.

The City of Los Angeles, California has an extensive program for watershed protection and to address TMDLs. The program includes low impact development, green infrastructure, and a collaborative approach with other municipalities, non-governmental organizations, and community members to implement "Enhanced Watershed Management Plans" for Los Angeles' five watersheds. Also, in 2004, the City of Los Angeles received voter approval for a $500 million general obligation (GO) bond to fund projects that fit into four general categories that are focused on providing water quality benefits in an effort called "Proposition O". (Source: City of Los Angles Watershed Protection website) This seems like a large amount but, compared to the City of Los Angeles approved annual general fund revenue budgeted in 2004-2005 year of $3.65 billion, it is less than 14 percent of that year's anticipated revenues. For comparison, the City of Appleton's 2021 General fund revenue was set at $61.7 million. A similar GO bond by the City of Appleton would be valued at about $8.5 million, which would be impactful, but would only fund a portion of the work needed. (Source: City of Los Angeles and City of Appleton annual budget reports). Furthermore, this impact would not be spread out of the City of Appleton's general fund, but would impact the Stormwater Utility, which estimated 2021 revenue of $11.8 million.

Another example of a program to achieve TMDL compliance that is closer to home is the Menomonee River Watershed-Based MS4 Permit (WPDES Permit No. WI-S065404-2). This permit consists of a group of 11 MS4s (five villages, five cities, and Milwaukee County). This permitted group is unique in that while they have individual permit benchmarks, they are allowed to operate together to improve the overall health of the Menomonee River Watershed to comply with permit requirements collectively where pooling resources is determined to be more efficient. The specifics for how a project is selected, accomplished, paid for, and how credit for improvements are shared are determined by the collaborating permittees (Source: WDNR Fact Sheet for WPDES Permit No. WI-S065404-2).

The key takeaway from this cursory review of other national programs is that there is no one-size-fits all approach to TMDL compliance. While there are a variety of tools for moving towards compliance, selecting the right practice takes time and effort. Collaboration can take many forms and range from permittees tied to a shared permit to local cost share or engineering support for a stormwater practice that provides benefits to both parties. The City has collaborated with the Wisconsin Department of Transportation to construct and maintain a stormwater pond for the Hwy 441/Oneida Street reconstruction and also with developers to manage private and public land together in shared SMPs.

4.7 Impacts of New Development and Redevelopment

As part of this Citywide water quality plan, it was desired to understand the impacts that both new (future) development and existing areas that redevelop have on water quality pollutant loadings. As the City grows and redevelops, there will be incremental impact, either positively or negatively, on the City's overall level of pollutant reduction and can provide some insight into how ordinance changes could impact future pollution reductions. Some municipalities are changing their ordinances to require higher levels of pollution control/reduction to place more of the burden on new development and redevelopment sites. These changes can provide incremental improvements in water quality but are also impactful to developers and can be challenging to convince development stakeholders (internal and external) to accept such a change.

4.7.1 New Development

The WDNR TMDL Guidance for MS4 Permit Planning, Implementation and Modeling Guidance requires the TMDL analysis area to include all land areas within its corporate boundary unless it is listed as optional (e.g., riparian areas). Therefore, as the City grows, so will its no controls and with controls pollutant loadings.

The Upper Fox/Wolf TMDL report states that a reserve capacity of 5 percent was set aside for future discharges, changes in current discharge loading, and other sources not defined through the TMDL associated with controllable loads (does not include background or general permitted baseline loads); however, there is no direct application or allowance of new development to individual municipalities or other sources of pollutant loads. When reviewing the Lower Fox River TMDL report, that document states that the analysis did not include any reserve capacity for future growth of municipalities. The two main factors attributed to the lack of any reserve capacity for MS4 communities are: (1) the expectation that often growth is attributed to the conversion of agricultural land into urban land uses (which the report suggests TP and TSS loads may remain the same or decrease but is not guaranteed), and (2) the need to comply with NR 151 and NR 216 requiring new development to reduce pollutant loads.

As the City boundary expands or open land within the current City boundary develops (for areas not already identified as developed), the impacts will be incorporated into future water quality plan updates. The City of Appleton Water System Master Plan, October 2019, identified several areas (named A through X) that were poised to develop in 10, 20, and 30 years (see AECOM Figure 3-3 Future Service Area and Land Use in Appendix B for area locations). The analysis identified the type and acreage of land use and the timing of development which averaged between about 80 and 120 acres per year of new development. Some of those areas were already fully developed as of 2019. The map and table of land use identifying anticipated buildout timing were used in this study to approximate the impact of future development over those 10, 20, and 30 years by TMDL reachshed. A TSS reduction of 80 percent was assumed for all areas as required under the City's current post-construction ordinance, and a TP reduction of 54 percent was also assumed based on existing modeling associated with wet detention SMPs. It is important to note that TP reductions can vary depending on the practice used.

Under the current post-construction ordinance, all reachsheds will see positive movement towards TMDL compliance as areas develop. However, the Bear Creek TMDL TSS reduction requirement is 84 percent, which is higher than the current ordinance requirement of 80 percent for new development. In addition, the TMDL TP reduction requirements are 68.6 percent in Garners Creek and 85.6 percent in both Bear Creek and Lake Winnebago reachsheds, all of which are higher than the anticipated TP reduction of 54 percent that is commensurate with the 80 percent TSS reduction. That means that for the reachsheds noted, there will be a shortfall between the TMDL goals and new

development reductions that theoretically the City would need to make up in other areas to achieve the goals. A table with an analysis of projected future loads and reductions for the next three decades based on the provided information and analysis with TMDL reachshed information is included in Appendix B.

4.7.2 Redevelopment

The impact of future redevelopment areas on the City's ability to make progress towards meeting the various TMDL reachshed goals was evaluated. The City's current post-construction stormwater management ordinance has two redevelopment conditions: (1) areas 5 acres and larger are required to achieve an 80 percent reduction in TSS compared to no controls (TP reduction is assumed to be approximately 54 percent under this condition using wet detention as a surrogate SMP); and (2) areas from 1 to 5 acres are required to achieve a 40 percent reduction in TSS compared to no controls (TP reduction is assumed to be 27 percent under this condition based on the assumption used in the aforementioned WDNR guidance document, p. 5).

To evaluate this scenario, the database used to develop the with controls condition for this project was evaluated and areas were extracted for land uses that had no existing SMPs or had existing SMPs that were underperforming the reductions required under the City's ordinance. The analysis assumed that no maximum extent practicable (MEP) relief from the requirements is granted, but it is acknowledged that will likely happen as allowed by City ordinance. The analysis also did not include reducing the area of disturbance or impervious area triggers to increase the number of parcels that could be impacted by the ordinance, but that is something that the City could consider as a modification to the current ordinance. The loads associated with those areas were then reduced based on the City's current post-construction ordinance and the new TSS and TP loads were aggregated by reachshed and are reported in Table 4-11.

No specific timeline was applied to the redevelopment in any particular reachshed but rather was used to evaluate the full potential progress towards meeting TMDL target reductions. The City Community Development Department currently does not keep track of acres of redevelopment. However, based on a review by City staff of permit submittals over the last 10 years, it was estimated that the current rate of redevelopment is 20 acres per year. The results are noted in the "Redevelopment TSS (or TP) Incremental Reduction Percentage" columns in Table 4-11. The impact varies quite a bit between the various reachsheds, ranging from 0 percent to 18.6 percent improvement for TSS and 0 percent to 8.6 percent for TP. The greatest impact of redevelopment is in the Lower Fox River and Mud Creek reachsheds. The table suggests that over time Mud Creek could reach compliance with TMDL TSS reduction requirements through redevelopment in that reachshed.

This same dataset was also used to evaluate other potential ordinance requirement alternative scenarios, including requiring redevelopment control to the City's current post-construction ordinance levels for new development or TMDL reachshed targets for TSS and TP, whichever is greater. The analysis shows modest gains in incremental reductions, with the greatest impact of the change affecting the Lower Fox River reachsheds. Results are shown in Table 4-12.

A review of ordinances in other surrounding areas and Fox River tributary communities shows almost a 50-50 split between communities using NR 151 reduction requirements and those that are requiring TMDL reachshed reductions. The list of communities included in the review and their requirements are shown on Table 4-13. This information was shared with the City of Appleton Community Development Department which was not opposed to bringing an ordinance change forward to the City Common Council for consideration.

Table 4-11. Redevelopment Analysis Under Existing Ordinance Requirements

Total Suspended Solids

TMDL Reachshed	Current Conditions						Improvement Under Existing Ordinance Requirements				
	Total Reachshed Area (ac)	No Controls TSS Load (tons/year)	With Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With Controls TSS Reduction % (Compared to no controls total load)	Is TSS Load Reduction Target Met?	Potential Redevelopment Area (ac)	Redevelopment Incremental TSS Load Reduction (tons/year)	Redevelopment Incremental TSS Reduction % (Compared to no controls total load)	Future Reachshed TSS Reduction % (Compared to no controls total load)	Is TSS Load Reduction Target Met?
Apple Creek	3,388	332.3	231.8	52%	69.7%	Yes	411	12.3	3.7%	73.40%	Yes
Duck Creek	57	3.8	2.8	52%	73.7%	Yes	0	0.0	0.0%	73.7%	Yes
Garners Creek	1,576	236.7	179.7	60%	75.9%	Yes	391	5.1	2.2%	78.1%	Yes
Lower Fox River (DS)	5,966	830.6	298.7	72%	36.0%	No	950	82.3	9.9%	45.9%	No
Lower Fox River (US)	1,664	229.1	57.9	72%	25.3%	No	242	26.9	11.7%	37.0%	No
Mud Creek	1,055	164.7	47.1	43%	28.6%	No	265	30.7	18.6%	47.2%	Yes
Bear Creek	137	4.6	1.2	84%	25.8%	No	0	0.0	0.0%	25.8%	No
Lake Winnebago	427	47.2	10.6	20%	22.4%	Yes	19	2.7	5.7%	28.1%	Yes

Total Phosphorus

TMDL Reachshed	Current Conditions						Improvement Under Existing Ordinance Requirements				
	Total Reachshed Area (ac)	No Controls TP Load (lbs/year)	With Controls TP Load Reduction (lbs/year)	TMDL Target TP Load Reduction %	With Controls TP Reduction % (compared to no controls total load)	Is TP Load Reduction Target Met?	Potential Redevelopment Area (ac)	Redevelopment Incremental TP Load Reduction (lbs/year)	Redevelopment Incremental TP Reduction % (compared to no controls total load)	Future Reachshed TP Reduction % (compared to no controls total load)	Is TP Load Reduction Target Met?
Apple Creek	3,388	2,277.2	1,107.9	40.5%	48.3%	Yes	411	41.7	1.8%	50.1%	Yes
Duck Creek	57	33.7	16.4	40.5%	48.5%	Yes	0	0.0	0.0%	48.5%	Yes
Garners Creek	1,576	1,280.0	717.3	68.6%	56.0%	No	391	6.7	0.5%	56.6%	No
Lower Fox River (DS)	5,966	5,015.6	1,179.9	40.5%	23.5%	No	950	234.7	4.7%	28.2%	No
Lower Fox River (US)	1,506	1,281.0	168.5	40.5%	15.4%	No	242	81.5	5.9%	21.1%	No
Mud Creek	1,055	868.0	180.1	48.2%	20.8%	No	265	74.4	8.6%	29.3%	No
Bear Creek	137	46.9	5.4	85.6%	11.4%	No	0	0.0	0.0%	11.4%	No
Lake Winnebago	586	456.1	98.3	85.6%	15.3%	No	19	9.8	2.8%	18.1%	No

Table 4-12. Redevelopment Analysis Under Potential Modified Ordinance Requirements

Total Suspended Solids

TMDL Reachshed	Current Conditions						Improvement Under Modified Ordinance Requirements (Greater of Existing Requirements or TMDL Target)				
	Total Reachshed Area (ac)	No Controls TSS Load (tons/year)	With Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With Controls TSS Reduction % (Compared to no controls total load)	Is TSS Load Reduction Target Met?	Potential Redevelopment Area (ac)	Redevelopment Incremental TSS Load Reduction (tons/year)	Redevelopment Incremental TSS Reduction % (Compared to no controls total load)	Future Reachshed TSS Reduction % (Compared to no controls total load)	Is TSS Load Reduction Target Met?
Apple Creek	3,388	332.3	231.8	52%	69.7%	Yes	411	12.9	3.9%	73.6%	Yes
Duck Creek	57	3.8	2.8	52%	73.7%	Yes	0	0.0	0.0%	73.7%	Yes
Garners Creek	1,576	236.7	179.7	60%	75.9%	Yes	391	5.5	2.3%	78.2%	Yes
Lower Fox River (DS)	5,966	830.6	298.7	72%	36.0%	No	950	107.6	13.0%	48.9%	No
Lower Fox River (US)	1,664	229.1	57.9	72%	25.3%	No	242	35.0	15.3%	40.6%	No
Mud Creek	1,055	164.7	47.1	43%	28.6%	No	265	31.4	19.1%	47.6%	Yes
Bear Creek	137	4.6	1.2	84%	25.8%	No	0	0.0	0.0%	25.8%	No
Lake Winnebago	427	47.2	10.6	20%	22.4%	Yes	19	2.7	5.7%	28.1%	Yes

Total Phosphorus

TMDL Reachshed	Current Conditions						Improvement Under Modified Ordinance Requirements (Greater of Existing Requirements or TMDL Target)				
	Total Reachshed Area (ac)	No Controls TP Load (lbs/year)	With Controls TP Load Reduction (lbs/year)	TMDL Target TP Load Reduction %	With Controls TP Reduction % (compared to no controls total load)	Is TP Load Reduction Target Met?	Potential Redevelopment Area (ac)	Redevelopment Incremental TP Load Reduction (lbs/year)	Redevelopment Incremental TP Reduction % (compared to no controls total load)	Future Reachshed TP Reduction % (compared to no controls total load)	Is TP Load Reduction Target Met?
Apple Creek	3,388	2,277.2	1,107.9	40.5%	48.3%	Yes	411	43.6	1.9%	50.2%	Yes
Duck Creek	57	33.7	16.4	40.5%	48.5%	Yes	0	0.0	0.0%	48.5%	Yes
Garners Creek	1,576	1,280.0	717.3	68.6%	56.0%	No	391	7.7	0.6%	56.6%	No
Lower Fox River (DS)	5,966	5,015.6	1,179.9	40.5%	23.5%	No	950	307.9	6.1%	29.7%	No
Lower Fox River (US)	1,506	1,281.0	168.5	40.5%	15.4%	No	242	104.4	7.5%	22.9%	No
Mud Creek	1,055	868.0	180.1	48.2%	20.8%	No	265	76.2	8.8%	29.5%	No
Bear Creek	137	46.9	5.4	85.6%	11.4%	No	0	0.0	0.0%	11.4%	No
Lake Winnebago	586	456.1	98.3	85.6%	15.3%	No	19	9.8	2.8%	18.1%	No

Table 4-13. Stormwater Quality Ordinance Research				
Municipality	Pollution Reduction Requirements		Requirements Applicability	
	TMDL Reach TSS/TP Reductions	NR151 (80%/40%) TSS Reductions	Disturbed Area	New Impervious Area
Appleton, City of		X	1 acre	
Calumet, County of	X		1 acre	20,000 sf
DePere, City of [1]		X	1 acre	20,000 sf
Fox Crossing, Village of	X		1 acre	20,000 sf
Grand Chute, Town of	X		1 acre	4,000 sf
Green Bay, City of		X	Tiered	1/4 acre
Harrison, Village of		X	1 acre	20,000 sf
Kaukauna, City of	X		1 acre	20,000 sf
Kimberly, Village of		X	1 acre	20,000 sf
Little Chute, Village of		X	1 acre	20,000 sf
Menasha, City of	X		1 acre	20,000 sf
Neenah, City of	X		1 acre	20,000 sf
Outagamie, County of	X		1 acre	20,000 sf

Note: [1] -DePere has stormwater utility fee incentive if you meet TMDL reduction requirements.

4.8 Pollutant Trading

Rather than solely implementing source controls or other SMPs on the City's stormwater management system, another alternative is to identify entities or sources available for water quality pollutant trading.

The WDNR's "Guidance for Implementing Water Quality Trading in WPDES Permits" was updated on June 1, 2020. The guidance document is intended to assist with developing and implementing trades associated with various WPDES permits as authorized in s. 283.84 Wis. Stats. Trades may be used by industrial and municipal WPDES permit holders to demonstrate compliance with water quality-based effluent limitations (WQBELs). Trading is different from, and not to be confused, with adaptive management. Adaptive management is typically for phosphorus compliance only and must demonstrate evidence through monitoring of in-stream phosphorus concentrations and eventually achieving phosphorus water quality criteria in the water of focus. It is important to note that an adaptive management approach must be under the lead of a Wastewater Treatment Plant. A stormwater program cannot undertake an adaptive management approach on its own.

Water quality trading can be applied to a number of pollutants, not just phosphorus, and involves the purchase or creation of "credits" in the watershed to achieve compliance. A trade can be between two point sources "point to point" or a point source and nonpoint source "point to nonpoint". Municipal stormwater runoff and discharges are sometimes referred to as nonpoint sources and other times as point sources. For the purpose of trading, stormwater is considered a point source, as is the City of Appleton's wastewater treatment plant discharge. "Nonpoint sources" are land management activities that contribute runoff, seepage, or percolation which adversely affects water quality, such as agricultural runoff.

The various potential pollutant trading options available to the City of Appleton's stormwater management program were evaluated. Details are included in the Water Quality Trading Alternative Summary document located in Appendix B and highlights are noted in the following sections.

4.8.1 Water Quality Trading in Agricultural Areas

While water quality trading is not new to Wisconsin, it is not widely utilized as a tool for WPDES permit compliance. To assist in understanding some past trades and considerations in agricultural situations, City of Appleton and BC staff met with Jessica Schultz, Executive Director of the Fox-Wolf Watershed Alliance (FWWA), on January 21, 2021. As part of the discussion, Jessica shared her experiences from her feasibility study "Exploring Water Quality Trading for Compliance" with Neenah-Menasha and Fox-West Regional Sewerage Commissions and the Heart of the Valley Metropolitan Sewerage District (Wisconsin's first water quality trade in a TMDL watershed). During that discussion, Jessica noted that, while there have been some positive changes associated with WDNR guidance, her experience has been that, in its current state, water quality trading continues to be a rather costly method of moving towards compliance that involves considerable risk in most cases.

Based on FWWA's experience with trading and the current WDNR guidance, it appears that the best scenario for a trade working with agricultural land would result if the City had an opportunity to convert agricultural lands into the City's parks and open space plan. In this instance, the purchase of the land would match other objectives of the City, would not have the secondary impact of removing land areas that might be otherwise developable and beneficial to the tax base, and would provide the desired long-term benefit. The number of credits available would depend on the specific identified final use of the land and need to go through the full pollutant loading evaluation effort and trade process in the WDNR guidance. The proposed trade must be approved by the WDNR through the Notice of Intent process and follow the guidance outlined to be eligible. Past acquisition or instances are not eligible.

During a review with the City of the concept to implement a trade with an agricultural area through conversion of the ag land to park land, it was noted that the City may have such an opportunity where a future park site is suggested on farmed land currently owned by Thrivent in the Apple Creek Reachshed. While the Apple Creek reachshed does not need further TSS or TP reductions, excess reductions could be applied to the Lower Fox River DS Reachshed. A brief desktop analysis was conducted (see Appendix B) using information from the Lower Fox River TMDL report to evaluate the base load and load reduction requirements for ag land in the Apple Creek Reachshed and using WinSLAMM to assess the loads associated with parkland.

This scenario was discussed with WDNR staff. There are a number of potential challenges with this specific trade as noted in the discussion items presented in Appendix B. Although it is possible that the credit that could ultimately be obtained, proving evidence of actual improvement to the Apple Creek reachshed may challenging because of existing stormwater practices treating the area in question. Also, a trade such as this would require the City to move from their current General Permit to an Individual Permit, as that is the mechanism that the WDNR uses to track trade related permit compliance items. City staff review of the example individual permit provided by DNR determined additional staff would be needed to meet the additional permit requirements. The addition of staff was avoided in developing this plan.

4.8.2 Water Quality Trading with the City of Appleton Wastewater Utility

Beyond looking at agricultural areas for generating stormwater quality credits, the City also has the potential to consider a trade between the City of Appleton's Wastewater Utility (wastewater utility) and the City's stormwater management program. Excess credits available in the wastewater utility could be purchased by the stormwater management utility to help close the gap on reachshed TMDL compliance. The cost per pound to purchase the credits must be developed and compared to other

potential practices for cost effectiveness, and both entities must be willing to have the trade incorporated into their permits and understand the long-term impacts of the trade.

City of Appleton stormwater staff and BC staff met with Chris Stempa, Deputy Director of Utilities for the City of Appleton, on January 27, 2021, to discuss this water quality option. The goals of the meeting included obtaining an understanding of current wastewater utility operations and WPDES permit requirements, review current treatment/discharge levels of TSS and TP compared to permit limits, and initiate a discussion on potential water quality trading opportunities available to both parties.

The City's wastewater treatment plant discharges to the Lower Fox River Mainstem Downstream Reach. The Lower Fox TMDL evaluated the point loads from the wastewater plant and a TP load allocation was established in the TMDL for daily loadings to the reach of 20.69 lbs/day (7,556 lbs/yr), which is a 43.7 percent reduction from their baseline load. The TMDL also allocated a TSS load of 465 bs/day (169,857 lbs/year) which did not result in a TSS load allocation reduction target being established for the wastewater discharge.

The WPDES permit for the wastewater treatment plant includes discharge limits of 1,322 lbs/day (expressed as a monthly average) and 2,434 lbs/day (expressed as a weekly average) for TSS. The plant is operating under an interim limit of 1.0 mg/L for TP, but the discharge limit will be lowered to 23 lbs/day (expressed as a six-month average) and 69 lbs/day (expressed on a monthly average) with the issuance of the next permit. These current TSS and pending TP discharge limits are based on the Lower Fox TMDL wasteload allocations for the plant. The current permit for the plant expires on March 31, 2022.

The wastewater utility would like to increase their factor/margin of safety for TP compliance, so are unlikely at this time to be able to entertain a trade of any excess TP. However, TSS discharge loads have been well below their permit levels and the load allocated to the wastewater utility in the TMDL. Based on this information and the data presented in Appendix B, it appears that there may be an opportunity for the stormwater utility to purchase excess TSS capacity/credits available from the wastewater utility. Further clarification from the WDNR on this topic via email noted that a trade ratio of 1.1:1 would be applied, resulting in approximately 124 tons per year of TSS available for trade. The WDNR also noted that both entities would need to have their permits modified to reflect and document that trade. This would mean that the City would need to have their General Stormwater WPDES Permit modified to an Individual Permit.

To develop an estimated value of this trade, the cost for the City for the Leona Street Pond was used as a reference for a recent regional stormwater management facility. The cost to construct the Leona Street Pond was approximately $1,925,882, per City of Appleton Expense Reporting (includes engineering, land acquisition, and construction related costs – but does not include any ongoing maintenance costs) to remove 16.4 tons/year of TSS. However, Leona Street provides both stormwater quantity and quality management and the City has typically allocated 40 percent of the construction cost to stormwater quality. This would result in approximately $770,350 in construction related costs and equate to approximately $46,973/ton of TSS removed. It is important to note that the Leona Street detention facility was constructed with some features such as a deeper wet detention pool to allow for the potential future addition and application of enhanced phosphorus treatment which increases its cost somewhat over some other stormwater facilities. At 124 tons/year, the excess TSS capacity of the Appleton WWTP is the equivalent of building over 7 (~7.56) Leona Street detention facilities. If $50,000/ton of TSS is used, the present worth value of the 124 tons/year of excess WWTP TSS would be $6,200,000.

Ultimately the cost or value of the TSS trade from the wastewater utility would need to be negotiated between the wastewater and stormwater utilities in consultation with the City Finance and Legal staff to understand internal logistics. There would also need to be a clear understanding of the benefits to both the wastewater and stormwater utility rate payers for the trade as they ultimately will bear the cost of a trade. Additionally, there are reduced benefits to the stormwater utility if only TSS credit is gained as both TSS and TP reductions are needed. Based on the WDNR indicating that the City's stormwater management program would have to change from the General Permit to an Individual Permit, the City is not currently interested in implementing a trade in the near term.

4.8.2.1 Other Potential Opportunities for Pollutant Trading

During the meeting, there was also discussion on how the wastewater utility and stormwater utility might consider working together to evaluate and implement a shared trade with a nonpoint (agricultural) source might work. There is interest from the wastewater utility to increase their margin of safety with their TP discharge given the seasonal variability. Additionally, the use of chemical treatment to achieve the TP levels on an ongoing basis is costly and may also provide some potential relief to reduce polymer use and still be able to achieve wastewater plant WPDES permit levels reliably. The balance of the TP reductions realized from a nonpoint source trade could be utilized by the stormwater utility. The wastewater utility does not need additional TSS reductions, so any credits realized in that regard could be available to the stormwater utility.

4.8.3 Water Quality Trading with City of Appleton TMDL Compliant Reachsheds

The only pollutant trading that the City has considered to date was discussed in the 2014 City of Appleton Citywide Stormwater Management Plan, where excess TSS and TP in TMDL compliant reachsheds were identified as an internal trade opportunity to help close the gap with downstream reachsheds. This continues to be a viable and very cost-effective method to implement a trade since there essentially is no cost because the TSS and TP reductions are already available and in the control of the City. Section 3.3.6 of this report identified reachsheds with excess TSS (See Table 3-7) and TP (See Table 3-8) that can be applied to the Lower Fox Mainstem. The City has confirmed with the WDNR during this study that there is no trade ratio for the City to internally apply credit to a downstream reachshed. However, one key caveat to this is that the City needs to have model evidence of each pond performance with the ability to maintain the long-term performance before the credit can be applied. Therefore, the City has scheduled the development of additional models to confirm these expectations.

4.9 Technological Changes for Stormwater Pollution Removal

The City of Appleton utilizes various types of SMPs—wet detention, catch basins/HSDs, street cleaning, and biofiltration—to treat stormwater discharges. The City has explored a variety of practices over the years including implementing an enhanced leaf management program (as discussed in Section 4.2), incorporating coagulant use with wet detention for enhanced TP removal (Section 4.4), and other practices such as permeable pavement. As the City continues to grow in understanding of the potential future application of technologies and program changes, some will work their way into the City's efforts to improve stormwater quality, while others may not. Regardless, the City remains interested in understanding what other technological changes are taking place that could become additional tools for implementation to further improve stormwater quality. While the City is open to considering new technologies, it is also important to understand how the WDNR accepts these new technologies and provides assurances that credit toward TMDL reduction targets is granted before any investment is made. New technologies also come with limited cost data for long term operation and maintenance. Some potential technologies for implementation or augmentation of current practices are presented in the following sections.

4.9.1 Proprietary Filtration Devices

Proprietary filtration devices are not necessarily new, but the variety of vendors and types of filters has grown over the years. More importantly, the WDNR has developed a new technical standard (1010) for Proprietary Storm Water Filtration Devices, and these types of devices are also now able to be modeled more directly in WinSLAMM. The City of Appleton currently does not have any municipally implemented proprietary filtration devices. The model and guidance document includes an evaluation of pollutant removal and provides an expectation of filter maintenance frequency (filters are sized to be replaced annually).

As part of a recent study to evaluate the conversion of a rural section of road to an urban section in another community, BC considered multiple types of potential SMPs to treat stormwater discharges to the required level of pollutant reduction. Proprietary filters were one of the practices evaluated. Challenges with incorporating them included space restrictions (horizontal and vertical for structure placement to physically install the devices and develop the required head to pass the needed flows) and location for convenient access to replace the filter cartridges and maintain the devices annually as required. One additional challenge for the evaluated site was the amount of off-site runoff that was being treated by a grassed swale. Replacing the swale with an urban section of road would have required a large number of filtration devices that could not be readily accommodated in the right-of-way that was available.

A preliminary cost estimate to install four dispersed devices to remove 0.91 tons/yr of TSS and achieve a 67 percent reduction suggested a capital cost of almost $135,000 (about $150,000 per ton of TSS). That does not include the additional identified costs for storm sewer, design, and estimated $20,000 of annual maintenance cost needed to dispose and replace media packs.

4.9.2 Treatment Practice Augmentation

The addition of a coagulant treatment component to an existing (or future) wet detention facility is one example of modifying (augmenting) a traditional type of treatment practice to enhance pollutant removals. While the WDNR does not have a full standard developed for the use of coagulants, there are documents for “Water quality review procedures for additives” and “Allowable usage rates for water applied additives” available on the WDNR’s website and a way that the WDNR would accept pollutant reductions if this practice was utilized, without currently having a full technical standard developed.

Two other types of additives that have been used to enhance pollutant removal effectiveness in a traditional stormwater practice are iron filings and blast slag.

The Minnesota Stormwater Manual suggests that the incorporation of iron filings into a filtration media aides in the removal of dissolved pollutants, particularly phosphorus. Source: https://stormwater.pca.state.mn.us/index.php?title=Iron_enhanced_sand_filter_combined

The iron filings are typically mixed into a sand filter treatment device, but an example project also included a sand infiltration bench in a wet detention pond. Depending on the device and how a sand filter is incorporated, there can be aesthetic impacts as plants generally do not grow well in sand and may be more appropriately suited to an industrial land use situation.

From a maintenance perspective it was noted that the devices should have a pretreatment component to remove a significant portion of the solids, limiting drainage area can help maintain pollutant removal efficiency, and that there needs to be good/easy site access for routine and periodic maintenance. As phosphorus binds with the iron, the effectiveness will be reduced and eventually the media will need to be removed and replaced.

Another admixture incorporated into a stormwater practice was the City of Cudahy Wisconsin's City Hall and Squires Avenue Parking Lots and Green Alley project. That project incorporated air-cooled blast furnace slag into the project to enhance pollutant removals with a permeable paver system and a proprietary high rate biofiltration system. Source: https://www.estormwater.com/videos/2019-top-project-city-hall-squires-ave-parking-lots-green-alley The project is undergoing a 3-year monitoring effort to evaluate the effectiveness of the modified practices. The blast slag was obtained from an out-of-state source which would increase the cost of the material and, like the iron filings noted previously, will need to be replaced when they are no longer removing phosphorus at the desired rate.

4.10 Evaluate Compliance with General Stormwater Discharge Limitations

An aspect of the scope of services associated with the grant that the City received from the WDNR included a review and discussion/coordination with WDNR on WPDES Permit Section 1.9 "General Stormwater Discharge Limitations" and consideration of that permit section when proposing SMPs where appropriate. Communication with the WDNR noted that "Section 1.9 is a narrative description of water quality standards. The intent of the permit as a whole is to meet the water quality standards."

Further discussion and reflection with City staff on Section 1.9 and the statement from the WDNR led to a conclusion that the City's program seeks to address the water quality standards through a variety of mechanisms including the City's illicit discharge detection and elimination (IDDE) program. The annual IDDE program includes a screening and inspection of city outfalls.

Section 5

Post-Construction Stormwater Ordinance Updates

The City of Appleton periodically makes updates to the post-construction stormwater management ordinance, and other ordinances as needed, to align with current WDNR regulations, improve usability, and incorporate other improvements. The post-construction ordinance (Article VI of Chapter 20 of the Municipal Code of the City of Appleton) was last modified in 2020 and became effective on April 28, 2020. The ordinance updates included changes to definitions, general language, and requirements to conform to regulations and increase usability.

As part of the Citywide study as outlined in the WDNR grant, the City reviewed potential revisions to the ordinance as described in this section.

5.1 Post-Construction Stormwater Ordinance Updates

As part of this citywide stormwater management plan update, multiple potential revisions to the post-construction stormwater ordinance were considered including:

- Modifying TSS reduction percentage requirements to call for the more restrictive of either the current TSS reductions (based on NR151/216) or that of the TMDL reachshed targets
- Adding TP reduction requirements (current ordinance requires reporting TP reductions but does not have a required reduction percentage)
- Lowering the applicability trigger by adding a threshold for the amount of new impervious area in a development that would trigger the water quality requirements (e.g., 4,000 square feet or more of new impervious surface)
- Lowering the disturbed area threshold below the current one-acre trigger (e.g., 1/2 acre)

The impact of modifying the current ordinance on redevelopment is discussed in section 4.7.2 of this report for increased TSS and TP reductions. The review suggested incremental progress could be made in almost every reachshed. A review of neighboring and peer municipalities as presented in Table 4-14, also found that almost 60 percent of the ordinances reviewed were utilizing unique targets by TMDL reachshed (not all necessarily set at the same levels based on TMDL reports, partially because some ordinances were updated before TMDL reports were completed).

These potential changes were shared with Community Development, which was supportive of making the TSS and TP reduction requirement changes. Both DPW and Community Development were not supportive of adding an impervious area trigger or reducing the disturbed area threshold, which would increase the City's administrative load, be burdensome on small parcels, and make smaller incremental differences.

The City also identified other modifications to the ordinance that increased overall usability of the ordinance, such as requiring developers to submit models and other digital information that help define the treated area(s) that can be of use to the City in future plan updates. The updated ordinance language is undergoing review by elected officials and is currently expected to be put before the Common Council for consideration and action in March of 2022 with a target effective date of August 1, 2022. The updated Post-Construction Ordinance can be found in Appendix C.

Section 6

Implementation Plan

Under the MS4 General Permit, Section 1.5 describes the requirements for compliance with "approved TMDLs". For the City of Appleton, this includes both the Lower Fox River TMDL and the Upper Fox/Wolf River TMDL. One of the permit requirements is the development of an implementation plan if the stormwater pollution analysis shows that the current pollution control level is not meeting the pollutant reduction requirements for each reachshed in the MS4. The permit states that the implementation plan schedule may extend beyond the expiration date of the current permit, and no ultimate implementation deadline is specified. The analysis conducted in Section 3 of this report concludes that the City's existing management practices do not fully achieve the TSS or TP reduction targets for all reachsheds and therefore the City must develop an implementation plan.

The targets were developed through monitoring and modeling during the TMDLs development process. The WDNR recognizes that, although the reduction targets are the best estimate of needed pollution loading levels, there is no certainty as to how the impaired receiving waters will respond to the changes in pollution loads. The impaired waters may achieve the desired water quality conditions with less pollution load control, or, conversely, the desired water quality conditions may require more pollution control than indicated.

This report has evaluated multiple potential actions that the City could take and stormwater management practices that the City could implement to move towards future compliance with the TMDL reduction targets as outlined in Section 4. The WDNR requires that MS4 permittees show continued progress towards achieving the pollution reduction targets. Brown and Caldwell and City staff worked together to select the components included in the implementation plan. This section discusses components that have been included in the detailed implementation plan located in Appendix D.

6.1 Implementation Plan Components

As previously stated, the current MS4 Permit does not require the City to set a firm deadline for when the pollution reduction targets will be met. The permit language states that the City must "make progress toward achieving compliance". This plan provides a clear approach to "make progress toward achieving compliance". The detailed implementation plan, located in Appendix D, provides a schedule for implementation of the recommendations and the corresponding impact on pollutant loadings to the various reachsheds. Where applicable, the impacted area associated with a specific practice being implemented is noted. The schedule was developed to be achievable within the technologies currently available and with an eye on cost effectiveness of practices and approaches overall. General details of the implementation plan components are described in the following sections:

6.1.1 Street Cleaning

The City's street cleaning program is a proven technology that contributes to reduced stormwater runoff pollution and improved aesthetics. The City intends to add additional high efficiency street cleaning equipment and sweep all areas using high-efficiency street cleaners in 2030 after other capital purchases and projects are complete. They will maintain some conventional sweepers for use as needed.

The implementation plan currently does not include an expansion of cleaning frequency in the spring to an 'intensive cleaning' six-week schedule due to the need to procure outside contracted cleaning support but may be considered in future years.

6.1.2 Leaf Management

The City has scheduled a change in their leaf management program over a phased implementation period through 2026 to move away from the current collection methodology. The change allows for increased pollutant reduction credit for leaf management in specific residential land use areas that meet the criteria under the WDNR's guidance documentation.

The program will be implemented citywide and as a result there will be water quality benefits that currently cannot be quantified under the WDNR's guidance. It is hoped that, as the guidance develops further, the City can take further credit for this programmatic change.

A more robust evaluation of the City's leaf collection program and analysis of TP removal credit is programmed for 2028.

6.1.3 Regional Stormwater Management Practices (SMPs)

The City currently has many regional SMPs located throughout the various reachsheds that provide reliable and proven stormwater treatment. The City is continuing to provide routine maintenance and is in the process of evaluating locations to manage future wet detention pond dredge material.

This plan evaluated several potential locations for future SMPs and the implementation plan has identified six future potential practices for installation. The RGL Warehouse/Lagoons Pond in the Mud Creek Reachshed is the first scheduled for implementation and has a more detailed schedule laid out in the implementation plan. Future projects are generally scheduled for development over a five-year period to allow for land acquisition, environmental investigations, engineering design and construction. Projects are scheduled sequentially through 2053.

6.1.4 Enhanced Settling for Phosphorus Removal

The City has considered the use of coagulant treatment of stormwater runoff to provide enhanced settling for pollutant removal for a number of years, including a broad consideration in the 2014 Citywide Plan. Recent design projects for Leona Street and Wisconsin Avenue have further considered the technology. The Leona Street wet detention facility was constructed with a deeper pool to allow for the accumulation of floc from coagulants; however, the City has not fully implemented an augmented wet detention practice at this time.

It appears that the WDNR may be planning to develop technical guidance for the use of coagulants in stormwater that could reduce some of the uncertainty with implementing this technology. Currently, the implementation plan includes wet detention pond augmentation starting in 2054, after the regional SMPs discussed previously are in place. Like the regional SMP implementation schedule, wet pond augmentation to include coagulant treatment is scheduled for six existing or proposed facilities over a 5-year period from 2054 through 2083. It is possible that the establishment of WDNR guidance for this practice may create incentive to adjust the schedule and incorporate enhanced settling with a new facility sooner than currently laid out in the plan.

6.1.5 Hydrodynamic Separation Devices (HSDs)

The City routinely includes stormwater quality considerations when developing watershed studies, even if the driver behind the study is flood management. As those studies are completed, numerous opportunities for small treatment devices (HSDs) are identified where larger regional facilities could not be implemented due to limited space. Those devices are further evaluated and, where possible, implemented during road construction. While they do not provide major pollutant reduction, they do add incremental benefits to the overall pollutant reduction program. Since road reconstruction projects are scheduled based on need (road deterioration evaluation or other reasons) the specific timing of most HSDs cannot currently be identified. Therefore, they are added near the end of the implementation plan for reachsheds with identified HSDs.

6.1.6 Non-Regional SMPs and Ordinance Modifications

In addition to the City installed HSDs discussed in the prior section, other non-regional SMPs were considered in this study and previous citywide studies. In the prior 2014 Citywide SWMP, biofilters and permeable pavement were investigated as ways to treat more dispersed development areas, with a focus on parking lots, when regional facilities could not be implemented. While the evaluation was conducted on a high level, it resulted in the highest cost per ton of TSS or pound of TP. Several sites were also reviewed in this plan as small site options and the potential for new technologies, such as proprietary filters. These practices are challenging to implement because they would largely be on private lands that require easement or acquisition, be impacted by owner willingness and/or ability to give up the space and allow the project to proceed, topographic and/or utility challenges, and the overriding concerns over cost effectiveness and future maintenance.

This study included an evaluation of the impact of modifying the City's current post-construction stormwater management ordinance to incorporate water quality reduction requirement targets (note that maximum extent practicable can still be requested) that will positively impact TMDL reachsheds for new development and redevelopment. When evaluating the impact of ordinance changes on redevelopment, the analysis conducted under Section 4.7.2 identified a potential 2,277 acres that could be positively impacted by changes to the post-construction ordinance. Duck Creek and Bear Creek were the only two reachsheds that were identified that did not have noted benefits from an ordinance change. Since redevelopment can generally not be pinpointed and timed to a specific reachshed, for the purposes of the implementation plan, it was assumed that the recent rate of redevelopment of 20 acres per year would equally impact all potential redevelopment areas. Under this theory, all areas would be redeveloped in about 114 years (simplified to 120 years in the implementation plan so redevelopment would be theoretically complete in 12 decades). The implementation plan incorporates these theoretical improvements by decade and is subject to change based on actual redevelopment.

New development will also be impacted by these ordinance changes with the increased TSS and TP reduction requirements. The specific impact of these changes is not currently identified in the implementation plan as much of the new development would be the conversion of agricultural areas into some form of urban land use that would modify the no controls and with controls pollutant loads and is not easily calculated in the implementing spreadsheet nor can it be readily placed on the timeline.

6.1.7 Pollutant Trading

This study looked extensively at various pollutant trading options. Currently, the only option that appears acceptable and readily implementable to the City is an internal trade of excess TSS and/or TP from an upstream reachshed to a downstream reachshed. No trading with other municipalities is currently proposed or envisioned.

The implementation plan identifies reachsheds that are meeting their TMDL reduction goals and to what reachshed the reductions are proposed to be credited. For some reachsheds, there is an internal credit applied in 2023, after the City's 2022 efforts to complete their library of regional SMP WinSLAMM models is completed to confirm the available trade amount available. To be conservative, the implementation plan suggests a trade of 80 percent of the available excess TSS and/or TP loads. There is also an internal trade noted at the end of the implementation plan period to calculate an end of plan trade to downstream reachsheds in an effort to meet the TMDL reduction targets.

6.1.8 Non-measurable Implementation Plan Components

In addition to the various components of the implementation plan described in the previous sections that provide measurable progress towards meeting the various TMDL reachshed goals, there are numerous other items identified in the plan that do not provide direct quantifiable/measurable progress toward stormwater goals. The following list contains implementation plan components that contribute toward improving stormwater quality and how they are relevant to the implementation plan.

- **Model development.** Confirms existing SMP effectiveness and complete WinSLAMM model library which will also allow the City to implement internal TSS and TP trades.
- **Stormwater utility billing system updates**. Allows accurate billing charges and supports revenue needed to implement the plan.
- **Plan updates.** Allows the City to quantify progress towards meeting TMDL goals and evaluate emerging technologies.
- **MSB expansions.** Allows storage and maintenance of equipment used to implement or maintain stormwater management practices.
- **Leaf management implementation**. Implementation is citywide and improving stormwater quality on all impacted areas, even those that are not currently identified as able to receive credit based on WDNR guidance.
- **Wet detention pond floc dredge.** A floc dredge is required for removal of settled material when wet detention ponds are modified with this technology. Implementation is anticipated to be applicable citywide ultimately, but currently identified in the plan associated with the Garners Creek Kensington Pond which is the first pond identified for potential use.

6.1.9 Implementation Plan Component Limitations and Opportunities

In development of this report and the resulting implementation plan, there are several qualifications or limitations that should be understood and are listed in the following items:

- **Regional SMP TSS and TP reductions.** The pollutant reductions associated with regional SMPs were based on WinSLAMM modeling where available. For SMPs without a model, reductions are based on prior planning report information. As part of this Citywide SWMP, WinSLAMM models were developed for several regional SMPs that the City did not have a model for. The City of Appleton is developing WinSLAMM models for the remaining regional SMPs in 2022. It is important to note that some differences were found between the models developed as part of this study and previously reported treatment efficiency. It is anticipated that minor differences will also be found as a result of the 2022 modeling efforts for the 21 models that are under development.
- **Identified implementation practice feasibility.** The planning team made an effort to consider potential hurdles and opportunities to the implementation of the various practices evaluated. All practices were discussed, evaluated, and identified for implementation with the support of City staff and are believed to be implementable. Regional SMPs were discussed with neighboring municipalities where appropriate, and with current landowners to assess willingness to participate

in the projects. Preliminary engineering will be needed to further evaluate the specifics of each project including detailed environmental evaluation and permitting as needed.

- **Leaf Management reductions.** Leaf management reductions on TP loads were included based on an assessment of tree density (spacing) throughout the City and current WDNR guidance and limitations (such as applicability only to specific medium density residential land use areas). Future enhancements to the WDNR guidance and further understanding of tree cover/canopy may allow expansion to current identified land use areas and/or include other land use areas to increase TP credit. A leaf management analysis is identified for 2028 to investigate this practice further.
- **Enhanced TP reductions through coagulant treatment.** Estimates on performance and cost associated with enhanced TP treatment as an augmented practice to wet detention ponds was based on previous studies. The WDNR appears to be poised to develop technical guidance that could reduce some of the unknowns with applying this technology. Furthermore, it is recommended that additional research into this practice be conducted including pilot testing of stormwater samples and coagulants and close coordination with City of Appleton Wastewater Utility staff to evaluate any impact to WWTP operations and to further define both construction and annual treatment and disposal costs.
- **Financial.** Cost estimates were developed from a number of sources including City provided studies, labor costs, equipment costs, bid tables, and outside sources. An annual inflation value of 3 percent was used to estimate the value of operation and maintenance activities to determine present worth for cost efficiency comparisons as well as to project the cost of identified construction projects implemented in future years. Market volatility and other factors can impact the actual rate of inflation.
- **Regional Practices development.** During this study, there was an effort to reach out to neighboring municipalities and entities, such as WisDOT, to discuss opportunities to develop regional practices that can be of benefit to multiple entities. The City will continue to explore opportunities in the future.
- **TSS and TP reduction estimates.** Estimates are based on WinSLAMM modeling to the extent possible. Final reductions achieved by a specific practice will be determined following design and ultimately construction in some instances. Redevelopment estimates are based on full compliance with the current or future post-construction stormwater management ordinances and does not include any allowance for potential reduction in effectiveness due to approved maximum extent practicable (MEP) that may be allowed to developers based on challenging site considerations, technological limitations, or financial hardship/cost effectiveness reasons.

6.2 Implementation Plan Results

The implementation plan provides details for the proposed activities as a result of this Citywide SWMP Update. The implementation plan envisions the potential to meet TMDL reduction targets for all of the Lower Fox TMDL reachsheds.

For the Upper Fox/Wolf TMDL reachsheds, the Lake Winnebago reachshed is currently meeting the TSS reduction goal; however, it is not meeting (nor does the plan identify a way to achieve) the 85.6 percent TP reduction goal. In addition to identified efforts in the implementation plan, the City of Appleton will look for opportunities to work with the City of Menasha on future joint stormwater management facilities to treat stormwater runoff in this reachshed.

Additionally, the Bear Creek reachshed is not currently meeting the 84 percent TSS or 85.6 percent TP reduction goals; nor does the plan identify a way to achieve the goals at this time. As new development takes place in the Bear Creek reachshed, it is anticipated that the gap will be greatly

reduced, particularly with respect to the TSS goal. However, while new development will reduce the current TP gap, the required reduction is extremely aggressive and would require advanced treatment of stormwater runoff that is technologically a challenge and can be extremely costly.

6.3 Compliance with Permit Requirements

For the Lower Fox TMDL reaches, which the City of Appleton was subject to a TMDL approved prior to May 1, 2014, the City is seeking compliance with the TMDL reduction requirements over multiple terms as allowed under WPDES Permit WI-S050075-3 Appendix A.5. The City believes it is meeting all requirements as follows:

- A.5.1 – the City is notifying the Department through this report document (in writing) which reachsheds and pollutants of concern are not in full TMDL compliance
- A.5.2 – The City is currently operating under an approved implementation plan and is further modifying that plan through this report document, and is currently in compliance with achieving:
  - at least 20 percent of the remaining reduction needed beyond the current 20 percent TSS reduction required under NR151.13(2)(b)1.b (the City is exceeding this requirement)
  - at least 10 percent of the remaining reduction needed beyond 15 percent TP reduction to achieve full compliance (the City is exceeding this requirement)
- A.5.3 – The City:
  - is currently updating their post-construction ordinance to be stricter than the statewide standards established by the Department of Natural Resources
  - currently requires development and implementation of a maintenance plan for privately-owned storm water treatment facilities for which the City takes TSS and/or TP reduction credit and is further modifying their post-construction ordinance to expand on requirements
  - currently requires submittal of record drawings via their post-construction ordinance
  - is implementing an expanded municipal leaf collection program as described in this report
  - has inventoried the condition of outfalls within the MS4 permitted area and addresses erosion or scour
  - installed the Leona Street facility as a new structural measure during the current permit term
  - has conducted an analysis of the current municipal street cleaning program in this report and has identified future program modifications in the implementation plan

For the Upper Fox/Wolf TMDL reaches, which the City of Appleton was subject to a TMDL approved after May 1, 2019, this document includes a TMDL implementation plan in accordance with Appendix C.4. The City believes it is meeting all requirements as follows:

- C.4.1 – within 36 months of the approved TMDL (approved by EPA February 27, 2020), the City is submitting updated storm sewer system mapping as part of this report
- C.4.2 – within 36 months of the approved TMDL, the City is submitting a tabular summary associated with each MS4 TMDL reachshed

Appendix A: Figures

Appendix B: Supplemental Project Information

1. WisDOT Agreement
2. Calumet and Outagamie County Agreements
3. Figure B-1 Neighboring Municipality Right-of-Way Jurisdiction
4. 2014-2020 Soils Comparison
5. WinSLAMM Street Cleaning Parameters
6. Table 3-5B-Regional SMP Details
7. Table 3-6B-Non-Regional SMPs
8. Street Cleaning Assumptions
9. B4-2a Leaf Management Program Alternatives Summary
10. B4-2b Leaf Management Program Modification Assumptions
11. B4-3a Regional SMP Alternatives Summary
12. B4-3b Annual Pond Maintenance Cost Graph
13. B4-3c Wet Detention Cost Analysis
14. B4-5a HSD Annual Maintenance Assumptions
15. B4-5b HSDs Not Tributary to Existing SMPs
16. B4-5c HSDs Tributary to Existing SMPs
17. Future Development Map
18. B4-7a New Development Impact Analysis
19. Water Quality Trading Alternative Summary

Memorandum of Agreement for Stormwater Detention Pond Construction and Maintenance
between
City of Appleton and Wisconsin DOT
10/16/2017

Project ID 1517-07-04 & 1517-75-73
USH 10 – USH 10/STH 441
USH 10
Winnebago County

Introduction

This Memorandum of Agreement (MOA) documents decisions and responsibilities agreed to by the Wisconsin Department of Transportation (Department); and the City of Appleton (Municipality); through each agency undersigned duly authorized officers or officials.

The purpose of the MOA is to specify:

- Construction responsibilities of the Department
- Repair responsibilities of all parties
- Maintenance responsibilities of all parties
- Land ownership responsibilities of all parties
- Land use change responsibilities of all parties

Project Concepts

As part of the US 10/ WIS 441 Tri-County Expansion Project, under construction project ID 1517-75-73 (the "Project"), which is currently scheduled to be completed by October of 2019 the Department will construct a stormwater detention pond and related stormwater management facilities, as more fully described herein (the "Detention Pond") near the northwest quadrant of the WIS 441 / US 10 (Oneida St) interchange in order to meet Wisconsin Department of Natural Resources (DNR) stormwater quality requirements.

The Municipality expressed interest in the Detention Pond and recognizes a cost savings would result from the additional stormwater quality improvement on the watershed within their boundaries that would be treated at the Detention Pond. This will reduce or eliminate their need to construct separate stormwater pond in the area or construct more costly measures such as biofilters or underground storage. Hence, the municipality is willing to perform routine maintenance of the Pond at no cost to the Department.

WisDOT Detention Pond Construction Responsibilities

The Department shall complete construction of the Detention Pond, with the exception of final planting, funded 100% by the Department to provide a greater than 80 % total suspended solids (TSS) reduction in accordance with the current WinSLAMM computer model and current Wisconsin Department of Natural Resource guidance documents. The Department shall be responsible for securing any additional right-of-way and other property owner approvals necessary to construct and maintain (for both the Department and Municipality) the Detention Pond covered by this MOA. The Department shall construct the herein described Detention Pond as part of the Project.

The Department will provide the Municipality with final design quantity and quality computer models and any associated maps/documentation for the Detention Pond

The Department shall provide as-built plans to the Municipality and demonstrate that it was constructed and performs as intended under the project plans and specifications, and the terms of this Agreement, following completion of the Detention Pond.

Municipal Detention Pond Construction Responsibilities
The Municipality shall be solely responsible for completing the final planting and management of the planting establishment period at the Detention Pond after completion of other construction by the Department.

Detention Pond Repair Responsibilities
The Department shall be responsible for the reconstruction or repair of the Detention Pond in the event of a catastrophic flood, failure, or substantial destruction of the Detention Pond at its sole cost and expense during and after the construction of the Project. This includes any necessary replacement of pipe, inlets, manholes, or endwalls and the repair and replacement of backflow preventers.

Municipal Detention Pond Maintenance Responsibilities
Once construction of the Project is complete, the Municipality agrees to provide future maintenance of the Detention Pond at their sole cost and expense to ensure that the Detention Pond operates properly. The Municipality agrees to provide for all regular operation and maintenance of the Detention Pond. Operation and maintenance activities include, but are not limited to, the following:

1. Mowing and trimming of vegetation around the Detention Pond.
2. Regular inspection of the Detention Pond embankments, discharge pipe, and ditches for wear and damage. Copies of inspection reports will be provided to the Department if requested.
3. Perform any repairs that do not require replacement of pipes, inlets, manholes, endwalls, or check valves.
4. Confirm every five years that the Detention Pond is operating effectively and achieving the required stormwater quality and total suspended solids (TSS) reduction of greater than 80% in accordance with the current WinSLAMM computer model and current Wisconsin Department of Natural Resource guidance documents.
5. Vegetation & Noxious Weeds Management of the Detention Pond
6. Algae management of the Detention Pond
7. Erosion Control of the Detention Pond
8. Nuisance wildlife management of the Detention Pond
9. Mosquito Control of the Detention Pond
10. Work or maintenance that may be necessary to maintain reasonable ingress and egress to the Detention Pond site.

The Municipality will take over routine maintenance of the pond in September of 2019 after the Department's contractor completes construction.

WisDOT Detention Pond Maintenance Responsibilities
The Department will be responsible for ownership, operation, and maintenance of pipes, inlets, manholes, endwalls, or check valves that tie into the pond but are located outside of the pond berm.

The Department also agrees to provide for dredging of soil and debris accumulation from the pond and main sedimentation basin such that the pond continues to improve storm water quality of the area runoff. The Department agrees to take ownership of any dredged material and will dispose or manage the material as required under Chapter NR 528 of the Wisconsin Administrative Code. The cost share for this dredging shall be split between the Municipality and the Department based on estimated TSS loading generated as shown in the table below. The cost share between the Department and the Municipality shall be apportioned to the Department for 32% of the dredging costs and the Municipality for 68% of the dredging costs. The Department's participation in such costs is subject to the availability of funding.

Estimated Annual TSS Load Generated (LBS)

Pond	City of Appleton	WisDOT	Total
5	24,569	11,453	36,022
	68%	32%	100%

Detention Pond Underlying Land ownership

Following construction of the detention pond, the Municipality agrees to give ownership of the portion of the Detention Pond built on the Municipality-owned parcel so that pond ownership is not split between Municipality and Department right-of-way. Attached as Exhibit A is the legal description of the Municipal Property upon which a portion of the Detention Pond will be built (herein the "Municipal Property"). Upon completion of the Detention Pond, the City of Appleton will draft a legal description providing for the transfer of sufficient real estate from the Municipal Property to accommodate the Detention Pond, access for maintenance and improvement of the Detention Pond as required under this Agreement, and for any other reasonable requirements the Department deems necessary. The transfer of the Detention Pond and underlying real estate shall occur 60 days after written notice by the Department that the Detention Pond is complete. This transfer will occur at no cost to the Department and is subject to applicable Wisconsin law.

Terms Survive Transfer

The terms of this Agreement shall survive the Detention Pond transfer of ownership from the Municipality to the Department. All terms and rights in this Agreement shall remain in full force and effect after such transfer for so long as the Detention Ponds are used.

Department Rights

In the event the Municipality fails to adhere to their obligations described in this Agreement, the Department may, but shall not be obligated to, complete any needed repairs or maintenance to the Detention Pond that the Department determines in its sole and reasonable discretion, are necessary for the proper operation of said Detention Ponds. The Municipality agrees that if the Department incurs costs because of the Municipality's failure to adhere to the obligations in this Agreement, the Department has the right to set off such amounts from any other amounts owed by the Department to the Municipality.

Land Use Changes Affecting Stormwater Runoff

The Department and the Municipality will re-evaluate land use within the Detention Pond drainage basin a minimum of every 5 years and if either the Department or the Municipality become aware of any proposed significant land use changes within the associated Detention Pond drainage basin, all parties agree to cooperate to try and minimize the potential for additional runoff that might cause the pond to

provide less than 80% TSS reduction. The Municipality agrees that any repair, construction, or maintenance of the Detention Pond required as a result of surrounding land use changes shall be undertaken at their sole cost and expense.

Approval of Memorandum of Agreement
This Agreement is made by the undersigned under proper authority to make such Agreement for the Municipality and upon acceptance by the State shall constitute agreement between the Municipality and the State.

Additional Costs
Nothing in this Agreement referencing costs that could be or will be incurred by the Municipality is intended to limit the Municipal's ability to pass said costs on to others as within their authority.

Miscellaneous Provisions

a. This Addendum and Agreement supersedes any other previous agreement(s) between the Parties.

b. The parties executing this Agreement represent and warrant that each have the authority for their respective parties to undertake the obligations contained in this Agreement. This Agreement is effective on the date the document is duly executed by all Parties hereto. This Agreement will be null and void if not duly executed by all signatories by _____ _____, 2017.

c. This Agreement may be executed in counterparts, and when taken together, shall be deemed one Agreement.

d. This Agreement shall be construed according to the internal laws of the State of Wisconsin.

e. The provisions of this Agreement are intended to be enforceable between the Parties and the Parties' respective successors and assigns. Nothing herein shall limit the statutory obligations and privileges of WisDOT, and nothing in this Agreement shall prevent WisDOT from revising or revoking any permitted access points should the terms of this Agreement be breached or as otherwise permitted by law.

f. In the event of a dispute, the Parties shall meet and attempt to resolve the dispute informally. In the event any terms of this Agreement are violated, WisDOT may take action to enforce its rights under this Agreement though judicial proceeding or other method of dispute resolution.

g. This Agreement shall be recorded in a manner agreed to by all parties, to ensure all affected parties have full and equal access to this Agreement.

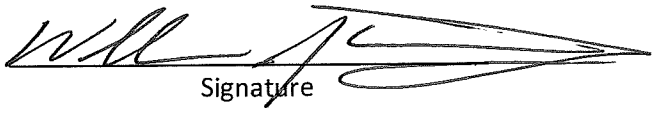
Signed for and in behalf of the City of Appleton:

Paula Vandehey	Director of Public Works	11-16-17
Signature	Title	Date

Signature	Title	Date
Signature	Title	Date

Signed for and in behalf of the Wisconsin Department of Transportation:

William J Doorey	District Director	11/27/17
Printed Name	Title	Date



Signature

MEMORANDUM OF UNDERSTANDING
CTH AP (Midway Road)

This Memorandum of Understanding is meant to establish the Midway Road (CTH AP – Oneida Street to Coop Road) maintenance responsibilities for each jurisdiction.

Calumet County shall be responsible for the following tasks:

- Pavement Maintenance
- Signage
- Snow and Ice Maintenance

City of Appleton shall be responsible for the following tasks:

- Hauling snow
- Sidewalk maintenance
- Stormsewer maintenance
- Terrace mowing
- Tree maintenance
- Street Sweeping

By: Brian P. Glaeser Date: 11/24/15
Brian P. Glaeser, Calumet County Highway Commissioner

By: Paula Vandehey Date: 11-24-15
Paula A. Vandehey, City of Appleton Director of Public Works

MEMORANDUM OF UNDERSTANDING
OF
COUNTY HIGHWAY MAINTENANCE RESPONSIBILITIES

This Memorandum of Understanding establishes the highway maintenance responsibilities for Outagamie County Highways within the City of Appleton. This understanding is regarding maintenance only, and does not change how capital projects are cost shared. The maintenance responsibilities are as outlined on the attached Exhibit A and may be modified at any time based on mutual agreement by both Outagamie County and the City of Appleton.

By: Paula Vandehey
Paula Vandehey, Director of Public Works
City of Appleton

Date: 2/7/2019

By: DE Stg
Dean Steingraber, Highway Commissioner
Outagamie County

Date: 2/5/19

Exhibit A

10/11/2018

COUNTY HIGHWAY SEGMENT	Pavement Maintenance	Curb & Gutter Maintenance	Pavement Marking	Signage	Pedestrian Signals & Warning Devices	Traffic Signals	Street Lighting	Sidewalk Maintenance	Stormsewer Maintenance	Bike Signage & Pavement Markings	Tree Maintenance Islands & RAB	Tree Maintenance Terraces	Landscape Maintenance Islands & RAB	Landscape Maintenance Terraces	Ditch Mowing	Snow & Ice	Street Sweeping
Prospect Avenue (CTH BB)																	
East of Riverdale Dr to West City Limits	County	County	County	County	Appleton	N/A	Appleton	Appleton	Appleton	N/A	N/A	Appleton	N/A	N/A	N/A	County	Appleton
Lynndale Drive (CTH A)																	
College Ave to Packard St	County	County	County	County	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	County	County	Appleton
Calumet Street (CTH KK)																	
John St to Coop Rd	County	County	County	County	Appleton	See map	Appleton	Appleton	Appleton	N/A	N/A	Appleton	N/A	Appleton	N/A	County	Appleton
Northland Avenue (CTH OO)																	
West City Limits to Richmond St	County	County	County	County	Appleton	See map	Appleton	Appleton	Appleton	N/A	Appleton	Appleton	Appleton	County	N/A	County	Appleton
Richmond St to Meade St	County	County	County	County	Appleton	See map	Appleton	Appleton	Appleton	N/A	N/A	Appleton	N/A	N/A	N/A	County	Appleton
Meade St to Ballard Rd	County	County	County	County	Appleton	See map	Appleton	N/A	Appleton	N/A	N/A	N/A	N/A	N/A	County	County	Appleton
Ballard Road to Conkey St	County	County	County	County	Appleton	See map	Appleton	Appleton	Appleton	N/A	N/A	N/A	County	County	County	County	Appleton
Edgewood Drive (CTH JJ)																	
West City Limits to Ballard Rd	County	County	County	County	Appleton	See map	Appleton	N/A	Appleton	N/A	N/A	N/A	N/A	N/A	County	County	Appleton
Ballard Rd to Lightning Dr	County	County	County	County	Appleton	See map	Appleton	Appleton	Appleton	Appleton	County	Appleton	County	Appleton	N/A	County	Appleton
Lightning Dr to East City Limits	County	N/A	County	County	N/A	N/A	Appleton	N/A	Appleton	N/A	N/A	N/A	N/A	N/A	County	County	Appleton
Ballard Road (CTH E)																	
Northland Ave to Edgewood Dr	County	County	County	County	Appleton	See map	Appleton	Appleton	Appleton	N/A	Appleton	Appleton	Appleton	Appleton	N/A	County	Appleton
Edgewood Dr to Apple Creek Rd	County	County	County	County	Appleton	See map	Appleton	N/A	Appleton	N/A	N/A	Appleton	N/A	Appleton	County	County	Appleton
Ballard Road (CTH EE)																	
Apple Creek Rd to North City Limits	County	N/A	County	County	N/A	N/A	Appleton	N/A	Appleton	N/A	N/A	N/A	N/A	N/A	County	County	Appleton
Apple Creek Road (CTH E)																	
Ballard Rd to French Rd	County	N/A	County	County	N/A	N/A	Appleton	N/A	Appleton	N/A	N/A	N/A	N/A	N/A	County	County	Appleton

Legend

- Appleton Municipal Limits
- City of Appleton
- Other Jurisdiction
- Split Jurisdiction

N

of Center

Town of Freedom

Ballard Rd

Town of Vandenbroek

Meade St

Town of Grand Chute

USH 41

Village of Little Chute

Northland Ave

Wisconsin Ave

Village of Kimberly

W College Ave

E College Ave

Memorial Dr

Town of Buchanan

Village of Harrison

USH 441

Village of Fox Crossing

Village of Harrison

Town of Harrison

6/9/2020

Figure B-1
Neighboring Municipality
Right-of-Way Jurisdiction

Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Brown AND Caldwell

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Comparison of Impact of NRCS Soils Changes on Pollutant Loadings by TMDL Basin (Reachshed)
City of Appleton

		2014 Soils		2020 Soils		2014-20 Soils Change	
TMDL_Basin	Area (ac)	TSS Load (tons/yr)	TP Load (lbs/yr)	TSS Load (tons/yr)	TP Load (lbs/yr)	TSS Load %	TP Load %
Apple Creek	2,910	301	2,011	301	2,015	0.0%	0.2%
Bear Creek	125	3.4	40	3.4	40	0.0%	0.0%
Duck Creek	66	4.7	40	4.7	40	0.0%	0.0%
Garners Creek	1,576	237	1,279	237	1,280	0.0%	0.1%
Lake Winnebago	583	62	453	62	453	0.0%	0.0%
Lower Fox River (DS)	5,910	820	4,981	819	4,967	-0.1%	-0.3%
Lower Fox River (US)	1,509	215	1,294	215	1,283	0.0%	-0.9%
Mud Creek	1,048	165	871	164	865	-0.6%	-0.7%
Citywide	13,727	1,808	10,969	1,806	10,943	-0.1%	-0.2%

Note: The analysis uses municipal limits from the 2014 SWMP with land use and excluded areas from the 2020 SWMP and compares 2014 and 2020 soils information. There is an increase in total analyzed area from 2014 to 2020 due to a reduction in excluded areas as agricultural lands are developing.

Legend

- Appleton Municipal Limits
- 2020 Annexation

Regional SMP Drainage Areas

- Regional SMP Drainage Areas

Areas with Soil Category Changes from 2014 to 2020

2020 Soil Type

- Sand
- Silt
- Clay

N

Ballard Rd

Meade St

USH 41

Northland Ave

Wisconsin Ave

W College Ave

E College Ave

Memorial Dr

USH 441

12/1/2020

Figure B-2
2014 to 2020 WinSLAMM Soil Category Changes
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

WinSLAMM Street Cleaning Parameters

Land Use	Parking Density	Parking Controls
Cemetery	None	Yes
Commercial Downtown	Extensive (short term)	Yes
Duplex	Light	Yes
Golf	None	Yes
High Density Residential Alleys	Medium	Yes
High Density Residential No Alleys	Medium	Yes
Hospital	Extensive (short term)	Yes
Institutional	Medium	Yes
Light Industrial	Light	Yes
Light Industrial 1	Light	Yes
Light Industrial 2	Light	Yes
Low Density Residential	None	Yes
Medium Density Residential No Alleys	Light	Yes
Medium Density Residential Alleys	Light	Yes
Medium Industrial	Light	Yes
Mobile Homes	Light	Yes
Multi Family Residential	None	Yes
Office Park	None	Yes
Office Park 1	None	Yes
Office Park 2	None	Yes
Open Space	None	Yes
Parks	None	Yes
Rail	None	Yes
School	Extensive (short term)	Yes
Shopping Center	None	Yes
Strip Commercial	Light	Yes

Table 3-5B. Regional SMP Pollutant Load Reduction Results
Stormwater Management Plan Update
City of Appleton, WI

Lower Fox River TMDL

Reachshed	Regional SMP Name	Pond ID	Public/Private	Year Constructed	TSS Reduction %	TP Reduction %	WinSLAMM Model Status
Apple Creek	AHF East Pond	24	Public	2005	80%	54%	Model Needed
	AHF High Pond	32	Public	2005	80%	54%	Model Needed
	AHF Pond 1A/1B	29	Public	2004	80%	54%	Model Needed
	AHF Pond 3	28	Public	2004	80%	54%	Model Needed
	AHF Pond 4	27	Public	2004	80%	54%	Model Needed
	AHF Pond 5	26	Public	2004	80%	54%	Model Needed
	AHF Pond 6	25	Public	2004	80%	54%	Model Needed
	AHF Pond E-2	30	Public	2008	80%	54%	Model Needed
	AHF Pond G-1	31	Public	2006	80%	54%	Model Needed
	Apple Ridge Pond A	40	Public	2019	92%	62%	Existing Model on File
	Apple Ridge Pond B	41	Public	2020	95%	64%	Existing Model on File
	Apple Ridge Pond C	42	Public	2020	83%	56%	Existing Model on File
	Ashbury	8	Public	2000	79%	53%	Model Needed
	Ballard Pond	3	Public	1996	87%	59%	Model Created for SWMP
	Clearwater Creek Pond	18	Public	2007	82%	59%	Model Created for SWMP
	Emerald Valley	36	Public	2006	80%	54%	Model Needed
	GR Southeast	23	Public	2007	91%	70%	Existing Model on File
	GR WERNW	22	Public	2007	76%	58%	Existing Model on File
	GR WERS	39	Public	2007	88%	66%	Existing Model on File
	GR WERSW	21	Public	2007	86%	66%	Existing Model on File
	Holland	7	Public	1998	79%	53%	Model Needed
	JJ Lightning Pond	43	Public	2017	81%	55%	Model Needed
	Meade & Evergreen Pond	9	Public	2001	52%	35%	Model Created for SWMP
	Meade & JJ Pond	11	Public	2001	66%	47%	Model Created for SWMP
	NE Bus Park	6	Public	1996	78%	53%	Model Needed
	North Edgewood Estates Pond	44	Public	2019	82%	57%	Existing Model on File
	Spartan Pond 5	47	Public	2020	90%	64%	Existing Model on File
Duck Creek	Mackville Pond	33	Public	2008	80%	54%	Model Needed
Garners Creek	Coop Road Pond	12	Public	2008	69%	48%	Model Created for SWMP
	Horizon Plaza	38	Private	2006	76%	51%	Model Needed
	Kensington Pond	1	Public	2009	78%	53%	Model Created for SWMP
	Plank Rd Pond	4	Public	2000	78%	58%	Model Created for SWMP
	Plank Road NW Pond	35	Public	2005	82%	55%	Model Created for SWMP
	Plank Road W Pond	34	Public	2005	92%	62%	Model Created for SWMP
	SPCPPN	5	Public	2004	80%	54%	Model Needed
	SPCPPS	13	Public	2004	80%	54%	Model Needed
Lower Fox River Mainstem (DS)	Conkey	16	Public	2011	82%	55%	Model Needed
	Leona Pond	48	Public	2019	79%	58%	Existing Model on File
	MPPNE	14	Public	2007	77%	52%	Model Needed
	MPPS	17	Public	2011	76%	51%	Model Needed
	Pershing	15	Public	2009	77%	55%	Model Created for SWMP
	Reid GC E	20	Public	2013	83%	56%	Model Needed
	Reid GC S	19	Public	2013	83%	56%	Model Needed
Lower Fox River Mainstem (US)	Schindler 441 Pond	51	Public	2019	92%	44%	Existing Model on File
Mud Creek	Cotter Street Pond	49	Public	2017	84%	53%	Existing Model on File
	CrossMeadow/MCN	37	Public	1997	25%	17%	Dry Pond - Not Modeling
	Mud Creek South Pond	10	Public	2002	90%	66%	Model Created for SWMP
	Northland Ave Pond	50	Public	2018	82%	62%	Existing Model on File

Upper Fox-Wolf TMDL

Reachshed	Regional SMP Name	Pond ID	Public/Private	Year Constructed	TSS Reduction %	TP Reduction %	WinSLAMM Model Status
Bear Creek	Spartan Pond 2	45	Public	2020	85%	49%	Existing Model on File
	Spartan Pond 4	46	Public	2020	92%	75%	Existing Model on File

Table 3-6B. Non-Regional SMP Pollutant Load Reduction Results
Stormwater Management Plan Update
City of Appleton, WI

Lower Fox River TMDL Reachsheds

Reachshed	Non-Regional SMP Name	SMP ID	Public/Private	TSS Reduction %	TP Reduction %
Apple Creek	APPLE CREEK NATURE CENTER YMCA	40	Private	80%	54%
	FRENCH GARDEN ESTATES	23	Private	82%	55%
	Glenhurst La HSD BI-3	136	Public	-	-
	Pondview Estates	125	Private	20%	15%
Duck Creek	MEU Holdings	36	Private	81%	55%
Lower Fox River (DS)	A to Z MACHINE	31	Private	47%	32%
	AIR GAS	2	Private	91%	62%
	Appleton Medical Center	22	Private	32%	22%
	Appleton NE Storage	77	Private	57%	39%
	Appleton West High School	107	Private	35%	24%
	Appleton West Referendum	110	Private	39%	26%
	Armament Systems	111	Private	44%	22%
	AUGUST WINTER PARKING	42	Private	40%	27%
	Banta Bowl	112	Private	71%	48%
	C3 Corporation	1	Private	82%	80%
	COLLEGE ARLINGTON ST	56	Public	20%	14%
	COLLEGE BANTA BIOFILTER (SE)	65	Public	46%	31%
	COLLEGE BANTA CT	50	Public	27%	18%
	COLLEGE BUCHANAN ST	60	Public	19%	13%
	COLLEGE CHRISTINE ST	57	Public	16%	11%
	COLLEGE EAST BIOFILTER (NE)	66	Public	52%	35%
	COLLEGE FIDELIS ST	62	Public	19%	13%
	COLLEGE JOSEPH ST NORTH	58	Public	19%	13%
	COLLEGE JOSEPH ST SOUTH	59	Public	22%	15%
	COLLEGE LEE ST NORTH	53	Public	17%	12%
	COLLEGE LEE ST SOUTH	54	Public	10%	7%
	COLLEGE MATTHIAS ST NORTH	63	Public	17%	12%
	COLLEGE MATTHIAS ST SOUTH	64	Public	18%	12%
	COLLEGE MIDPARK AVE	61	Public	19%	13%
	COLLEGE TELULAH ST	52	Public	21%	14%
	COLLEGE WARNER ST	51	Public	20%	14%
	COLLEGE WEIMAR ST	55	Public	13%	9%
	COLLEGE WEST BIOFILTER (SW)	67	Public	40%	27%
	Commerce Ct Office	114	Private	81%	59%
	CVS	21	Private	53%	36%
	Eagle Court	115	Private	59%	47%
	Eagle Point	116	Private	80%	31%
	Encircle Health	25	Private	84%	57%
	Endeavor Electric	33	Private	80%	54%
	Erb Park	117	Private	64%	39%
	Glendale/Sandra HSD	135	Public	-	-
	Grand Central Station	79	Private	40%	27%
	HEARTWOOD HOMES PHASE 1 & 2	48	Private	62%	42%
	Johnston School	12	Private	42%	29%
	Konietzki Holdings	120	Private	76%	57%
	Lawrence University Campus Center (Biofilter)	101	Private	90%	61%
	Lawrence University Campus Center (Catch Basins)	10	Private	34%	23%
	LOT 1 NE BUS. PARK	43	Private	81%	55%
	Menards	121	Private	74%	50%
	Morrison and Washington HSD	74	Public	18%	12%
	MSB	5	Private	12%	8%
	Mt Olive Church	123	Private	82%	70%
	Newberry St HSD DD-4	143	Public	23%	17%
	Newberry St HSD DD-5	144	Public	23%	18%
	Newberry St HSD J-54	145	Public	16%	12%
	Newberry St HSD J-60	146	Public	19%	13%
	Northland Ave Biofilter	4	Public	17%	12%
	OLDE ONEIDA HSDs	71	Public	22%	15%
	Oneida St Study BB-53	148	Public	13%	9%
	Oneida St Study KK-8	150	Public	19%	13%
	Owaissa St HSD Z-20	151	Public	-	-
	Owaissa St HSD Z-75	152	Public	-	-
	RENNES NURSING HOME	34	Private	45%	30%
	River Heath	126	Private	50%	34%
	Romanesko Development	3	Private	85%	57%
	Sager Center	127	Private	41%	33%
	South Island Street & Olde Oneida Street	19	Public	21%	14%
	Spring to Mead CBs	75	Public	15%	10%

Table 3-6B. Non-Regional SMP Pollutant Load Reduction Results
Stormwater Management Plan Update
City of Appleton, WI

Lower Fox River TMDL Reachsheds

Reachshed	Non-Regional SMP Name	SMP ID	Public/Private	TSS Reduction %	TP Reduction %
Lower Fox River (US)	Telulah Park	8	Private	90%	61%
	Telulah Skate Park	128	Private	78%	53%
	Union Square Apartments	129	Private	72%	48%
	Valley Packaging	9	Private	90%	61%
	WALGREENS	38	Private	46%	31%
	West High Artificial Turf	130	Private	81%	81%
	Wire Works	7	Private	82%	56%
	Woodland and McDonald HSD	76	Public	28%	19%
	7th Street	11	Public	19%	13%
	BOYS AND GIRLS CLUB	37	Private	50%	34%
	College Mason Mike Blank	113	Private	27%	18%
	DOUGLAS ST HSD	72	Public	13%	9%
	Elm St HSD	133	Public	-	-
	Expo Center/Jones Park	118	Private	58%	40%
	FOREMOST FARMS	46	Private	51%	34%
	GOODWILL	29	Private	41%	28%
	Seminole Rd and Propsect Ave HSD II-20	137	Public	-	-
	Perkins St and Prospect Ave HSD II-30	138	Public	-	-
	Jensen Auto Sales	18	Private	86%	58%
	Lawrence St HSD	139	Public	-	-
	Locust ST HSD	140	Public	-	-
	Lutz Dr HSD's	141	Public	19%	13%
	Lutz Park	132	Public	48%	19%
	Miller Electric Parking	122	Private	47%	35%
	Oneida St Study BB-155	147	Public	13%	9%
	Oneida St Study BB-53	148	Public	13%	9%
	Oneida St Study KK-32	149	Public	17%	11%
	Pierce Plat	124	Private	16%	11%
	POLICE STATION	41	Private	48%	32%
	SECURA	26	Private	88%	59%
	SCHINDLER PLACE	39	Private	82%	55%
	South Island Street & Olde Oneida Street	19	Private	21%	14%
	St Elizabeth Hospital	17	Private	23%	16%
	St. Elizabeth Hospital Kindercare Parking	82	Private	51%	34%
	TROLLEY SQUARE	47	Private	89%	60%
	US OIL	105	Private	82%	55%
	VALLEY FAIR MALL	104	Private	84%	57%
	Xavier Addition	16	Private	88%	60%
	Xavier Track	15	Private	62%	42%
	Yacht Club	131	Private	44%	22%
Mud Creek	1200 S. Perkins St	108	Private	73%	49%
	Appleton West HS NW Parking Lot	109	Private	61%	51%
	Appleton West HS Offsite Parking Lot	20	Private	75%	51%
	Bemis/Curwood	14	Private	25%	22%
	DMV	70	Private	81%	55%
	Glendale Ave HSD AA-246	134	Public	0%	0%
	Marian University	45	Private	56%	49%
	Marquette St HSD AA-139	142	Public	13%	10%
	Motomart (Biofilter)	6	Private	90%	61%
	Motomart (Stormceptor)	100	Private	26%	17%
	OEC GRAPHICS	44	Private	54%	36%
	TIMBER CREST DENTAL	24	Private	80%	54%
	Valley Transit	13	Private	90%	61%
	WE ENERGIES	28	Private	70%	47%

Appendix B4-1a - Street Cleaning Assumptions

EQUIPMENT COST	Number of High Efficiency (HE) Sweepers	Cost per HE Sweeper	MSB Capital Allocation	Life Span of HE Sweeper (yrs)	Life Span of Building (yrs)	Annual HE Sweeper Maintenance	Annual CEA (Replacement Fund) Payment Allocation	Annual MSB Maint	Annual inflation
	2	$ 310,000	$ -	10	75	$ 38,000	$ 44,796	$ -	3%

10-year Annualized Equipment Capital Cost per Sweeper (2021 $)	$ 36,332
Annual HE Maintenance Cost per Sweeper (2021 $)	$ 38,000
Annual CEA Payments per Sweeper (2021 $)	$ 44,796
MSB Cost	$ -
Total Annual Cost (2021 $)	**$ 119,128**

CONTRACT LABOR COST 2021 labor and equipment quote from Precision Sealcoating of Princeton, WI

Alternative 2 Only

$149.50	per hour
160	hours per week supplemental sweeping needed
3	weeks sweeping support needed (every other week during 6 week intensive cleaning period)
$71,760	2021 cost for contract services for intensive cleaning program

	Alt 1 Annual Cost (2021 $)	Alt 2 Annual Cost (2021 $)		Cost Effectiveness Alt 1	Alt 2
Capital	$ 72,664	$ 72,664	TSS $/ton/year	$18,122	$13,695
Maintenance	$ 76,000	$ 76,000	TSS $/lb/yr	$2,803	$2,450
CEA Fund	$ 89,592	$ 89,592			
Contract Labor	$ -	$ 73,913	w/3% Inflation ac	See Tables 4-2 and 4-3 for load reduction information	
MSB Cost	$ -	$ -			
Total	**$ 238,256**	**$ 312,169**			

Street Cleaning Alternative Assumptions

Alternative #1 - move to all high efficiency (HE) sweepers

Number of new sweepers needed :	2	
Capital Cost for a single new sweeper:	$ 310,000	
Life of a sweeper (yrs):	10	(Reduced from 15 to 10 years per 9/8/2021 Operations Discussion)
Annual HE maintenance cost per sweeper:	$ 38,000	
Annual CEA Payments (equipment replacement fund program) per Sweeper	$ 44,796	
MSB Expansion cost allocation:	$ -	(MSB Costs will not be allocated to any particular practice at this time per 9/8/2021 Operations Discussion)
MSB Annual Maintenance cost:	$ -	

Alternative #2 - move to all HE sweepers plus add contract services for 3 weeks sweeping in spring

2021 labor and equipment quote from Precision Sealcoating of Princeton, WI		
quoted hourly rate:	$149.50	
hours per week supplemental sweeping needed:	160	(Per email from City operations staff)
weeks sweeping support needed (every other week during 6 week intensive cleaning period):	3	weeks
2021 3 weeks contract sweeping cost:	$ 73,913	w/3% inflation

Appendix B4-2a

Leaf Management Program Alternatives Summary

City of Appleton – Citywide Stormwater Quality Management Plan

1.1 Leaf Management

The City of Appleton operates a bulk leaf collection program as a service to the public which also provides a stormwater quality benefit. The WDNR has recognized that there may be beneficial changes in municipal leaf management programs that can reduce phosphorus discharges to waters of the state. Based on research conducted by the WDNR and USGS, the WDNR developed "Interim Municipal Phosphorus Reduction Credit for Leaf Management Programs", effective March 2018. That research is continuing and the WDNR is considering expanded credit under additional conditions. The following sections document the City's current leaf management program, current and draft WDNR guidance and potential reduction credit, and the City's potential to meet the requirements for obtaining available credits.

1.1.1 Existing City Bulk Leaf Management Program

The City's existing leaf collection program currently starts six weeks before the Friday preceding the Wisconsin nine-day deer gun hunting season, placing the start near the beginning of October. Leaves are collected throughout the City three to four times per year. Currently, like many communities, the City asks residents to rake their leaves in the fall into the gutter of the roadway for pickup by the City. Residents are also allowed to place other bulk materials (sticks, garden debris, etc.) out for pickup at the same time. The City has 4 single-axle dump trucks with modified leaf pushers/rakes that collect leaves into large piles which are then picked up by front end loaders with a clamshell bucket that loads the leaves into trucks for disposal. The City has invested a lot of time and effort to develop a working relationship with area farmers who receive the leaves which are used as mulch/fertilizer in their farming operations. The streets are swept with a conventional street cleaner following bulk pickup.

The City receives no specific stormwater quality credit or reduction for their current leaf collection program. The Wisconsin Department of Natural Resources (WDNR) has developed a guidance document that allows a municipality to take credit for a bulk leaf collection program that meets the criteria as outlined in their 2018 guidance. The WDNR is also considering a second level of allowable credit as outlined by the WDNR in presentations provided in 2020 but are not currently available in final guidance format. Future research may allow credit in additional land use areas or applications but are not considered in this discussion. The City can only take credit for increased numeric stormwater pollution reduction as allowed under WDNR guidance and assuming the conditions outlined in the guidance are met by the City. Non-numeric credit can be taken for other land uses that are not currently outlined for numeric credit and can be a component of the City's implementation plan and evidence of working towards TMDL pollutant reduction goals. The current and potential WDNR leaf collection program modification options and the City's evaluation of potential changes are discussed in the following sections.

1.1.2 Current WDNR Leaf Management Program Guidance (2018)

The WDNR, recognizing that differing methods of leaf collection could have a positive impact on water quality, worked with the USGS and municipalities to study this stormwater management source control measure further. Following some initial research, the WDNR developed the "Interim Municipal

Phosphorus Reduction Credit for Leaf Management Programs" which was approved for use in 2018. A leaf management program is considered a form of source control to remove the source of pollution (leaf matter) from potential contact with rainfall and runoff, rather than a treatment practice to try and remove the pollutants once they comingled with the stormwater runoff. The guidance document allows a municipality to assume a 17% reduction in total phosphorus (TP) loadings for medium density residential land use areas with no alleys (MDRNA). The reduction is only applicable to TP and not total suspend solids. The reduction is limited to this land use and conditions based on research conducted at the time that led to the initial findings. The reduction can be applied if the following conditions are met:

1. Reduction can be applied to MDRNA land use areas (note: if alleys receive the same treatment as noted in these conditions, that land use area can also apply the reduction).
2. Applies to areas with curb and gutter drainage with storm sewer systems and light parking densities during street cleaning activities.
3. An average of one or more mature trees located between the sidewalk and curb for every 80 linear feet of curb. Where sidewalk is not present, trees within 15 feet of the curb may be counted toward tree cover. (Generally, this equates to a tree canopy over the street (pavement only) of 17% or greater. Field investigations or aerial photography may be used to document tree cover.) For the purposes of this study, a mature tree was based on the City's GIS tree inventory and trees with a diameter of 6-inches and larger were considered mature.
4. The municipality has an ordinance prohibiting residents from placement of leaves in the street and a policy stating that residents may place leaves on the terrace or in bags or piles for collection.
5. Municipal leaf collection is provided at least 4 times spaced through the months of October and November. Leaves may be pushed, vacuumed, or manually loaded into a fully enclosed vehicle, such as a garbage truck or covered dump truck. No leaf piles are left in the street overnight.
6. Within 24 hours of leaf collection, remaining leaf litter in the street must be collected using street cleaning machines such as mechanical broom or vacuum assist street cleaner. A brush attachment on a skid steer is not an acceptable equivalent.

1.1.3 Potential WDNR Leaf Management Program Guidance (2020)

In 2020, based on expanded USGS research and monitoring, the WDNR presented an additional Draft option for TP reduction credits for leaf collection based on expanded research. (Note: Until this alternative is put into a formal and Final approved WDNR guidance, it is not available for application/credit and the requirements are subject to change.) This option as currently proposed by the WDNR would allow up to a 25% reduction in TP loadings for MDRNA land use areas. The reduction remains limited to this land use and conditions based on research conducted at the time that led to the expanded findings. The reduction can be applied if the following conditions (which are slightly different than those required for the 17% reduction) are met:

1. Reduction can be applied to MDRNA land use areas (note: if alleys receive the same treatment as noted in these conditions, that land use area can also apply the reduction).
2. Applies to areas with curb and gutter drainage with storm sewer systems and light parking densities during street cleaning activities.
3. An average of one or more medium to large canopy trees located between the sidewalk and curb for every 80 linear feet of curb.
4. A 40% or greater leaf canopy exists over the pavement on average.

5. A 45% or greater leaf canopy exists over the right-of-way.
6. The municipality has an ordinance prohibiting residents from placement of leaves in the street and a policy stating that residents may place leaves on the terrace or in bags or piles for collection.
7. Municipal bulk leaf collection (as described in 2018 guidance) is provided 3 to 4 times a season with a start date based on geography within the State (October 1st for the City of Appleton) spaced through the months of October and November.
8. Weekly street cleaning is provided during the leaf collection season with a regenerative air sweeper.

1.1.4 Bulk Leaf Management Program Modification Considerations and Costs

The two potential WDNR leaf collection program modification options were discussed with City staff at a meeting on January 19, 2021.

General considerations with making a change in the program include:

1. Bagging is not considered a desirable option for reasons including potential for repetitive motion injury of City staff and the end users (farmers) of the leaves do not want paper bags included with the leaves due to the potential to block infiltration, impede plant growth and other factors.
2. To accommodate this program using existing staff, an existing service (such as collection of bulky garbage/waste materials) would need to be discontinued.
3. Not raking leaves into the gutter would have a positive effect as piles would no longer block bike lanes.
4. Early steps would need to be taken to educate the public on the changing program. The Climate Task Force may be available to assist with educating citizens on this change.
5. The City is not in favor of a pilot project and would prefer a phased implementation that would allow the program to be implemented over 3-5 years in a strategic approach.
6. Leaf collection is not conducted in private owned and maintained streets. Although the City feels that these areas receive similar treatment from the private owners, these areas are rather limited and were not included in the analysis.
7. Some terraces are narrow and areas with narrow or no terraces may need to be collected more frequently. Details such as these will be evaluated and addressed as the program is phased in.

Specific considerations and costs to comply with the current (17% TP reduction) WDNR guidance:

1. Modification to the City's bulk leaf collection program had been discussed in the past and staff believes that changes to the current program to meet the existing WDNR guidance is possible.
2. For this study, the leaf collection activity is considered to have a neutral impact on staff costs to adopt changes to the leaf collection program as outlined by the current WDNR guidance to obtain the 17% TP reduction credit (assuming changes in other bulk waste collection programs can be made).
3. Based on the WDNR criteria, there are a total of approximately 749 acres of MDRNA land use along public curb and gutter streets and not draining to regional detention areas applicable to this practice as shown in Figure 4-1. A summary of land use area, incremental TP reduction by sweeper zone and reachshed is shown in Table 4-4. The table shows that implementing the required leaf management program results in a total TP reduction of 30.45

lbs/year, an average reduction of 5% for applicable treatment areas across the City with an impact on the entire City and any individual reachshed being much lower. The most benefit would be realized in the Lake Winnebago reachshed which would see an approximate 1.7 percent reduction in TP on a reachshed basis. All other reachshed reductions are less than 1 percent.

4. To estimate the cost of implementing this program, a 4-year phased implementation was assumed. Two of the eight sweeper zones were incorporated into the program in each of the four years. The street cleaning zones were based on 2018 mapped street cleaning zones as provided by the City, with minor modifications to fit the project area limits of this study and are also shown on Figure 4-1.
5. City Staff developed an assessment of the various equipment purchases that would be needed to implement this program change. On June 17, 2021, the City developed a memorandum on a "Proposed Modified Operations Plan for DPW" that outlined potential program changes for approval. The above Memo is attached to this document as well as a more detailed list of equipment, equipment cost and CEA payments, and equipment life expectancy. At this time, the City is working under the assumption that operation and maintenance (O&M) effort will be the same for the modified program as it is for the existing leaf collection program.
6. It is important to note several related items at this time: 1) the initial program costs are likely higher in early years than future years as the initial equipment cost is included in the annualized program cost at the same time that future equipment replacement funds are collected/allocated through CEA payments. In future years, all things being equal, it is expected that the cost per pound of TP would go down; 2) the modified city program will be implemented city-wide, in phases; 3) the current WDNR program only includes a provision to take credit for medium density residential land use areas. It is anticipated that this could change in the future, increasing the City's potential TP removal; 4) the estimated amount of TP removal was completed using the best available information on trees and tree spacing available and not all areas that were applicable for credit were included based on the available tree spacing and size. Future study may allow for an increase in areas and loads considered to be eligible under this program change; 5) Similar to the street cleaning program although the City is anticipating expanding the Municipal Services Building (MSB) the details of that expansion and any potential allocation back to individual programs is not yet defined and therefore no cost is currently allocated to any specific program. A future allocation back to this leaf management program would impact/increase the cost per pound of TP removed.
7. The information provided by the City on program capital, and CEA costs and life expectancy were used to estimate an initial program cost per pound of TP, assuming an annual inflation rate of 3% to annualize capital purchase. Equipment purchases and CEA payments were provided and spread out of a period of 2022 through 2026. It is further assumed that the identified purchases over the 5 years constitute all of the required purchases know at this time and as noted do not include a component for MSB cost allocation or include any O&M cost changes. (Note: Small increases in capital equipment purchase prices and CEA payments were typically included in the City provided information. However, since the costs are experienced over a multi-year period, no adjustments were made to create a present worth value for each item.) Based on the information provided, an annual increase to the City leaf collection program are expected to cost based changes are expected to cost $559,570 annually.

8. Based on the total pounds of TP reduction shown in Table 4-5 (30.45 lbs/yr), the cost in 2021 dollars to implement this program is $18,377 per pound of TP.

Specific considerations to comply with the proposed (25% TP reduction) WDNR guidance:

1. The City has some concerns with meeting the requirements of the draft proposed guidance, such as use of water-based street cleaning in colder months. The WDNR guidance suggest using a high efficiency cleaner weekly during the 8 weeks leaf collection time period. While feedback from the WDNR indicates that the intent was to describe the type of sweeper device and vacuum suction needed, as compared to a conventional broom sweeper, per city staff, the sweepers are run with water to keep the dust down and protect the internal equipment (fans). Shifts would need to be run in day and night which would likely further reduce the number of times high efficiency cleaners could be used due to cold temperatures.
2. Additionally, in 2020, the City attempted to see what the best street cleaning frequency was with current staff resources. It took about 320 hours of sweeping effort to get through the entire City in a week (8 sweeper shifts x 40 hours each). This was accomplished by running the City's 4 sweepers 16 hours a day for 5 days. It was determined that current resources could sweep the entire City once over a two-week period over regular shifts or would require the addition of staff and the purchase of three or four more high efficiency street cleaning units or enlisting contracted support.
3. A visual review was also conducted of leaf canopy GIS data for the City. From a cursory review of the canopy coverage, it appeared that meeting the 45% tree canopy coverage over the right-of-way would further reduce the number of streets applicable to receive this level of credit. Given the cost per pound estimated under the current guidance and given the need to increase resources and cost to meet the sweeping requirement and an anticipated loss of applicable streets and treatment area, implementing the program under the proposed guidance was considered to be cost-prohibitive at this time.

Appendix B4-2b-Leaf Management Program Modification Assumptions

Here is the equipment cost estimates.
We did not factor in additional O&M since we believe the new costs to be similar to old costs. Assumed inflation 3%
(From July 30, 2021 Email from Nate Loper)

				Life (yrs)	Monthly Reserve (Vac Unit)	Monthly Reserve (Chasis)	Annualized Equipment Cost	CEA Payments
2022	**Equipment Purchases**	**CEA Payments**	**Total**					
Convert ASL Truck	$65,000	$18,000		7	$970	$530	$ 10,433	$18,000
Convert ASL Truck	$65,000	$18,000		7	$970	$530	$ 10,433	$18,000
Convert ASL Truck	$65,000	$19,800		7	$1,120	$530	$ 10,433	$19,800
Convert ASL Truck	$65,000	$19,800		7	$1,120	$530	$ 10,433	$19,800
Convert ASL Truck	$65,000	$19,800		7	$1,120	$530	$ 10,433	$19,800
Total 2022 Costs	$325,000	$95,400	**$420,400**					
2023								
Convert ASL Truck	$75,000	$19,800		7	$1,120	$530	$ 12,038	$19,800
Rolloff Unit (on new truck)	$145,000	$20,220		10	$1,685		$ 16,994	$20,220
Rolloff Unit (on new truck)	$145,000	$20,220		10	$1,685		$ 16,994	$20,220
Total 2023 Costs	$365,000	$60,240	**$425,240**					
2024								
Trailer Unit	$145,000	$20,220		10	$1,685		$ 16,994	$20,220
Trailer Unit	$145,000	$20,220		10	$1,685		$ 16,994	$20,220
Trailer Unit	$145,000	$20,220		10	$1,685		$ 16,994	$20,220
Total 2024 Costs	$435,000	$60,660	**$495,660**					
2025								
Trailer Unit	$150,000	$20,952		10	$1,746		$ 17,580	$20,952
Trailer Unit	$150,000	$20,952		10	$1,746		$ 17,580	$20,952
Trailer Unit	$150,000	$20,952		10	$1,746		$ 17,580	$20,952
Total 2025 Costs	$450,000	$62,856	**$512,856**					
2026								
Trailer Unit	$150,000	$21,672		10	$1,806		$ 17,580	$21,672
Trailer Unit	$150,000	$21,672		10	$1,806		$ 17,580	$21,672
Total 2026 Costs	$300,000	$43,344	**$343,344**					
5 Year Total Cost			**$2,197,500**				$ 237,070	$ 322,500

MSB Costs NOT included at this time.

Total Annual Program Equipment and CEA Cost :	**$**	**559,570**
Annual TP reduction currently identified (see Table 4-5) :		30.45
Cost per pound of TP :	**$**	**18,377**
Potential Cost per pound of TP (CEA Payments Only) :	$	10,591.13

Appendix B4-3a

Potential Regional Stormwater Management Practice (SMP) Summary

City of Appleton – Citywide Stormwater Quality Management Plan

Site #1 – Bellaire Court

Location: North of intersection of North Sampson Street and East Atlantic Street

SMP Type: Wet Detention Pond (created in southwest 'finger' of the Bellaire Ravine)

TMDL Reachshed: Lower Fox River (DS)

Drainage Area: 691 acres

Pollutant Reductions: TSS – 45.6 tons/year (44.3%), TP 209 lbs/year (33.1%)

Project Description: A portion of the ravine would be modified through excavation and potential creation of a berm to establish a wet detention pond. The pond area identified is currently under private ownership and easements or land purchase would be required. Additionally, there is some concern with the proximity of residential buildings at the top of the ravine. Sewers in the area would be daylighted to discharge to the newly created pond in the ravine. Approximately 400 feet of storm sewer in Atlantic Street would need to be relayed and a new sewer at intersection of Sampson Street would be added to divert low flows to the new pond. WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterway issues. A WDNR Natural Heritage Inventory (NHI) review suggested that further actions are needed to ensure compliance with Wisconsin and Federal Endangered Species Law/Act. **(Note: Based on this review, since the land area in question is under private ownership and the single-family homes are situated at the top of the ravine, the City feels this site is less desirable and this location is not currently being considered further at this time. A WDNR BRRTS site evaluation and Endangered Resources Review would also need to be conducted before the project is considered further. In addition, while no waterways were identified in the review, the City would ask the WDNR to do a navigability determination.)**

Site #2 – Everett Street

Location: West of Intersection of W Everett Street and S Lilas Drive. Located in Grand Chute.

SMP Type: Wet Detention Pond

TMDL Reachshed: Mud Creek

Drainage Area: 249 acres

Pollutant Reductions: TSS – 33.6 tons/year (61.8%), TP 96.6 lbs/year (43.7%)

Project Description: This area contains extensive commercial and industrial land uses. There is a small portion captured within the drainage area that is tributary to the Cotter Street Pond. The pond area identified is currently under private ownership in the Town of Grand Chute. A development was recently considered for this area. Town easements or land purchase would be required. WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterways. A WDNR Natural Heritage Inventory (NHI) review suggested that further actions are needed to ensure compliance with Wisconsin and Federal Endangered Species Law/Act. **(Note: Since the identified location is in the Town and based on discussion with the Town, there does not appear to provide a shared benefit for the town and this location is not being considered further at this time. A WDNR BRRTS site evaluation and Endangered Resources Review would also need to be conducted before the project is considered further.)**

Site #3 – Hillock Court

Location: West of Hillock Court, north of Northland Ave. Located in Grand Chute.

SMP Type: Wet Detention Pond

TMDL Reachshed: Mud Creek

Drainage Area: 76 acres

Pollutant Reductions: TSS – 7.5 tons/year (79.3%), TP 36.5 lbs/year (59.8%)

Project Description: The drainage area contains a mix of residential and commercial development. The suggested potential wet detention area is situated in currently farmed land that is privately owned in Grand Chute and easements or land purchase would be required. WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterways in the location of the specific detention facility and a WDNR Natural Heritage Inventory (NHI) review did not identify any records of endangered resources in the area, but wetlands do surround the potential site. Discussions with the Town did not identify any current interest in developing the site in question. The is a small potential that the site could offer a share benefit to town lands to the north but would need to be studied further. A wetland delineation should be conducted for the site in the future prior to the project moving forward. A WDNR BRRTS review identified 3 closed sites within 0.35 miles that are not likely to have impact on a future detention pond use based on distance and/or closure status. No EPA ECHO sites were identified in the area. **(Note: <u>The City is interested in the potential of this site for future implementation</u> based on discussions with the property owner and the Town of Grand Chute.)**

Site #4 – Kensington

Location: West of Kensington Drive and east of Peter Street

SMP Type: Underground Wet Detention

TMDL Reachshed: Lower Fox River (DS)

Drainage Area: 145 acres

Pollutant Reductions: TSS – 21.7 tons/year (80.1%), TP 80.2 lbs/year (60.4%)

Project Description: The drainage area contains a mix of residential and commercial/industrial development. A potential wet detention facility was suggested in the 2009 Kensington North Watershed Study on the west side of Kensington Drive, near Warehouse Road, but the landowner was not interested in participating in the project. Based on current parcel layout and ownership, a stormwater facility may need to be broken into multiple areas to accommodate active industrial sites and work around rail lines and other features. As an alternative to this site, underground detention on the east side of Kensington Drive could be considered under current paved parking/driveway/storage and greenspace areas with easements or land purchase. WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterways in the location of the specific detention facility, however, further discussion with the City identified a site-specific wetland delineation that was done in 2016 that is not on the Surface Water Data Viewer. A WDNR Natural Heritage Inventory (NHI) review identified the location is covered by the Broad Incidental Take Permit /Authorization for No/Low Impact Activities (No/Low BITP/A). A WDNR BRRTS review identified six closed sites within 0.25 miles, two of which have the potential for impact due to soil contamination that may need to be managed during excavation of the site. The other four sites are not likely to have impact on a future detention pond use based on distance and/or closure status. Four EPA ECHO sites were identified within 0.2 miles and are not anticipated to have any impact due to compliance status. **(Note: Based on this review, <u>this location is not currently being considered further at this time</u>.)**

Site #5 – Meade and Wisconsin

Location: Beneath parking lot at the northeast corner of the intersection of N Meade St and E Wisconsin Ave

SMP Type: Underground Wet Detention

TMDL Reachshed: Lower Fox River (DS)

Drainage Area: 393 acres

Pollutant Reductions: TSS – 33.8 tons/year (67.2%), TP 171.4 lbs/year (49.8%)

Project Description: The drainage area contains a mix of residential and commercial development. The proposed underground detention would be created under existing privately owned parking lot and driveway areas with easements or land purchase required. WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterways in the location of the specific detention facility and a WDNR Natural Heritage Inventory (NHI) review identified the location is covered by the Broad Incidental Take Permit /Authorization for No/Low Impact Activities (No/Low BITP/A). A WDNR BRRTS review identified twelve closed and one open sites within 0.15 miles, four of which have the potential for impact due to proximity and status of soil or groundwater contamination that may need to be managed during excavation of the site. The other sites are not likely to have impact on a future detention pond use based on distance and/or closure status. Six EPA ECHO sites were identified within 0.25 miles and are not anticipated to have any impact due to compliance status. **(Note: Based on this review and potential future redevelopment opportunities, <u>this location is not currently being considered further at this time</u>.)**

Site #6 – Northland and 441

Location: South of Northland Ave and East of N French Road in Little Chute

SMP Type: Wet Detention Pond

TMDL Reachshed: Lower Fox River DS

Drainage Area: 2,401 acres

Pollutant Reductions: TSS – 173 tons/year (72.6%), TP 744 lbs/year (48.8%)

Project Description: The drainage area contains a mix of residential and commercial/industrial development and has multiple current stormwater management practices within the larger tributary drainage area. This site is being considered because the DOT is planning on making changes to the interchange and will need to mitigate stormwater impacts and this is seen as an opportunity to work with the DOT and Little Chute to develop a shared stormwater management feature. The facility location is in currently farmed land areas and a review of the WDNR Surface Water Data Viewer indicated that wetland and/or wetland indicator soils are in the vicinity of the project and would need to be evaluated during further consideration of this site. Easements or land purchase would be required. WDNR Natural Heritage Inventory (NHI) review identified the location as within 1 mile of a recorded Bald Eagle and timing of construction may be impacted. **(Note: Based on feedback from the Village of Little Chute and DOT, this pond does not have support for implementation and <u>this location is not currently being considered further at this time.</u>)**

Site #7 – Pierce Park

Location: Pierce Park west of S Lutz Drive

SMP Type: Wet Detention Pond

TMDL Reachshed: Lower Fox River (US)

Drainage Area: 343 acres

Pollutant Reductions: TSS – 24.2 tons/year (45.0%), TP 93.5 lbs/year (33.2%)

Project Description: This project location in the Pierce Park area has been considered in the past to develop a wet detention pond to help improve flood control and water quality in the area but was not viewed favorably by a homeowner that would be impacted by the project. This project drainage area contains a mix of residential, commercial, and industrial land uses. Land purchase and removal of a home would be required. An initial review of the WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterways in the location of the specific detention facility and a WDNR Natural Heritage Inventory (NHI) review identified the location as recommending a voluntary environmental review (ER) due to proximity of a nearby waterbody (the Fox River). However recent changes in the WDNR "Maximum Extent Wetland Indicators" layer after the analysis did add some indicator soils to the potential project area, suggesting that if this project were selected to move forward, a wetland delineation should be conducted. A WDNR BRRTS review identified ten closed sites within 0.3 miles, none of which are likely to have impact on a future detention pond use based on distance and/or closure status. One EPA ECHO site was identified within 0.3 miles and is not anticipated to have any impact due to compliance status. **(Note: <u>The City is interested in the potential of this site for future implementation</u> and sent to the homeowners expressing interest in the site. The owners are not interested in selling at this time, so the project will be considered for future implementation.)**

Site #8 – Riverview Gardens

Location: In the ravine west of S Oneida Street and north of W Seymour Street

SMP Type: Wet Detention Pond

TMDL Reachshed: Lower Fox River (US)

Drainage Area: 198 acres

Pollutant Reductions: TSS – 13.4 tons/year (59.0%), TP 65.5 lbs/year (43.9%)

Project Description: This project location in the southern end of the ravine in Riverview Gardens would be constructed by excavating an area within the ravine and daylighting storm sewers south and east of the new detention area. Some trees would need to be removed during creation of the pond and local pathways on the property would need to be moved to the outer perimeter of the detention facility. Easements or land purchase would be required. The detained water in the permanent pool could be used as a water source for the gardens on site. WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterway issues. A WDNR Natural Heritage Inventory (NHI) review suggested that further actions are needed to ensure compliance with Wisconsin and Federal Endangered Species Law/Act. A WDNR BRRTS review identified thirteen closed and one open sites within 0.26 miles, two of which have the potential for impact due to proximity and status of soil contamination that may need to be managed during excavation of the site. The other sites are not likely to have impact on a future detention pond use based on distance and/or closure status. Two EPA ECHO sites were identified within 0.37 miles and are not anticipated to have any impact due to compliance status. **(Note: <u>The City is interested in the potential of this site for future implementation</u> and met on site with the owners of the property. The City will request a navigability determination from WDNR and conduct an Endangered Resources Review before the project is advanced further.)**

Site #9 – Winslow Avenue

Location: Between E Northland Ave and E Winslow Ave, west of Highway 441

SMP Type: Wet Detention Pond

TMDL Reachshed: Lower Fox River DS

Drainage Area: 153 acres

Pollutant Reductions: TSS – 25 tons/year (74.4%), TP 75.3 lbs/year (56.3%)

Project Description: The drainage area is a mix of industrial and commercial property. The wet detention area would be situated in a portion of the industrial park and would reduce the developable amount of land in the park. Easements or land purchase would be required. The topography and depth of sewer is such that the pond would need to be constructed unusually deep (as currently estimated), to the depth of the existing storm sewer, to function by gravity. Alternatively, a lift station would be required to pump smaller, water quality events up into the pond which would then drain by gravity back into the storm sewer system. This area would be tributary to the Northland/441 Pond #6 described previously and would not be necessary if that project is implemented. WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterways in the location of the specific detention facility and a WDNR Natural Heritage Inventory (NHI) review identified the location is covered by the Broad Incidental Take Permit /Authorization for No/Low Impact Activities (No/Low BITP/A). A WDNR BRRTS review identified five closed sites within 0.45 miles that are not likely to have impact on a future detention pond use based on distance and/or closure status. Ten EPA ECHO sites were identified within 0.45 miles that are not anticipated to have any impact due to compliance status. **(Note: <u>The City is interested in the potential of this site for future implementation</u> and sent a letter to the owners of the property expressing their interest in the site.)**

Site #10 – Wisconsin Avenue

Location: East of N Ballard drive, south of Highway 96

SMP Type: Wet Detention Pond

TMDL Reachshed: Lower Fox River (DS)

Drainage Area: 102 acres

Pollutant Reductions: TSS – 13.6 tons/year (82%), TP 56.7 lbs/year (63.1%)

Project Description: The drainage area is a mix of commercial and residential property. The wet detention area would be situated in a field that is currently farmed. Easements or land purchase would be required. Because the storm sewer in the area is deep, the pond would need to be constructed unusually deep (as currently estimated), to the depth of the existing storm sewer, to function by gravity. Alternately, approximately 1,500 feet of storm sewer would need to be replaced to allow for a gravity inflow to the pond, or a lift station would need to be used to pump smaller water quality events up into the pond which would then drain by gravity back into the storm sewer system. An initial WDNR Surface Water Data Viewer did not indicate any wetland, wetland indicator soils, or waterways in the location of the specific detention facility. However, changes in the WDNR “Maximum Extent Wetland Indicators” layer that took place after the analysis did add some indicator soils to the potential project area, suggesting that if this project were selected to move forward, a wetland delineation should be conducted. A WDNR Natural Heritage Inventory (NHI) review suggested that further actions are needed to ensure compliance with Wisconsin and Federal Endangered Species Law/Act. A WDNR BRRTS review identified five closed and one open sites within 0.97 miles, two of which have the potential for impact due to proximity and/or open status for soil and/or potential groundwater contamination that may need to be managed during excavation of the site. The other sites are not likely to have impact on a future detention pond use based on remediation/closure status. Two EPA ECHO sites were identified within 0.25 miles and are not anticipated to have any impact due to compliance status. **(Note: <u>The City is interested in the potential of this site for future implementation</u> and have begun discussions with the property owners. An Endangered Resources Review will be conducted before the project is advanced further.)**

Technical Memorandum

250 East Wisconsin Avenue, Suite 1600
Milwaukee, WI 53202
T: 414-273-8800

Prepared for: City of Appleton

Project Title: RGL Warehouse Pond Feasibility Study

Project No.: 156199

Technical Memorandum

Subject: RGL Warehouse Pond Outlet Options Analysis

Date: October 4, 2021

To: Sue Olson, City of Appleton

From: Chuck Boehm, Brown and Caldwell

Prepared by: 
Doug Joachim

Reviewed by: 
Chuck Boehm

The City of Appleton (City) is considering purchasing land to construct a stormwater management facility at the RGL Warehouse location at the southwest quadrant of the W Leonard Street and S Lynndale Drive intersection and has asked Brown and Caldwell (BC) to assist with evaluating the viability of the site. This was the site of former City lagoons for settling out lime from the water treatment process and was previously considered for stormwater quality and/or quantity management uses in the Leonard Street Basin Study (August 24, 2010). The City is currently working with Westwood Infrastructure to evaluate the removal and use/disposal of the lime in the ponds.

To assess whether this location is advantageous for stormwater management, BC reviewed the prior Leonard Street Basin Study memo and associated modeling. The previous study showed that during the 100-year storm event, existing conditions flood depths along S Lynndale Drive exceeded two feet in several locations. (See attached Figure 4 from the 2010 study.)

The prior study also evaluated four stormwater management alternatives to address flood concerns and water quality. The first two alternatives included the proposed pond at S Lynndale and W Leonard Street. Alternative 1 included minor storm sewer improvements and was relatively ineffective at managing flooding during large events. Alternative 2 included substantial storm sewer improvements and was the most effective alternative analyzed. Alternative 2 was the focus of BC's review for this memo. (See attached Figure 10 from the 2010 study.) It should be noted that the City anticipates that the pond shape indicated in the prior figure would likely be changed to place the storage on the central and eastern portions of the property as shown on Figure 1.

Alternative 2 in the prior study included storm sewer upsizing along W Leonard Street and S Lynndale Drive along with the proposed regional wet detention pond. With these improvements in place, flooding was greatly reduced and eliminated in many areas of the study area. Please reference attached Figures 4 and 10 from the prior study to see the recommended storm sewer improvements and pond location in Alternative 2 as well as the changes in peak flood depths from existing to proposed conditions for the 100-year event.

While the prior study did not model the proposed pond for water quality using WinSLAMM, the pond was sized to reduce TSS by 80% per WDNR Technical Standard 1001. Based on information from the on-going Appleton city-wide water quality study, the pollutant loads in the area draining to the proposed pond (excluding any upstream treatment) are 74.8 tons of total suspended solids (TSS) and 285 lbs of total phosphorus (TP.) Applying 80% TSS load reduction and 54% TP load reduction to the drainage area results in a reduction of 59.8 tons of TSS and 154 lbs of TP. Based on the size of the site, it is anticipated that the stated pollutant reductions are achievable but would need to be modeled to confirm the necessary permanent pool size and other details.

The prior study also included a planning level cost estimate for this project. The construction of the pond and associated storm sewer improvements from Alternative 2 were estimated to cost approximately $4 million, with approximately $2.6 million associated with the pond construction and $1.4 million associated with storm sewer improvements.

Based on our review of the prior study, the general location does appear to be suitable for both water quality and quantity control; however, in conversation with City staff, the outlet location identified in the 2010 memo (Outlet Option #3 in the attached Figure 1) seemed to present several challenges, so alternate outlet options were considered. Following a site visit by City staff and further discussions with BC, two alternate potential discharge locations are presented on Figure 1. The three potential outlet configurations for the site are identified on Figure 1 and their various advantages and disadvantages are discussed in the following sections.

Outlet Option #1 – Prospect Avenue discharge location. This option routes flow southwest parallel to the railroad right-of-way where it will discharge into an existing stormwater pond in the Town of Grand Chute north of Prospect Avenue. The existing pond drains to the east to Prospect Avenue via an existing culvert under the railroad. This option utilizes the existing pond and outlet to convey flow to the Fox River.

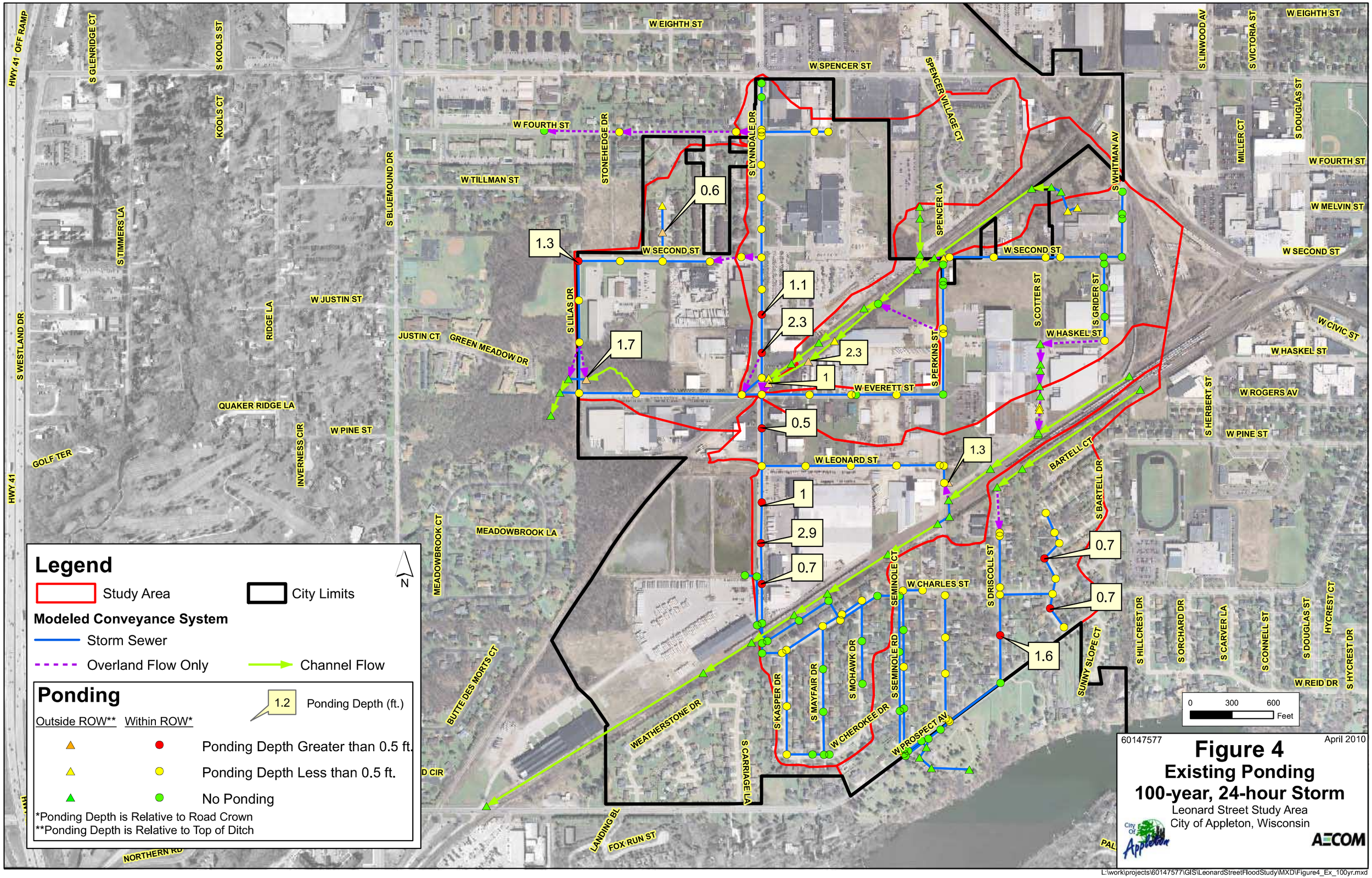
- Advantages
    - This option drains via gravity from the potential RGL Warehouse Pond to the downstream pond where it will utilize an existing gravity drainage outfall.
    - This option utilizes an existing culvert under the railroad.
- Disadvantages
    - The City may need acquire the existing pond north of Prospect Avenue which is located in the Town of Grand Chute.
    - Future storm sewers and/or drainage of the former lagoon area would need to be discussed with the current owners to consider their future development plans for the remaining area.
    - The ability of the existing infrastructure to take the additional flow would need to be evaluated.
    - This option requires discharging under the railroad tracks to the east through a new or existing culvert. Coordinating a railroad discharge is costly and time-consuming. A study would be needed to prove no increase in peak WSEL in the railroad ditch up to and including the 100-year event.

Outlet Option #2 – Pumping to Everett Street. This option routes flow from the potential RGL Warehouse Pond north to the existing storm sewer on Everett Street via a small discharge pump station.

- Advantages
    - This option does not require any work near railroad right-of-way.
    - No work outside the City of Appleton will be required for this option.
    - Flows are returned to the same current discharge location.
- Disadvantages
    - This option requires the installation and maintenance of a small discharge pump station. Installing and maintaining a pump station will have annual operation and maintenance costs that will be higher than most gravity sewer alternatives.
    - In the event of a discharge pump failure, they City would need to employ a small portable pump.

Outlet Option #3 – Discharging directly to the west underneath the railroad. This was the original outlet option considered in the 2010 Leonard Street Study. This option conveys flow from the potential RGL Warehouse Pond via gravity to an existing channel in the Town of Grand Chute to the west where it will flow to Mud Creek. A new culvert crossing the railroad is required for this option and is considered the least desirable by both City staff and BC.

- Advantages
    - This option is the simplest from a hydraulic perspective. Stormwater will be conveyed to an existing channel west of the railroad via a small culvert. Approximately 1,200 feet downstream of the new crossing, flow will enter the existing Everett Street discharge channel and be conveyed to Mud Creek.
- Disadvantages
    - This option requires discharging under the railroad tracks to the west through a new or existing culvert. Coordinating a railroad discharge is costly and time-consuming. A study would be needed to prove no increase in peak WSEL in the railroad ditch up to and including the 100-year event.
    - The channel downstream of the railroad is heavily vegetated and difficult to access due to fencing and topography. Initial construction and future maintenance of the channel and culvert will be difficult.
    - The City would need to negotiate access and easements with private owners and the railroad.
    - There is a floodplain downstream of the discharge that would require further analysis.



Legend

Study Area

City Limits

Modeled Conveyance System

Storm Sewer

Overland Flow Only

Channel Flow

Ponding

1.2 Ponding Depth (ft.)

Outside ROW**	Within ROW*	
▲	●	Ponding Depth Greater than 0.5 ft.
△	○	Ponding Depth Less than 0.5 ft.
▲	●	No Ponding

*Ponding Depth is Relative to Road Crown

**Ponding Depth is Relative to Top of Ditch

60147577 April 2010

Figure 4

Existing Ponding 100-year, 24-hour Storm

Leonard Street Study Area

City of Appleton, Wisconsin

AECOM

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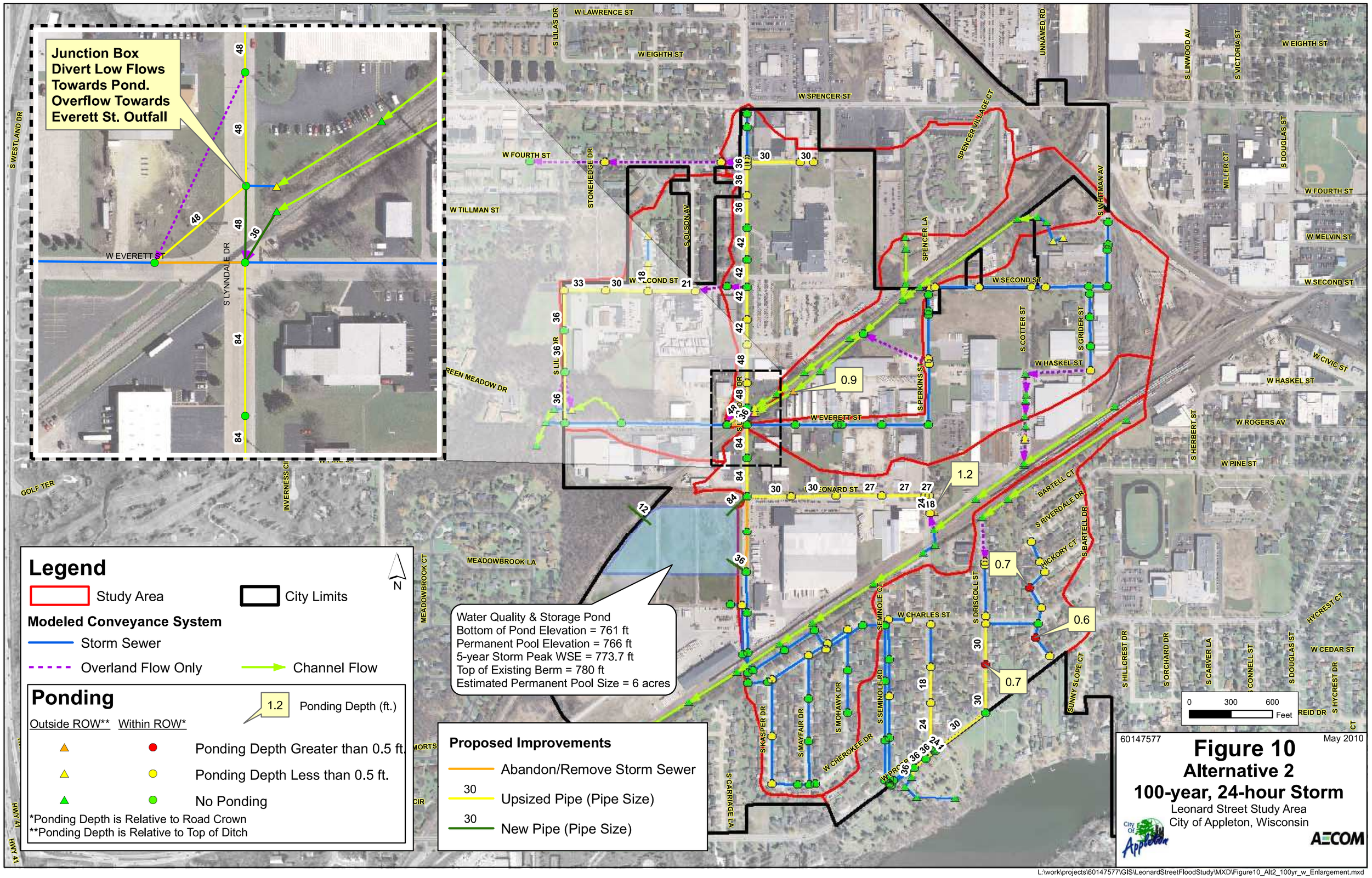
Junction Box
Divert Low Flows
Towards Pond.
Overflow Towards
Everett St. Outfall
W EVERETT ST
S LYNNDALE DR
W LAWRENCE ST
W EIGHTH ST
W SPENCER ST
W FOURTH ST
W TILLMAN ST
W SECOND ST
W HASKEL ST
W CHARLES ST
W EVERETT ST
MEADOWBROOK LA
0.9
1.2
0.7
0.6
0.7
Water Quality & Storage Pond
Bottom of Pond Elevation = 761 ft
Permanent Pool Elevation = 766 ft
5-year Storm Peak WSE = 773.7 ft
Top of Existing Berm = 780 ft
Estimated Permanent Pool Size = 6 acres
Legend
Study Area
City Limits
Modeled Conveyance System
Storm Sewer
Overland Flow Only
Channel Flow
Ponding
1.2 Ponding Depth (ft.)
Outside ROW** Within ROW*
Ponding Depth Greater than 0.5 ft.
Ponding Depth Less than 0.5 ft.
No Ponding
*Ponding Depth is Relative to Road Crown
**Ponding Depth is Relative to Top of Ditch
Proposed Improvements
Abandon/Remove Storm Sewer
30 Upsized Pipe (Pipe Size)
30 New Pipe (Pipe Size)
N
0 300 600 Feet
60147577
May 2010
Figure 10
Alternative 2
100-year, 24-hour Storm
Leonard Street Study Area
City of Appleton, Wisconsin
AECOM
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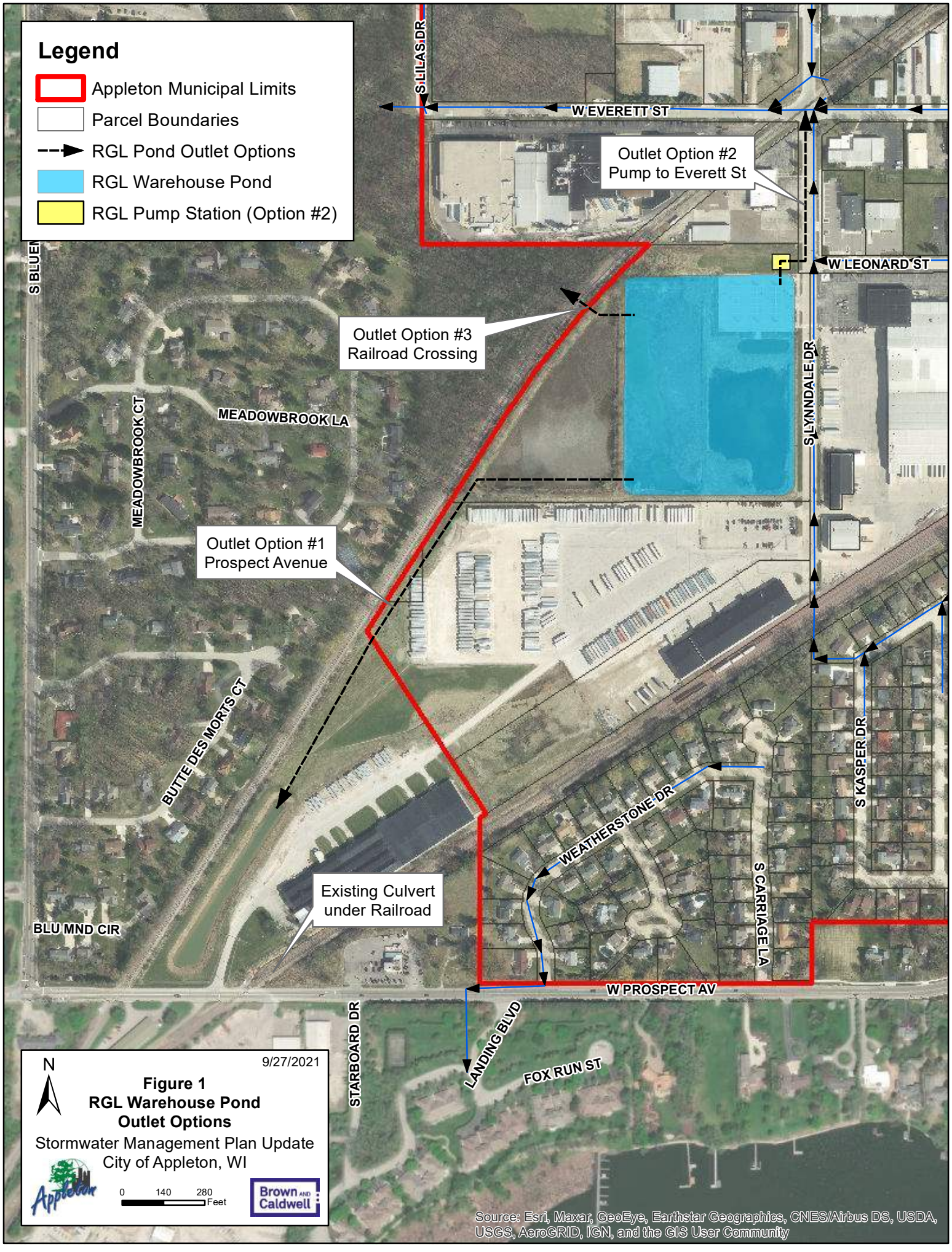
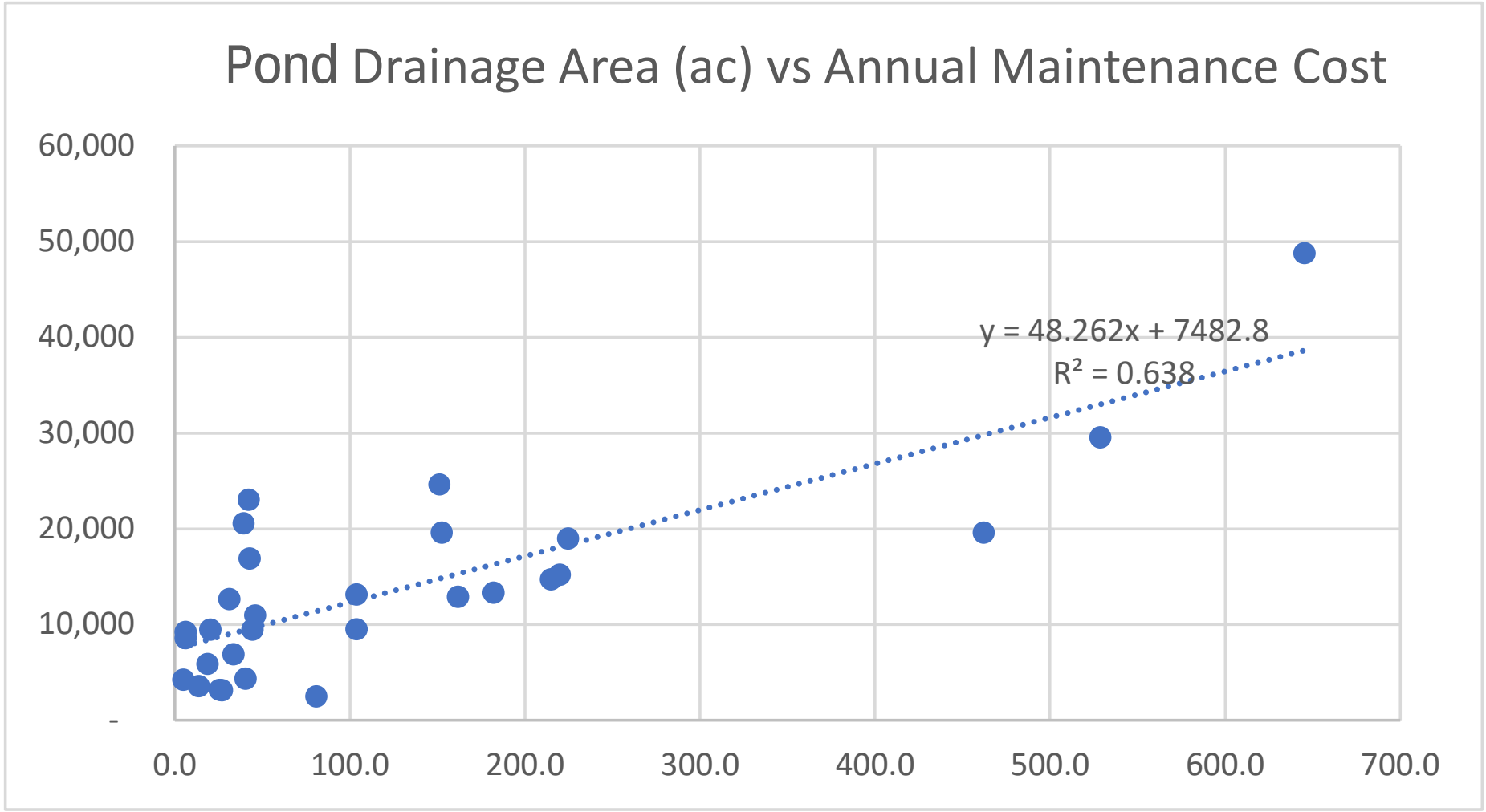

Legend
Appleton Municipal Limits
Parcel Boundaries
RGL Pond Outlet Options
RGL Warehouse Pond
RGL Pump Station (Option #2)
S LILAS DR
W EVERETT ST
Outlet Option #2
Pump to Everett St
W LEONARD ST
S LYNNDALE DR
Outlet Option #3
Railroad Crossing
MEADOWBROOK CT
MEADOWBROOK LA
Outlet Option #1
Prospect Avenue
BUTTE DES MORTS CT
S KASPER DR
WEATHERSTONE DR
S CARRIAGE LA
Existing Culvert
under Railroad
BLU MND CIR
W PROSPECT AV
STARBOARD DR
LANDING BLVD
FOX RUN ST
N
9/27/2021
Figure 1
RGL Warehouse Pond
Outlet Options
Stormwater Management Plan Update
City of Appleton, WI
0 140 280
Feet
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix B4-3b Pond Annual Maintenance Graph



Appendix B4-3c
City of Appleton
Wet Detention Alternatives Cost Analysis

Pond Name (Reachshed)	Pond Analyzed Drainage Basin (acres)	% TSS Reduction from Drainage Basin	(X) Annual Tons TSS Removed from Drainage Basin	% TP Reduction from Drainage Basin	(Y) Annual Pounds TP Removed from Drainage Basin	(A) Wet Pond Construction Cost (2021)	(B) Land Acquisition Cost (2021)	(C1) Base Annual Maintenance Cost (2021)	(C2) Dredging Maintenance Cost (2021)	Total Annualized Cost	Annualized Cost per Ton of TSS Removed	Annualized Cost per Pound of TP Removed
3 - Hillock Court (Mud Creek)	76	79.3%	7.5	59.8%	36.5	$1,412,600	$2,070,000	$11,151	$498,490	$155,048	$20,673	$4,248
7 - Pierce Park (Lower Fox River (US))	343	45.0%	24.2	33.2%	93.5	$776,900	$550,000	$24,037	$287,968	$85,451	$3,531	$914
8 - Riverview Gardens (Lower Fox River (US))	198	59.0%	13.4	43.9%	65.5	$472,300	$400,000	$17,039	$255,570	$61,865	$4,617	$945
9 - Winslow Avenue (Lower Fox River (DS))	153	74.4%	25.0	56.3%	75.3	$1,999,040	$540,960	$14,867	$567,545	$133,524	$5,341	$1,773
10 - Wisconsin Avenue (Lower Fox River (DS))	102	82.0%	13.6	63.1%	56.7	$1,509,400	$700,000	$12,406	$804,270	$136,491	$10,036	$2,407
11-RGL Lagoons (Mud Creek)	232	92.3%	46.0	67.8%	129.7	$4,257,600	$3,185,000	$18,680	$2,942,406	$452,340	$9,844	$3,487

Assumptions

Unit Prices based on Appleton Bid Tabs, DOT Unit Prices, recent estimates from other projects, and Outagamie County Assessor information for land values

Annual maintenance cost based on City maintenance data for existing SMPs and does not include periodic dredging

Dredging based on 3 feet of permanent pool volume of sediment storage, dredged 20 years after initial construction, disposal at $80/cubic yard (assumes landfill disposal)

All costs (capital, land, maintenance) are in 2021 $

Annualized cost assumes land and pond construction capital cost are distributed over 100-years (life of pond is 100-years) and dredging cost is annualized assuming 3% interest over 20 years between dredge cycles

Appendix B4-5a – HSD Annual Maintenance Assumptions

Mike Stanonik 9-14-21 information:

I copied in Sue as she had a standing request for some info as well. I reviewed the last five years and we've been all across the board on our procedures and documentation of these sumps. When I first started in this position, we were cleaning everything, and over the last few years Sue has helped narrow down the criteria for when we need to clean or just inspect. So it's a little hard to say at this point how often they really need to be cleaned and with the data we have, I don't feel confident giving an answer.

For example, Sandra and Glendale will typically have 3' of sediment and be cleaned annually. While some of the other structures at Riverheath may only have an inch or two and not be cleaned. After some discussion with the sewer crew today it sounds like the time to clean these structures varies on the crew and dewatering process. These structures can hold several truck loads of water and sediment. Sometimes we can dewater into the sanitary. As the sediment increases, that means trucking back to the dump pad. Jim described the cleaning could take as much as a half a day for the larger structures. 4-5 hours.

Sewer OP2 - $28.00
Sewer Truck 44 - $110.14

Total 2021 hours we have for the spring sump cleaning.

78 person hours
39 truck equipment hours
127 structures visited
35 structures cleaned of various sizes, but mostly the smaller inlet sumps.

Nate Loper 9-14-21 information:

Thanks Mike, this is helpful! One thing to add, we will need to add benefits costs to the labor. Carrie can get that for you. Then, we would double the hourly number (including benefits) since we have 2 employees working on this task. Does this sound accurate?

Mike Stanonik 9-14-21 information:

There is an additional $13.56 for the average benefits costs that can get added to the $28/hour = $41.56/hour total

You will see the hours listed below are already doubled when compared to the truck hours.

ASSUMPTIONS For HSD CLEANING

Based on City provided information regarding HSD cleaning, the following assumptions will be used to develop an annual maintenance cost for cleaning HSDs:

- HSD Cleaning Frequency: 1x/yr (this varies by structure and can be conservative for some structures)
- HSD Cleaning labor cost (2021): 2 operations employees for 4 hours each at a cost of $41.56/hr/employee = 2 x 4 x $41.56 = $332.48
- Equipment cost: 4 truck hours at $110.14/hr = 4 x $110.14 = $440.56
- Total annual labor and equipment cost per HSD = $332.48+$440.45 = $773.04 (Say $775/structure/year)

ASSUMPTIONS For HSD CAPITAL COST

Based on City provided cost information for City construction projects X-19 and Y-20

X-19 Contract – 96" (8-foot) diameter structure was $950/vertical foot at 19.6' deep = $18,620
Y-20 Bid Tabs – 96" (8-foot) diameter structure for a 20' deep structure; City received 6 bids ranging from $715/vf ($14,300) to $2,038/vf ($40,760) – average was $1,294/vf ($25,880)

Appendix B4-5b
Hydrodynamic Separator Devices (HSDs) For Implementation Consideration

TMDL Reachshed	Drainage Area Name	Drainage Area (acres)	No Controls TSS Load (tons/year)	Existing TSS Removed (tons/year)	Existing TSS Reduction %	HSD Only TSS Reduction %[1]	Estimated HSD Incremental TSS Reduction (tons/yr)[3]	No Controls TP Load (lbs/year)	Existing TP Removed (lbs/year)	Existing TP Reduction %	HSD Only TP Reduction %[2]	Estimated HSD Incremental TP Reduction (lbs/yr)[4]	(A) Annual Maintenance Cost (2021 $)	(B) Initial Capital Cost (Assumes 96-inch diameter structure) (2021 $)	(C) Total Annualized Cost (2021 $)	Cost per Ton of TSS Removed	Cost per Pound of TP Removed
Lake Winnebago	Manitowoc HSD 21NEW	2.13	0.23	0.04	18.6%	44%	0.06	1.75	0.20	11.3%	30%	0.32	$ 775	$ 25,000	$ 1,568	$ 26,892	$ 4,874
Lake Winnebago	Manitowoc HSD 24NEW	6.50	0.52	0.10	19.7%	25%	0.05	4.18	0.47	11.2%	17%	0.24	$ 775	$ 25,000	$ 1,568	$ 30,281	$ 6,660
Lake Winnebago	Manitowoc HSD P-148	3.08	0.34	0.06	18.2%	25%	0.03	2.52	0.28	11.2%	17%	0.14	$ 775	$ 25,000	$ 1,568	$ 46,545	$ 10,860
Lake Winnebago	Manitowoc HSD P-158	4.70	0.51	0.09	18.4%	25%	0.05	3.85	0.43	11.2%	17%	0.22	$ 775	$ 25,000	$ 1,568	$ 30,950	$ 7,151
Lake Winnebago	Manitowoc HSD P-44	4.45	0.48	0.09	18.6%	38%	0.09	3.65	0.41	11.3%	26%	0.52	$ 775	$ 25,000	$ 1,568	$ 16,851	$ 2,990
Lake Winnebago	Manitowoc HSD P-58	3.94	0.42	0.08	18.6%	23%	0.04	3.23	0.36	11.3%	16%	0.14	$ 775	$ 25,000	$ 1,568	$ 36,888	$ 11,462
Lake Winnebago	Manitowoc HSD P-60	3.35	0.36	0.07	18.6%	25%	0.04	2.75	0.31	11.3%	17%	0.15	$ 775	$ 25,000	$ 1,568	$ 43,354	$ 10,213
Lake Winnebago	Manitowoc HSD P-66	2.06	0.22	0.04	18.6%	24%	0.02	1.69	0.19	11.3%	16%	0.08	$ 775	$ 25,000	$ 1,568	$ 70,423	$ 18,872
Lake Winnebago	Manitowoc HSD P-75	4.65	0.52	0.10	18.5%	32%	0.07	3.87	0.44	11.5%	22%	0.39	$ 775	$ 25,000	$ 1,568	$ 22,350	$ 4,002
Lake Winnebago	Manitowoc HSD P-78	5.14	0.48	0.09	19.1%	22%	0.05	3.74	0.42	11.3%	15%	0.13	$ 775	$ 25,000	$ 1,568	$ 32,753	$ 11,713
Lake Winnebago	Manitowoc HSD UU-16	3.09	0.33	0.06	18.6%	25%	0.03	2.53	0.29	11.3%	17%	0.14	$ 775	$ 25,000	$ 1,568	$ 47,052	$ 11,084
Totals		**43.10**	**4.41**	**0.83**			**0.54**	**33.77**	**3.81**			**2.49**					
Reachshed Impact		**586.00**	**62.00**	**23.60**			**0.87%**	**456.10**	**98.30**			**0.54%**					
Lower Fox River (DS)	Ballard Rd HSD 10	6.35	0.75	0.14	18.2%	23%	0.08	5.43	0.61	11.2%	16%	0.24	$ 775	$ 25,000	$ 1,568	$ 20,899	$ 6,640
Lower Fox River (DS)	Ballard Rd HSD 11	5.37	0.66	0.11	16.4%	22%	0.07	4.39	0.44	9.9%	15%	0.22	$ 775	$ 25,000	$ 1,568	$ 23,832	$ 7,238
Lower Fox River (DS)	Ballard Rd HSD 5	9.50	1.26	0.23	18.1%	19%	0.13	8.48	1.05	12.4%	13%	0.25	$ 775	$ 25,000	$ 1,568	$ 12,405	$ 6,163
Lower Fox River (DS)	Ballard Rd HSD 6	10.38	1.92	0.36	18.6%	19%	0.19	9.81	1.29	13.1%	13%	0.29	$ 775	$ 25,000	$ 1,568	$ 8,172	$ 5,328
Lower Fox River (DS)	Ballard Rd HSD 7	8.62	1.08	0.18	16.7%	23%	0.11	7.29	0.78	10.7%	16%	0.35	$ 775	$ 25,000	$ 1,568	$ 14,485	$ 4,426
Lower Fox River (DS)	Ballard Rd HSD 8	5.80	0.69	0.12	16.8%	23%	0.07	4.75	0.50	10.6%	16%	0.23	$ 775	$ 25,000	$ 1,568	$ 22,829	$ 6,716
Lower Fox River (DS)	College Ave HSD 1	14.07	1.95	0.28	14.4%	16%	0.19	12.40	1.24	10.0%	11%	0.37	$ 775	$ 25,000	$ 1,568	$ 8,050	$ 4,214
Lower Fox River (DS)	College Ave HSD 2	8.92	1.13	0.21	18.2%	18%	0.11	7.71	0.88	11.4%	12%	0.23	$ 775	$ 25,000	$ 1,568	$ 13,825	$ 6,774
Lower Fox River (DS)	College Ave HSD 3	8.44	0.91	0.17	19.1%	19%	0.09	6.92	0.80	11.6%	13%	0.21	$ 775	$ 25,000	$ 1,568	$ 17,232	$ 7,553
Lower Fox River (DS)	College Ave HSD 4	5.11	0.53	0.10	18.3%	22%	0.05	4.09	0.45	11.0%	15%	0.16	$ 775	$ 25,000	$ 1,568	$ 29,432	$ 9,976
Lower Fox River (DS)	College Ave HSD 5	4.05	0.44	0.08	19.3%	18%	0.04	3.33	0.39	11.7%	12%	0.10	$ 775	$ 25,000	$ 1,568	$ 35,674	$ 15,667
Lower Fox River (DS)	College Ave HSD 6	3.26	0.38	0.07	17.4%	23%	0.04	2.82	0.30	10.8%	16%	0.13	$ 775	$ 25,000	$ 1,568	$ 41,450	$ 11,698
Lower Fox River (DS)	College Ave HSD 7	15.67	1.87	0.33	17.9%	15%	0.19	13.08	1.46	11.1%	10%	0.39	$ 775	$ 25,000	$ 1,568	$ 8,403	$ 3,994
Lower Fox River (DS)	College Ave HSD 8	10.73	1.17	0.22	18.4%	18%	0.12	8.86	0.99	11.2%	12%	0.27	$ 775	$ 25,000	$ 1,568	$ 13,429	$ 5,900
Lower Fox River (DS)	CTH OO HSD 10	5.23	0.56	0.11	18.6%	18%	0.06	4.29	0.48	11.3%	12%	0.13	$ 775	$ 25,000	$ 1,568	$ 27,794	$ 12,187
Lower Fox River (DS)	CTH OO HSD 11	16.77	1.81	0.36	20.1%	20%	0.18	13.75	1.67	12.2%	14%	0.41	$ 775	$ 25,000	$ 1,568	$ 8,668	$ 3,799
Lower Fox River (DS)	CTH OO HSD 12	10.77	1.33	0.41	31.3%	20%	0.13	9.03	1.58	17.5%	14%	0.27	$ 775	$ 25,000	$ 1,568	$ 11,829	$ 5,785
Lower Fox River (DS)	CTH OO HSD 13	18.76	2.22	0.61	27.6%	19%	0.22	15.73	2.43	15.5%	13%	0.47	$ 775	$ 25,000	$ 1,568	$ 7,061	$ 3,321
Lower Fox River (DS)	CTH OO HSD 14	5.68	0.59	0.11	19.4%	18%	0.06	4.35	0.53	12.1%	12%	0.13	$ 775	$ 25,000	$ 1,568	$ 26,677	$ 12,022
Lower Fox River (DS)	CTH OO HSD 15	7.84	0.80	0.16	19.7%	15%	0.08	5.79	0.72	12.5%	10%	0.17	$ 775	$ 25,000	$ 1,568	$ 19,688	$ 9,018
Lower Fox River (DS)	CTH OO HSD 16	9.78	1.06	0.20	18.4%	18%	0.11	8.07	0.90	11.2%	12%	0.24	$ 775	$ 25,000	$ 1,568	$ 14,768	$ 6,472
Lower Fox River (DS)	CTH OO HSD 17	13.54	1.88	0.67	35.6%	18%	0.19	11.88	3.40	28.6%	12%	0.36	$ 775	$ 25,000	$ 1,568	$ 8,331	$ 4,399
Lower Fox River (DS)	CTH OO HSD 20	7.34	0.80	0.15	18.6%	35%	0.13	6.03	0.68	11.3%	24%	0.74	$ 775	$ 25,000	$ 1,568	$ 11,971	$ 2,113
Lower Fox River (DS)	CTH OO HSD 21	9.93	2.28	0.75	32.9%	24%	0.23	10.21	2.38	23.3%	16%	0.31	$ 775	$ 25,000	$ 1,568	$ 6,860	$ 5,116
Lower Fox River (DS)	CTH OO HSD 22	31.36	5.31	0.82	15.5%	14%	0.53	25.75	2.56	9.9%	9%	0.77	$ 775	$ 25,000	$ 1,568	$ 2,953	$ 2,029

Appendix B4-5b
Hydrodynamic Separator Devices (HSDs) For Implementation Consideration

TMDL Reachshed	Drainage Area Name	Drainage Area (acres)	No Controls TSS Load (tons/year)	Existing TSS Removed (tons/year)	Existing TSS Reduction %	HSD Only TSS Reduction %[1]	Estimated HSD Incremental TSS Reduction (tons/yr)[3]	No Controls TP Load (lbs/year)	Existing TP Removed (lbs/year)	Existing TP Reduction %	HSD Only TP Reduction %[2]	Estimated HSD Incremental TP Reduction (lbs/yr)[4]	(A) Annual Maintenance Cost (2021 $)	(B) Initial Capital Cost (Assumes 96-inch diameter structure) (2021 $)	(C) Total Annualized Cost (2021 $)	Cost per Ton of TSS Removed	Cost per Pound of TP Removed
Lower Fox River (DS)	CTH OO HSD 23	18.77	3.62	0.70	19.4%	15%	0.36	16.58	2.12	12.8%	10%	0.50	$ 775	$ 25,000	$ 1,568	$ 4,326	$ 3,152
Lower Fox River (DS)	CTH OO HSD 24	23.76	4.13	0.80	19.4%	15%	0.41	19.21	2.51	13.1%	10%	0.58	$ 775	$ 25,000	$ 1,568	$ 3,792	$ 2,720
Lower Fox River (DS)	CTH OO HSD 25	32.72	6.35	1.15	18.0%	16%	0.64	29.36	3.36	11.4%	11%	0.88	$ 775	$ 25,000	$ 1,568	$ 2,468	$ 1,780
Lower Fox River (DS)	CTH OO HSD 27	18.63	2.38	0.43	18.1%	19%	0.24	15.85	1.91	12.0%	13%	0.48	$ 775	$ 25,000	$ 1,568	$ 6,596	$ 3,296
Lower Fox River (DS)	CTH OO HSD 28	5.24	0.61	0.11	18.9%	18%	0.06	4.52	0.53	11.7%	12%	0.14	$ 775	$ 25,000	$ 1,568	$ 25,885	$ 11,566
Lower Fox River (DS)	CTH OO HSD 29	8.13	0.88	0.19	21.3%	19%	0.09	6.70	0.87	13.0%	13%	0.20	$ 775	$ 25,000	$ 1,568	$ 17,748	$ 7,796
Lower Fox River (DS)	CTH OO HSD 3	5.26	0.61	0.10	17.0%	18%	0.06	4.42	0.46	10.4%	12%	0.13	$ 775	$ 25,000	$ 1,568	$ 25,526	$ 11,832
Lower Fox River (DS)	CTH OO HSD 30	4.79	0.52	0.10	18.7%	19%	0.05	3.93	0.45	11.4%	13%	0.12	$ 775	$ 25,000	$ 1,568	$ 30,321	$ 13,291
Lower Fox River (DS)	CTH OO HSD 33	2.45	0.27	0.05	17.9%	24%	0.03	2.06	0.23	11.0%	16%	0.11	$ 775	$ 25,000	$ 1,568	$ 57,395	$ 14,573
Lower Fox River (DS)	CTH OO HSD 35	9.30	1.12	0.19	17.3%	17%	0.11	8.24	0.89	10.8%	11%	0.25	$ 775	$ 25,000	$ 1,568	$ 14,058	$ 6,344
Lower Fox River (DS)	CTH OO HSD 36	20.37	2.66	0.40	15.0%	15%	0.27	19.25	1.84	9.5%	10%	0.58	$ 775	$ 25,000	$ 1,568	$ 5,884	$ 2,715
Lower Fox River (DS)	CTH OO HSD 37	7.77	1.02	0.15	15.2%	16%	0.10	7.34	0.71	9.7%	11%	0.22	$ 775	$ 25,000	$ 1,568	$ 15,427	$ 7,120
Lower Fox River (DS)	CTH OO HSD 38	23.61	3.11	0.47	15.2%	15%	0.31	22.40	2.18	9.7%	10%	0.67	$ 775	$ 25,000	$ 1,568	$ 5,048	$ 2,333
Lower Fox River (DS)	CTH OO HSD 39	11.22	1.33	0.23	17.5%	16%	0.13	9.87	1.07	10.9%	11%	0.30	$ 775	$ 25,000	$ 1,568	$ 11,753	$ 5,292
Lower Fox River (DS)	CTH OO HSD 4	6.50	0.90	0.16	18.1%	20%	0.09	5.66	0.67	11.8%	14%	0.17	$ 775	$ 25,000	$ 1,568	$ 17,342	$ 9,230
Lower Fox River (DS)	CTH OO HSD 40	19.41	2.41	0.37	15.4%	16%	0.24	16.96	1.62	9.5%	11%	0.51	$ 775	$ 25,000	$ 1,568	$ 6,506	$ 3,080
Lower Fox River (DS)	CTH OO HSD 41	6.03	0.68	0.14	20.0%	17%	0.07	5.13	0.63	12.3%	11%	0.15	$ 775	$ 25,000	$ 1,568	$ 22,884	$ 10,179
Lower Fox River (DS)	CTH OO HSD 5	5.59	0.61	0.16	25.8%	20%	0.06	4.60	0.73	15.9%	14%	0.14	$ 775	$ 25,000	$ 1,568	$ 25,533	$ 11,347
Lower Fox River (DS)	CTH OO HSD 6	6.45	0.72	0.15	20.9%	18%	0.07	5.39	0.69	12.9%	12%	0.16	$ 775	$ 25,000	$ 1,568	$ 21,783	$ 9,702
Lower Fox River (DS)	CTH OO HSD 7	6.43	0.69	0.13	18.6%	21%	0.07	5.28	0.60	11.3%	14%	0.16	$ 775	$ 25,000	$ 1,568	$ 22,590	$ 9,902
Lower Fox River (DS)	CTH OO HSD 8	6.71	0.77	0.14	18.3%	20%	0.08	5.55	0.63	11.3%	14%	0.17	$ 775	$ 25,000	$ 1,568	$ 20,233	$ 9,414
Lower Fox River (DS)	CTH OO HSD 9	3.52	0.39	0.08	19.4%	21%	0.04	2.92	0.35	12.0%	14%	0.09	$ 775	$ 25,000	$ 1,568	$ 40,025	$ 17,877
Lower Fox River (DS)	Green Bay Rd HSD 11	11.13	2.07	0.42	20.3%	16%	0.21	9.98	1.34	13.5%	11%	0.30	$ 775	$ 25,000	$ 1,568	$ 7,566	$ 5,237
Lower Fox River (DS)	Green Bay Rd HSD 12	2.26	0.44	0.09	21.7%	27%	0.04	2.19	0.30	13.5%	18%	0.10	$ 775	$ 25,000	$ 1,568	$ 35,813	$ 15,197
Lower Fox River (DS)	Green Bay Rd HSD 13	7.97	1.46	0.32	21.6%	19%	0.15	7.61	1.02	13.4%	13%	0.23	$ 775	$ 25,000	$ 1,568	$ 10,721	$ 6,864
Lower Fox River (DS)	Green Bay Rd HSD 14	5.04	0.72	0.13	18.4%	22%	0.07	4.53	0.53	11.7%	15%	0.14	$ 775	$ 25,000	$ 1,568	$ 21,712	$ 10,995
Lower Fox River (DS)	Kensington North HSD 1	8.92	2.14	0.32	14.7%	16%	0.21	8.19	0.80	9.8%	11%	0.25	$ 775	$ 25,000	$ 1,568	$ 7,316	$ 6,379
Lower Fox River (DS)	Kensington North HSD 2	3.56	0.38	0.07	18.6%	27%	0.04	2.92	0.33	11.3%	18%	0.20	$ 775	$ 25,000	$ 1,568	$ 40,787	$ 7,737
Lower Fox River (DS)	Kensington North HSD 3	20.28	4.12	2.47	59.9%	17%	0.41	17.53	7.16	40.8%	11%	0.53	$ 775	$ 25,000	$ 1,568	$ 3,803	$ 2,980
Lower Fox River (DS)	Kensington North HSD 6	7.05	1.79	0.43	24.2%	19%	0.18	7.56	1.35	17.9%	13%	0.23	$ 775	$ 25,000	$ 1,568	$ 8,759	$ 6,914
Lower Fox River (DS)	Kensington North HSD 7	4.23	0.91	0.20	22.2%	22%	0.09	4.11	0.66	16.0%	15%	0.12	$ 775	$ 25,000	$ 1,568	$ 17,255	$ 12,707
Lower Fox River (DS)	Kensington North HSD 8	4.37	0.47	0.09	18.6%	26%	0.05	3.58	0.40	11.3%	18%	0.22	$ 775	$ 25,000	$ 1,568	$ 33,261	$ 6,990
Totals		**580.78**	**83.68**	**17.89**			**8.42**	**503.67**	**67.45**			**16.46**					
Reachshed Impact		**5966.00**	**830.60**	**298.70**			**1.01%**	**5015.60**	**1179.90**			**0.33%**					

Appendix B4-5b
Hydrodynamic Separator Devices (HSDs) For Implementation Consideration

TMDL Reachshed	Drainage Area Name	Drainage Area (acres)	No Controls TSS Load (tons/year)	Existing TSS Removed (tons/year)	Existing TSS Reduction %	HSD Only TSS Reduction %[1]	Estimated HSD Incremental TSS Reduction (tons/yr)[3]	No Controls TP Load (lbs/year)	Existing TP Removed (lbs/year)	Existing TP Reduction %	HSD Only TP Reduction %[2]	Estimated HSD Incremental TP Reduction (lbs/yr)[4]	(A) Annual Maintenance Cost (2021 $)	(B) Initial Capital Cost (Assumes 96-inch diameter structure) (2021 $)	(C) Total Annualized Cost (2021 $)	Cost per Ton of TSS Removed	Cost per Pound of TP Removed
Lower Fox River (US)	Green Bay Rd HSD 1	1.84	0.34	0.07	21.7%	23%	0.03	1.70	0.23	13.6%	16%	0.05	$ 775	$ 25,000	$ 1,568	$ 46,084	$ 30,681
Lower Fox River (US)	Green Bay Rd HSD 2	2.85	0.55	0.12	21.7%	23%	0.06	2.76	0.37	13.5%	16%	0.08	$ 775	$ 25,000	$ 1,568	$ 28,427	$ 18,917
Lower Fox River (US)	Green Bay Rd HSD 3	8.76	1.36	0.23	17.1%	20%	0.14	8.33	0.94	11.3%	14%	0.25	$ 775	$ 25,000	$ 1,568	$ 11,519	$ 6,275
Lower Fox River (US)	Green Bay Rd HSD 4	3.96	0.38	0.09	23.0%	24%	0.04	2.80	0.40	14.1%	16%	0.08	$ 775	$ 25,000	$ 1,568	$ 40,751	$ 18,659
Lower Fox River (US)	Green Bay Rd HSD 5	3.18	0.61	0.07	11.9%	24%	0.07	2.82	0.24	8.4%	16%	0.22	$ 775	$ 25,000	$ 1,568	$ 21,179	$ 7,127
Lower Fox River (US)	Green Bay Rd HSD 6	9.84	1.83	0.11	6.1%	17%	0.20	9.18	0.35	3.9%	11%	0.70	$ 775	$ 25,000	$ 1,568	$ 7,882	$ 2,240
Lower Fox River (US)	Green Bay Rd HSD 7	3.48	0.67	0.15	21.7%	24%	0.07	3.36	0.46	13.5%	16%	0.10	$ 775	$ 25,000	$ 1,568	$ 23,289	$ 15,542
Lower Fox River (US)	Green Bay Rd HSD 8	5.96	1.07	0.23	21.6%	18%	0.11	5.39	0.73	13.5%	12%	0.16	$ 775	$ 25,000	$ 1,568	$ 14,584	$ 9,695
Lower Fox River (US)	Green Bay Rd HSD 9	4.27	0.83	0.18	21.7%	29%	0.08	4.13	0.56	13.5%	20%	0.25	$ 775	$ 25,000	$ 1,568	$ 18,971	$ 6,292
Lower Fox River (US)	Leonard St HSD 10	2.45	0.27	0.06	23.2%	21%	0.03	2.04	0.29	14.2%	14%	0.06	$ 775	$ 25,000	$ 1,568	$ 58,159	$ 25,631
Lower Fox River (US)	Leonard St HSD 11	7.15	0.74	0.13	18.1%	19%	0.07	5.48	0.62	11.3%	13%	0.16	$ 775	$ 25,000	$ 1,568	$ 21,159	$ 9,538
Lower Fox River (US)	Leonard St HSD 9	8.94	1.04	0.18	17.6%	23%	0.10	7.67	0.85	11.0%	16%	0.34	$ 775	$ 25,000	$ 1,568	$ 15,021	$ 4,546
Lower Fox River (US)	Xavier HSD 1	8.85	0.96	0.20	20.5%	23%	0.10	7.30	0.91	12.4%	16%	0.23	$ 775	$ 25,000	$ 1,568	$ 16,329	$ 6,878
Lower Fox River (US)	Xavier HSD 2	4.19	0.47	0.10	20.5%	23%	0.05	3.53	0.44	12.5%	16%	0.11	$ 775	$ 25,000	$ 1,568	$ 33,461	$ 14,816
Lower Fox River (US)	Xavier HSD 3	2.49	0.27	0.05	18.6%	22%	0.03	2.04	0.23	11.3%	15%	0.07	$ 775	$ 25,000	$ 1,568	$ 58,512	$ 21,450
Lower Fox River (US)	Xavier HSD 4	3.65	0.39	0.07	18.6%	24%	0.04	2.99	0.34	11.3%	16%	0.15	$ 775	$ 25,000	$ 1,568	$ 39,868	$ 10,683
Lower Fox River (US)	Xavier HSD 5	1.46	0.16	0.03	18.6%	27%	0.02	1.20	0.14	11.3%	18%	0.08	$ 775	$ 25,000	$ 1,568	$ 99,193	$ 18,780
Lower Fox River (US)	Xavier HSD 6	1.61	0.14	0.02	17.6%	30%	0.02	1.16	0.11	9.9%	20%	0.12	$ 775	$ 25,000	$ 1,568	$ 90,197	$ 13,052
Lower Fox River (US)	Xavier HSD 7	3.84	0.47	0.09	18.6%	25%	0.05	3.25	0.37	11.5%	17%	0.18	$ 775	$ 25,000	$ 1,568	$ 33,031	$ 8,932
Lower Fox River (US)	Xavier HSD 8	6.08	0.83	0.13	15.1%	25%	0.08	5.30	0.52	9.9%	17%	0.37	$ 775	$ 25,000	$ 1,568	$ 18,786	$ 4,218
Totals		**94.87**	**13.41**	**2.32**			**1.37**	**82.44**	**9.08**			**3.77**					
Reachshed Impact		**1506.00**	**214.30**	**44.90**			**0.64%**	**1281.00**	**168.50**			**0.29%**					
Mud Creek	Leonard St HSD 1	4.02	0.67	0.13	19.7%	20%	0.07	3.64	0.53	14.4%	14%	0.11	$ 775	$ 25,000	$ 1,568	$ 23,505	$ 14,357
Mud Creek	Leonard St HSD 2	4.78	0.66	0.15	22.9%	21%	0.07	4.33	0.69	16.0%	14%	0.13	$ 775	$ 25,000	$ 1,568	$ 23,842	$ 12,054
Mud Creek	Leonard St HSD 3	6.20	1.53	0.56	36.6%	17%	0.15	5.34	1.29	24.1%	11%	0.16	$ 775	$ 25,000	$ 1,568	$ 10,269	$ 9,776
Mud Creek	Leonard St HSD 4	8.03	1.77	0.18	9.9%	19%	0.18	5.64	0.41	7.3%	13%	0.31	$ 775	$ 25,000	$ 1,568	$ 8,868	$ 5,020
Mud Creek	Leonard St HSD 5	3.52	0.89	0.19	21.4%	25%	0.09	3.52	0.56	16.0%	17%	0.11	$ 775	$ 25,000	$ 1,568	$ 17,677	$ 14,845
Mud Creek	Leonard St HSD 6	4.39	0.88	0.14	15.5%	19%	0.09	3.50	0.37	10.7%	13%	0.10	$ 775	$ 25,000	$ 1,568	$ 17,820	$ 14,937
Mud Creek	Leonard St HSD 7	6.05	0.65	0.12	18.5%	23%	0.07	4.98	0.56	11.2%	16%	0.21	$ 775	$ 25,000	$ 1,568	$ 23,946	$ 7,316
Totals		**36.99**	**7.04**	**1.46**			**0.70**	**30.95**	**4.41**			**1.14**					
Reachshed Impact		**1055.00**	**164.70**	**75.60**			**0.43%**	**868.00**	**326.50**			**0.13%**					

[1] Note: TSS removal as reported from prior City of Appleton Watershed Studies.

[2] Note: TP removal based on assumed ratio of 54% TP removal to 80% TSS removal standard and is not based on WinSLAMM modeling results.

[3] Note: Incremental TSS removal is based on applying the difference between the HSD only minus the Existing Conditions TSS reduction or 10% (whichever is greater) and not on direct WinSLAMM modeling results.

[4] Note: Incremental TP removal is based on applying the difference between the HSD only minus the Existing Conditions TP reduction or 3% (whichever is greater) and not on direct WinSLAMM modeling results.

[5] Note: Total Annualized Cost assumes a 100-year life of the concrete sump structure, and annualizes the initial capital cost assuming a 3% interest rate.

min	$ 2,468	$ 1,780
max	$ 99,193	$ 30,681
average	$ 23,511	$ 9,023

Appendix B4-5c

Hydrodynamic Separator Devices (HSDs) Tributary to Existing SMPs That Will Not Generate Additional TSS and TP Reductions for the City if Implemented

TMDL Reachshed	Drainage Area Name	Drainage Area (acres)	No Controls TSS Load (Tons/year)	Existing Tons TSS Removed (per Year)	Existing % Total Suspended Solids (TSS) Reduction	Potential HSD Only TSS Removal %	Estimated HSD Incremental TSS Reduction (tons/yr)[6]	No Controls TP Load (lbs/year)	Existing Pounds TP Removed (per Year)	Existing % Total Phosphorus (TP) Reduction	Potential HSD Only TP Removal %[1]	Estimated HSD Incremental TP Reduction (lbs/yr)[6]	NR 528 Sediment Control Possibly Required?	Existing DS Regional SMP	(A) Annual Maintenance Cost (2021 $)	(B) Initial Capital Cost (Assumes 96-inch diameter structure) (2021 $)	(C) Total Annualized Cost (2021 $)	Cost per Ton of TSS Removed	Cost per Pound of TP Removed
Lower Fox River (US)	Manitowoc HSD 11NEW	3.04	0.38	0.22	56.7%	25%	0.04	2.58	0.79	30.6%	17%	0.08	yes	Schindler 441 Pond	$ 775	$ 25,000	$ 1,568	$ 40,827	$ 20,272
Lower Fox River (US)	Manitowoc HSD 6NEW	13.05	0.70	0.58	82.5%	22%	0.07	5.33	2.24	42.0%	15%	0.16	yes	Schindler 441 Pond	$ 775	$ 25,000	$ 1,568	$ 22,422	$ 9,797
Lower Fox River (US)	Manitowoc HSD 7NEW	3.62	0.49	0.46	92.3%	20%	0.05	3.27	1.44	44.1%	14%	0.10	yes	Schindler 441 Pond	$ 775	$ 25,000	$ 1,568	$ 31,771	$ 15,985
Lower Fox River (US)	Manitowoc HSD P-104	6.58	0.42	0.39	92.3%	23%	0.04	3.79	1.67	44.1%	16%	0.11	yes	Schindler 441 Pond	$ 775	$ 25,000	$ 1,568	$ 36,921	$ 13,794
Lower Fox River (DS)	AMC HSD 1	4.61	0.60	0.47	78.7%	24%	0.06	3.99	2.33	58.4%	16%	0.12	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 26,294	$ 13,080
Lower Fox River (DS)	AMC HSD 2	3.83	0.60	0.45	74.2%	22%	0.06	3.54	1.96	55.2%	15%	0.11	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 26,089	$ 14,740
Lower Fox River (DS)	AMC HSD 3	5.99	0.73	0.58	78.6%	23%	0.07	4.95	2.89	58.3%	16%	0.15	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 21,392	$ 10,559
Lower Fox River (DS)	AMC HSD 5	7.43	0.85	0.67	78.4%	27%	0.08	6.35	3.69	58.1%	18%	0.19	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 18,458	$ 8,234
Lower Fox River (DS)	AMC HSD 7	7.97	0.85	0.67	78.6%	23%	0.09	6.49	3.79	58.4%	16%	0.19	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 18,434	$ 8,047
Lower Fox River (DS)	AMC HSD 8	9.43	1.05	0.83	78.8%	17%	0.11	7.92	4.63	58.5%	11%	0.24	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 14,879	$ 6,600
Lower Fox River (DS)	Ballard Rd HSD 1	4.89	0.67	0.53	78.8%	27%	0.07	4.25	2.48	58.5%	18%	0.13	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 23,377	$ 12,309
Lower Fox River (DS)	Ballard Rd HSD 2	17.58	2.35	1.85	78.8%	18%	0.23	14.64	8.56	58.5%	12%	0.44	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 6,679	$ 3,569
Lower Fox River (DS)	Ballard Rd HSD 3	9.41	1.10	0.87	78.8%	23%	0.11	7.93	4.64	58.5%	16%	0.24	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 14,272	$ 6,593
Lower Fox River (DS)	Ballard Rd HSD 4	4.40	0.47	0.37	78.4%	26%	0.05	3.61	2.10	58.2%	18%	0.11	yes	Leona Pond	$ 775	$ 25,000	$ 1,568	$ 33,028	$ 14,480
Lower Fox River (DS)	CTH OO HSD 1	10.80	2.34	0.97	41.5%	16%	0.23	10.39	2.72	26.2%	11%	0.31	no	MPPNE	$ 775	$ 25,000	$ 1,568	$ 6,689	$ 5,029
Lower Fox River (DS)	CTH OO HSD 18	13.30	1.41	1.09	77.0%	21%	0.14	10.79	5.61	52.0%	14%	0.32	no	MPPNE	$ 775	$ 25,000	$ 1,568	$ 11,086	$ 4,841
Lower Fox River (DS)	CTH OO HSD 19	10.25	1.24	0.95	77.0%	18%	0.12	8.79	4.57	52.0%	12%	0.26	no	MPPNE	$ 775	$ 25,000	$ 1,568	$ 12,675	$ 5,943
Lower Fox River (DS)	CTH OO HSD 2	7.64	1.59	1.22	77.0%	18%	0.16	7.21	3.75	52.0%	12%	0.22	no	MPPNE	$ 775	$ 25,000	$ 1,568	$ 9,878	$ 7,246

[1] Note: TSS removal as reported from prior City of Appleton Watershed Studies.

[2] Note: TP removal based on assumed ratio of 54% TP removal to 80% TSS removal standard and is not based on WinSLAMM modeling results.

[3] Note: Incremental TSS removal is based on applying the difference between the HSD only minus the Existing Conditions TSS reduction or 10% (whichever is greater) and not on direct WinSLAMM modeling results.

[4] Note: Incremental TP removal is based on applying the difference between the HSD only minus the Existing Conditions TP reduction or 3% (whichever is greater) and not on direct WinSLAMM modeling results.

[5] Note: Total Annualized Cost assumes a 100-year life of the concrete sump structure, and annualizes the initial capital cost assuming a 3% interest rate.

[6] Note: No credit can be taken for annualized TSS or TP removals due to downstream practices.

min	$ 6,679	$ 3,569
max	$ 40,827	$ 20,272
average	$ 20,843	$ 10,062

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LEGEND

FUTURE LAND USE

- ONE AND TWO-FAMILY RESIDENTIAL
- MULTIFAMILY RESIDENTIAL
- COMMERCIAL
- MIXED-USE
- CENTRAL BUSINESS DISTRICT
- BUSINESS / INDUSTRIAL
- INDUSTRIAL
- PUBLIC / INSTITUTIONAL
- CEMETERY
- PUBLIC PARKS AND OPEN SPACE
- AGRICULTURAL AND PRIVATE OPEN SPACE
- PONDS / WATER
- 2019 DEVELOPMENT AREAS
- 2050 PLANNING BOUNDARY

BASE MAPPING

- ROADS
- WATER
- MUNICIPAL BOUNDARIES
- WATER MAIN

A B C D E F G H I J K L M N O P Q R S T U V W X

0 3,700 7,400 FEET

AECOM

FIGURE 3-3
FUTURE SERVICE AREA AND LAND USE
APPLETON, WISCONSIN

MAY 2019 **60578987**

Appendix B4-7a
New Development Impact Analysis

2019 Future Development Areas (Data from City of Appleton Water System Master Plan - October 2019)

Unique Area	TMDL Reachshed	TMDL TSS Removal Requirement	TMDL TP Removal Requirement	Acreage by Land Use Category							Total (acre)
				Single Family	Multi-Family	Commercial	Institutional	Mixed-Use	Business / Industrial	Ponds / Green Space	
A	Apple Creek	52.0%	40.5%	-	40	11	6	-	-	-	57
B				PREVIOUSLY DEFINED DEVELOPMENT AREA THAT IS NOW FULLY DEVELOPED AS OF 2019.							
C	Bear Creek	84.0%	85.6%	-	29	56	-	-	193	-	278
D	Apple Creek	52.0%	40.5%	-	-	41	8	22	-	-	71
E	Apple Creek	52.0%	40.5%	-	-	25	-	-	-	-	25
F	Apple Creek	52.0%	40.5%	-	-	13	16	-	-	-	29
G	Apple Creek	52.0%	40.5%	-	-	417	-	-	-	44	461
H				PREVIOUSLY DEFINED DEVELOPMENT AREA THAT IS NOW FULLY DEVELOPED AS OF 2019.							
I1	Apple Creek	52.0%	40.5%	-	4	27	-	-	13	-	44
I2	Lower Fox River (DS)	72.0%	40.5%	-	4	27	-	-	13	-	44
J	Lower Fox River (DS)	72.0%	40.5%	-	-	-	-	-	22	-	22
K	Lower Fox River (DS)	72.0%	40.5%	-	-	-	-	-	37	-	37
L	Garners Creek	60.0%	68.6%	-	-	-	-	38	-	-	38
M	Garners Creek	60.0%	68.6%	-	-	16	-	27	-	-	43
N	Garners Creek	60.0%	68.6%	-	-	-	-	-	247	-	247
O				PREVIOUSLY DEFINED DEVELOPMENT AREA THAT IS NOW FULLY DEVELOPED AS OF 2019.							
P	Bear Creek	84.0%	85.6%	-	-	131	-	-	-	-	131
Q	Bear Creek	84.0%	85.6%	420	-	-	-	-	-	-	420
R1	Apple Creek	52.0%	40.5%	401	-	-	-	-	-	-	401
R2	Duck Creek	52.0%	40.5%	155	-	-	-	-	-	-	155
S	Apple Creek	52.0%	40.5%	331	-	-	-	-	-	26	357
T	Apple Creek	52.0%	40.5%	73	-	-	12	-	-	-	85
U	Apple Creek	52.0%	40.5%	62	-	-	-	-	-	-	62
V1	Lower Fox River (DS)	72.0%	40.5%	6	2	-	1	-	-	-	10
V2	Lower Fox River (US)	72.0%	40.5%	2	1	-	1	-	-	-	3
W	Mud Creek	43.0%	48.2%	-	-	28	-	-	-	-	28
X	Lower Fox River (US)	20.0%	85.6%	-	-	29	-	-	-	-	29
Total				1,450	80	821	44	87	525	70	3,077

* Note - if area is in multiple reachsheds, the removal requirment was weighted in this evaluation for simplification.

total acres 3,077

Unique Area	Data Adjustment to Citywide Project GIS WinSLAMM Areas				
	AGR Land Use	OPEN Land Use	Out of City Area	Total GIS Area (ac)	AGR, OPEN, and Out of City Area with No Regional BMP
A	0.00	5.76	51.06	56.8	56.8
B					
C	29.04	2.98	229.65	272.0	261.7
D	0.00	0.17	46.91	75.0	47.1
E	0.00	10.82	4.97	25.2	15.8
F	0.00	0.00	3.37	52.9	3.4
G	0.00	0.00	0.00	535.1	0.0
H					
I1	0.00	0.00	0.00	41.1	0.0
I2	0.00	0.00	0.00	41.1	0.0
J	3.99	9.66	2.33	18.8	16.0
K	0.00	0.00	38.28	38.3	38.3
L	0.00	3.38	0.00	34.8	3.4
M	0.00	0.00	0.00	42.3	0.0
N	0.00	0.30	0.26	256.6	0.6
O					
P	0.00	0.00	177.60	177.6	177.6
Q	0.00	0.00	423.99	424.0	424.0
R1	0.00	4.53	168.43	396.0	173.0
R2	0.00	1.75	65.24	153.4	67.0
S	0.00	7.19	248.54	361.2	255.7
T	0.00	0.00	7.96	80.8	8.0
U	0.00	0.00	61.49	62.9	61.5
V1	0.00	0.00	0.00	9.6	0.0
V2	0.00	0.00	0.00	3.4	0.0
W	0.00	0.00	0.00	25.9	0.0
X	0.00	0.00	0.00	29.0	0.0
Total	**33**	**47**	**1,530**	**3,214**	**1,610**

Unique Area	2030 Development Analysis									
	Estimated % Buildout 2030	Acres Developed in 2020-2030	Existing TSS Load (tons) 2030 Dev. Area	Existing TP Load (lbs) 2030 Dev. Area	Estimated 2030 TSS Load (tons)	Estimated 2030 TP Load (lbs)	Potential Net TSS Removal (tons)	Potential Net TP Removal (lbs)	Reachshed TSS Reduction Impact vs TMDL Target (tons)	Reachshed TP Reduction Impact vs TMDL Target (lbs)
A	50%	28.4	0.70	8.48	4.37	25.59	2.94	9.24	1.03	2.31
B	N/A									
C	10%	27.2	0.64	7.81	6.07	23.63	4.35	8.54	(0.22)	(5.00)
D	100%	75.0	1.15	14.05	8.45	40.13	5.83	14.09	2.04	3.52
E	75%	18.9	0.29	3.54	2.25	10.21	1.57	3.60	0.55	0.90
F	75%	39.7	0.06	0.76	0.49	2.27	0.34	0.82	0.12	0.20
G	50%	267.6	-	-	-	-	-	-	-	-
H	N/A									
I1	100%	41.1	-	-	-	-	-	-	-	-
I2	100%	41.1	-	-	-	-	-	-	-	-
J	25%	4.7	0.10	1.19	1.03	3.65	0.75	1.33	0.07	0.33
K	25%	9.6	0.23	2.86	2.47	8.75	1.79	3.18	0.18	0.80
L	30%	10.4	0.02	0.30	0.16	0.82	0.10	0.28	0.03	(0.08)
M	50%	21.2	-	-	-	-	-	-	-	-
N	50%	128.3	0.01	0.08	0.07	0.26	0.05	0.09	0.01	(0.03)
O	N/A									
P	0%	-	-	-	-	-	-	-	-	-
Q	0%	-	-	-	-	-	-	-	-	-
R1	25%	99.0	1.06	12.90	3.40	29.20	1.88	8.80	0.66	2.20
R2	25%	38.4	0.41	5.00	1.32	11.31	0.73	3.41	0.25	0.85
S	50%	180.6	3.13	38.16	9.91	85.30	5.42	25.46	1.90	6.37
T	50%	40.4	0.10	1.19	0.38	2.83	0.23	0.89	0.08	0.22
U	40%	25.2	0.60	7.34	1.94	16.61	1.07	5.01	0.37	1.25
V1	100%	9.6	-	-	-	-	-	-	-	-
V2	100%	3.4	-	-	-	-	-	-	-	-
W	100%	25.9	-	-	-	-	-	-	-	-
X	100%	29.0	-	-	-	-	-	-	-	-
Total	**Totals**	**1,164**	**8.50**	**103.64**	**42.31**	**260.58**	**27.05**	**84.75**		
	Development rate	116	acres per year							

Unique Area	2040 Development Analysis									
	Estimated % Buildout 2040	Acres Developed in 2030-2040	Existing TSS Load (tons) 2040 Dev. Area	Existing TP Load (lbs) 2040 Dev. Area	Estimated 2040 TSS Load (tons)	Estimated 2040 TP Load (lbs)	Potential Net TSS Removal (tons)	Potential Net TP Removal (lbs)	Reachshed TSS Reduction Impact vs TMDL Target (tons)	Reachshed TP Reduction Impact vs TMDL Target (lbs)
A	100%	28.4	1.39	16.96	8.74	51.18	5.88	18.48	2.06	4.62
B	N/A									
C	50%	108.8	3.20	39.04	30.37	118.15	21.74	42.72	(1.09)	(25.00)
D	100%	-	1.15	14.05	8.45	40.13	5.83	14.09	2.04	3.52
E	100%	6.3	0.39	4.71	3.00	13.62	2.09	4.81	0.73	1.20
F	100%	13.2	0.08	1.01	0.65	3.03	0.46	1.09	0.16	0.27
G	75%	133.8	-	-	-	-	-	-	-	-
H	N/A									
I1	100%	-	-	-	-	-	-	-	-	-
I2	100%	-	-	-	-	-	-	-	-	-
J	50%	4.7	0.20	2.38	2.06	7.30	1.50	2.66	0.15	0.66
K	100%	28.7	0.94	11.42	9.90	35.00	7.17	12.73	0.72	3.18
L	60%	10.4	0.05	0.61	0.31	1.64	0.21	0.56	0.05	(0.15)
M	80%	12.7	-	-	-	-	-	-	-	-
N	75%	64.2	0.01	0.13	0.11	0.38	0.08	0.14	0.02	(0.04)
O	N/A									
P	25%	44.4	1.09	13.25	8.44	38.26	5.88	13.51	(0.29)	(7.90)
Q	25%	106.0	2.59	31.63	8.34	71.59	4.60	21.58	(0.23)	(12.63)
R1	50%	99.0	2.12	25.80	6.80	58.41	3.75	17.60	1.31	4.40
R2	50%	38.4	0.82	10.00	2.64	22.62	1.45	6.82	0.51	1.70
S	75%	90.3	4.69	57.23	14.86	127.96	8.13	38.19	2.85	9.55
T	100%	40.4	0.19	2.37	0.76	5.66	0.45	1.77	0.16	0.44
U	60%	12.6	0.90	11.01	2.90	24.92	1.60	7.51	0.56	1.88
V1	100%	-	-	-	-	-	-	-	-	-
V2	100%	-	-	-	-	-	-	-	-	-
W	100%	-	-	-	-	-	-	-	-	-
X	100%	-	-	-	-	-	-	-	-	-
Total	**Totals**	**842**	**19.81**	**241.60**	**108.33**	**619.86**	**70.81**	**204.26**		
	Development rate	84	acres per year							

Unique Area	2050 Development Analysis									
	Estimated % Buildout 2050	Acres Developed in 2040-2050	Existing TSS Load (tons) 2050 Dev. Area	Existing TP Load (lbs) 2050 Dev. Area	Estimated 2050 TSS Load (tons)	Estimated 2050 TP Load (lbs)	Potential Net TSS Removal (tons)	Potential Net TP Removal (lbs)	Reachshed TSS Reduction Impact vs TMDL Target (tons)	Reachshed TP Reduction Impact vs TMDL Target (lbs)
A	100%	-	1.39	16.96	8.74	51.18	5.88	18.48	2.06	4.62
B	N/A									
C	100%	136.0	6.40	78.08	60.74	236.31	43.47	85.44	(2.17)	(50.00)
D	100%	-	1.15	14.05	8.45	40.13	5.83	14.09	2.04	3.52
E	100%	-	0.39	4.71	3.00	13.62	2.09	4.81	0.73	1.20
F	100%	-	0.08	1.01	0.65	3.03	0.46	1.09	0.16	0.27
G	100%	133.8	-	-	-	-	-	-	-	-
H	N/A									
I1	100%	-	-	-	-	-	-	-	-	-
I2	100%	-	-	-	-	-	-	-	-	-
J	100%	9.4	0.39	4.77	4.13	14.60	2.99	5.31	0.30	1.33
K	100%	-	0.94	11.42	9.90	35.00	7.17	12.73	0.72	3.18
L	100%	13.9	0.08	1.01	0.52	2.73	0.35	0.93	0.09	(0.25)
M	100%	8.5	-	-	-	-	-	-	-	-
N	100%	64.2	0.01	0.17	0.14	0.51	0.10	0.19	0.03	(0.05)
O	N/A									
P	100%	133.2	4.35	53.00	33.75	153.06	23.52	54.03	(1.18)	(31.62)
Q	100%	318.0	10.38	126.52	33.36	286.37	18.39	86.32	(0.92)	(50.51)
R1	100%	198.0	4.23	51.61	13.61	116.81	7.50	35.21	2.63	8.80
R2	100%	76.7	1.64	19.99	5.27	45.25	2.91	13.64	1.02	3.41
S	100%	90.3	6.26	76.31	19.81	170.61	10.84	50.92	3.80	12.73
T	100%	-	0.19	2.37	0.76	5.66	0.45	1.77	0.16	0.44
U	100%	25.2	1.50	18.35	4.84	41.53	2.67	12.52	0.93	3.13
V1	100%	-	-	-	-	-	-	-	-	-
V2	100%	-	-	-	-	-	-	-	-	-
W	100%	-	-	-	-	-	-	-	-	-
X	100%	-	-	-	-	-	-	-	-	-
Total	**Totals**	**1,207**	**39.39**	**480.33**	**207.67**	**1,216.40**	**134.63**	**397.48**		
	Development rate	121	acres per year							

			2030 Summary		2040 Summary		2050 Summary	
TMDL Reachshed	TMDL TSS Removal Requirement	TMDL TP Removal Requirement	Reachshed TSS Reduction Impact vs TMDL Target (tons)	Reachshed TP Reduction Impact vs TMDL Target (lbs)	Reachshed TSS Reduction Impact vs TMDL Target (tons)	Reachshed TP Reduction Impact vs TMDL Target (lbs)	Reachshed TSS Reduction Impact vs TMDL Target (tons)	Reachshed TP Reduction Impact vs TMDL Target (lbs)
Apple Creek	52.0%	40.5%	6.75	16.98	9.87	25.89	12.50	34.72
Duck Creek	52.0%	40.5%	0.25	0.85	0.51	1.70	1.02	3.41
Garners Creek	60.0%	68.6%	0.04	(0.10)	0.07	(0.19)	0.11	(0.30)
Lower Fox River Mainstem (DS)	72.0%	40.5%	0.25	1.13	0.87	3.85	1.02	4.51
Lower Fox River Mainstem (US)	72.0%	40.5%	-	-	-	-	-	-
Mud Creek	43.0%	48.2%	-	-	-	-	-	-
Bear Creek	84.0%	85.6%	(0.22)	(5.00)	(1.61)	(45.53)	(4.27)	(132.13)
Lake Winnebago	20.0%	85.6%	-	-	-	-	-	-

Note: Negative values indicate that TMDL reduction targets are higher than current City ordinance requirements.

Appendix B4-8a

Water Quality Trading Alternatives Summary

City of Appleton – Citywide Stormwater Quality Management Plan

1.1 Pollutant Trading

Rather than solely implementing source controls or other SMPs on the City's stormwater management system, another alternative is to identify entities or sources available for water quality pollutant trading.

The WDNR's "Guidance for Implementing Water Quality Trading in WPDES Permits" was updated on June 1, 2020. The guidance document (consisting of over 160 pages of information) is intended to assist with developing and implementing trades associated with various WPDES permits as authorized in s. 283.84 Wis. Stats. Trades may be used by industrial and municipal WPDES permit holders to demonstrate compliance with water quality-based effluent limitations (WQBELs). Trading is different from, and not to be confused, with adaptive management. Adaptive management is typically for phosphorus compliance only and must demonstrate evidence through monitoring of in-stream phosphorus concentrations and eventually achieving phosphorus water quality criteria in the water of focus. It is important to note that an adaptive management approach must be under the lead of a Wastewater Treatment Plant. A stormwater program cannot undertake an adaptive management approach on its own.

Water quality trading can be applied to a number of pollutants, not just phosphorus, and involves the purchase of "credits" in the watershed to achieve compliance. Permit compliance is demonstrated by comparing permittee discharge data (through modeling or monitoring), available credits, and permit limits. Because of the depth and complexity of this approach for moving towards compliance, only limited details on water quality trading are provided in this document as presented in the following paragraphs. For more detailed information and related resources, please see the WDNR's website at https://dnr.wisconsin.gov/topic/Wastewater/WaterQualityTrading.html.

A trade can be between two point sources "point to point" or a point source and nonpoint source "point to nonpoint". Municipal stormwater runoff and discharges are sometimes referred to as nonpoint sources and other times as point sources. For the purpose of trading, stormwater is considered a point source. "Nonpoint sources" are land management activities that contribute runoff, seepage, or percolation which adversely affects water quality, such as agricultural runoff. Trades are typically made directly between the "credit generator" (the source that is providing the excess pollutant load reduction) and the "credit user" (the entity purchasing the excess, available credits). There is also language in the guidance for "credit brokers" and a "credit exchange" to act as third parties to participate in matching credit generators and credit users.

Implementing the guidance is a rather complicated and detailed process, typically involving modeling evaluations of various credit alternatives, understanding and applying trade ratios, development of trading agreements (which would result in changes to both the wastewater and stormwater WPDES permits, including changing the City from a general stormwater permit to an individual permit) and following the required documentation with WDNR (Illustrated on Table 4 of the guidance document)

that includes completion of four different WDNR forms, development of the trade agreement, and an annual report summary. Additionally, there must be the construction of the identified treatment practice, technology, or land cover/condition implementation to complete the trade.

1.1.1 Water Quality Trading in Agricultural Areas

While water quality trading is not new to Wisconsin, it is not widely utilized as a tool for WPDES permit compliance. To assist in understanding some past trades and considerations in agricultural situations, City of Appleton and BC staff met with Jessica Schultz, Executive Director of the Fox-Wolf Watershed Alliance on January 21, 2021. As part of the discussion, Jessica shared her experiences from her feasibility study "Exploring Water Quality Trading for Compliance" with Neenah-Menasha and Fox-West Regional Sewerage Commissions and the Heart of the Valley Metropolitan Sewerage District (Wisconsin's first water quality trade in a TMDL watershed). During that discussion, Jessica noted that, while there have been some positive changes associated with WDNR guidance, her experience has been that, in its current state, water quality trading continues to be a rather costly method of moving towards compliance that involves considerable risk in most cases. Some specific insight into this is as follows:

Effective duration of trading plan approval by WDNR

The state statute for water quality trading requires the trade terms and conditions to be included in the WPDES permit. The permit must be issued, reissued, or modified to include information on the trade and is approved for a single permit term that must be re-approved in subsequent permits. Therefore, the length of time a plan is approved for by WDNR is equal to the length of the permit term which is five years for the City of Appleton.

Duration of trade agreements with credit generator

Management practices implemented on farm fields are often targeted as sources of credits, especially for phosphorus. One challenge that has been encountered is the reluctance for farmers to enter into long-term agreements. In the past, NRCS agreements with farmers have been short, approximately 1-year, which farmers have become accustomed to and willing to accept. Also, farmers have had the option to 'walk away' from an agreement. Water quality trade agreements go well beyond the short NRCS agreement duration. Some farmers have accepted agreements of three-to-five-year durations. However these are still relatively short and do not guarantee the long-term availability of credits for a WPDES permitholder like the City of Appleton to rely on them for achieving TMDL reductions. that will take decades to reach full compliance.

Cost per pound of credit (due to farmer risk)

Work by FWWA and other entities to encourage farmers to enter into credit agreements shows the cost to implement practices to be close to the cost of purchasing the crops that were lost to get farmers to buy into the deal. This raises the cost of the trade on a per-pound basis and ends up being more expense and less sustainable, especially since this may be a limited arrangement that the farmer may be unwilling to maintain under future permit cycles. This will result in there not being a long-term benefit for the funds spent.

Taking land out of production

Because of some of the aforementioned challenges, the most cost effective and perhaps only way to guarantee a long-term benefit from a trade is to purchase the land identified for the trade and take it out of production. Ownership would be maintained by the City of Appleton or possibly placed in a trust of a non-profit organization to protect the credit generating characteristics of the property. Two potential concerns of this option include; 1) the possibility that the farming practice changes on other areas not protected by the purchase could be negatively modified and the overall benefit of the trade to the watershed and receiving water could be diluted and; 2) land areas owned by a tax exempt entity that might have otherwise provided an opportunity for development (e.g. residential, commercial, etc.) would impact the future tax base of the City of Appleton or another municipality in which the land area was purchased.

Based on FWWA's experience with trading and the current WDNR guidance, it appears that the best scenario for a trade working with agricultural land would result if the City had an opportunity to convert agricultural lands into the City's parks and open space plan. In this instance, the purchase of the land would match other objectives of the City, would not have the secondary impact of removing land areas that might be otherwise developable and beneficial to the tax base, and would provide the desired long-term benefit. The number of credits available would depend on the specific identified final use of the land and need to go through the full pollutant loading evaluation effort and trade process in the WDNR guidance. The proposed trade must be approved by the WDNR through the Notice of Intent process and follow the guidance outlined to be eligible. Past acquisition or instances are not eligible.

During a review with the City of the concept to implement a trade with an agricultural area through conversion of the ag land to park land, it was noted that the City may have such an opportunity where a future park site is suggested on farmed land currently owned by Thrivent in the Apple Creek Reachshed. While the Apple Creek reachshed does not need further TSS or TP reductions, excess reductions could be applied to the Lower Fox River DS Reachshed. A brief desktop analysis was conducted using information from the Lower Fox River TMDL report to evaluate the base load and load reduction requirements for ag land in the Apple Creek Reachshed, and using WinSLAMM to assess the loads associated with parkland.

The analysis identified that the TMDL report indicated that ag land baseline loads were 1.32 lbs/ac/yr for TP and 458.49 lbs/acre/yr for TSS. Allowable loads from ag land were 0.28 lbs/ac/yr (78.6% reduction) for TP and 201.31 lbs/ac/yr (56.1% reduction) for TSS. The WDNR guidance on trading noted that if the TP results were less than 0.5 lbs/ac/year that the allocation value may be rounded up to 0.5 lbs/ac/yr.

The WinSLAMM loadings for parkland in silty soil conditions are 0.46 lbs/yr/ac for TP and 110.4 lbs/ac/yr for TSS. A minimum trade ratio of 1.2 is required based on ta review of the trade ratio components. This left essentially no TP available for a trade of this sort, and only 75.76 lbs/ac/yr of available TSS for a trade. For a 10-acre park this is only about 758 lbs/ac/yr that would be the resulting benefit of such a trade. While rather small, since this may be a project the City plans to implement regardless, the cost of submitting the required documents to the WDNR should be evaluated and the value of this trade proposition considered. Also, a trade such as this would require the City to move from their current General Permit to an Individual Permit as that is the mechanism that the WDNR uses to track trade related permit compliance items.

This scenario was discussed with Jake Zimmerman from the WDNR during a call on June 3, 2021 to review the details of the potential trade. Jake noted several considerations that does not rule out the site as a possibility but are items that would need to be evaluated further and are listed below.

- Typically a conversion of agricultural areas are made to a restored natural condition and not to a park land use.
- Typically an agricultural trade includes the installation of a stormwater management practice (SMP).
- Conversion of agricultural land to an MS4 park land use would require that the new developed obtain NR151 or TMDL reduction goals.
- The WDNR trading guidance indicates that there must be a measurable improvement in water quality. Since the area already drains to an existing City regional SMP (Ballard Road Pond), the improvement may be more difficult to quantify even though it is understood that the TMDL report incorporated the area in question as agricultural non-treated area. There is an expectation that sediment and nutrient loading to the existing regional SMP would be reduced and likely result in improved SMP performance, it is difficult to determine to what extent.
- A full analysis of the conditions would need to be developed following the WDNR guidance (e.g. using SnapPlus for agricultural loading analysis).
- If the trade evaluation was accepted, the City could use the improved conditions towards the Apple Creek reachshed reduction and, if TMDL goals were met, the excess could be internally traded to the Fox River reach. The City could not consider trading any anticipated excess reductions with outside entities until all regional models were completed for the Apple Creek reachshed that 'verified' that the City had met their TMDL reduction requirements. Currently, the models created for Apple Creek do not result in meeting the TMDL reduction requirements, although from a review of all existing practices, it is anticipate that the City will meet and exceed the required reductions.

1.1.2 Water Quality Trading with the City of Appleton Wastewater Utility

Beyond looking at agricultural areas for generating water quality credits, the City also has the potential to consider a trade between the City of Appleton's Wastewater Utility (wastewater utility) and the City's stormwater management program. Excess credits available in the wastewater utility could be purchased by the stormwater management utility to help close the gap on reachshed TMDL compliance. The cost per pound to purchase the credits must be developed and compared to other potential practices to determine the cost effectiveness of the trade and both entities must be willing to have the trade incorporated into their permits and understand the long-term impacts of the trade.

City of Appleton stormwater staff and BC staff met with Chris Stempa, Deputy Director of Utilities for the City of Appleton, on January 27, 2021 to discuss this water quality option. The goals of the meeting included obtaining an understanding of current wastewater utility operations and WPDES permit requirements, review current treatment/discharge levels of total suspended solids (TSS) and total phosphorus (TP) compared to permit limits, and initiate a discussion on potential water quality trading opportunities available to both parties.

The City's wastewater treatment plant discharges to the Lower Fox River Mainstem Downstream Reach. The Lower Fox TMDL evaluated the point loads from the wastewater plant and a TP load allocation was established in the TMDL for daily loadings to the reach of 20.69 lbs/day (7,556 lbs/yr), which is a 43.7%

reduction from their baseline load. The TMDL also allocated a TSS load of 465 bs/day (169,857 lbs/year) which did not result in a TSS load allocation reduction target being established for the wastewater discharge.

Current Wastewater Plant Operations and Opportunities to Trade Excess Load Capacity

The WPDES permit for the wastewater treatment plant includes discharge limits of 1,322 lbs/day (expressed as a monthly average) and 2,434 lbs/day (expressed as a weekly average) for TSS. The plant is operating under an interim limit of 1.0 mg/L for TP, but the discharge limit will lower to 23 lbs/day (expressed as a six-month average) and 69 lbs/day (expressed on a monthly average) with the issuance of the next permit. These current TSS and pending TP discharge limits are based on the Lower Fox TMDL wasteload allocations for the plant. The current permit for the plant expires on March 31, 2022.

To comply with the lower TP limits in the next permit, the wastewater utility commissioned a plant optimization study to evaluate various technologies available to obtain the target load level for TP. As a result, the wastewater utility has implemented projects over the last few years that have moved them towards compliance with their current WPDES permit TP discharge load target of 23 lbs/6-month average. There is variability depending on seasonality and other factors that impact discharge loads, but a recent range of 14-23 lbs/6-month average has been met. The wastewater utility would like to increase their factor/margin of safety for TP compliance, so are unlikely at this time to be able to entertain a trade of any excess TP.

Total TSS discharge loads have been well below their permit levels and the load allocated to the wastewater utility in the TMDL. Recent discharge loadings for TP and TSS are shown in Table 4-x.

Based on this information and the data presented in Table 4-x, it appears that there may be an opportunity for the stormwater utility to purchase excess TSS capacity/credits available from the wastewater utility. Further clarification from the WDNR on this topic via email noted that a trade ratio of 1.1:1 would be applied, resulting in approximately 124 tons per year of TSS available for trade. The WDNR also noted that both entities would need to have their permits modified to reflect and document that trade. This would mean that the City would need to have their General Stormwater WPDES Permit modified to an Individual Permit.

To develop an estimated value of this trade, the cost for the City for the Leona Street Pond was used as a reference for a recent regional stormwater management facility. The cost to construct the Leona Street Pond was approximately $1,925,882, per City of Appleton Expense Reporting (includes engineering, land acquisition, and construction related costs – but does not include any ongoing maintenance costs) to remove 16.4 tons/year of TSS (approximately $117,432/ton). It is important to note that the Leona Street detention facility was constructed with some features such as a deeper wet detention pool to allow for the potential future addition and application of enhanced phosphorus treatment which increases its cost somewhat over some other stormwater facilities. At 124 tons/year, the excess TSS capacity of the Appleton WWTP is the equivalent of building over 7 (~7.56) Leona Street detention facilities. If $100,000/ton of TSS is used, the present worth value of the 124 tons/year of excess WWTP TSS would be $12,400,000.

Table 4-x. Appleton Wastewater Treatment Plant Annual TSS and TP Loadings and Available Trade Capacity
Stormwater Management Plan Update
City of Appleton, WI

WPDES Permit TMDL Monthly Average TSS load Allowe	1322	lb/day
WPDES Permit TMDL Monthly Average TSS load Allowe	63	lb/day

Year	Avg. Monthly TSS (lbs/day)	Available TSS Based on Avg. Monthly - Permit Allowable (lbs/day)	Annual Available TSS Based on Avg. Monthly - Permit Allowable (lbs/year)	Avg. Monthly TP (lbs/day)	Available TP Based on Avg. Monthly - Permit Allowable (lbs/day)	Annual Available TP Based on Avg. Monthly - Permit Allowable (lbs/year)	Annual Rainfall Total (inches) Note: Average for Appleton is 32 inches)	Notes
2016	231	1,031	376,320	23	40	14,503		
2017	309	1,013	369,741	19	50	18,409	37.75	7th Wettest Year on Record
2018**	427	895	326,533	40	29	10,511	41.73	3rd Wettest Year on Record
2019*	476	846	308,612	21	48	17,365	43.03	Wettest Year on Record
2020	300	1,022	372,923	19	50	18,411		
5-year Averag	361	961	350,826	26	43	15,841		

* Note: February and March 2019 appear to be outliers to the montly data set. Average Monthly TSS w/o February and March is 330 lbs/day.
** Note: 2018 had 3 months that were higher than the 5-year average and the 2018 average is approximatly double that of the preceeding and following year, so this values presented seem conservative.

WPDES Permit TMDL Monthly Average TSS load Allowed (lbs/day)	Highest Average Annual Monthly TSS Load Last 5 Years (2019) (lbs/day)	Add Monthly Margin of Safety (MOS)	Avg. Monthly TSS with MOS (lbs/day)	Annual Available TSS Based on Highest 5-year Monthly w/MOS - Permit Allowable (lbs/day)	Annual Available TSS Based on Highest 5-year Monthly w/MOS - Permit Allowable (lbs/year)	Annual Available TSS Based on Highest 5-year Monthly w/MOS - Permit Allowable (tons/year)	Effective TSS Available for Trade Based on 1.1:1 Trade Ratio (tons/year)
1,322	476	20%	572	750	273,828	137	124.47

* Note: A 20% MOS over 2019 Max. Monthly results in approximatly a 34% MOS over 2018 (next highest year).

WPDES Permit TMDL Monthly Average TP load Allowed (lbs/day)	Highest Average Annual Monthly TP Load Last 5 Years (2019) (lbs/day)	Add Monthly Margin of Safety (MOS)	Avg. Monthly TSS with MOS (lbs/day)	Annual Available TSS Based on Highest 5-year Monthly w/MOS - Permit Allowable (lbs/day)	Annual Available TSS Based on Highest 5-year Monthly w/MOS - Permit Allowable (lbs/year)	Annual Available TSS Based on Highest 5-year Monthly w/MOS - Permit Allowable (tons/year)	Effective TP Available for Trade Based on 1.1:1 Trade Ratio (tons/year)
63	40	20%	48	21	7,577	4	3.44

** Note: 2018 had 3 months that were higher than the 5-year TP average and the 2018 average is approximatly double that of the preceeding and following year.

Ultimately the cost or value of the TSS trade from the wastewater utility would need to be negotiated between the wastewater and stormwater utilities in consultation with the City Finance and Legal staff to understand internal logistics. There would also need to be a clear understanding of the benefits to both the wastewater and stormwater utility rate payers for the trade as they ultimately will bear the cost of a trade. Based on the WDNR indicating that the City's stormwater management program would have to change from the General Permit to an Individual Permit, the City is not currently interested in implementing a trade in the near term.

Other Potential Opportunities for Pollutant Trading

During the meeting, there was also discussion on how the wastewater utility and stormwater utility might consider coordinating together to evaluate and implement a shared trade with a nonpoint (agricultural) source might work. There is interest from the wastewater utility to increase their margin of safety with their TP discharge given the seasonal variability. Additionally, the use of chemical treatment to achieve the TP levels on an ongoing basis is costly and may also provide some potential relief to reduce polymer use and still be able to achieve wastewater plant WPDES permit levels reliably. The balance of the TP reductions realized from a nonpoint source trade could be utilized by the stormwater utility. The wastewater utility does not need additional TSS reductions, so any credits realized in that regard could be available to the stormwater utility.

This alternative to enter into a joint project with the wastewater utility was discussed with the WDNR; however, the WDNR seems to discourage such a joint project because if the project did not achieve the intended objectives, both entities would be found in violation of their respective permit conditions.

1.1.3 Water Quality Trading with City of Appleton TMDL Compliant Reachsheds

The only pollutant trading that the City has considered to date was discussed in the 2014 City of Appleton Citywide Stormwater Management Plan, where excess TSS and TP in TMDL compliant reachsheds were identified as an internal trade opportunity to help close the gap with downstream reachsheds. This continues to be a viable and very cost-effective method to implement a trade since there essentially is no cost because the TSS and TP reductions are already available and in the control of the City. Section 3.3.6 of this report identified reachsheds with excess TSS (See Table 3-7) and TP (See Table 3-8) that can be applied to the Lower Fox Mainstem. The City has confirmed with the WDNR during this study that there is no trade ratio for the City to internally apply credit to a downstream reachshed.

Appendix C: Updated Post-Construction Ordinance

ARTICLE VI. STORMWATER MANAGEMENT STANDARDS AND PLANNING

DIVISON 1. IN GENERAL

Sec. 20-300. Authority.

(a) This ordinance is adopted by the Common Council of the City of Appleton under the authority granted by §62.234, Wis. Stat. This ordinance supersedes all provisions of a stormwater management ordinance previously enacted under §62.23, Wis. Stat., that relates to stormwater management regulations. Except as specifically provided for in §62.234, Wis. Stat., §62.23, Wis. Stat. applies to this ordinance and to any amendments to this ordinance.

(b) The provisions of this ordinance are deemed not to limit any other lawful regulatory powers of the same governing body.

(c) The Common Council of the City of Appleton hereby designates the Director of Public Works or designee to administer and enforce the provisions of this ordinance.

(d) The requirements of this ordinance do not pre-empt more stringent stormwater management requirements that may be imposed by any of the following:

(1) WDNR administrative rules, permits or approvals including those authorized under §281.16 and §283.33, Wis. Stat.

(2) Targeted non-agricultural performance standards promulgated in rules by the WDNR under s. NR 151, Wisconsin Administrative Code.

(Ord 188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

Sec. 20-301. Findings of fact.

The Common Council of the City of Appleton finds that uncontrolled post-construction runoff has a significant impact upon water resources and the health, safety, and general welfare of the City of Appleton and diminishes the public enjoyment and use of natural resources. Specifically, uncontrolled post-construction runoff can:

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

(b) Diminish the capacity of lakes and streams to support fish, aquatic life, recreational and water supply uses by increasing pollutant loading of sediment, suspended solids, nutrients, heavy metals, bacteria, pathogens, and other urban pollutants.

(c) Alter wetland communities by changing wetland hydrology and by increasing pollutant loads.

(d) Reduce the quality of groundwater by increasing pollutant loads.

(e) Threaten public health, safety, property and general welfare by overtaxing storm sewers, drainage ways, and other drainage facilities.

(f) Threaten public health, safety, property and general welfare by increasing major flood peaks and volumes.

(g) Undermine floodplain management efforts by increasing the incidence and levels of flooding.

(Ord 188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

Sec. 20-302. Purpose and intent.

(a) ***Purpose.*** The purpose of this ordinance is to establish long-term, post-construction runoff management requirements that will diminish the threats to public health, safety, welfare, and the aquatic environment.

Specific purposes are to:

(1) Further the maintenance of safe and healthful conditions.

(2) Prevent and control the adverse effects of stormwater; prevent and control soil erosion; prevent and control water pollution; protect spawning grounds, fish and aquatic life; manage building sites, placement of structures and land uses; preserve ground cover and scenic beauty; and promote sound economic growth.

(3) Control exceedances of the safe capacity of existing drainage facilities and receiving water bodies; prevent undue channel erosion; control increases in the scouring and transportation of particulate matter; and prevent conditions that endanger downstream property.

(4) Minimize the amount of pollutants discharged from the separate storm sewer to protect waters of the state.

(5) Meet applicable Federal and State requirements and regulations.

(b) ***Intent.*** It is the general intent of the City of Appleton that this ordinance achieve its purpose through:

(1) Regulating long-term, post-construction stormwater runoff from land development and redevelopment activities.

(2) Controlling the quantity, peak flow rates, and quality of stormwater runoff from land development and redevelopment activities.

(3) Providing services to maintain and enhance the quality of life within the community.

(c) ***Implementation.*** To this end the City of Appleton will manage post-construction stormwater runoff to protect, maintain and enhance the natural environment; diversity of fish and wildlife; human life; property; and recreational use of waterways within the city of Appleton and its extraterritorial area.

This ordinance may be applied on a site-by-site basis. The City of Appleton recognizes, however, that the preferred method of achieving the stormwater performance standards set forth in this ordinance is through the preparation and implementation of comprehensive, systems-level stormwater management plans that cover hydrologic units, such as watersheds, on a municipal and regional scale. Such plans may prescribe regional stormwater devices, practices or systems, any of which may be designed to treat runoff from more than one site prior to discharge to waters of the State of Wisconsin. Where such plans are in conformance with the performance standards developed under §281.16, Wis. Stat., for regional stormwater management measures, and have been approved by the City of Appleton, it is the intent of this ordinance that the approved plan be used to identify post-construction management measures acceptable for the community.

Sec. 20-303. Title.

This ordinance shall be known as the Stormwater Management Standards and Planning Ordinance for the City of Appleton.

Sec. 20-304. Definitions.

The following words, terms and phrases when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Adequate sod, or self sustaining vegetative cover means maintenance of sufficient vegetation types and densities such that the physical integrity of the streambank or lakeshore is preserved. Self-sustaining vegetative cover includes grasses, forbes, sedges and duff layers of fallen leaves and woody debris.

Administering authority means a governmental employee that is designated by the City of Appleton to administer this ordinance.

Agricultural facilities and practices has the meaning given in §281.16(1), Wis. Stats.

Agricultural use means bee keeping; commercial feed-lots; dairying; egg production; floriculture; fish or fur farming; forest and game management; grazing; livestock raising; orchards; plant greenhouses and nurseries; poultry raising; raising of grain, grass, mint, and seed crops; raising of fruits, nuts, and berries; sod farming; placing land in federal programs in return for payments in kind; owning land, at least thirty-five (35) acres of which is enrolled in the conservation reserve program under 16 USC 3831 to 3836; participation in the mile production termination program under 7 USC 1446 (d); and vegetable raising (§91.01(1), Wis. Stat.).

Atlas 14 means the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 8 (Midwestern States), published in 2013.

Average annual rainfall means a typical calendar year of precipitation as determined by the Wisconsin Department of Natural Resources for users of models such as WinSLAMM or other methodology approved by the City. An average annual rainfall for Green Bay, 1969 (March 29-November 25) is applicable for the City of Appleton.

Business day means a day that offices of the City of Appleton are routinely and customarily open for business.

Cease and desist order means a court issued order to halt land disturbing construction activity that is being conducted without the required permit or not in conformance with an existing permit.

City means the City of Appleton.

Common plan of development or sale means a development or sale where multiple separate and distinct land disturbing construction activities may be taking place at different times on different schedules but under one plan. A common plan of development or sale includes, but is not limited to, subdivision plans, certified survey maps, and other developments.

Concentrated flow channel means a channel produced by erosion from runoff, or by construction, that would not be removed by tillage operations typically needed to prepare a field for crop production.

Connected imperviousness means an impervious surface connected to the water of the state via a separate storm sewer, an impervious flow path, or a minimally pervious flow path.

Construction site means an area upon which one or more land disturbing construction activities occur, including areas that are part of a larger common plan of development or sale where multiple separate and distinct land disturbing construction activities may be taking place at different times on different schedules but under one plan.

Design storm means a hypothetical discrete rainstorm characterized by a specific duration, temporal distribution, rainfall intensity, return frequency and total depth of rainfall. Rainfall amounts for 24-hour design rainfall events in Appleton are: 100-year, 5.50 inches; 10-year, 3.51 inches; 5-year, 3.01 inches; 2-year, 2.45 inches, and 1-year, 2.14 inches. The distribution shall be NOAA Atlas 14 MSE4.

Development means residential, commercial, industrial or institutional land uses and associated roads.

Direct conduits to groundwater means wells, sinkholes, swallets, fractured bedrock at the surface, sand or gravel surficial deposits, mine shafts, non-metallic mines, tile inlets discharging to groundwater, quarries, or depressional groundwater recharge areas over shallow fractured bedrock.

Division of land means the creation from one or more parcels or building sites of additional parcels or building sites where such creation occurs at one time or through the successive partition within a 5-year period.

Effective infiltration area means the area of the infiltration system devoted specifically to active infiltration, excluding areas required for site access, berms, pretreatment, or other area required for the installation, operation, or maintenance of the infiltration device.

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

Exceptional resource waters means waters listed in s. NR 102.11, Wisconsin Administrative Code.

Existing land use condition means the condition of the development site and the adjacent properties that are present at the time of the stormwater permit application.

Extraterritorial means the unincorporated area as defined in Ch. 236, Wis. Stat.

Fee in lieu means a payment of money to the City of Appleton in place of meeting all or part of the stormwater performance standards required by this ordinance.

Filtering layer means soil that has at least a 3-foot deep layer with at least twenty percent (20%) fines; or at least a five- (5-) foot deep layer with at least ten percent (10%) fines; or an engineered soil with an equivalent level of protection as determined by the regulatory authority for the site.

Final stabilization means that all land disturbing construction activities at the construction site have been completed and that a uniform perennial vegetative cover has been established with a density of at least seventy percent (70%) of the cover for the unpaved areas and areas not covered by permanent structures or that employ equivalent permanent stabilization measures.

Financial guarantee means a performance bond, maintenance bond, surety bond, irrevocable letter of credit, or similar guarantees submitted to the City of Appleton by the responsible party to assure that requirements of the ordinance are carried out in compliance with the stormwater management plan.

Governing body means the Common Council of the City of Appleton.

Impervious surface means an area that releases as runoff all or a large portion of the precipitation that falls on it, except for frozen soil. Rooftops, sidewalks, driveways, bike trails, multi-use trails, parking lots, and streets are examples of surfaces that typically are impervious. Gravel surfaces are considered impervious unless specifically designed for infiltration.

In-fill means an undeveloped area of land located within an existing urban sewer service area, surrounded by development or development and natural or man-made features where development cannot occur.

Infiltration means the entry of precipitation or runoff into or through the soil.

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

Land disturbing construction activity means any man-made alteration of the land surface resulting in a change in the topography or existing vegetative or non-vegetative soil cover, that may result in stormwater runoff and lead to increased soil erosion and movement of sediment into waters of the state. Land disturbing construction activity includes clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities, parking lot reconstruction, but does not include parking lot resurfacing.

Land user means any person operating, leasing, renting, or having made other arrangements with the landowner by which the landowner authorizes use of his or her land.

Landowner means any person holding fee title, an easement or other interest in property, which allows the person to undertake cropping, livestock management, land disturbing construction activity or maintenance of stormwater SMPs on the property.

Major Stormwater Management Plan means a Stormwater Management Plan for a subdivision or a plan that proposes the use of one or more devices to meet standards or a non-one or two family site that is not considered a Minor Stormwater Management Plan.

Maintenance agreement means a legal document that is filed with the County Register of Deeds as a property deed restriction, and that provides for long-term maintenance of stormwater management practices.

Maximum extent practicable (MEP) has the meaning given it in s. NR 151.002(25), Wis. Adm. Code.

Minor Stormwater Management Plan means a Stormwater Management Plan for a site that has a regional stormwater facility in place that meets applicable standards, has a 100-year event conveyance system to the regional facility in place, and is free from unusual conditions, including but not limited to, contamination, critical site designation, change in land use, high impervious ratio, or floodplain.

~~***Natural wetlands*** means an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and that has soils indicative of wet conditions. These wetlands include existing, mitigated, and restored wetlands.~~

New development means development resulting from the conversion of previously undeveloped land or agricultural land uses.

Non-structural measure means a practice, technique, or measure to reduce the volume, peak flow rate, or pollutants, in stormwater that does not require the design or installation of fixed stormwater management facilities.

NRCS means the Natural Resources Conservation Service of the U.S. Department of Agriculture (USDA) formerly known as the SCS (Soil Conservation Service of the USDA).

NRCS MSE4 distribution means a specific precipitation distribution developed by the United States Department of Agriculture, Natural Resources Conservation Service, using precipitation data from Atlas 14.

Off-site means lands located outside the subject property boundary described in the permit application.

On-site means lands located within the subject property boundary described in the permit application.

Ordinary high-water mark has the meaning in s. NR 115.03(6), Wisconsin Administrative Code.

Outstanding resource waters means waters listed in s. NR 102.10, Wisconsin Administrative Code.

Parking lot reconstruction means removing asphalt to the base course by milling or other construction methods.

Parking lot resurfacing means removing a portion of an asphalt surface but leaving at least one inch (1") thickness of asphalt surface in place.

Peak flow or peak flow discharge rate means the maximum rate that a unit volume of stormwater is discharged. This is usually expressed in terms of cubic feet per second (cfs).

Percent fines means the percentage of a given sample of soil, that passes through a Number 200 sieve, in accordance with the "American Society for Testing and Materials", current standard.

Performance security means cash or an irrevocable letter of credit submitted to the City of Appleton by the permit holder to assure that requirements of the ordinance are carried out in compliance with the stormwater management plan and to recover any costs incurred by the City for design, engineering, preparation, checking and review of plans

and specifications, regulations and ordinances; and legal, administrative and fiscal work undertaken to assure and implement such compliance.

Performance standard means a narrative or measurable number specifying the minimum acceptable outcome for a facility or practice.

Permit means a written authorization made by the City of Appleton to the applicant to conduct land disturbing construction activity or to discharge post-construction runoff to waters of the state.

Permit application fee means a sum of money paid to the City of Appleton by the permit applicant for the purpose of recouping expenses incurred by the City in administering the permit.

Pervious surface means an area that releases as runoff a small portion of the precipitation that falls on it. Lawns, gardens, parks, forests, or other similar vegetated areas are examples of surfaces that typically are pervious.

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 as described in §283.01(13), Wis. Stat.

Pollution has the meaning in §281.01(10), Wis. Stat.

Post-construction site means a construction site following the completion of land disturbing construction activity and final site stabilization.

Post-development land use condition means the extent and distribution of land cover types, anticipated to occur under conditions of full development or redevelopment that will influence runoff and infiltration.

Pre-development condition means the extent and distribution of land cover types present before the initiation of land disturbing construction activity, assuming that all land uses prior to development activity are managed in an environmentally sound manner.

Pre-treatment is the practice of reducing pollutants in stormwater before discharging the stormwater to another pollution control structure.

Preventive action limit has the meaning in s. NR 140.05(17), Wisconsin Administrative Code.

Protective area means an area of land that commences at the top of the channel of lakes, streams and rivers, or at the delineated boundary of wetlands, and that it is the greatest of the widths as listed in Sec. 20-312(g) of this code, as measured horizontally from the top of the channel or delineated wetland boundary to the closest impervious surface.

Redevelopment means areas where development is replacing older development.

Residential land development means development that is created to house people, including the residential dwellings as well as all affected portions of the development including lawns, driveways, sidewalks, garages, and access streets. This type of development includes single-family, multi-family, apartment and trailer parks.

Responsible party means any person holding fee title to the property or other entity contracted or obligated by other agreement to implement and maintain post-construction stormwater SMPs, or other requirements of this ordinance.

Runoff means stormwater or precipitation including rain, snow, or ice melt or similar water that moves on the land surface via sheet or channelized flow.

Runoff Curve Number or RCNs means an index that represents the combination of: a hydrologic soil group, land use, land cover, impervious area, interception storage, surface storage, and antecedent moisture conditions. RCNs

convert mass rainfall into mass runoff. The Natural Resources Conservation Service of the USDA defines RCNs in TR-55.

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

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

(a) Is designed or used for collecting water or conveying runoff.

(b) Is not part of a combined sewer system.

(c) Is not part of a publicly owned wastewater treatment works that provides secondary or more stringent treatment.

(d) Discharges directly or indirectly to waters of the state.

Silviculture activity means activities including tree nursery operations, tree harvesting operations, reforestation, tree thinning, prescribed burning, and pest and fire control. Clearing and grubbing of an area of a construction site is not a silviculture activity.

Site means the entire area included in the legal description of the land on which the land disturbing construction activity is proposed in the permit application or has occurred.

Stop work order means an order issued by the City of Appleton that requires all construction activity on the site be stopped.

Stormwater conveyance system means any method employed to carry stormwater runoff within and from a land development or redevelopment activity to the waters of the state. Examples of methods include: swales, channels, and storm sewers.

Stormwater management measure means structural or non-structural practices that are designed to reduce stormwater runoff pollutant loads, discharge volumes and/or peak flow discharge rates.

Stormwater management plan means a comprehensive plan provided by the land developer, land owner or permit holder that identifies the measure to be taken to reduce the discharge of pollutants from stormwater, and control the peak flow and volume of runoff after the site has undergone final stabilization, following completion of construction activity.

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

Stormwater management system plan is a comprehensive plan, including SMPs, designed to reduce the discharge of runoff and pollutants from hydrologic units on a regional or municipal scale.

Targeted performance standard means a performance standard that applies in a specific area that requires additional practices to meet water quality standards.

Technical standard means a document that specifies design, predicted performance, and operation and maintenance specifications for a material, device, or method.

Top of the channel means an edge or point on the landscape landward from the ordinary high water mark of a surface water of the state, where the slope of the land begins to be less than twelve percent (12%) continually for at least fifty (50) feet. If the slope of the land is 12 percent (12%) or less continually for the initial fifty (50) feet landward

from the ordinary high water mark, the top of the channel is the ordinary high water mark.

Total maximum daily load or TMDL means the amount of pollutants specified as a function of one or more water quality parameters, that can be discharged per day into a water quality limited segment and still ensure attainment of the applicable water quality standard.

TP means total phosphorus.

TP-40 means Technical Paper No. 40, Rainfall Frequency Atlas of the United States, published in 1961.

TR-55 means the United States Department of Agriculture, Natural Resources Conservation Services (previously Soil Conservation Service), Urban Hydrology for Small Watersheds, Second Edition, Technical Release 55, June 1986, which is incorporated by reference for this chapter.

Transportation facility means a highway, a railroad, a public mass transit facility, a public-use airport, a public trail, and also includes any other public work for transportation purposes such as harbor improvements under §85.095(1)(b), Wis. Stat. "Transportation Facility" does not include building sites for the construction of public buildings and buildings that are places of employment that are regulated by the Department pursuant to §281.33, Wis. Stat.

TSS means total suspended solids.

Type II distribution means a rainfall type curve as established in the "United States Department of Agriculture, Soil Conservation Service, Technical Paper 149, published 1973".

Waters of the state has the meaning in §283.01(20), Wis. Stat.

WDNR means the Wisconsin Department of Natural Resources.

WPDES permit means a Wisconsin Pollutant Discharge Elimination System permit issued pursuant to Ch. 283, Wis. Stat.

Wetland functional value means the type, quality, and significance of the ecological and cultural benefits provided by wetland resources, such as: flood storage, water quality protection, groundwater recharge and discharge, shoreline protection, fish and wildlife habitat, floral diversity, aesthetics, recreation and education.

~~***Natural w***~***Wetlands*** means an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and that has soils indicative of wet conditions. ~~These wetlands include existing, mitigated, and restored wetlands.~~

(Ord 188-03, §1, 10-21-03; Ord 66-10, §1, 4-13-10; Ord 156-11, §1, 1-1-12; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

Secs. 20-305 – 20-310. Reserved.

DIVISION 2. STORMWATER MANAGEMENT

Sec. 20-311. Applicability and jurisdiction.

(a) ***Applicability.*** This ordinance applies to all post-construction land development, redevelopment, and in-fill~~ing~~ sites with one (1) acre or more of land disturbing construction activities, except:

(1) A post-construction site with less than ten percent (10%) connected imperviousness of the total area based on area of land disturbance, provided the cumulative area of all parking lots, roads, and rooftops

is less than one (1) acre. However, the exemption of this paragraph does not include exemption from the protective area standards of this ordinance.

(2) Agricultural facilities and practices.

(3) Nonpoint discharges from silviculture activities.

(4) Underground utility construction such as water, sewer, and fiberoptic lines. This exemption does not apply to the construction of any above ground structures associated with utility construction.

Notwithstanding these applicability requirements, this ordinance applies to any post-construction site of any size that, in the opinion of the City of Appleton, is likely to result in runoff that exceeds the safe capacity of the existing drainage facilities or receiving body of water, that causes undue channel erosion, that increases water pollution by scouring or the transportation of particulate matter or other pollutants, or that endangers property or public safety.

(b) ***Jurisdiction.*** This ordinance applies to post-construction land development and redevelopment sites within the boundaries of the City of Appleton and to all lands located within three (3) miles of the corporate limits pursuant to the City's extraterritorial plat approval jurisdiction as set forth in §236.45(2), Wis. Stat., even if plat approval is not involved.

(c) ***County and town ordinances.*** This ordinance supersedes any county or town stormwater management ordinance for lands annexed to the City after the effective date of the county or town ordinance, except when the county or town ordinance is more restrictive than this ordinance; then the more restrictive provisions set forth in the county or town ordinance shall become part of this ordinance and apply to the annexed lands. In such cases, the City may grant a variance from the more restrictive requirements, provided that the criteria for a variance as set forth in the county or town ordinance is met.

(d) ***State agency.*** This ordinance is not applicable to activities conducted by a state agency, as defined under §227.01(1), Wis. Stat., and the office of the district attorney, which is subject to the state plan promulgated or a memorandum of understanding entered into under §281.33(2), Wis. Stat.

(e) ***Waivers.*** Requests to waive the stormwater management plan requirements shall be submitted to the City of Appleton for approval. Written waivers may be granted administratively by the City for stormwater requirements that are required only by the City if it is demonstrated to the satisfaction of the City that it is reasonable to expect that the objectives of this ordinance will be met by the proposed post-construction land development and redevelopment activity without a stormwater management plan or portion thereof.

(f) ***Applicability of maximum extent practicable.*** Maximum extent practicable applies when a person who is subject to a performance standard of this ordinance demonstrates to the City's satisfaction that a performance standard is not achievable and that a lower level of performance is appropriate. In making the assertion that a performance standard is not achievable and that a level of performance different from the performance standard is the maximum extent practicable, the responsible party shall take into account the best available technology, cost effectiveness, geographic features, and other competing interests such as protection of public safety and welfare, protection of endangered and threatened resources, and preservation of historic properties.
(Ord 188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

Sec. 20-312. Performance standards.

Unless otherwise provided for in this ordinance, all post-construction land development, redevelopment, and in-filling activities subject to this ordinance shall establish on-site management practices to control the peak flow rates of stormwater discharged from the site, the quality of the discharged stormwater, and the volume of the discharged stormwater as described in this ordinance. Technical standards identified, developed, or disseminated by the WDNR under subchapter V of Chapter NR 151, Wisconsin Administrative Code, shall be used. Where technical standards have not been identified or developed by the WDNR, other technical standards may be used provided that the methods have been approved by the City of Appleton. The responsible party shall implement a post-construction stormwater management plan that incorporates the requirements of this section.

Exceptions to these standards are listed in Sec. 20-312(l) of this ordinance.

(a) ***Maintenance of effort.*** For redevelopment sites where the redevelopment will be replacing older development that was subject to post-construction performance standards of NR 151 in effect on or after October 1, 2004, the responsible party shall meet the total suspended solids reduction, total phosphorus reduction, peak flow control, infiltration, and protective areas standards applicable to the older development or meet the redevelopment standards of this ordinance, whichever is more stringent.

For non-highway transportation facility redevelopment sites and highway reconstruction where the redevelopment or reconstruction will be replacing older development or highway that was subject to post-construction performance standards of this chapter in effect on or after October 1, 2004, the responsible party shall meet the total suspended solids reduction, total phosphorus reduction, peak flow control, infiltration, and protective areas standards applicable to the older development or highway, or meet the redevelopment or highway reconstruction standards of (d) – (m) of this section, whichever are more stringent.

(b) ***Off-site drainage.*** When designing stormwater management practices for (d), (e), and (f) of this section, runoff draining to the stormwater management practices from off-site shall be taken into account in determining the treatment efficiency of the practice. Any impact on the efficiency shall be compensated for by increasing the size of the SMP accordingly.

(c) ***Separation distances.*** Stormwater management practices shall be adequately separated from wells to prevent contamination of drinking water, and the following minimum separation distances shall be met:

(1) Stormwater infiltration systems and ponds shall be located at least 400 feet from a well serving a community water system unless the Wisconsin Department of Natural Resources concurs that a lesser separation distance would provide adequate protection of a well from contamination.

(2) Stormwater management practices shall be located with a minimum separation distance from any well serving a non-community or private water system as follows:

i. 25 feet to the edge of a stormwater detention pond or basin.

ii. 100 feet for a stormwater infiltration basin or system.

iii. 8 feet to a stormwater culvert or edge of a ditch that is not a river or stream.

(Ord 72-20, §1, 5-1-20)

(d) ***Peak discharge***

(1) The proposed post-construction land use shall not increase peak flow rates of stormwater runoff from that which would have resulted from the same design storm occurring over the site with the land in its pre-development condition. Unless the site is currently woodland, pre-development peak flow rates shall be based on the grassland condition, as defined in Table 1. If the existing site contains a combination of woodland and grassland, a runoff curve number shall be weighted based on land cover using the curve numbers in Table 1. Peak flow rates shall be determined for storms of twenty-four (24) hour duration and recurrence intervals of one (1), two (2), five (5), ten (10), and one hundred (100) years. For proposed conditions, appropriate curve numbers, as described in TR-55 and weighted based on the proposed land cover, shall be used in TR-55 calculations. The composite RCNs as defined in TR-55 should not be used.~~, woodland condition, as defined in Table 1 of this ordinance for storms of twenty-four (24) hour duration and recurrence intervals of one (1), two (2), five (5), ten (10), and one hundred (100) years. Appropriate curve numbers, as described in TR-55 and weighted based on the proposed land cover, shall be used in TR-55 calculations. The composite RCNs as defined in TR-55 should not be used.~~

Table 1
Maximum Pre-Development Runoff Curve Numbers

Runoff Curve Number	Hydrologic Soil Group			
	A	B	C	D
Woodland	30	55	70	77
Grassland	39	61	71	78
~~Cropland~~	~~55~~	~~69~~	~~78~~	~~83~~

~~Where the pre-development condition is a combination of the Table 1 land uses, the runoff curve number shall be weighted based on area of land cover.~~

(2) All stormwater conveyance systems within the post-construction site shall be designed to completely contain the peak storm flows as described herein. Calculations for determining peak flows for conveyance system sizing shall use RCNs based on the existing or future proposed land use for off-site areas (whichever results in the highest peak flows), and the proposed land use for on-site areas.

a. For open channel conveyance systems the peak flow from the 100-year, 24-hour storm shall be completely contained within the channel bottom and banks.

b. For storm sewer conveyance systems the peak flow from the 5-year storm shall be completely contained within the storm sewers with no surcharging. The peak flow for the 10-year storm shall not surcharge above the permanent pavement surface at the gutter.

c. For storms greater than the five- (5-) year event, and up to the 100-year, 24-hour event, conveyance of flow to the appropriate waters of the state shall be within existing or proposed street right-of-ways or recorded drainage easements. In no case shall the depth of water exceed twelve (12) inches at the outer edge of pavement or six (6) inches at the road crown, whichever is less.

d. The 100-year storm runoff flow path outside of the storm sewer conveyance system must not impact structural improvements on property.

e. Existing flow onto the site cannot be restricted or modified to impact adjacent properties without a written agreement between property owners.

(3) Determination of peak flow rates and volume of runoff for purposes of meeting the requirements of Sec. 20-312(d)(1) of this ordinance shall be computed by procedures based on the principals and procedures described in TR-55. Other proposed calculation methods must have prior written approval of the City of Appleton.

(4) The rainfall distributions for the storm events shall be NOAA Atlas 14 MSE4, unless otherwise approved by the City of Appleton. On a case-by-case basis, the City of Appleton may allow the use of TP-40 precipitation depths and the Type II distribution.

~~(5) Existing wetlands shall not be incorporated in the proposed stormwater management practice for peak flow control. Peak flow shall be managed prior to discharge to an existing wetland. Should any changes to natural wetlands be proposed, the impact of the proposal on wetland functional values shall be assessed and significant changes to wetland functional values shall be avoided (as defined by s. NR 103, Wisconsin Administrative Code).~~

(~~6~~5) Peak stormwater discharge reductions do not apply for a site meeting any one of these requirements:

a. Redevelopment post-construction sites less than five (5) acres in size.

b. In-fill development areas less than five (5) acres in size.

c. Sites that directly discharge to the Fox River without flowing over or through a municipally owned separate storm sewer or stormwater conveyance system.

d. A transportation facility that is part of a redevelopment project.

e. A highway reconstruction site.

(Ord 72-20, §1, 5-1-20)

(e) ***Stormwater discharge quality.*** Unless otherwise provided for in this ordinance, all post-construction land development, ~~and~~ redevelopment and infill activities subject to this ordinance shall establish on-site management practices to control the quality of stormwater discharged from the post-construction site. The design shall be based on the average rainfall, as compared to no runoff management controls. Total Suspended Solids (TSS) and Total Phosphorus (TP) load reduction is required in accordance with Table 2. ~~On-site management practices shall be used to meet the following minimum standards:~~

Table 2.
Total Suspended Solids (TSS) and Total Phosphorus (TP) Loan Reduction Requirements

Watershed	New Development, Redevelopment 5 acres or larger and Infill		Redevelopment less than 5 acres and Transportation Facility Redevelopment	
	TSS	TP	TSS	TP
Apple Creek	80.0%	40.5%	52.0%	40.5%
Duck Creek	80.0%	40.5%	52.0%	40.5%
Mud Creek	80.0%	48.2%	42.8%	48.2%
Garners Creek	80.0%	68.6%	59.9%	68.6%
Fox River	80.0%	40.5%	72.2%	40.5%
Bear Creek	84.0%	85.6%	84.0%	85.6%
Lake Winnebago	80.0%	85.6%	40.0%	85.6%

(1) All new development, redevelopment, and infill sites shall calculate TSS and TP loads without and with the proposed on-site stormwater management measures using an appropriate computer model. Both the loads and the amounts of removal shall be reported in the plan narrative and included in the computer model submitted for the project.

(2) Effectiveness of the stormwater management measures shall be evaluated using the latest version of the Source Loading and Management Model for Windows (WinSLAMM). Other models may be used with prior written approval of the City.

~~(1) *Total suspended solids (TSS).* SMPs shall be designed, installed and maintained to control total suspended solids carried in runoff from the post-construction site as follows:~~

~~a. For new development and new transportation facilities, by design, reduce to the maximum extent practicable, the total suspended solids load by eighty percent (80%), based on the average annual rainfall, as compared to no runoff management controls.~~

~~b. For redevelopment less than five (5) acres of disturbed land and highway reconstruction, by design, reduce to the maximum extent practicable, the total suspended solids load by forty percent (40%), based upon the average annual rainfall, as compared to no runoff management controls.~~

~~c. For redevelopment five (5) acres or greater of disturbed land, reduce to the maximum extent practicable, the total suspended solids load by eighty percent (80%), based on the average annual rainfall, as compared to no runoff management controls.~~

~~d. For in-fill development by design, reduce to the maximum extent practicable, the total suspended solids load by eighty percent (80%), based on the average annual rainfall, as compared to no runoff management controls.~~

~~e. For non-highway transportation facility redevelopment, by design, reduce to the maximum extent practicable, the total suspended solids load by 40% based on average annual rainfall as compared to no runoff management controls.~~

~~(2) *Total phosphorus (TP).* All new development, redevelopment, and infill sites shall calculate the total phosphorus load and the amount of phosphorus removed with the proposed on-site practices with an appropriate computer model. Both the load and the amount of removal shall be reported in the plan narrative and included in the computer model submitted for the project.~~

~~(3) Effectiveness of the stormwater management measures shall be evaluated using the latest version of the Source Loading and Management Model (WinSLAMM). Other models may be used with prior written approval of the City.~~

(Ord 66-10, §1, 4-13-10; Ord 72-20, §1, 5-1-20)

(f) ***Infiltration.*** Unless otherwise provided for in this ordinance, all post-construction land development and redevelopment sites subject to this ordinance shall design, install, and maintain on-site stormwater management practices to infiltrate runoff in accordance with the following, to the maximum extent practicable.

(1) *Low imperviousness*. For development up to 40 percent (40%) connected imperviousness, such as parks, cemeteries, and low density residential development, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 90 percent (90%) of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than one percent (1%) of the post-construction site is required as an effective infiltration area.

(2) *Moderate imperviousness*. For development with more than forty percent (40%) and up to eighty percent (80%) connected imperviousness, such as medium and high density residential, multi-family development, industrial and institutional development, and office parks, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least seventy-five percent (75%) of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than two percent (2%) of the post-construction site is required as an effective infiltration area.

(3) *High imperviousness*. For development with more than eighty percent (80%) connected imperviousness, such as commercial strip malls, shopping centers, and commercial downtowns, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least sixty percent (60%) of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than two percent (2%) of the post-construction site is required as an effective infiltration area.

(4) *Pre-development*. The pre-development condition shall be as specified in Table ~~1~~3.

Table 3

Runoff Curve Number	Hydrologic Soil Group			
	A	B	C	D
Woodland	30	55	70	77
Grassland	39	61	71	78
Cropland	55	69	78	83

(5) A model that calculates runoff volume, such as WinSLAMM or other methodology approved by the City shall be used. Other models may be used with prior written approval of the City.

(6) Before infiltrating runoff, pretreatment shall be required for parking lot runoff and for runoff from new road construction in commercial, industrial, and institutional areas that will enter an infiltration system. The pretreatment shall be designed to protect the infiltration system from clogging prior to scheduled maintenance in accordance with Sec. 20-314 of this ordinance.

Pretreatment may include, but is not limited to, oil/grease separation, sedimentation, biofiltration, filtration, treatment swales or filter strips. It is desirable to infiltrate the cleanest runoff to meet the infiltration standard. To achieve this, the design may propose greater infiltration of runoff from some sources such as roofs, and lesser from dirtier sources such as parking lots.

(7) For the purpose of this section, turf grass swales are not counted towards the one percent (1%) or two percent (2%) infiltration areas described in subsections (1) and (2).

(8) *Source areas.*

a. *Prohibitions*. Runoff from the following areas may not be infiltrated and may not qualify as contributing to meeting the requirements of this section unless demonstrated to meet the conditions identified in Sec. 20-312(f)(11):

i. Areas associated with a tier 1 industrial facility identified in s. NR 216.21(2)(a), Wisconsin Administrative Code, including storage, loading and parking. Rooftops may be infiltrated with the concurrence of the regulatory authority.

ii. Storage and loading areas of a tier 2 industrial facility identified in s. NR216.21(2)(b), Wisconsin Administrative Code.

NOTE TO USERS: Runoff from the employee and guest parking and rooftop areas of a tier 2 facility may be infiltrated but runoff from the parking area may require pretreatment.

iii. Fueling and vehicle maintenance areas. Runoff from rooftops and fueling and vehicle maintenance areas may be infiltrated with the concurrence of the regulatory authority.

b. *Exemptions*. Runoff from the following areas may be credited toward meeting the requirement when infiltrated, but the decision to infiltrate runoff from these source areas is optional:

i. Parking areas and access roads less than 5,000 square feet for commercial development.

ii. Parking areas and access roads less than 5,000 square feet for industrial development not subject to the prohibitions under par a.

iii. Redevelopment post-construction sites, except as provided under Sec. 20-312(a), Maintenance of effort.

iv. In-fill development areas less than five (5) acres.

v. Roads on commercial, industrial and institutional land uses, and arterial residential roads.

vi. Transportation facility highway reconstruction and new highways.

(9) *Location of practices.*

a. *Groundwater limitations.* When permanent infiltration systems are used, appropriate on-site testing shall be conducted to determine if seasonal high groundwater elevation or top of bedrock is within five (5) feet of the bottom of the proposed infiltration system.

b. *Prohibitions*. Infiltration practices may not be located in the following areas:

i. Areas within 1,000 feet upgradient or within 100 feet downgradient of direct conduits to groundwater.

ii. Areas within 400 feet of a community water system well as specified in s. NR 811.16(4), Wisconsin Administrative Code or within the separation distances listed in s. NR 812.08, Wisconsin Administrative Code for any private well or non-community well for runoff infiltrated from commercial, including multi-family residential, industrial and institutional land uses, or regional devices for one- and two-family residential development.

iii. Areas where contaminants of concern, as defined in s. NR 720.03 (2), Wisconsin Administrative Code, are present in the soil through which infiltration will occur.

c. *Separation distances*.

i. Infiltration practices shall be located so that the characteristics of the soil and the separation distance between the bottom of the infiltration system and the elevation of seasonal high groundwater or the top of bedrock are in accordance with Table ~~2~~4.

Table ~~2~~4
Separation Distances and Soil Characteristics

Source Area	Separation Distance	Soil Characteristics
Industrial, Commercial, Institutional Parking Lots and Roads	5 feet or more	Filtering layer
Residential Arterial Roads	5 feet or more	Filtering layer
Roofs Draining to Subsurface Infiltration Practices	1 foot or more	Native or Engineered soil with particles finer than coarse sand
Roofs Draining to Surface Infiltration Practices	Not applicable	Not applicable
All Other Impervious Source Areas	3 feet or more	Filtering Layer

ii. Notwithstanding par. b., applicable requirements for injection wells classified under ch. NR 815, Wisconsin Administrative Code shall be followed.

d. *Infiltration rate exemptions*. Infiltration practices located in the following areas may be credited toward meeting the requirements under the following conditions, but the decision to infiltrate under these conditions is at the Developer's option:

i. Where the infiltration rate of the soil measured at the proposed bottom of the infiltration system is less than 0.6 inches per hour using a scientifically credible field test method.

ii. Where the least permeable soil horizon to five (5) feet below the proposed bottom of the

infiltration system using the U.S. Department of Agriculture method of soils analysis is one of the following: sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay.

(10) *Alternate use*. Where alternate uses of runoff are employed, such as for toilet flushing, laundry, or irrigation or storage on green roofs where an equivalent portion of the runoff is captured permanently by rooftop vegetation, such alternate use shall be given equal credit toward the infiltration volume required by this section.

(11) *Groundwater standards.*

a. Infiltration systems designed in accordance with this section shall, to the extent technically and economically feasible, minimize the level of pollutants infiltrating to groundwater and shall maintain compliance with the preventive action limit at a point of standards application in accordance with s. NR 140, Wisconsin Administrative Code. However, if site-specific information indicates that compliance with a preventive action limit is not achievable, the infiltration SMP shall not be installed or shall be modified to prevent infiltration to the maximum extent practicable.

b. Notwithstanding paragraph (a), the discharge from SMPs shall remain below the enforcement standard at the point of standards application.

(Ord 72-20, §1, 5-1-20)

(g) ***Protective areas.*** Protective area means an area of land that commences at the top of the channel of lakes, streams and rivers, or at the delineated boundary of wetlands, and that is the greatest of the widths described below, as measured horizontally from the top of the channel or delineated wetland boundary to the closest impervious surface. However, in this section, protective area does not include any area of land adjacent to any stream enclosed within a pipe or culvert, such that runoff cannot enter the enclosure at this location.

(1) Protective areas are:

a. For outstanding resource waters and exceptional resource waters, seventy-five (75) feet.

b. For perennial and intermittent streams identified on a United States geological survey 7.5-minute series topographic map, or a county soil survey map, whichever is more current, fifty (50) feet.

c. For lakes, 50 feet.

d. For wetlands not subject to par. e. or f., 50 feet.

e. For highly susceptible wetlands, 75 feet. Highly susceptible wetlands include the following types: calcareous fens, sedge meadows, open and coniferous bogs, low prairies, coniferous swamps, lowland hardwood swamps, and ephemeral ponds.

f. For less susceptible wetlands, ten percent (10%) of the average wetland width, but no less than ten (10) feet nor more than thirty (30) feet. Less susceptible wetlands include: degraded wetland dominated by invasive species such as reed canary grass; cultivated hydric soils, and any gravel pits, or dredged material or fill material disposal sites that take on the attributes of a wetland.

g. In pars. d. to f., determinations of the extent of the protective area adjacent to wetlands shall be made on the basis of the sensitivity and runoff susceptibility of the wetland in accordance with the standards and criteria in s. NR 103.03, Wisconsin Administrative Code.

h. Wetland boundary delineation shall be made in accordance with s. NR 103.08(1m), Wisconsin Administrative Code. This paragraph does not apply to wetlands that have been completely filled in compliance with all applicable state and federal regulations. The protective area for wetlands that have been partially filled in compliance with all applicable state and federal regulations shall be measured from the wetland boundary delineation after fill has been placed. Where there is a legally

authorized wetland fill, the protective area standard need not be met in that location.

i. For concentrated flow channels with drainage areas greater than 130 acres, 10 feet.

j. Notwithstanding pars. a. to i., the greatest protective area width shall apply where rivers, streams, lakes, and wetlands are contiguous.

(2) This section applies to post-construction sites located within a protective area, except those areas exempted pursuant to sub. 5.

(3) The following requirements shall be met:

a. Impervious surfaces shall be kept out of the protective area entirely or to the maximum extent practicable. The stormwater management plan shall contain a written site-specific explanation for any parts of the protective area that are disturbed during construction.

b. Where land disturbing construction activity occurs within a protective area, and where no impervious surface is present, adequate sod or self-sustaining native vegetative cover of seventy percent (70%) or greater shall be established and maintained. The self-sustaining vegetative cover shall be sufficient to provide for bank stability, maintenance of fish habitat and filtering of pollutants from upslope overland flow areas under sheet flow conditions. Non-vegetative materials, such as rock riprap, may be employed on the bank as necessary to prevent erosion, such as on steep slopes or where high velocity flows occur.

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

(4) A protective area established or created after the adoption date of this ordinance shall not be eliminated or reduced, except as allowed in subd. (5)b., c., or d below.

(5) Protective areas do not apply to:

a. Redevelopment post-construction sites, including non-highway transportation redevelopment sites, provided the minimum requirements within subd. (4) above are satisfied.

b. Structures that cross or access surface waters such as boat landings, bridges and culverts.

c. Structures constructed in accordance with §59.692(1v), Wis. Stat.

d. Post-construction sites, including transportation facilities, from which runoff does not enter the surface water, including wetlands, without first being treated by a SMP, except to the extent that vegetative ground cover is necessary to maintain bank stability.

e. Infill development less than five (5) acres.

(Ord 66-10, §1, 4-13-10; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

(h) ***Fueling and vehicle maintenance areas.*** Fueling and vehicle maintenance areas shall, to the maximum extent practicable, have SMPs designed, installed, and maintained to reduce petroleum within runoff, such that the runoff that enters waters of the state contains no visible petroleum sheen. A combination of the following SMPs may be used: oil and grease separators, canopies, petroleum spill cleanup materials, or any other structural or non-structural method of preventing or treating petroleum in runoff.

(1) This ordinance applies to:

a. New fueling and vehicle maintenance areas approved after the effective date of this ordinance.

b. Any modifications to existing fueling and vehicle maintenance areas regardless of the size of the disturbed area. SMPs installed as part of a site modification shall, to the maximum extent practicable, be designed and operated to treat all stormwater leaving the site so that the stormwater contains no visible petroleum sheen.

c. Transportation and non-highway transportation sites.

(2) A stormwater management plan per Sec. 20-313 of this ordinance, a maintenance agreement per Sec. 20-314 of this ordinance and a stormwater permit per Sec. 20-321 of this ordinance are required.

(Ord 66-10, §1, 4-13-10; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

(i) ***General considerations for stormwater management measures.*** The following considerations shall be observed in on-site and off-site runoff management.

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

(2) Overland flow for all stormwater facilities shall be provided to prevent exceeding the safe capacity of downstream drainage facilities and prevent endangerment of downstream property or public safety.

(3) Overland flow paths from adjoining properties to an offsite facility must be maintained.

(4) Low impact development techniques and green infrastructure should be included to the extent possible. These techniques include but are not limited to: increasing the time of concentration by lengthening the flow path and increasing the roughness of the flow path, using native, deep rooted vegetation instead of turf grasses and deep tilling onsite compacted soil.

(Ord 66-10, §1, 4-13-10; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

(j) ***Location and regional treatment option.***

(1) The SMPs may be located on-site or off-site as part of a regional stormwater device, practice or system, but shall be installed in accordance with s. NR 151.003 Wisconsin Administrative Code.

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

(3) Post-construction runoff shall meet the post-construction performance standards prior to entering navigable surface water.

a. To the maximum extent practicable, SMPs shall be located to treat runoff prior to discharge to navigable surface waters.

b. Post-construction SMPs for such runoff may be located in a navigable surface water if allowable under all other applicable federal, state and local regulations such as s. NR 103, Wisconsin Administrative Code and Chapter 30, Wis. Stat.

(4) The City of Appleton may approve off-site management measures provided that all of the following conditions are met:

a. The post-construction runoff is covered by a stormwater management system plan that is approved by the City of Appleton and that contains management requirements consistent with the purpose and intent of this ordinance.

b. The off-site facility meets all of the following conditions:

i. The facility is in place.

ii. The facility is designed and adequately sized to provide a level of stormwater control equal to or greater than that which would be afforded by on-site practices meeting the performance standards of this ordinance.

iii. The facility has a legally obligated entity responsible for its long-term operation and maintenance.

iv. Permittee must demonstrate that the proposed post-construction land development or redevelopment activity has received permission to use the off-site facility.

v. Permittee must also demonstrate the flow path to the off-site facility will not result in negative impacts to structural improvements on the property.

vi. Permittee must provide easements of all overland flow paths up to and including the overland flow path of the 100-year storm.

(5) Where a regional treatment option exists such that the City of Appleton exempts the applicant from all or part of the minimum on-site stormwater management requirements, the applicant may be required to pay a one-time fee in an amount determined by the City of Appleton. In determining the fee for post-construction runoff, the City may consider an equitable distribution of the cost for land, engineering design, construction, and maintenance of the regional treatment option.

(6) The discharge of runoff from a SMP, such as a wet detention pond, or after a series of such SMPs, is subject to this ordinance.

(Ord 72-20, §1, 5-1-20)

(k) ***Additional requirements.*** The City of Appleton may establish stormwater management requirements more stringent than those set forth in this ordinance if the City determines that the requirements are needed to control stormwater quantity or control flooding, comply with federally approved total maximum daily load requirements, or control pollutants associated with existing development or redevelopment.

(l) ***Swale treatment for transportation facilities.***

(1) *Applicability*. Except as provided in Sec. 20-312(i)(2) of this ordinance, transportation facilities that use swales for runoff conveyance, pollutant removal and infiltration meet the stormwater discharge quality requirements of this section, if the swales are designed to the maximum extent practicable to do all of the following:

a. Be vegetated. However, where appropriate, non-vegetative measures may be employed to prevent erosion or provide for runoff treatment, such as rock riprap stabilization or check dams. It is preferred that tall and dense vegetation be maintained within the swale because of its greater effectiveness at enhancing runoff pollutant removal.

b. Swales shall comply with sections V.F. (Velocity and Depth) and V.G. (Sale Geometry Criteria) with a swale treatment length as long as that specified in section V.C. (Pre-Treatment) of the Wisconsin Department of Natural Resources technical standard 1005 "Vegetated Infiltration Swales", dated May 2007, or a superseding document. Transportation facility swale treatment does not have to comply with other sections of technical standard 1005.

(2) *Other requirements.*

a. The City of Appleton may, consistent with water quality standards, require other provisions of this section be met on a transportation facility with average daily traffic of vehicles greater than two

thousand five hundred (2,500) per day and where the initial surface water of the state that the runoff directly enters is any of the following:

i. An outstanding resource water.

ii. An exceptional resource water.

iii. Waters listed in s. 303(d) of the Federal Clean Water Act that are identified as impaired in whole or in part, because of nonpoint source impacts.

iv. Waters where targeted performance standards are developed under s. NR 151.004, Wisconsin Administrative Code, to meet water quality standards.

b. The transportation facility authority shall contact the City to determine if additional SMPs beyond a water quality swale are needed under this subsection.

(Ord 66-10, §1, 4-13-10; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

(m) Innovative stormwater management systems that do not meet Sec. 20-312(d), (e) or (f) of this ordinance must be reviewed and accepted by the City before installation.
(188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16)

Sec. 20-313. Stormwater management plans.

(a) ***Plan requirements.***

(1) The stormwater management plan required under Sec. 20-321 of this ordinance shall contain any such information the City of Appleton may need to evaluate the characteristics of the area affected by land development and redevelopment activities, the potential impacts of the proposed activity upon the quality and quantity of stormwater discharges, the potential impacts upon water resources and drainage systems and the effectiveness and acceptability of proposed stormwater management measures in meeting the performance standards set forth in this ordinance.

(2) All initial and final site investigations, geotechnical reports, plans, designs, computations and drawings for stormwater management measures and plans submitted for review shall be stamped by a professional engineer registered in the State of Wisconsin and be prepared in accordance with accepted engineering practice and in accordance with criteria set forth by the City of Appleton.

(3) Plan submittal shall include a digital version of the WinSLAMM *.mdb file(s) and a digital representation of post-construction drainage area(s) to each individual treatment practice in ESRI GIS Shapefile or Geodatabase format, Autodesk AutoCAD (*.dwg), or other format approved by the City.

(4) Wetland evaluations and delineations shall be prepared by a qualified professional and submitted with any State and/or Federal concurrence letter(s).

(b) ***Minimum content.*** The stormwater management plan shall contain at a minimum the following information:

(1) Name, address and telephone number for the following and their designees: landowner; developer; project engineer for practice design and certification; person(s) responsible for installation of stormwater management practices; and person(s) responsible for maintenance of stormwater management practices prior to the transfer, if any, of maintenance responsibility to another party.

(2) A proper legal description of the property proposed to be developed in Outagamie County Coordinate System and referenced to the U.S. Public Land Survey system or to block and lot numbers within a recorded land subdivision plat.

(3) Pre-development site conditions, including:

a. One or more site maps of current site conditions at a scale of not less than one (1) inch equal one hundred (100) feet. The site maps shall show the following: site location and legal property description; predominant soil types and hydrologic soil groups; existing cover type and condition; topographic contours of the site; topography and drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the site; watercourses that may affect or be affected by runoff from the site; flow path and direction for all stormwater conveyance sections; watershed boundaries used in hydrology determinations to show compliance with performance standards; lakes, streams, wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site; limits of the 100-year floodplain; location of wells and wellhead protection areas covering the project area and delineated pursuant to s. NR 811.16, Wisconsin Administrative Code.

b. Hydrology and pollutant loading computations as needed to show compliance with performance standards. All major assumptions used in developing input parameters shall be clearly stated. The geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s).

(4) Post-construction site conditions, including:

a. Explanation of the provisions to preserve and use natural topography and land cover features to minimize changes in peak flow runoff rates and volumes to surface waters and wetlands.

b. Explanation of any restrictions on stormwater management measures in the development area imposed by wellhead protection plans and ordinances.

c. One or more site maps at a scale of not less than one (1) inch equals one hundred (100) feet showing the following: post-construction pervious areas including vegetative cover type and condition; impervious surfaces including all buildings, structures and pavement; post-construction topographic contours of the site; post-construction drainage network including enough of the contiguous properties to show runoff patterns onto, through and from the site; locations and dimensions of drainage easements; locations of maintenance easements specified in the maintenance agreement; flow path and direction for all stormwater conveyance sections; location and type of all stormwater management conveyance and treatment practices, including the on-site and off-site tributary drainage areas; location and type of conveyance system that will carry runoff from the drainage and treatment practices to the nearest adequate outlet such as a curbed street, storm drain, or natural drainage way; watershed boundaries used in hydrology and pollutant loading calculations and any changes to lakes, streams, wetlands, channels, ditches and other watercourses on and immediately adjacent to the site.

d. Hydrology and pollutant loading computations as needed to show compliance with performance standards. The computations shall be made for each discharge point in the development and the geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s). The plan shall include a table summarizing the drainage area, pre-project and post-project loadings and removal efficiencies for each treatment practice. If the project includes off-site drainage areas those areas shall be incorporated into the modeling to determine treatment practice effectiveness but shall be listed separately in the table. A development cannot take credit for off-site areas and reductions without a written agreement from the off-site landowner(s).

e. Results of investigations of soil and groundwater required for the placement and design of stormwater management measures.

f. Detailed drawings including cross-sections and profiles of all permanent stormwater conveyance and treatment practices.

(5) A description and installation schedule for the stormwater management practices needed to meet the

performance standards in Sec. 20-312 of this ordinance.

(6) A maintenance plan and inspection report form developed for the life of each stormwater management practice including the required maintenance activities and maintenance activity schedule.

(7) An explanation of the technical basis used to select the stormwater management practices.

(8) If maximum extent practicable is requested for any of the requirements of this ordinance, the plan shall include a written, site-specific explanation of why the standard cannot be met.

(9) Other information requested in writing by the City of Appleton to determine compliance of the proposed stormwater management measures with the provisions of this ordinance.

(Ord 72-20, §1, 5-1-20)

(c) ***Alternate requirements.*** The City of Appleton may prescribe alternative submittal requirements for applicants seeking an exemption to on-site stormwater management performance standards under Secs. 20-312(d), (e) or (f) of this ordinance.

(d) ***Modifications.*** When a change in land use or stormwater management practice occurs at a site with an approved stormwater management plan, a modified stormwater management plan must be submitted to the City for review and approval before those changes in practice occur. Plan modifications shall be modeled in the latest version of WinSLAMM unless otherwise approved by the City.

(Ord 188-03, §1, 10-21-03; Ord 66-10, §1, 4-13-10, Ord 42-16, §1, 5-1-16, Ord 72-20, §1, 5-1-20)

Sec. 20-314. Maintenance agreement.

(a) ***Maintenance agreement required.*** The maintenance agreement required for stormwater management practices under Sec. 20-321(b) of this ordinance shall be an agreement between the City of Appleton and the responsible party to provide for perpetual maintenance of stormwater practices. The agreement shall be recorded with the appropriate (Outagamie, Winnebago, or Calumet) County Register of Deeds, as a property deed restriction so that it is binding upon all subsequent owners of land served by the stormwater management practices.

(Ord 66-10, §1, 4-13-10; Ord 42-16, §1, 5-1-16)

(b) ***Agreement provisions.*** The responsible party shall maintain stormwater management practices in accordance with the stormwater practice maintenance provisions contained in the approved stormwater management plan submitted under Sec. 20-321(b) of this ordinance. This maintenance agreement includes:

(1) Identification of the stormwater facilities and designation of the drainage area served by the facilities.

(2) A schedule for regular maintenance of each aspect of the stormwater management system consistent with the stormwater management plan as required under Sec. 20-321 of this ordinance.

(3) Identification of the responsible party(ies), organization or city, county, town or village responsible for long-term maintenance of the stormwater management practices identified in the stormwater management plan as required under Sec. 20-321 of this ordinance.

(4) Requirement that the responsible party(ies), organization(s), or city, county, town or village shall maintain stormwater management practices in accordance with the schedule included in Sec. 20-314(b)(2) of this ordinance.

(5) Authorization for the City of Appleton to access the property to conduct inspections of stormwater practices as necessary to ascertain that the practices are being maintained and operated in accordance with the approved stormwater management plan. The City of Appleton shall maintain public records of the results of the site inspections, shall inform the responsible party for maintenance of the inspection results and shall specifically indicate any corrective actions required to bring the stormwater management practice into proper working condition and a reasonable time frame during which the

corrective action must be taken.

(6) Authorization for the City of Appleton to perform the corrected actions identified in the inspection report if the responsible party does not make the required corrections in the specified time period. The City of Appleton shall charge the responsible party(ies) identified in the maintenance agreement for the cost of such work and shall place a lien on the property by the City of Appleton, which may be collected as special charges pursuant to subchapter VII, §66(16).

(c) ***Modification of agreement.*** This maintenance agreement may be modified by mutual agreement of the responsible party and the City of Appleton. The modification date shall be the date the modified maintenance agreement is recorded with the appropriate (Outagamie, Winnebago, or Calumet) County Register of Deeds, as a property deed restriction so that the modified agreement is binding upon all subsequent owners of the land served by the stormwater management practices.

The maintenance agreement shall be modified when there are changes in land use or stormwater management practices at the site. The modified plan shall be submitted and approved by the City before changes in practices occur. (Ord 66-10, §1, 4-13-10)

(d) ***Long term maintenance stormwater management report.***

(1) Every property owner that has been granted a ~~storwmater~~ stormwater management permit, constructed on-site stormwater management practices and signed and recorded the required maintenance agreement, shall submit to the Director of Public Works a report on the condition of the site's stormwater management devices and a certification that the SMPs are functioning per the approved plan.

(2) Owners shall be notified by the City of the requirements and the deadline for reporting.

The report and certification shall be completed and sealed by a Professional Engineer currently licensed in the State of Wisconsin, on forms provided by the City.

(3) The requirement that the report and certification be sealed by a Professional Engineer may be omitted in the case of a stormwater management plan consisting solely of storm sewer inlet filters and/or catch basin sumps, provided that the applicant can provide the appropriate documentation of cleaning activities and dated photos.

(4) For sites with more extensive stormwater management systems, the requirements may include, but are not limited to:

a. Photos of the management device at the time of inspection. This shall include photos of existing conditions and photos after the completion of any required maintenance.

b. Bathometric survey.

c. Topographic survey.

d. Infiltration testing.

e. Completed inspection forms.

f. Documentation of the completion of the required annual maintenance, including copies of receipts (actual prices paid need not be reported) from agents hired to perform the work and the date the work was completed.

(5) Upon receipt of the report and certification, if requested on the cover letter accompanying the report or by separate email, City Engineering staff shall provide an email response to the contact listed on the reporting forms stating that the report was received. This response from the City shall be made within

20 workings days of receiving the report.
(Ord 72-20, §1, 5-1-20)

(e) ***Termination of agreement.*** The maintenance agreement shall be terminated at such time that responsibility for maintenance of the stormwater management practice is legally transferred to the City of Appleton or agency acceptable to the City of Appleton, through a written, binding agreement. The termination date of the maintenance agreement required under Sec. 20-314(a) of this ordinance shall be the date upon which the legal transfer of maintenance responsibility to the City of Appleton or agency is made effective.
(Ord 188-03, §1, 10-21-03; Ord 66-10, §1, 4-13-10; Ord 42-16, §1, 5-1-16; Ord 72-20, §1, 5-1-20)

Secs. 20-315 – 20-320. Reserved.

DIVISION 3. PERMITTING AND FEES

Sec. 20-321. Permitting requirements, procedures, and fees.

(a) ***Permit required.*** No responsible party may undertake a land disturbing construction activity except One- and Two-family residential lots, without receiving a post-construction runoff permit from the City of Appleton prior to commencing the proposed activity.

(b) ***Permit application and fee.*** Unless specifically excluded by this ordinance, any responsible party desiring a permit (permit holder) shall submit to the City of Appleton a permit application made on a form provided by the City of Appleton for that purpose.

(1) Unless otherwise excepted by this ordinance, a permit application must be accompanied by a stormwater management plan, narrative and drawings, grading plan, utility plan, landscape plan, non-refundable permit review fee and an operation and maintenance plan and agreement as set forth in Table ~~3~~5. The initial submittal and the final approved plan shall be stamped by an engineer licensed in the State of Wisconsin. ~~in a hard copy format.~~ The initial and final submittals shall include one stamped hard copy of the drawings and all documents in .pdf format.

Table ~~3~~5

Land Development Activity	Permit	Stormwater Mgmt Plan	Grading & Drainage Plan	Maintenance Agrm
Agricultural Use	--	--	--	--
Non-Residential	X	X	X	X
1 & 2 Family Residential on 1 acre or greater lot	X	X	X	--
Multi-Family Residential	X	X	X	X
Subdivision Development	X	X	X	X

(2) The stormwater management plan shall be prepared to meet the requirements of Sec. 20-313 of this ordinance and the maintenance agreement shall be prepared to meet the requirements of Sec. 20-314 of this ordinance.

(3) Plan revisions occurring after initial plan approval shall be submitted for review with an application, applicable changes to drawings, calculations, and the Operation and Maintenance Agreement. Fees shall be per (4) below.

(4) Fees for the above-noted permits will include a non-refundable one hundred dollar ($100) application fee and will be the actual costs incurred by the City. The application fee shall be credited toward the actual costs incurred by the City. Fees shall be payable within thirty (30) days of receipt of an invoice from the City. An invoice will be sent any time an applicant fails to resubmit a plan revision for ninety

(90) days or more.
(Ord 66-10, §1, 4-13-10; Ord 157-11, §1, 1-1-12, Ord 42-16, §1, 5-1-16)

(c) ***Review and approval of permit application.*** The City of Appleton will review any complete permit application that is submitted with the required fee. The following procedure will be used:

(1) For a Major Stormwater Management Plan, within thirty (30) business days of the receipt of a complete permit application, including all documents as required by Sec. 20-321(b)(1) of this ordinance, the City of Appleton shall inform the applicant whether the application, plan and maintenance agreement are approved or disapproved. The City of Appleton shall base the decision on requirements set forth in Secs. 20-312, 20-313 and 20-314 of this ordinance.

(2) For a Minor Stormwater Management Plan, within fifteen (15) business days of receipt of a complete permit application, including all documents as required by Sec. 20-321(b)(1) of this ordinance, the City of Appleton shall inform the applicant whether the application, plan and maintenance agreement are approved or disapproved. The City of Appleton shall base the decision on requirements set forth in Secs. 20-312, 20-313 and 20-314 of this ordinance.

(3) If the stormwater permit application, stormwater management plan and maintenance agreement are approved, or if an agreed upon payment of fees in lieu of stormwater management practices are paid, the City of Appleton shall issue the permit.

(4) If the stormwater permit application, stormwater management plan or maintenance agreement are disapproved, the applicant may revise the stormwater management plan or agreement, or may appeal the decision of the City of Appleton as provided for in Sec. 20-327 of this ordinance.

(5) If additional information is submitted, the City of Appleton shall have thirty (30) business days from the date the additional information is received for a Major Stormwater Management Plan and fifteen (15) business days for a Minor Stormwater Management Plan to inform the applicant that the plan and maintenance agreement are either approved or disapproved.

(6) Failure by the City of Appleton to inform the permit applicant of a decision within the timelines listed above shall be deemed to mean approval of the submittal and applicant may proceed as if permit has been issued.
(Ord 157-11, §1, 1-1-12, 42-16, §1, 5-1-16)

(d) ***Stormwater practice installation and maintenance performance security***. The City of Appleton may, at its discretion, require the submittal of a cash escrow, letter of credit, or performance security prior to issuance of the permit to ensure that the stormwater practices are installed and maintained by the responsible party as required by the stormwater management plan. The amount of the installation performance security shall be determined by the City of Appleton, not to exceed the total estimated construction cost of the stormwater management practices approved under the permit unless otherwise specified in the permit.

The amount of the maintenance performance security shall be determined by the City of Appleton, not to exceed ten- (10-) years of the maintenance costs estimated in the stormwater plan. The performance security shall contain forfeiture provisions for failure to complete work specified in the stormwater management plan.

Conditions for the release of performance security are as follows:

(1) The installation performance security shall be released in full only upon submission of "as built plans" and written certification by the design engineer that the stormwater practice(s) were installed and function as intended in accordance with the approved plan and other applicable provisions of this ordinance. The City of Appleton may make provisions for a partial pro-rata release of the performance security based on the completion of various development stages including the final inspection of landscaping material.

(2) The maintenance performance security, minus any costs incurred by the City of Appleton to conduct required maintenance, design, engineering, preparation, checking and review of designs, plans and specifications; supervision and inspection to ensure that construction is in compliance with applicable plans, specifications, regulations and ordinances; and legal, administrative and fiscal work undertaken to assure and implement such compliance, shall be released at such time that the responsibility for practice maintenance is passed on to another private entity, via an approved maintenance agreement, or to the City of Appleton.

(e) ***Permit conditions.*** All permits issued under this ordinance shall be subject to the following conditions, and holders of permits issued under this ordinance shall be deemed to have accepted these conditions. The City of Appleton may suspend or revoke a permit for violation of a permit condition, following written notification of the responsible party. An action by the City of Appleton to suspend or revoke this permit may be appealed in accordance with Sec. 20-327 of this ordinance.

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

(2) The responsible party shall design, install, and maintain all structural and nonstructural stormwater management measures in accordance with the approved stormwater management plan, maintenance agreement, and this permit.

(3) The responsible party shall notify the City of Appleton at least three (3) business days before commencing any work in conjunction with the stormwater management plan, and within five (5) business days upon completion of the stormwater management practices.

If required as a special condition, the permit holder shall make additional notification according to a schedule set forth by the City of Appleton so that practice installations can be inspected during construction.

(4) Completed stormwater management practices must pass a final inspection to determine if they are in accordance with the approved stormwater management plan and ordinance. The inspection must be made by the City of Appleton, or other competent professionals. The City of Appleton shall notify the permit holder in writing of any changes required in such practices to bring them into compliance with the conditions of this permit. The responsible party is further required to submit an as-built plan and a certificate of completion, stating the completion of the permitted work is in accordance with the stormwater management plan, City of Appleton, state and federal requirements. The certificate must be signed by the design engineer.

(5) The responsible party shall notify the City of any significant modifications it intends to make to an approved stormwater management plan. The City of Appleton may require that the proposed modifications be submitted for approval prior to incorporation into the stormwater management plan and execution by the responsible party.

(6) The responsible party shall maintain all stormwater management practices specified in the approved stormwater management plan until the practices either become the responsibility of the City of Appleton, or are transferred to a subsequent responsible party as specified in the approved maintenance agreement.

(7) The responsible party authorizes the City of Appleton to perform any work or operations necessary to bring stormwater management measures into conformance with the approved stormwater management plan, and consents to placing associated costs upon the tax roll as a special lien against the property which may be collected as special charges pursuant to §66.0627, Wis. Stat., by the City of Appleton or to charging such costs against the letter of credit or cash bond posted for the project.

(8) If so directed by the City of Appleton, the responsible party shall repair at the permit holder's own expense all damage to adjoining municipal facilities and drainage ways caused by runoff, where such damage is caused by activities that are not in compliance with the approved stormwater management

plan.

(9) The responsible party shall permit property access to the City of Appleton or its designee for the purpose of inspecting the property for compliance with the approved stormwater management plan and this permit.

(10) Where necessary, it shall be the responsibility of the permit holder to obtain any appropriate easements or other necessary property/interests with affected property owners concerning the prevention of endangerment to property or public safety. Issuance of this permit does not create or affect any such rights.

(11) The owner is subject to the enforceable actions detailed in Sec. 20-326 of this ordinance if the responsible party fails to comply with the terms of this permit.

(Ord 66-10, §1, 4-13-10; Ord 42-16, §1, 5-1-16)

(f) ***Permit duration.*** The responsible party must start the permit activities within one (1) year of the date the permit is issued. An extension of one (1) year may be granted by the Director, provided a written request is submitted to the Director prior to the expiration date for the initial permit. If permit activities are not started, then a new permit application and fee may be required.

(Ord 6610, §1, 4-13-10)

(g) ***Fee in lieu of on-site stormwater management practices.*** Where the City of Appleton waives all or part of the minimum on-site stormwater management requirements under Sec. 20-313(c) of this ordinance, or where the waiver is based on the provision of adequate stormwater facilities provided by the City of Appleton downstream of the proposed development or redevelopment, as provided for under Sec. 20-312 of this ordinance, the applicant shall be required to pay a fee in an amount as determined by the City of Appleton pursuant to §66.0617, Wis. Stat. and any other applicable law.

(Ord 188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16)

Secs. 20-322 – 20-325. Reserved.

DIVISION 4. ENFORCEMENT AND APPEALS

Sec. 20-326. Enforcement and penalties.

(a) Any land disturbing construction activity or any post-construction runoff initiated after the effective date of this ordinance by any person, firm, association or corporation subject to the ordinance provisions shall be deemed a violation unless conducted in accordance with the requirements of this ordinance.

(b) The City of Appleton shall notify the responsible party or owner by certified mail of any non-complying land disturbing construction activity or post construction runoff. The notice shall describe the nature of the violation, remedial actions needed, a schedule for remedial action and additional enforcement action, which may be taken.

(c) Upon receipt of written notification from the City of Appleton, the responsible party or owner shall correct work that does not comply with the stormwater management plan or other provisions of this permit. The responsible party or owner shall make corrections as necessary to meet the specifications and schedule set forth by the City of Appleton in the notice.

(d) If the violations to a permit issued pursuant to this ordinance are likely to result in damage to properties, public facilities, or waters of the state, the City of Appleton may enter the land and take emergency actions necessary to prevent such damage. The costs incurred by the City of Appleton plus interest and legal costs shall be billed to the responsible party or owner.

(e) The City of Appleton is authorized to post a stop work order on all land disturbing construction activity that

is in violation of this ordinance, or to request the Appleton City Attorney to obtain a cease and desist order.

(f) The City of Appleton may revoke a permit issued under this ordinance for non-compliance with ordinance provisions.

(g) Any permit revocation, stop work order or cease and desist order shall remain in effect unless retracted by the City of Appleton or by a court of competent jurisdiction.

(h) The City of Appleton is authorized to refer any violation of this ordinance, or of a stop work order or cease and desist order issued pursuant to this ordinance to the Appleton City Attorney for the commencement of further legal proceedings.

(i) Any person, firm, association or corporation who does not comply with the provisions of this ordinance shall be subject to the general penalty provisions of the Appleton Municipal Code Sec. 1-16. Each day that the violation exists shall constitute a separate offense.

(j) Violations of this ordinance deemed to be a public nuisance shall be subject to abatement under Sec. 12-32 of the City of Appleton Municipal Code or compliance with this ordinance may be enforced by injunctional order in any court with jurisdiction. It shall not be necessary to prosecute for forfeiture or a cease and desist order before resorting to injunctional proceedings.

(k) When the City of Appleton determines that the holder of a permit issued pursuant to this ordinance has failed to follow practices set forth in the stormwater management plan submitted and approved pursuant to Sec. 20-321 of this ordinance, or has failed to comply with schedules set forth in said stormwater management plan, the City of Appleton or a party designated by the City of Appleton may enter upon the land and perform the work or other operations necessary to bring the condition of said lands into conformance with requirements of the approved plan. The City of Appleton shall keep a detailed accounting of the costs and expenses of performing this work. These costs and expenses shall be deducted from any performance or maintenance security posted pursuant to Sec. 20-321 of this ordinance. Where such a security has not been established, or where such a security is insufficient to cover these costs, the costs and expenses shall be entered on the tax roll as a special charge against the property.
(Ord 188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16)

Sec. 20-327. Appeals.

(a) ***Appeals.*** The Utilities Committee of the Appleton Common Council shall hear and recommend to Council appeals where it is alleged that there is error in any order, decision or determination made by the City of Appleton in administering this ordinance. The Committee shall use the rules, procedures, duties and powers authorized by statute in hearing and recommending appeals.

Upon appeal, the Committee may recommend to Council relief from the provisions of this ordinance that are not contrary to the public interest or provisions of state regulations, and where owing to special conditions a literal enforcement of this ordinance will result in unnecessary hardship.

(b) ***Who may appeal.*** Appeals to the Utilities Committee of the City of Appleton may be taken by any aggrieved person or by an officer, department, board or bureau of the City of Appleton affected by any decision of the City of Appleton. Written appeals shall be filed with the City Clerk. The Utilities Committee will make a recommendation within forty-five (45) calendar days of filing of the appeal. If the Utilities Committee takes no action within forty-five (45) calendar days, the appeal will automatically be sent to Council with a recommendation for approval. Either party may file a written request for a time extension with the City Clerk.
(Ord 188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16)

Secs. 20-328 – 20-330. Reserved.

DIVISION 5. SEVERABILITY

Sec. 20-331. Severability.

If any section or portion thereof shall be declared by a decision of a court of competent jurisdiction to be invalid, unlawful or unenforceable, such decision shall apply only to the specific section or portion thereof directly specified in the decision, and not affect the validity of all other provisions, sections or portion thereof of the ordinance which shall remain in full force and effect.
(Ord 188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16)

DIVISION VI. EFFECTIVE DATE.

Sec. 20-332. Effective date.

This ordinance is in full force and effect on ~~May 1, 2016~~August 1, 2022.
(Ord 188-03, §1, 10-21-03; Ord 42-16, §1, 5-1-16)

Appendix D: Implementation Plan

TMDL COMPLIANCE SUMMARY AND IMPLEMENTATION PLAN **APPLE CREEK** **Lower Fox TMDL** Assessment Date: December 2021

	TSS tons/yr	TP lbs/yr	TSS %	TP %
No Controls Loads (per 2020-2021 Citywide Stormwater Plan)	332.3	2277.2		
TMDL REDUCTION TARGETS	173	922	52.0%	40.5%
With Controls Current Load Reductions (per 2020-2021 Citywide Stormwater Plan)	231.8	1099.3	69.7%	48.3%
Remaining Loads (per 2020-2021 Citywide Stormwater Plan)	100.6	1177.9		
Reduction Requirements Achieved?	**YES**	**YES**		
Tradeable Loads (positive value) or remaining gap (negative value)	**59.0**	**177.1**		

				INCREMENTAL MEASURE TREATMENT				CUMULATIVE REACHSHED REDUCTION				City Cost Planning Information		
BENCHMARK	DESCRIPTION OF MEASURE	IMPLEMENTATION DATE	IMPACTED AREA (ac)	TSS Tons/yr	TP lbs/yr	TSS %	TP %	TSS Tons/yr	TP lbs/yr	TSS %	TP %			
1	Complete Regional Practice WinSLAMM Models (12) [1]	2022	N/A	0.0	0.0	0.0%	0.0%	231.8	1,099.3	69.7%	48.3%	$ 36,000	Prorate cost by # of models / 21	
2	Implement Ordinance Change	2023	Citywide	0.0	0.0	0.0%	0.0%	231.8	1,099.3	69.7%	48.3%	$ -	No City Cost Impact	
3	Apply Internal Trade of TSS and TP Credit to Lower Fox River (DS) (80% of excess to be conservative)	2023	N/A	-47.2	-141.6	-14.2%	-6.2%	184.6	957.7	55.5%	42.1%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR	
4	Complete Multi-Family SWU GIS/Billing Database Update [2]	2026	Citywide	0.0	0.0	0.0%	0.0%	184.6	957.7	55.5%	42.1%	$ 14,286	Prorate cost by 1/7	
5	Complete Leaf Management Implementation [3]	2026	1	0.0	0.0	0.0%	0.0%	184.6	957.7	55.5%	42.1%	$ 313,929	Prorate cost by 1/7 (Total Capital Cost 2021-2025, includes CEA Payments)	
6	Municipal Services Building Expansion Phase 1 Completion [4]	2026	Citywide	0.0	0.0	0.0%	0.0%	184.6	957.7	55.5%	42.1%	$ 285,714	Prorate cost by 1/7	
7	Complete Commercial/Industrial SWU GIS/Billing Database Update [2]	2028	Citywide	0.0	0.0	0.0%	0.0%	184.6	957.7	55.5%	42.1%	$ 14,286	Prorate cost by 1/7	
8	Detailed Leaf Collection Analysis	2028	Citywide	0.0	0.0	0.0%	0.0%	184.6	957.7	55.5%	42.1%	$ 5,000	Prorate cost by 1/7	
9	Expand Street Cleaning Equipment to all High Efficiency	2030	3388	1.2	5.5	0.4%	0.2%	185.9	963.2	55.9%	42.3%	$ 115,586	Prorate cost by 1/7 (2021 capital cost inflated 3%/year for 9 years)	
10	Redevelopment Impacts (includes Plamann Park SMPs/County Agrmt) [5]	2020-2030	34	1.1	3.6	0.3%	0.2%	186.9	966.8	56.2%	42.5%	$ -	No City Cost Impact	
11	Municipal Services Building Expansion Phase 2 Completion [6]	2031	Citywide	0.0	0.0	0.0%	0.0%	186.9	966.8	56.2%	42.5%	$ 328,571	Prorate cost by 1/7	
12	Citywide Plan Update Completed	2031	Citywide	0.0	0.0	0.0%	0.0%	186.9	966.8	56.2%	42.5%	$ 25,000	Prorate cost by 1/8	
13	Redevelopment Impacts [5]	2030-2140	374	11.9	40.0	3.6%	1.8%	198.8	1,006.8	59.8%	44.2%	$ -	No City Cost Impact	
14	Apply Internal Trade of TSS and TP Credit to Lower Fox River (DS) (80% of excess to be conservative)	2140	N/A	-20.8	-67.6	-6.3%	-3.0%	178.0	939.2	53.6%	41.2%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR	
												$ **1,143,371**	**Total Cost**	

Notes:

[1] Reductions included in current With Controls reductions since model development is not anticipated to make significant changes to current TSS or TP reductions but will confirm attainment of reached goals and amount eligible for internal trading to downstream reachsheds.

[2] Stormwater Utility GIS/Billing Database Update needed to confirm fair and equitable rates and ability to fund stormwater quality and other program costs.

[3] Leaf management implementation is of minimal quantifiable load reduction impact due to extent of regional ponds, current reduction level and WDNR guidance, and inability to directly model in series with other practices. Practice is addressing all land uses, not just MDRNA area as currently provided credit through WDNR guidance.

[4] Municipal Services Building Expansion Required to store and maintain expanded leaf management equipment since equipment is additive, not replacing old equipment.

[5] Redevelopment impacts are estimate based on potential land available for redevelopment, redevelopment rate of 20 acres per year, and even distribution of redevelopment Citywide - actual redevelopment will be measured with each Citywide Plan update.

[6] Municipal Services Building Expansion Required to store and maintain expanded street cleaning equipment since equipment is additive, not replacing old equipment.

Note: Costs prorated by 1/7 are spread over 7 of 8 reachsheds and do not include a cost share to Bear Creek reachshed due to the current very low development of that reachshed.

TMDL COMPLIANCE SUMMARY AND IMPLEMENTATION PLAN **DUCK CREEK** Assessment Date: December 2021

Lower Fox TMDL

	TSS tons/yr	TP lbs/yr	TSS %	TP %
No Controls Loads (per 2020-2021 Citywide Stormwater Plan)	3.8	33.7		
TMDL REDUCTION TARGETS	2	14	52.0%	40.5%
With Controls Current Load Reductions (per 2020-2021 Citywide Stormwater Plan)	2.8	16.4	73.7%	48.5%
Remaining Loads (per 2020-2021 Citywide Stormwater Plan)	1.0	17.3		
Reduction Requirements Achieved?	YES	YES		
Tradeable Loads (positive value) or remaining gap (negative value)	0.8	2.7		

				INCREMENTAL MEASURE TREATMENT				CUMULATIVE REACHSHED REDUCTION				City Cost Planning Information	
BENCHMARK	DESCRIPTION OF MEASURE	IMPLEMENTATION DATE	IMPACTED AREA (ac)	TSS Tons/yr	TP lbs/yr	TSS %	TP %	TSS Tons/yr	TP lbs/yr	TSS %	TP %		
1	Complete Regional Practice WinSLAMM Models (1) [1]	2022	N/A	0.0	0.0	0.0%	0.0%	2.8	16.4	73.7%	48.5%	$ 3,000	Prorate cost by # of models / 21
2	Implement Ordinance Change [2]	2023	Citywide	0.0	0.0	0.0%	0.0%	2.8	16.4	73.7%	48.5%	$ -	No City Cost Impact
3	Complete Multi-Family SWU GIS/Billing Database Update [3]	2026	Citywide	0.0	0.0	0.0%	0.0%	2.8	16.4	73.7%	48.5%	$ 14,286	Prorate cost by 1/7
4	Complete Leaf Management Implementation [4]	2026	0	0.0	0.0	0.0%	0.0%	2.8	16.4	73.7%	48.5%	$ 313,929	Prorate cost by 1/7 (Total Capital Cost 2021-2025, includes CEA Payments)
5	Municipal Services Building Expansion Phase 1 Completion [5]	2026	Citywide	0.0	0.0	0.0%	0.0%	2.8	16.4	73.7%	48.5%	$ 285,714	Prorate cost by 1/7
6	Complete Commercial/Industrial SWU GIS/Billing Database Update [3]	2028	Citywide	0.0	0.0	0.0%	0.0%	2.8	16.4	73.7%	48.5%	$ 14,286	Prorate cost by 1/7
7	Detailed Leaf Collection Analysis	2028	Citywide	0.0	0.0	0.0%	0.0%	2.8	16.4	73.7%	48.5%	$ 5,000	Prorate cost by 1/7
8	Expand Street Cleaning Equipment to all High Efficiency	2030	57	0.0	0.1	0.6%	0.3%	2.8	16.5	74.4%	48.9%	$ 115,586	Prorate cost by 1/7 (2021 capital cost inflated 3%/year for 9 years)
9	Municipal Services Building Expansion Phase 2 Completion [6]	2031	Citywide	0.0	0.0	0.0%	0.0%	2.8	16.5	74.4%	48.9%	$ 328,571	Prorate cost by 1/7
10	Citywide Plan Update Completed	2031	Citywide	0.0	0.0	0.0%	0.0%	2.8	16.5	74.4%	48.9%	$ 25,000	Prorate cost by 1/8
												$ 1,105,371	**Total Cost**

Notes:

[1] Reductions included in current With Controls reductions since model development is not anticipated to make significant changes to current TSS or TP reductions but will confirm attainment of reached goals and amount eligible for internal trading to downstream reachsheds.

[2] No redevelopment areas were identified in Duck Creek during the 2021 redevelopment evaluation.

[3] Stormwater Utility GIS/Billing Database Update needed to confirm fair and equitable rates and ability to fund stormwater quality and other program costs.

[4] Leaf management implementation is of minimal quantifiable load reduction impact due to extent of regional ponds, current reduction level and WDNR guidance, and inability to directly model in series with other practices. Practice is addressing all land uses, not just MDRNA area as currently provided credit through WDNR guidance.

[5] Municipal Services Building Expansion Required to store and maintain expanded leaf management equipment since equipment is additive, not replacing old equipment.

[6] Municipal Services Building Expansion Required to store and maintain expanded street cleaning equipment since equipment is additive, not replacing old equipment.

Note: Costs prorated by 1/7 are spread over 7 of 8 reachsheds and do not include a cost share to Bear Creek reachshed due to the current very low development of that reachshed.

TMDL COMPLIANCE SUMMARY AND IMPLEMENTATION PLAN **GARNERS CREEK**
Lower Fox TMDL

Assessment Date: December 2021

	TSS tons/yr	TP lbs/yr	TSS %	TP %
No Controls Loads (per 2020-2021 Citywide Stormwater Plan)	236.7	1280.0		
TMDL REDUCTION TARGETS	142	878	59.9%	68.6%
With Controls Current Load Reductions (per 2020-2021 Citywide Stormwater Plan)	179.7	717.3	75.9%	56.0%
Remaining Loads (per 2020-2021 Citywide Stormwater Plan)	57.0	562.7		
Reduction Requirements Achieved?	YES	NO		
Tradeable Loads (positive value) or remaining gap (negative value)	37.9	-160.8		

				INCREMENTAL MEASURE TREATMENT				CUMULATIVE REACHSHED REDUCTION				City Cost Planning Information	
BENCHMARK	DESCRIPTION OF MEASURE	IMPLEMENTATION DATE	IMPACTED AREA (ac)	TSS Tons/yr	TP lbs/yr	TSS %	TP %	TSS Tons/yr	TP lbs/yr	TSS %	TP %		
1	Complete Regional Practice WinSLAMM Models (3) [1]	2022	N/A	0.0	0.0	0.0%	0.0%	179.7	717.3	75.9%	56.0%	$ 9,000	Prorate cost by # of models / 21
2	Implement Ordinance Change	2023	Citywide	0.0	0.0	0.0%	0.0%	179.7	717.3	75.9%	56.0%	$ -	No City Cost Impact
3	Apply Internal Trade of TSS Credit to Lower Fox River (DS) (80% of excess to be conservative)	2023	N/A	-30.3	0.0	-12.8%	0.0%	149.4	717.3	63.1%	56.0%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
4	Complete Multi-Family SWU GIS/Billing Database Update [2]	2026	Citywide	0.0	0.0	0.0%	0.0%	149.4	717.3	63.1%	56.0%	$ 14,286	Prorate cost by 1/7
5	Complete Leaf Management Implementation [3]	2026	0	0.0	0.0	0.0%	0.0%	149.4	717.3	63.1%	56.0%	$ 313,929	Prorate cost by 1/7 (Total Capital Cost 2021-2025, includes CEA Payments)
6	Municipal Services Building Expansion Phase 1 Completion [4]	2026	Citywide	0.0	0.0	0.0%	0.0%	149.4	717.3	63.1%	56.0%	$ 285,714	Prorate cost by 1/7
7	Complete Commercial/Industrial SWU GIS/Billing Database Update [2]	2028	Citywide	0.0	0.0	0.0%	0.0%	149.4	717.3	63.1%	56.0%	$ 14,286	Prorate cost by 1/7
8	Detailed Leaf Collection Analysis	2028	Citywide	0.0	0.0	0.0%	0.0%	149.4	717.3	63.1%	56.0%	$ 5,000	Prorate cost by 1/7
9	Expand Street Cleaning Equipment to all High Efficiency	2030	1576	0.0	0.1	0.0%	0.0%	149.4	717.3	63.1%	56.0%	$ 115,586	Prorate cost by 1/7 (2021 capital cost inflated 3%/year for 9 years)
10	Redevelopment Impacts [5]	2020-2030	33	0.5	0.6	0.2%	0.1%	149.8	718.0	63.3%	56.1%	$ -	No City Cost Impact
11	Municipal Services Building Expansion Phase 2 Completion [6]	2031	Citywide	0.0	0.0	0.0%	0.0%	149.8	718.0	63.3%	56.1%	$ 328,571	Prorate cost by 1/7
12	Citywide Plan Update Completed	2031	Citywide	0.0	0.0	0.0%	0.0%	149.8	718.0	63.3%	56.1%	$ 25,000	Prorate cost by 1/8
13	Redevelopment Impacts [5]	2030-2050	66	0.9	1.3	0.4%	0.1%	150.7	719.3	63.7%	56.2%	$ -	No City Cost Impact
14	Kensington Pond Enhanced Phosphorus Treatment Augmentation [7]	2054-2058	911	11.0	181.0	4.6%	14.1%	161.7	900.3	68.3%	70.3%	$ 2,572,840	2021 capital cost inflated 3%/year for 35 years
15	Wet Detention Pond Augmented Floc Dredge	2059	Citywide	0.0	0.0	0.0%	0.0%	161.7	900.3	68.3%	70.3%	$ 703,500	2021 capital cost inflated 3%/year for 35 years
16	Redevelopment Impacts [5]	2050-2140	297	4.1	5.8	1.7%	0.5%	165.9	906.1	70.1%	70.8%	$ -	No City Cost Impact
17	Apply Internal Trade of TSS and TP Credit to Lower Fox River (DS) (80% of excess to be conservative)	2140	N/A	-19.3	-22.4	-8.1%	-1.8%	146.6	883.7	61.9%	69.0%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
												$ 4,392,712	**Total Cost**

Notes:

[1] Reductions included in current With Controls reductions since model development is not anticipated to make significant changes to current TSS or TP reductions but will confirm attainment of reached goals and amount eligible for internal trading to downstream reachsheds.

[2] Stormwater Utility GIS/Billing Database Update needed to confirm fair and equitable rates and ability to fund stormwater quality and other program costs.

[3] Leaf management implementation is of minimal quantifiable load reduction impact due to extent of regional ponds, current reduction level and WDNR guidance, and inability to directly model in series with other practices. Practice is addressing all land uses, not just MDRNA area as currently provided credit through WDNR guidance.

[4] Municipal Services Building Expansion Required to store and maintain expanded leaf management equipment since equipment is additive, not replacing old equipment.

[5] Redevelopment impacts are estimate based on potential land available for redevelopment, redevelopment rate of 20 acres per year, and even distribution of redevelopment Citywide - actual redevelopment will be measured with each Citywide Plan update.

[6] Municipal Services Building Expansion Required to store and maintain expanded street cleaning equipment since equipment is additive, not replacing old equipment.

[7] Assumes Kensington Pond TSS reduction improve from 79.7% to 90% and TP reduction improve from 60% to 85% with enhanced TP treatment augmentation.

Note: Costs prorated by 1/7 are spread over 7 of 8 reachsheds and do not include a cost share to Bear Creek reachshed due to the current very low development of that reachshed.

TMDL COMPLIANCE SUMMARY AND IMPLEMENTATION PLAN **MUD CREEK** **Lower Fox TMDL** Assessment Date: December 2021

	TSS tons/yr	TP lbs/yr	TSS %	TP %
No Controls Loads (per 2020-2021 Citywide Stormwater Plan)	164.7	868.0		
TMDL REDUCTION TARGETS	71	418	42.8%	48.2%
With Controls Current Load Reductions (per 2020-2021 Citywide Stormwater Plan)	47.1	180.1	28.6%	20.8%
Remaining Loads (per 2020-2021 Citywide Stormwater Plan)	117.7	687.8		
Reduction Requirements Achieved?	NO	NO		
Tradeable Loads (positive value) or remaining gap (negative value)	-23.5	-238.2		

				INCREMENTAL MEASURE TREATMENT				CUMULATIVE REACHSHED REDUCTION				City Cost Planning Information	
BENCHMARK	DESCRIPTION OF MEASURE	IMPLEMENTATION DATE	IMPACTED AREA (ac)	TSS Tons/yr	TP lbs/yr	TSS %	TP %	TSS Tons/yr	TP lbs/yr	TSS %	TP %		
1	Implement Ordinance Change	2022	Citywide	0.0	0.0	0.0%	0.0%	47.1	180.1	28.6%	20.8%	$ -	No City Cost Impact
2	RGL Warehouse/Lagoons Pond Environmental Investigation	2023	232	0.0	0.0	0.0%	0.0%	47.1	180.1	28.6%	20.8%	$ 85,000	
3	RGL Warehouse/Lagoons Pond Preliminary Engineering	2024	232	0.0	0.0	0.0%	0.0%	47.1	180.1	28.6%	20.8%	$ 150,000	
4	RGL Warehouse/Lagoons Pond Land Acquisition and Permitting	2024	232	0.0	0.0	0.0%	0.0%	47.1	180.1	28.6%	20.8%	$ 3,185,000	
5	RGL Warehouse/Lagoons Pond Final Design	2025	232	0.0	0.0	0.0%	0.0%	47.1	180.1	28.6%	20.8%	$ 225,000	
6	Complete Multi-Family SWU GIS/Billing Database Update [1]	2026	Citywide	0.0	0.0	0.0%	0.0%	47.1	180.1	28.6%	20.8%	$ 14,286	Prorate cost by 1/7
7	Complete Leaf Management Implementation [2]	2026	15	0.0	0.6	0.0%	0.1%	47.1	180.7	28.6%	20.8%	$ 313,929	Prorate cost by 1/7 (Total Capital Cost 2021-2025, includes CEA Payments)
8	Municipal Services Building Expansion Phase 1 Completion [3]	2026	Citywide	0.0	0.0	0.0%	0.0%	47.1	180.7	28.6%	20.8%	$ 285,714	Prorate cost by 1/7
9	RGL Warehouse/Lagoons Pond Construction Complete (~ 80% of reductions to be conservative)	2027	232	46.0	129.7	27.9%	14.9%	93.0	310.4	56.5%	35.8%	$ 4,415,790	2021 capital cost inflated 3%/year for 5 years
10	Complete Commercial/Industrial SWU GIS/Billing Database Update [1]	2028	Citywide	0.0	0.0	0.0%	0.0%	93.0	310.4	56.5%	35.8%	$ 14,286	Prorate cost by 1/7
11	Detailed Leaf Collection Analysis	2028	Citywide	0.0	0.0	0.0%	0.0%	93.0	310.4	56.5%	35.8%	$ 5,000	Prorate cost by 1/7
12	Apply Internal Trade of TSS Credit to Lower Fox River (US) (80% of excess to be conservative)	2029	N/A	-19.7	0.0	-12.0%	0.0%	73.3	310.4	44.5%	35.8%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
13	Expand Street Cleaning Equipment to all High Efficiency	2030	1055	1.6	7.2	1.0%	0.8%	74.9	317.6	45.4%	36.6%	$ 115,586	Prorate cost by 1/7 (2021 capital cost inflated 3%/year for 9 years)
14	Redevelopment Impacts [4]	2020-2030	22	2.6	6.4	1.6%	0.7%	77.5	323.9	47.0%	37.3%	$ -	No City Cost Impact
15	Municipal Services Building Expansion Phase 2 Completion [5]	2031	Citywide	0.0	0.0	0.0%	0.0%	77.5	323.9	47.0%	37.3%	$ 328,571	Prorate cost by 1/7
16	Citywide Plan Update Completed	2031	Citywide	0.0	0.0	0.0%	0.0%	77.5	323.9	47.0%	37.3%	$ 25,000	Prorate cost by 1/8
17	Hillock Court Wet Detention Pond	2034-2038	76	7.5	36.5	4.6%	4.2%	85.0	360.4	51.6%	41.5%	$ 5,425,891	2021 capital cost inflated 3%/year for 15 years
18	HSDs [6]	2022-2140	37.0	0.7	1.1	0.4%	0.1%	85.7	361.6	52.0%	41.7%	$ -	Cost not estimated due to inability to schedule improvements
19	Redevelopment Impacts [4]	2030-2140	242	28.8	69.9	17.5%	8.0%	114.5	431.4	69.5%	49.7%	$ -	No City Cost Impact
20	Apply Internal Trade of TSS Credit to Lower Fox River (DS) (80% of excess to be conservative)	2140	N/A	-35.2	-10.5	-21.3%	-1.2%	79.3	421.0	48.1%	48.5%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
												$ 14,594,052	**Total Cost**

Notes:

[1] Stormwater Utility GIS/Billing Database Update needed to confirm fair and equitable rates and ability to fund stormwater quality and other program costs.

[2] Leaf management implementation is of minimal quantifiable load reduction impact due to extent of regional ponds, current reduction level and WDNR guidance, and inability to directly model in series with other practices. Practice is addressing all land uses, not just MDRNA area as currently provided credit through WDNR guidance.

[3] Municipal Services Building Expansion Required to store and maintain expanded leaf management equipment since equipment is additive, not replacing old equipment.

[4] Redevelopment impacts are estimate based on potential land available for redevelopment, redevelopment rate of 20 acres per year, and even distribution of redevelopment Citywide - actual redevelopment will be measured with each Citywide Plan update.

[5] Municipal Services Building Expansion Required to store and maintain expanded street cleaning equipment since equipment is additive, not replacing old equipment.

[6] HSDs are implemented during road reconstruction projects which are scheduled on a 5-year capital planning basis, therefore, the potential impact of HSD implementation is added to the end of this plan.

Note: Costs prorated by 1/7 are spread over 7 of 8 reachsheds and do not include a cost share to Bear Creek reachshed due to the current very low development of that reachshed.

TMDL COMPLIANCE SUMMARY AND IMPLEMENTATION PLAN **LOWER FOX RIVER MAINSTEM (US)** Assessment Date: December 2021

Lower Fox TMDL

	TSS tons/yr	TP lbs/yr	TSS %	TP %
No Controls Loads (per 2020-2021 Citywide Stormwater Plan)	229.1	1390.5		
TMDL REDUCTION TARGETS	165	563	72.2%	40.5%
With Controls Current Load Reductions (per 2020-2021 Citywide Stormwater Plan)	57.9	213.9	25.3%	15.4%
Remaining Loads (per 2020-2021 Citywide Stormwater Plan)	171.2	1176.6		
Reduction Requirements Achieved?	NO	NO		
Tradeable Loads (positive value) or remaining gap (negative value)	-107.5	-349.3		

				INCREMENTAL MEASURE TREATMENT				CUMULATIVE REACHSHED REDUCTION				City Cost Planning Information	
BENCHMARK	DESCRIPTION OF MEASURE	IMPLEMENTATION DATE	IMPACTED AREA (ac)	TSS Tons/yr	TP lbs/yr	TSS %	TP %	TSS Tons/yr	TP lbs/yr	TSS %	TP %		
1	Apply Internal Trade of TSS Credit from Lake Winnebago (80% of excess to be conservative)	2023	N/A	0.9	0.0	0.4%	0.0%	58.8	213.9	25.7%	15.4%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
2	Implement Ordinance Change	2023	Citywide	0.0	0.0	0.0%	0.0%	58.8	213.9	25.7%	15.4%	$ -	No City Cost Impact
3	Complete Multi-Family SWU GIS/Billing Database Update [1]	2026	Citywide	0.0	0.0	0.0%	0.0%	58.8	213.9	25.7%	15.4%	$ 14,286	Prorate cost by 1/7
4	Complete Leaf Management Implementation [2]	2026	112	0.0	4.1	0.0%	0.3%	58.8	217.9	25.7%	15.7%	$ 313,929	Prorate cost by 1/7 (Total Capital Cost 2021-2025, includes CEA Payments)
5	Municipal Services Building Expansion Phase 1 Completion [3]	2026	Citywide	0.0	0.0	0.0%	0.0%	58.8	217.9	25.7%	15.7%	$ 285,714	Prorate cost by 1/7
6	Complete Commercial/Industrial SWU GIS/Billing Database Update [1]	2028	Citywide	0.0	0.0	0.0%	0.0%	58.8	217.9	25.7%	15.7%	$ 14,286	Prorate cost by 1/7
7	Detailed Leaf Collection Analysis	2028	Citywide	0.0	0.0	0.0%	0.0%	58.8	217.9	25.7%	15.7%	$ 5,000	Prorate cost by 1/7
8	Apply Internal Trade of TSS Credit from Mud Creek (80% of excess to be conservative)	2029	N/A	19.7	0.0	8.6%	0.0%	78.6	217.9	34.3%	15.7%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
9	Expand Street Cleaning Equipment to all High Efficiency	2030	1664	1.0	15.6	0.5%	1.1%	79.6	233.6	34.8%	16.8%	$ 115,586	Prorate cost by 1/7 (2021 capital cost inflated 3%/year for 9 years)
10	Redevelopment Impacts [5]	2020-2030	20	2.9	8.7	1.3%	0.6%	82.6	242.3	36.0%	17.4%	$ -	No City Cost Impact
11	Municipal Services Building Expansion Phase 2 Completion [4]	2031	Citywide	0.0	0.0	0.0%	0.0%	82.6	242.3	36.0%	17.4%	$ 328,571	Prorate cost by 1/7
12	Citywide Plan Update Completed	2031	Citywide	0.0	0.0	0.0%	0.0%	82.6	242.3	36.0%	17.4%	$ 25,000	Prorate cost by 1/8
13	Riverview Gardens Wet Detention Pond	2029-2033	198	13.4	65.5	5.8%	4.7%	96.0	307.8	41.9%	22.1%	$ 1,172,371	2021 capital cost inflated 3%/year for 10 years
14	Redevelopment Impacts [5]	2030-2040	20	2.9	8.7	1.3%	0.6%	98.9	316.5	43.1%	22.8%	$ -	No City Cost Impact
15	Pierce Park Wet Detention Pond	2039-2043	343	24.2	93.5	10.6%	6.7%	123.1	410.0	53.7%	29.5%	$ 2,396,381	2021 capital cost inflated 3%/year for 20 years
16	Redevelopment Impacts [5]	2040-2060	40	5.8	17.4	2.5%	1.3%	128.9	427.4	56.3%	30.7%	$ -	No City Cost Impact
17	Pierce Park Pond Enhanced Phosphorus Treatment Augmentation [6]	2064-2068	343	24.2	146	10.6%	10.5%	153.1	573.4	66.8%	41.2%	$ 3,457,883	2021 capital cost inflated 3%/year for 45 years
18	HSDs [7]	2022-2140	95	1.4	3.8	0.6%	0.3%	154.5	577.1	67.4%	41.5%	$ -	Cost not estimated due to inability to schedule improvements
19	Redevelopment Impacts [5]	2060-2140	160	23.3	69.6	10.2%	5.0%	177.8	646.7	77.6%	46.5%	$ -	No City Cost Impact
20	Apply Internal Trade of TSS and TP Credit to Lower Fox River (DS) (80% of excess to be conservative)	2140	N/A	-9.9	-66.9	-4.3%	-4.8%	167.9	579.9	73.3%	41.7%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
												$ 8,136,507	**Total Cost**

Notes:

[1] Stormwater Utility GIS/Billing Database Update needed to confirm fair and equitable rates and ability to fund stormwater quality and other program costs.

[2] Leaf management implementation is of minimal quantifiable load reduction impact due to extent of regional ponds, current reduction level and WDNR guidance, and inability to directly model in series with other practices. Practice is addressing all land uses, not just MDRNA area as currently provided credit through WDNR guidance.

[3] Municipal Services Building Expansion Required to store and maintain expanded leaf management equipment since equipment is additive, not replacing old equipment.

[4] Municipal Services Building Expansion Required to store and maintain expanded street cleaning equipment since equipment is additive, not replacing old equipment.

[5] Redevelopment impacts are estimate based on potential land available for redevelopment, redevelopment rate of 20 acres per year, and even distribution of redevelopment Citywide - actual redevelopment will be measured with each Citywide Plan update.

[6] Assumes Pierce Park TSS reduction improve from 45% to 90% and TP reduction improve from 33% to 85% with enhanced TP treatment augmentation.

[7] HSDs are implemented during road reconstruction projects which are scheduled on a 5-year capital planning basis, therefore, the potential impact of HSD implementation is added to the end of this plan.

Note: Costs prorated by 1/7 are spread over 7 of 8 reachsheds and do not include a cost share to Bear Creek reachshed due to the current very low development of that reachshed.

TMDL COMPLIANCE SUMMARY AND IMPLEMENTATION PLAN **LOWER FOX RIVER MAINSTEM (DS)** Assessment Date: December 2021

Lower Fox TMDL

	TSS tons/yr	TP lbs/yr	TSS %	TP %
No Controls Loads (per 2020-2021 Citywide Stormwater Plan)	830.6	5015.6		
TMDL REDUCTION TARGETS	600	2031	72.2%	40.5%
With Controls Current Load Reductions (per 2020-2021 Citywide Stormwater Plan)	298.7	1179.9	36.0%	23.5%
Remaining Loads (per 2020-2021 Citywide Stormwater Plan)	532.0	3835.8		
Reduction Requirements Achieved?	NO	NO		
Tradeable Loads (positive value) or remaining gap (negative value)	-301.0	-851.5		

				INCREMENTAL MEASURE TREATMENT				CUMULATIVE REACHSHED REDUCTION				City Cost Planning Information	
BENCHMARK	DESCRIPTION OF MEASURE	IMPLEMENTATION DATE	IMPACTED AREA (ac)	TSS Tons/yr	TP lbs/yr	TSS %	TP %	TSS Tons/yr	TP lbs/yr	TSS %	TP %		
1	Complete Regional Practice WinSLAMM Models (5) [1]	2022	N/A	0.0	0.0	0.0%	0.0%	298.7	1,179.9	36.0%	23.5%	$ 15,000	Prorate cost by # of models / 21
2	Implement Ordinance Change	2023	Citywide	0.0	0.0	0.0%	0.0%	298.7	1,179.9	36.0%	23.5%	$ -	No City Cost Impact
3	Apply Internal TSS and TP Trade from Apple Creek and TSS from Garners Creek Credits (80% of excess to be conservative)	2023	N/A	77.5	141.6	9.3%	2.8%	376.1	1,321.5	45.3%	26.3%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
4	Complete Multi-Family SWU GIS/Billing Database Update [2]	2026	Citywide	0.0	0.0	0.0%	0.0%	376.1	1,321.5	45.3%	26.3%	$ 14,286	Prorate cost by 1/7
5	Complete Leaf Management Implementation [3]	2026	450	0.0	18.1	0.0%	0.4%	376.1	1,339.6	45.3%	26.7%	$ 313,929	Prorate cost by 1/7 (Total Capital Cost 2021-2025, includes CEA Payments)
6	Municipal Services Building Expansion Phase 1 Completion [4]	2026	Citywide	0.0	0.0	0.0%	0.0%	376.1	1,339.6	45.3%	26.7%	$ 285,714	Prorate cost by 1/7
7	Complete Commercial/Industrial SWU GIS/Billing Database Update [2]	2028	Citywide	0.0	0.0	0.0%	0.0%	376.1	1,339.6	45.3%	26.7%	$ 14,286	Prorate cost by 1/7
8	Detailed Leaf Collection Analysis	2028	Citywide	0.0	0.0	0.0%	0.0%	376.1	1,339.6	45.3%	26.7%	$ 5,000	Prorate cost by 1/7
9	Expand Street Cleaning Equipment to all High Efficiency	2030	5966	8.1	51.4	1.0%	1.0%	384.3	1,391.1	46.3%	27.7%	$ 115,586	Prorate cost by 1/7 (2021 capital cost inflated 3%/year for 9 years)
10	Redevelopment Impacts [5]	2020-2030	79	9.0	25.7	1.1%	0.5%	393.2	1,416.7	47.3%	28.2%	$ -	No City Cost Impact
11	Municipal Services Building Expansion Phase 2 Completion [6]	2031	Citywide	0.0	0.0	0.0%	0.0%	393.2	1,416.7	47.3%	28.2%	$ 328,571	Prorate cost by 1/7
12	Citywide Plan Update Completed	2031	Citywide	0.0	0.0	0.0%	0.0%	393.2	1,416.7	47.3%	28.2%	$ 25,000	Prorate cost by 1/8
13	Redevelopment Impacts [5]	2030-2040	79	9.0	25.7	1.1%	0.5%	402.2	1,442.4	48.4%	28.8%	$ -	No City Cost Impact
14	Wisconsin Avenue Wet Detention Pond	2044-2048	102	13.6	56.7	1.6%	1.1%	415.8	1,499.1	50.1%	29.9%	$ 4,626,484	2021 capital cost inflated 3%/year for 25 years
15	Redevelopment Impacts [5]	2040-2050	79	9.0	25.7	1.1%	0.5%	424.8	1,524.7	51.1%	30.4%	$ -	No City Cost Impact
16	Winslow Avenue Wet Detention Pond	2049-2053	153	25.0	75.3	3.0%	1.5%	449.8	1,600.0	54.1%	31.9%	$ 6,164,580	2021 capital cost inflated 3%/year for 30 years
17	Redevelopment Impacts [5]	2050-2060	79	9.0	25.7	1.1%	0.5%	458.7	1,625.7	55.2%	32.4%	$ -	No City Cost Impact
18	Leona Street Pond Enhanced Phosphorus Treatment Augmentation [7]	2059-2063	196	2.8	44.0	0.3%	0.9%	461.5	1,669.7	55.6%	33.3%	$ 2,982,447	2021 capital cost inflated 3%/year for 40 years
19	Redevelopment Impacts [5]	2060-2070	79	9.0	25.7	1.1%	0.5%	470.5	1,695.3	56.6%	33.8%	$ -	No City Cost Impact
20	MPPS Pond Enhanced Phosphorus Treatment Augmentation [8]	2069-2073	529	10.5	154.0	1.3%	3.1%	481.0	1,849.3	57.9%	36.9%	$ 4,008,291	2021 capital cost inflated 3%/year for 50 years
21	MPPNE Pond Enhanced Phosphorus Treatment Augmentation [9]	2074-2078	220	3.2	58.0	0.4%	1.2%	484.1	1,907.3	58.3%	38.0%	$ 4,646,473	2021 capital cost inflated 3%/year for 55 years
22	Redevelopment Impacts [5]	2070-2080	79	9.0	25.7	1.1%	0.5%	493.1	1,933.0	59.4%	38.5%	$ -	No City Cost Impact
23	Reid GCS Pond Enhanced Phosphorus Treatment Augmentation [10]	2079-2083	225	1.7	52.0	0.2%	1.0%	494.8	1,985.0	59.6%	39.6%	$ 5,387,056	2021 capital cost inflated 3%/year for 60 years
24	HSDs [11]	2022-2140	581	8.4	16.5	1.0%	0.3%	503.2	2,001.5	60.6%	39.9%	$ -	Cost not estimated due to inability to schedule improvements
25	Redevelopment Impacts [5]	2080-2140	474	53.8	153.9	6.5%	3.1%	557.0	2,155.4	67.1%	43.0%	$ -	No City Cost Impact
26	Apply Internal TSS and TP Trade from Apple Creek, Garners Creek, Mud Creek and Lower Fox River (US) and TSS from Lake Winnebago Credits (80% of excess to be conservative)	2140	N/A	89.1	167.3	10.7%	3.3%	646.2	2,322.7	77.8%	46.3%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR

$ 28,937,701 Total Cost

Note: Costs prorated by 1/7 are spread over 7 of 8 reachsheds and do not include a cost share to Bear Creek reachshed due to the current very low development of that reachshed.

Notes:

[1] Reductions included in current With Controls reductions since model development is not anticipated to make significant changes to current TSS or TP reductions but will confirm attainment of reached goals and amount eligible for internal trading to downstream reachsheds.

[2] Stormwater Utility GIS/Billing Database Update needed to confirm fair and equitable rates and ability to fund stormwater quality and other program costs.

[3] Leaf management implementation is of minimal quantifiable load reduction impact due to extent of regional ponds, current reduction level and WDNR guidance, and inability to directly model in series with other practices. Practice is addressing all land uses, not just MDRNA area as currently provided credit through WDNR guidance.

[4] Municipal Services Building Expansion Required to store and maintain expanded leaf management equipment since equipment is additive, not replacing old equipment.

[5] Redevelopment impacts are estimate based on potential land available for redevelopment, redevelopment rate of 20 acres per year, and even distribution of redevelopment Citywide - actual redevelopment will be measured with each Citywide Plan update.

[6] Municipal Services Building Expansion Required to store and maintain expanded street cleaning equipment since equipment is additive, not replacing old equipment.

[7] Assumes Leona Street Pond TSS reduction improve from 78.8% to 90% and TP reduction improve from 58.5% to 85% with enhanced TP treatment augmentation.

[8] Assumes MPPS Pond TSS reduction improve from 76% to 90% and TP reduction improve from 51.3% to 85% with enhanced TP treatment augmentation.

[9] Assumes MPPNE Pond TSS reduction improve from 77% to 90% and TP reduction improve from 52% to 85% with enhanced TP treatment augmentation.

[10] Assumes Reid GCS Pond TSS reduction improve from 83% to 90% and TP reduction improve from 56% to 85% with enhanced TP treatment augmentation.

[11] HSDs are implemented during road reconstruction projects which are scheduled on a 5-year capital planning basis, therefore, the potential impact of HSD implementation is added to the end of this plan.

TMDL COMPLIANCE SUMMARY AND IMPLEMENTATION PLAN **BEAR CREEK**
Upper Fox/Wolf TMDL

Assessment Date: December 2021

	TSS tons/yr	TP lbs/yr	TSS %	TP %
No Controls Loads (per 2020-2021 Citywide Stormwater Plan)	4.6	46.9		
TMDL REDUCTION TARGETS	4	40	84.0%	85.6%
With Controls Current Load Reductions (per 2020-2021 Citywide Stormwater Plan)	1.2	5.4	25.8%	11.4%
Remaining Loads (per 2020-2021 Citywide Stormwater Plan)	3.4	41.5		
Reduction Requirements Achieved?	NO	NO		
Tradeable Loads (positive value) or remaining gap (negative value)	-2.7	-34.8		

				INCREMENTAL MEASURE TREATMENT				CUMULATIVE REACHSHED REDUCTION				City Cost Planning Information		
BENCHMARK	DESCRIPTION OF MEASURE	IMPLEMENTATION DATE	IMPACTED AREA (ac)	TSS tons/yr	TP lbs/yr	TSS %	TP %	TSS tons/yr	TP lbs/yr	TSS % [1]	TP % [1]			
1	Implement Ordinance Change [1]	2023	Citywide	0.0	0.0	0.0%	0.0%	1.2	5.4	25.8%	11.4%	$	-	No City Cost Impact
2	Citywide Plan Update Completed [1]	2031	Citywide	0.0	0.0	0.0%	0.0%	1.2	5.4	25.8%	11.4%	$	25,000	Prorate cost by 1/8
												$	**25,000**	**Total Cost**

Notes:

[1] The Bear Creek reachshed within City limits includes the City landfill, small areas of development along Spartan Drive, open/natural space, and mostly agricultural land areas that were excluded from the 2021 plan. The next Citywide plan update will evaluate the impact of new development and potentially assess grassed swales and filter strips at the landfill. No redevelopment is currently identified in Bear Creek. As excluded areas of the Bear Creek reachshed within City limits develop, the collective treatment effectiveness associated with new development will show progress towards meeting the TMDL TSS and TP reduction goals. However, based on the current state of development, available land and other factors, it may be challenging to attain the TMDL TSS goal, and there is no (cost-effective) technology currently available to achieve the TMDL TP goal. The 2021 Citywide Plan assessment of Bear Creek has met the requirements of the WPDES Permit.

TMDL COMPLIANCE SUMMARY AND IMPLEMENTATION PLAN **LAKE WINNEBAGO** Assessment Date: December 2021

Upper Fox/Wolf TMDL

	TSS tons/yr	TP lbs/yr	TSS %	TP %
No Controls Loads (per 2020-2021 Citywide Stormwater Plan)	47.2	346.6		
TMDL REDUCTION TARGETS	9	297	20.0%	85.6%
With Controls Current Load Reductions (per 2020-2021 Citywide Stormwater Plan)	10.6	52.9	22.4%	15.3%
Remaining Loads (per 2020-2021 Citywide Stormwater Plan)	36.6	293.6		
Reduction Requirements Achieved?	YES	NO		
Tradeable Loads (positive value) or remaining gap (negative value)	1.1	-243.7		

				INCREMENTAL MEASURE TREATMENT				CUMULATIVE REACHSHED REDUCTION				City Cost Planning Information	
BENCHMARK	DESCRIPTION OF MEASURE	IMPLEMENTATION DATE	IMPACTED AREA (ac)	TSS tons/yr	TP lbs/yr	TSS %	TP %	TSS tons/yr	TP lbs/yr	TSS %	TP % [7]		
1	Implement Ordinance Change	2023	Citywide	0.0	0.0	0.0%	0.0%	10.6	52.9	22.4%	15.3%	$ -	No City Cost Impact
2	Apply Internal Trade of TSS Credit to Lower Fox River (US) (80% of excess to be conservative)	2023	N/A	-0.9	0.0	-1.9%	0.0%	9.7	52.9	20.5%	15.3%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR
3	Complete Multi-Family SWU GIS/Billing Database Update [1]	2026	N/A	0.0	0.0	0.0%	0.0%	9.7	52.9	20.5%	15.3%	$ 14,286	Prorate cost by 1/7
4	Complete Leaf Management Implementation [2]	2026	169	0.0	7.6	0.0%	2.2%	9.7	60.5	20.5%	17.5%	$ 313,929	Prorate cost by 1/7 (Total Capital Cost 2021-2025, includes CEA Payments)
5	Municipal Services Building Expansion Phase 1 Completion [3]	2026	Citywide	0.0	0.0	0.0%	0.0%	9.7	60.5	20.5%	17.5%	$ 285,714	Prorate cost by 1/7
6	Complete Commercial/Industrial SWU GIS/Billing Database Update [1]	2028	Citywide	0.0	0.0	0.0%	0.0%	9.7	60.5	20.5%	17.5%	$ 14,286	Prorate cost by 1/7
7	Detailed Leaf Collection Analysis	2028	Citywide	0.0	0.0	0.0%	0.0%	9.7	60.5	20.5%	17.5%	$ 5,000	Prorate cost by 1/7
8	Expand Street Cleaning Equipment to all High Efficiency	2030	427	1.6	7.3	3.4%	2.1%	11.2	67.8	23.8%	19.6%	$ 115,586	Prorate cost by 1/7 (2021 capital cost inflated 3%/year for 9 years)
9	Redevelopment Impacts [4]	2020-2030	2	0.2	0.8	0.5%	0.2%	11.5	68.7	24.3%	19.8%	$ -	No City Cost Impact
10	Municipal Services Building Expansion Phase 2 Completion [5]	2031	Citywide	0.0	0.0	0.0%	0.0%	11.5	68.7	24.3%	19.8%	$ 328,571	Prorate cost by 1/7
11	Citywide Plan Update Completed	2031	Citywide	0.0	0.0	0.0%	0.0%	11.5	68.7	24.3%	19.8%	$ 25,000	Prorate cost by 1/8
12	HSDs [6]	2022-2140	43	0.5	2.5	1.1%	0.7%	12.0	71.1	25.5%	20.5%	$ -	Cost not estimated due to inability to schedule improvements
13	Redevelopment Impacts [4]	2030-2140	22	2.5	9.0	5.2%	2.6%	14.5	80.1	30.7%	23.1%	$ -	No City Cost Impact
14	Apply Internal Trade of TSS Credit to Lower Fox River (DS) (80% of excess to be conservative) [7]	2140	N/A	-4.0	0.0	-8.5%	0.0%	10.4	80.1	22.1%	23.1%	$ 2,500	Could be a minimal cost to update tables and coordinate with WDNR

$ 1,107,371

Note: Costs prorated by 1/7 are spread over 7 of 8 reachsheds and do not include a cost share to Bear Creek reachshed due to the current very low development of that reachshed.

Notes:

[1] Stormwater Utility GIS/Billing Database Update needed to confirm fair and equitable rates and ability to fund stormwater quality and other program costs.

[2] Leaf management implementation is of minimal quantifiable load reduction impact due to extent of regional ponds, current reduction level and WDNR guidance, and inability to directly model in series with other practices. Practice is addressing all land uses, not just MDRNA area as currently provided credit through WDNR guidance.

[3] Municipal Services Building Expansion Required to store and maintain expanded leaf management equipment since equipment is additive, not replacing old equipment.

[4] Redevelopment impacts are estimate based on potential land available for redevelopment, redevelopment rate of 20 acres per year, and even distribution of redevelopment Citywide - actual redevelopment will be measured with each Citywide Plan update.

[5] Municipal Services Building Expansion Required to store and maintain expanded street cleaning equipment since equipment is additive, not replacing old equipment.

[6] HSDs are implemented during road reconstruction projects which are scheduled on a 5-year capital planning basis, therefore, the potential impact of HSD implementation is added to the end of this plan.

[7] Based on the current state of development, available land and other factors, there is no (cost-effective) technology currently available to achieve the TMDL TP goal. The 2021 Citywide Plan assessment of Lake Winnebago has met the requirements of the WPDES Permit.

Appendix E: WPDES General Permit

WISCONSIN
DEPT. OF NATURAL RESOURCES

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

GENERAL PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM
WPDES PERMIT NO. WI-S050075-3

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

MUNICIPAL SEPARATE STORM SEWER SYSTEM

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

With written authorization by the Department, this permit will be used to cover a municipal separate storm sewer system initially covered under a previous version of a municipal separate storm sewer system general permit. The **Start Date** of coverage under this permit is the date of the Department letter sent to the municipality authorizing coverage under this permit. The Department is required to charge an annual permit fee to owners and operators authorized to discharge under this permit in accordance with s. 283.33(9), Wis. Stats., and s. NR 216.08, Wis. Adm. Code.

State of Wisconsin Department of Natural Resources
For the Secretary

By _____ 5/1/19

Michael C. Thompson, Director
Bureau of Watershed Management
External Services Division

Date Permit Signed

PERMIT EFFECTIVE DATE: May 1, 2019 **EXPIRATION DATE:** April 30, 2024

TABLE OF CONTENTS

1. APPLICABILITY CRITERIA

1.1 Permitted Area

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

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

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

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

1.2 Authorized Discharges

This permit authorizes storm water point source discharges from the MS4 to waters of the state in the permitted area. This permit also authorizes the discharge of storm water co-mingled with flows contributed by process wastewater, non-process wastewater, and storm water associated with industrial activity, provided the discharges are regulated by other WPDES permits or are discharges which are not considered illicit discharges pursuant to section 2.3.1 of this permit.

1.3 Water Quality Standards

1.3.1 This permit specifies the conditions under which storm water may be discharged to waters of the state for the purpose of achieving water quality standards contained in chs. NR 102 through 105, NR 140, and NR 207, Wis. Adm. Code. For the term of this permit, compliance with water quality standards will be addressed by adherence to the requirements in this permit.

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

1.4 Outstanding and Exceptional Resource Waters

1.4.1 The permittee shall determine whether any part of its MS4 discharges to an outstanding resource water (ORW) or exceptional resource water (ERW). ORWs and ERWs are listed in ss. NR 102.10 and 102.11, Wis. Adm. Code.

Note: An unofficial list of ORWs and ERWs may be found on the Department's Internet site at: https://dnr.wi.gov/topic/SurfaceWater/orwerw.html

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

1.4.3 If the permittee has an existing MS4 discharge to an ORW, it may increase the discharge of pollutants, either at the existing point of discharge or a new location, provided all of the following are met:

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

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

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

1.5 Impaired Waterbodies and Total Maximum Daily Load Requirements

1.5.1 By March 31 of each odd-numbered year, the permittee shall determine whether any part of its MS4 discharges to an impaired waterbody listed in accordance with section 303(d)(1) of the federal Clean Water Act, 33 USC § 1313(d)(1)(C), and the implementing regulation of the US Environmental Protection Agency, 40 CFR § 130.7(c)(1). For a permittee that determines that any part of its MS4 does discharge to a listed impaired waterbody but for which there is no United States Environmental Protection Agency (USEPA) approved Total Maximum Daily Load (TMDL) for the pollutant of concern, the permittee shall include a written section in its storm water management program that discusses the management practices and control measures it will implement as part of its program to reduce, with the goal of eliminating, the discharge of pollutants of concern that contribute to the impairment of the waterbody. This section of the permittee's program shall specifically identify control measures and practices that will collectively be used to try to eliminate the MS4's discharge of pollutants of concern that contribute to the impairment of the waterbody and explain why these control measures and practices were chosen as opposed to other alternatives.

Note: Every two years, the Department updates and publishes a list of waters considered impaired under the Clean Water Act. The list is updated in even-numbered years. A list of Wisconsin impaired waterbodies may be found on the Department's Internet site at: http://dnr.wi.gov/topic/impairedwaters/

1.5.2 For a permittee with an MS4 discharge of a pollutant of concern to a waterbody subject to an USEPA approved TMDL under which the permittee is assigned a Wasteload Allocation (WLA), the permittee shall meet the following requirements, in addition to the minimum control measures described within Section 2 of the permit:

a. Appendix A provides the permit conditions for permittees subject to the Rock River Basin TMDL, Lower Fox River Basin and Lower Green Bay TMDL, Lake St. Croix Nutrient

TMDL, Red Cedar River (Tainter Lake, Menomin Lake) TMDL, or Beaver Dam Lake TMDL. For a permittee subject to any of these TMDLs, the permittee shall comply with the provisions in Appendix A: MS4 Permittees Subject to a TMDL Approved Prior to May 1, 2014 including Applicable Updates.

b. Appendix B provides the permit conditions for permittees subject to the Milwaukee River Basin TMDL. For a permittee subject to this TMDL, the permittee shall comply with the provisions in Appendix B: MS4 Permittees Subject to Milwaukee River Basin TMDL.

c. Appendix C provides the permit conditions for permittees subject to the Wisconsin River Basin TMDL or any other TMDL approved on or after May 1, 2019. For a permittee subject to any of these TMDLs, the permittee shall comply with the provisions in Appendix C: MS4 Permittees Subject to the Wisconsin River Basin TMDL or a TMDL Approved After May 1, 2019.

Note: The reports for Department and USEPA approved TMDLs are available from the Department's Internet site at: https://dnr.wi.gov/topic/TMDLs/tmdlreports.html

1.5.3 After the effective date of this permit, the permittee may not establish a new MS4 discharge of a pollutant of concern to an impaired waterbody or increase the discharge of a pollutant of concern to an impaired waterbody unless the new or increased discharge causes the receiving water to meet applicable water quality standards, or the USEPA has approved a TMDL for the impaired waterbody.

1.6 Wetlands

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

1.7 Endangered and Threatened Resources

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

1.8 Historic Property

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

1.9 General Storm Water Discharge Limitations

In accordance with s. NR 102.04, Wis. Adm. Code, practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all surface waters including the mixing zone meet the following conditions at all times and under all flow and water level conditions:

1.9.1 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.

1.9.2 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.

1.9.3 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.

1.9.4 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.

1.10 Obtaining Permit Coverage

1.10.1 The owner or operator of an MS4 covered under a previous version of an MS4 permit before the effective date of this permit shall be covered by this permit pursuant to written authorization by the Department.

Note: The Department will notify in writing the owner or operator of an MS4 covered under a previous version of an MS4 permit that this permit has been reissued and that the MS4 is covered under it. However, the City of Madison and the City of Milwaukee are not eligible for coverage under this permit.

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

1.11 Transfers

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

1.12 Exclusions

The following are excluded from coverage and are not authorized under this permit:

1.12.1 Combined Sewer and Sanitary Sewer Systems

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

1.12.2 Agricultural Facilities and Practices

Discharges from agricultural facilities and agricultural practices. "Agricultural facility" means a structure associated with an agricultural practice. "Agricultural practice" means beekeeping; commercial feedlots; dairying; egg production; floriculture; fish or fur farming; grazing; livestock raising; orchards; poultry raising; raising of grain, grass, mint and seed crops; raising of fruits, nuts and berries; sod farming; placing land in federal programs in return for payments in kind; owning land, at least 35 acres of which is enrolled in the conservation reserve program under 16 USC § 3831 to 3836; and vegetable raising.

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

1.12.4 Indian Country
Storm water discharges within Indian Country. The federal Clean Water Act requires owners and operators of storm water discharges within Indian Country in Wisconsin to obtain permit coverage directly from the USEPA.

1.12.5 Non-MS4 Discharge
Storm water discharges that do not enter an MS4.

1.13 Compliance with Permit Requirements
Compliance with the requirements contained in this permit including the applicable appendices shall not be contingent upon receiving financial assistance from the Department or any other public or private grant or loan program.

2. PERMIT CONDITIONS

This permit establishes the following measurable goals, with a compliance schedule in section 3, for the permittee to maintain compliance with the minimum control measures for their storm water management program described under sections 2.1 through 2.6. The following permit conditions apply to the permittee, unless the Department issues a written determination that a condition is not appropriate under the circumstances. The permittee shall have a written storm water management program that describes in detail how the permittee intends to comply with the permit requirements for each minimum control measure. The permittee shall begin implementing any updates to its storm water management programs no later than March 31, 2021.

2.1 Public Education and Outreach

The permittee shall maintain its public education and outreach program to increase the awareness of storm water pollution impacts on waters of the state and to encourage changes in public behavior to reduce such impacts. The permittee shall implement the following measurable goals:

2.1.1 Topics. The permittee shall address all eight topics in Table 1 at least once during the permit term. Permittees that are a County shall address a minimum of six topics each year. Permittees that are a City, Village, Town, or University with a population of 5,000 or more based on the latest U.S. Census shall address a minimum of six topics each year. Permittees that are a City, Village, Town, or University with a population less than 5,000 based on the latest U.S. Census shall address a minimum of four topics each year. Topics may be repeated as necessary. Permittees shall select from the topic areas in Table 1.

Note: Universities should average its enrolled student population plus employee population over a recent ten-year period to determine which requirement it should follow for permit compliance. Universities are also expected to undertake public education efforts that reach the entire student body and staff.

Table 1: Public Education and Outreach Topic Areas and Descriptions

#	Topic Area	Description
1	Illicit Discharge Detection and Elimination	Promote detection and elimination of illicit discharges and water quality impacts associated with such discharges from municipal separate storm sewer systems.
2	Household Hazardous Waste Disposal/Pet Waste Management/Vehicle Washing	Inform and educate the public about the proper management of materials that may cause storm water pollution from sources including automobiles, pet waste, household hazardous waste and household practices.
3	Yard Waste Management/Pesticide and Fertilizer Application	Promote beneficial onsite reuse of leaves and grass clippings and proper use of lawn and garden fertilizers and pesticides.
4	Stream and Shoreline Management	Promote the management of streambanks and shorelines by riparian landowners to minimize erosion and restore and enhance the ecological value of waterways.

5	Residential Infiltration	Promote infiltration of residential storm water runoff from rooftop downspouts, driveways and sidewalks.
6	Construction Sites and Post-Construction Storm Water Management	Inform and educate those responsible for the design, installation, and maintenance of construction site erosion control practices and storm water management facilities on how to design, install and maintain the practices.
7	Pollution Prevention	Identify businesses and activities that may pose a storm water contamination concern, and educate those specific audiences on methods of storm water pollution prevention.
8	Green Infrastructure/Low Impact Development	Promote environmentally sensitive land development designs by developers and designers, including green infrastructure and low impact development.

Note: Additional information on green infrastructure and low impact development may be found on the USEPA's Internet site at: https://www.epa.gov/green-infrastructure

2.1.2 Delivery mechanism. The permittee shall use at least four public education delivery mechanisms each year. Permittees that are a City, Village, Town, or University with a population of 5,000 or more based on the latest U.S. census shall use at least two from the Active/Interactive Mechanisms column in Table 2 each year. Permittees that are a City, Village, Town, or University with a population less than 5,000 based on the latest U.S. census shall use at least one from the Active/Interactive Mechanisms column in Table 2 each year. Permittees that are a County shall use at least one from the Active/Interactive Mechanisms column in Table 2 each year."

Note: Universities should average its enrolled student population plus employee population over a recent ten-year period to determine which requirement it should follow for permit compliance. Universities are also expected to undertake public education efforts that reach the entire student body and staff.

Table 2: Public Education and Outreach Delivery Mechanisms (Active and Passive)

Active/Interactive Mechanisms	Passive Mechanisms
• Educational activities (school presentations, summer camps) • Informational booth at event • Targeted group training (contractors, consultants, etc.) • Government event (public hearing, council meeting) • Workshops • Tours • Other	• Passive print media (brochures at front desk, posters, etc.) • Distribution of print media (mailings, newsletters, etc.) via mail or email • Media offerings (radio and TV ads, press release, etc.) • Social media posts • Signage • Website • Other

2.1.3 Target audience. The permittee shall identify the target audience for each public education and outreach topic. Target audiences may include the general public, public employees, residents, businesses, contractors, developers, industries, and/or other appropriate audiences.

2.2 Public Involvement and Participation

The permittee shall maintain its public involvement and participation program, in compliance with applicable state and local public notice requirements, to notify the public of activities required by this permit and to encourage input and participation from the public regarding these activities. The permittee shall implement the following measurable goals:

2.2.1 Permit activities. The permittee shall provide a minimum of one opportunity annually for the public to provide input on each of the following permit activities: annual report, storm water management program, and if applicable, the adoption or amendment of storm water related ordinances.

2.2.2 Delivery mechanism. The permittee shall identify the public involvement and participation delivery mechanism for each permit activity in section 2.2.1. Delivery mechanisms may include public workshop, presentation of storm water information, government event (public hearing, council meeting, etc.), citizen committee meeting, or website.

2.2.3 Volunteer activities. The permittee shall implement at a minimum one of the following volunteer activities per year: group best management practice (BMP) installation or maintenance, storm drain stenciling, planting community rain garden, clean up event, stream monitoring, citizen committee meeting, public workshop, presentation of storm water information, or other hands-on event.

2.2.4 Target participants. The permittee shall identify the targeted participants for each permit activity and volunteer activity. Participants may include general public, public employees, residents, businesses, contractors, developers, industries, and/or other appropriate audience.

2.3 Illicit Discharge Detection and Elimination (IDDE)

The permittee shall continue to implement and enforce its program to detect and remove illicit connections and discharges to the MS4. The permittee shall implement the following measurable goals:

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

a. Prohibit illicit discharges and the discharge, spilling or dumping of non-storm water substances or materials into waters of the state or the MS4.

b. Identify non-storm water discharges or flows that are not considered illicit discharges. Categories of non-storm water discharges that are not considered illicit discharges include water line flushing, landscape irrigation, diverted stream flows, uncontaminated groundwater infiltration, uncontaminated pumped groundwater, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, lawn watering, individual residential car washing, flows from riparian habitats

and wetlands, fire-fighting and discharges authorized under a WPDES permit. However, the occurrence of a discharge listed above may be considered an illicit discharge on a case-by-case basis if the permittee or the Department identifies it as a significant source of a pollutant to waters of the state.

c. Establish inspection and enforcement authority.

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

2.3.2 IDDE field screening. On-going dry weather field screening shall be conducted at 100% of the total major outfalls at least once during the term of the permit. Additionally, the permittee shall select minor outfalls for annual on-going dry weather field screening during the term of the permit. The permittee shall develop a prioritization procedure to assist with selecting minor outfalls and 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 when selecting outfalls for annual field screening. At a minimum, field screening shall be documented and include:

a. Visual Observation - A narrative description of visual observations including color, odor, turbidity, oil sheen or surface scum, flow rate and any other relevant observations regarding the potential presence of non-storm water discharges or illicit dumping.

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

(1) Field screening points shall, where possible, be located downstream of any source of suspected illicit activity.

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

Note: The Department's MS4 Illicit Discharge Detection and Elimination guidance document includes several recommendations regarding selection of outfalls for field screening, screening frequency, indicator parameter selection, indicator parameter action levels and documentation. The Illicit Discharge Detection and Elimination guidance is available on the Department's Internet site at: https://dnr.wi.gov/topic/stormwater/municipal/overview.html

2.3.3 IDDE source investigation and elimination. Written procedures for responding to known or suspected illicit discharges, including an assessment of risks and the establishment to response times. At a minimum, procedures shall be established for:

a. Investigating portions of the MS4 that, based on the results of field screening or other information, indicate a reasonable potential for containing illicit discharges or other sources of non-storm water discharges.

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

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

d. Promoting, publicizing, and facilitating public reporting of illicit discharges or water quality impacts associated with discharges into or from MS4s through a central contact point, including a form, website, email address, and/or telephone number for complaints and spill reporting, and publicize to both internal permittee staff and the public.

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

f. Detecting and eliminating cross-connections and leakage from sanitary conveyance systems into the MS4.

g. Providing the Department with advanced notice of the time and location of dye testing within an MS4. Department notification prior to dye testing is required due to the likelihood that dye observed in waterways will be reported to the Department as an illicit discharge or spill.

h. Documentation of the following information:

(1) Dates and locations of IDDE screenings conducted in accordance with section 2.3.2.

(2) Reports of alleged illicit discharges received, including dates of the reports, and any follow-up actions taken by the permittee.

(3) Dates of discovery of all illicit discharges.

(4) Identification of outfalls, or other areas, where illicit discharge have been discovered.

(5) Sources (including a description and the responsible party) of illicit discharges (if known).

(6) Actions taken by the permittee, including dates, to address discovered illicit discharges.

2.3.4 The permittee shall take appropriate action to remove known illicit discharges from its MS4 system discovered under section 2.3 as soon as possible. If it will take more than 30 days to remove an illicit connection or if the potential illicit discharge is from a facility with WPDES permit coverage, the Department shall be contacted to discuss an appropriate action and/or timeframe for removal. Notwithstanding this 30-day timeframe and notification of the Department, the permittee shall be responsible for any known illicit connections to its MS4 system that are a significant risk to human health and the environment.

2.3.5 In the case of interconnected MS4s, the permittee shall notify the appropriate municipality within one working day of either of the following:

a. An illicit discharge that originates from the permittee's permitted area that discharges directly to a municipal separate storm sewer or property under the jurisdiction of another municipality.

b. An illicit discharge that has been tracked upstream to the interconnection point with or outfall from another municipality.

2.3.6 The name, title and phone number of the individuals responsible for responding to reports of illicit discharges and spills shall be included in the illicit discharge response procedure.

2.4 Construction Site Pollutant Control

The permittee shall continue to implement and enforce its program to reduce the discharge of sediment and construction materials from construction sites. The permittee shall implement the following measurable goals:

2.4.1 Construction site ordinance. An ordinance or other regulatory mechanism to require erosion and sediment control at construction sites and establish sanctions to ensure compliance. At a minimum, the ordinance or other regulatory mechanism shall establish or include:

a. Applicability and jurisdiction, pursuant to the authority provided to the permittee under Wisconsin statutes, the ordinance shall apply to all construction sites with one acre or more of land disturbance, and to sites of less than one acre if they are part of a larger common plan of development or sale.

b. Requirements for design and implementation of erosion and sediment control practices consistent with the criteria of those approved by the Department.

Note: Department approved erosion and sediment control technical standards may be found on the Department's Internet site at:
https://dnr.wi.gov/topic/stormwater/standards/const_standards.html

c. Construction site performance standards equivalent to those in ss. NR 151.11(6m), (7), and (8), and 151.23(4m), (5), and (6), Wis. Adm. Code, to achieve the following measurable goals:

(1) BMPs for construction sites that, by design, discharge no more than 5 tons per acre per year, or to the maximum extent practicable, of the sediment load carried in runoff from initial grading to final stabilization.

(2) BMPs for transportation facilities that, by design, discharge no more than 5 tons per acre per year, or to the maximum extent practicable, of the sediment load carried in runoff from initial grading to final stabilization.

Note: The requirements for erosion and sediment control practices, sediment performance standards, and preventive measures for non-transportation facilities can be found in s. NR 151.11(6m), Wis. Adm. Code, and for transportation facilities can be found in NR. 151.23(4m), Wis. Adm. Code.

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

e. Inspection and enforcement authority.

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

Note: In accordance with section 2.10, when a town demonstrates to the Department that an adequate county ordinance that meets the requirements of this permit is administered and enforced within its town, then the town may be excused from having to adopt its own ordinance. Model ordinances for construction site erosion and sediment control can be found in ch. NR 152, Wis. Adm. Code: https://docs.legis.wisconsin.gov/code/admin_code/nr/100/152

2.4.2 Erosion and sediment control plan review. Written procedures for construction site plan review which incorporate consideration of potential water quality impacts. Preconstruction erosion control plan reviews shall be conducted for all construction sites with greater than one acre of land disturbance.

2.4.3 Administrative procedures. Written procedures for the administration of the construction site pollutant control program including the process for obtaining local approval, managing and responding to complaints, tracking regulated construction sites, and construction site plan receipt and consideration of information submitted by the public.

2.4.4 Construction site inspections and enforcement. Written procedures for construction site inspection and enforcement of erosion and sediment control measures. By April 1, 2020, at a minimum, the procedures shall establish:

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

Note: The Department recommends that municipal construction site inspectors obtain certification as a Soil Erosion Inspector pursuant to s. SPS 305.63, Wis. Adm. Code, for more information:
https://dsps.wi.gov/Pages/Professions/SoilErosionInspector/Default.aspx

b. Construction site inspection frequency. The permittee shall inspect all construction sites, at a minimum, in accordance with the frequency specified in Table 3 below.

Table 3: Construction Site Inspection Frequency

Site	Inspection Frequency
(1) All sites one acre or more in size	• New projects shall be inspected within the first two weeks of commencement of land disturbing activity • All active sites shall be inspected at least once every 45 days • All inactive sites shall be inspected at least once every 60 days
(2) Follow up inspection	• Follow up inspections are required within 7 days of any sediment discharge or inadequate control measure, unless corrections were made and observed by the inspector during initial inspection or corrections were verified via photographs submitted to the inspector
(3) Final inspection	• Confirm that all graded areas have reached final stabilization and that all temporary control measures are removed, and permanent storm water management BMPs are installed as designed

c. Construction site inspection documentation. Compliance with the inspection requirements in 2.4.4.a. and b. above, shall be determined by proper documentation and maintenance of records of an established inspection program designed to inspect all sites.

Note: The Department's Construction Site Inspection Report (Form 3400-187) may be used to document inspections. The form can be found on the Department's Internet site at: https://dnr.wi.gov/topic/Stormwater/construction/forms.html

d. Enforcement mechanisms that will be used to obtain compliance.

2.5 Post-Construction Storm Water Management

The permittee shall continue to implement and enforce its program to require control of the quality of discharges from areas of new development, infill, and redevelopment, after construction is completed. The permittee shall implement the following measurable goals:

2.5.1 Post-construction storm water ordinance. An ordinance or other regulatory mechanism to regulate post-construction storm water discharges from new development and redevelopment. At a minimum, the ordinance or other regulatory mechanism shall establish or include:

a. Applicability and jurisdiction, pursuant to the authority provided to the permittee under Wisconsin statutes, the ordinance shall apply to construction sites with one acre or more of land disturbance, and sites of less than one acre if they are part of a larger common plan of development or sale.

b. Requirements for design and implementation of post-construction storm water management control practices consistent with the criteria of those approved by the Department.

Note: Department approved post-construction storm water management control technical standards may be found on the Department's Internet site at: https://dnr.wi.gov/topic/stormwater/standards/postconst_standards.html

c. For new development and infill, post-construction performance standards equivalent to those in ss. NR 151.122 through 151.126 and 151.242 through 151.246, Wis. Adm. Code, that meet the measurable goals for pollutant removal and post-construction storm water treatment. Post-construction performance standards for new development and infill may be more restrictive than those required in this section 2.5.1.c. if necessary to comply with federally approved TMDL requirements.

d. For redevelopment, post-construction performance standards equivalent to or more restrictive than those in ss. NR 151.122 through 151.126 and 151.242 through 151.246, Wis. Adm. Code, that meet the measurable goals for pollutant removal and post-construction storm water treatment.

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

f. Long-term maintenance requirements for landowners and other persons responsible for long-term maintenance of post-construction storm water control measures, including requirements for routine inspection and maintenance of privately owned post-construction storm water control measures that discharge to the MS4 to maintain their pollutant removal operating efficiency.

g. Inspection and enforcement authority.

Note: In accordance with section 2.10, when a town demonstrates to the Department that an adequate county ordinance that meets the requirements of this permit is administered and enforced within its town, then the town may be excused from having to adopt its own ordinance. Model ordinances for post-construction storm water management can be found in ch. NR 152, Wis. Adm. Code: https://docs.legis.wisconsin.gov/code/admin_code/nr/100/152

2.5.2 Administrative procedures. Written procedures for the administration of the post-construction storm water management program including the process for obtaining local approval and responding to complaints.

2.5.3 Storm water management plan review. Written procedures for post-construction site plan review which incorporate consideration of potential water quality impacts. Post-construction site plan reviews shall be conducted for all construction sites with greater than one acre of land disturbance.

Note: The Department recommends that municipal staff reviewing plans obtain training on post-construction plan review.

2.5.4 Long-term maintenance, inspections and enforcement. Written procedures that will be used by the permittee through its ordinance jurisdiction, approval process, and authority to, at a minimum, track and enforce the long-term maintenance of storm water management facilities implemented to meet the applicable post-construction performance standards in section 2.5.1.c and d of this permit. The procedures shall include:

a. A mechanism for tracking regulated sites.

b. At a minimum, long-term maintenance inspections shall occur once per permit term.

c. Inspection documentation.

d. Follow up enforcement with timeframes for corrective maintenance.

2.6 Pollution Prevention

The permittee shall continue to implement its pollution prevention program to prevent or reduce pollutant runoff from the MS4 to waters of the state. The permittee shall implement the following measurable goals:

2.6.1 Storm water management facilities. Update and maintain an inventory of municipally owned or operated storm water BMPs such as wet detention ponds, bioretention devices, infiltration basins and trenches, permeable pavement, proprietary sedimentation devices, vegetated swales, or any similar practices or devices used to meet a water quality requirement under this permit. At a minimum, the inventory shall be maintained in a tabular format and contain the following information for each structural storm water facility:

a. A key corresponding to the location of the BMP on the storm sewer system map required under section 2.8.

b. The name and a description of the BMP, including the type and year constructed.

c. A confirmation of whether each of the following elements exist or are not available:

(1) An operation and maintenance plan with inspection procedures and schedule.

(2) A record drawing.

Note: A record drawing is a complete clean set of drawings that accurately reflect how the final practice was built.

(3) If using a BMP to meet a water quality requirement in this permit and the BMP is owned by another entity, written documentation exists that the permittee has permission from the owner to use the BMP for this purpose.

2.6.2 For each BMP inventoried under section 2.6.1, the permittee shall develop and implement a maintenance plan with inspection procedures and schedule to maintain the pollutant removal operating efficiency of the practice in compliance with any water quality requirement under this permit. Documentation of inspections and maintenance activities shall be maintained.

Note: Chapter NR 528, Wis. Adm. Code, *Management of Accumulated Sediment from Storm Water Management Structures*, establishes a process to regulate sediment removal and use to help storm water pond owners manage storm water pond sediment. Information on NR 528 and managing accumulated sediment from storm water ponds is available through the Department's Internet site at: https://dnr.wi.gov/topic/waste/nr528.html

2.6.3 Municipally owned public works facilities. The storm water pollution prevention plans (SWPPPs) for municipal garages, municipal storage areas, and other public works related municipal facilities located within the permitted area shall be maintained and updated annually as needed and shall include the information in sections 2.6.3.a. When a SWPPP is updated, it shall be submitted to the Department with the annual report.

a. SWPPPs shall include the following information:

(1) The physical locations of each facility with a key corresponding to the locations on the storm sewer system map required under section 2.8.

(2) The contact information for the individuals with overall responsibility for each facility.

(3) A map of each facility, drawn to scale, and including the following features:

i. The locations and descriptions of major activities and storage areas.

ii. Identification of drainage patterns, potential sources of storm water contamination, and discharge points.

iii. Identification of nearby receiving waters or wetlands.

iv. Identification of connections to the permittees MS4.

(4) A description of procedures, good housekeeping activities, and any BMPs installed to reduce or eliminate storm water contamination.

(5) A maintenance plan with inspection procedures and schedule for each facility to identify deficiencies, necessary improvements and/or repairs, assess effectiveness, and address new or unaddressed potential sources of storm water contamination.

(6) Spills prevention and response standard operating procedures.

b. The permittee is not required to comply with section 2.6.3 if the permittee certifies that the municipal facility qualifies for no exposure with the Department's concurrence.

(1) No exposure means that the facility shall have all materials and activities protected by a storm-resistant shelter to prevent exposure to storm water. Materials or activities include material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products or waste products. Material handling activities include the storage, loading and unloading, transportation or conveyance of any raw material, intermediate product, final product or waste product.

(2) The permittee shall certify for no exposure for each facility at least once each permit term. The permittee shall submit a letter requesting no exposure, an inspection report of the site, and photos of all materials or activities at the site. The photo locations shall be labeled on an aerial photo diagram.

2.6.4 Measures to reduce municipal sources of storm water contamination within source water protection areas.

Note: Wisconsin's source water assessment program information may be found on the Department's Internet site at:
https://dnr.wi.gov/topic/drinkingwater/sourcewaterprotection.html

2.6.5 Collection services/Storm sewer system maintenance activities.

a. Street sweeping. If routine street sweeping is utilized to meet a water quality requirement under this permit, the permittee shall maintain documentation of the number and type of equipment used, standard operating procedures, an estimate of the number of lane-miles swept annually, and an estimate of the weight in tons of material collected annually.

b. Catch basins. If routine cleaning of catch basins with sumps is utilized to meet a water quality requirement under this permit, the permittee shall maintain documentation of the number of catch basins inspected, the number of catch basins cleaned, standard operating procedures, and an estimate of the weight in tons of material collected annually.

c. Material handling and disposal. Material collected under a. and b. of this section shall be handled and stored in a manner that prevents contamination of storm water runoff and shall be disposed of or beneficially reused in accordance with applicable solid and hazardous waste statutes and administrative codes. Non-storm water discharges to waters of the state associated with dewatering and drying material collected under sections a. and b. of this section are not authorized by this permit.

Note: Information on managing waste and materials is available on the Department's Internet site at: https://dnr.wi.gov/topic/Waste/. Information on WPDES permits for non-storm water discharges is available on the Department's Internet site at: https://dnr.wi.gov/topic/wastewater/

d. Leaf management. Proper management of leaves and grass clippings from municipally-owned properties and private property. The program may include instructions to private property owners for on-site composting, on-site beneficial reuse, or yard waste drop-off as opposed to a municipal collection program. On-site management and/or drop-off shall be communicated to private property owners in accordance with the public education and outreach program implemented under section 2.1 of this permit. If the permittee has a municipal collection program, collected material shall be handled and stored in a manner that prevents contamination of storm water runoff. For a municipal leaf collection program, the permittee shall maintain the following documentation:

(1) A description of the leaf collection program, including the type of pick-up methodology and equipment used, timing of associated street cleaning, standard operating procedures, schedule and frequency, and instructions for private property owners.

(2) An estimate of the weight in tons of material collected annually.

(3) Municipally operated leaf disposal locations with a key corresponding to the locations on the storm sewer system map required under section 2.8. If the disposal location is outside of the MS4 boundary, then the permittee can provide documentation if the disposal is taken elsewhere.

Note: The Department has developed "Interim Municipal Phosphorus Reduction Credit for Leaf Management Programs" guidance to assist permitted MS4s on creditable phosphorus reduction through leaf collection and management. The guidance document may be found on the Department's Internet site at: https://dnr.wi.gov/topic/stormwater/standards/ms4_modeling.html

2.6.6 Winter Road Management. If road salt or other deicers are applied by the permittee or a contractor on behalf of the permittee, no more shall be applied than necessary to maintain public safety. Documentation on deicing activities shall be performed by the permittee or a contractor on behalf of the permittee and include the following:

a. Contact information for the individuals with overall responsibility for winter roadway maintenance.

b. A description of the types of deicing products used.

c. The amount of deicing product used per month.

d. A description of the type of equipment used.

e. An estimate of the number of lane-miles treated with deicing products for the roadways that the permittee is responsible for, and an estimate in acres of the total area of municipally-owned parking lots treated with deicing products by the permittee or contractor.

f. If applicable, snow disposal locations with a key corresponding to the locations on the storm sewer system map required under section 2.8.

Note: Snow treatment and disposal guidance for municipalities is available through the Department's Internet site at: https://dnr.wi.gov/topic/stormwater/publications.html

g. A description of anti-icing, pre-wetting and brining, equipment calibration, pavement temperature monitoring, and/or salt reduction strategies implemented or being considered, and/or alternative products.

h. Other measurable data or information that the permittee uses to evaluate or modify its deicing activities.

Note: The Wisconsin Department of Transportation (WisDOT) Highway maintenance manual - Chapter 6, contains guidelines on winter maintenance including application of road salt and other deicers. Chapter 6 is available on the WisDOT's Internet site at: https://wisconsindot.gov/Pages/doing-bus/local-gov/hwy-mnt/mntc-manual/chapter06.aspx. The WisDOT highway salt storage requirements are contained in ch. Trans 277, Wis. Adm. Code.

2.6.7 Nutrient management. Application of turf and garden fertilizers on municipally controlled properties (such as parks, athletic fields, golf courses), with pervious surfaces over 5 acres each, in accordance with a site-specific nutrient application schedule based on appropriate soil tests.

Note: To assist permittees with this requirement, the Department has developed a technical standard for turf nutrient management. These documents may be found on the Department's Internet site at: https://dnr.wi.gov/topic/stormwater/standards/turf_nutrient.html

2.6.8 Environmentally sensitive development. Consideration of environmentally sensitive land development designs for municipal projects, including green infrastructure and low impact development, which shall be designed, installed, and maintained to comply with a water quality requirement under this permit.

Note: Additional information on green infrastructure and low impact development may be found on the following USEPA Internet sites:
https://www.epa.gov/green-infrastructure
https://www.epa.gov/nps/urban-runoff-low-impact-development

2.6.9 Internal training and education. At a minimum, the permittee shall hold one annual training event for appropriate municipal staff and other personnel involved in implementing each of the elements of the pollution prevention program under this section 2.6. Documentation shall be maintained of the date, the number of people attending the training, the names of each person attending and a summary of their responsibilities, and the content of the training. The permittee shall inform contractors performing any services to implement

section 2.6 of the permit requirements and expectations. The permittee shall also inform their elected officials of the permit requirements and expectations.

2.7 Storm Water Quality Management

The permittee shall implement its municipal storm water quality management program. This program shall maintain compliance with the developed urban area performance standards of s. NR 151.13(2)(b)1., Wis. Adm. Code, for those areas of the municipality that were not subject to the post-construction performance standards of ss. NR 151.12 or 151.24, or ss. NR 151.122 through 151.126, or ss. 151.242 through 151.246, Wis. Adm. Code. The permittee shall implement the following measurable goals:

2.7.1 To the maximum extent practicable, implementation and maintenance of all storm water management practices necessary to meet the more restrictive total suspended solids reduction of either of the following:

a. The permittee shall maintain all source area controls, structural storm water management facilities, and non-structural storm water BMPs that the permittee implemented on or before July 1, 2011, to achieve a reduction of 20% or more of total suspended solids carried by storm water runoff from existing development to waters of the state. If the permittee removes or modifies a storm water BMP, the permittee shall continue to achieve the reduction by installing, implementing, and maintaining the necessary storm water BMPs to, at a minimum, equal the same level of treatment. All structural storm water management facilities utilized to meet the requirements in section 2.7.1.a shall be inventoried and maintained in accordance with sections 2.6.1 and 2.6.2.

b. A 20% reduction in the annual average mass of total suspended solids discharging from the MS4 to surface waters of the state as compared to implementing no storm water management controls. All source area controls, structural storm water management facilities, and non-structural storm water BMPs implemented to achieve the 20% reduction in total suspended solids shall be maintained. If the permittee removes or modifies a storm water BMP, the permittee shall continue to achieve the 20% reduction by installing, implementing, and maintaining the necessary storm water BMPs to equal, at a minimum, the same level of treatment. All structural storm water management facilities utilized to meet the requirements in section 2.7.1.b shall be inventoried and maintained in accordance with sections 2.6.1 and 2.6.2.

Note: The total suspended solids reduction requirement applies to storm water runoff from areas of urban land use and is not applicable to agricultural or rural land uses and associated roads. Additional MS4 modeling guidance for modeling the total suspended solids control is available on the Department's Internet site at: https://dnr.wi.gov/topic/stormwater/standards/ms4_modeling.html. The permittee may elect to meet the applicable total suspended solids standard above on a watershed or regional basis by working with other permittees to provide regional treatment that collectively meets the standard.

2.8 Storm Sewer System Map

The permittee shall maintain its MS4 map. The storm sewer system map shall be updated annually as needed for changes occurring in the permitted area boundaries. The municipal storm sewer system map shall include:

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

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

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

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

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

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

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

2.8.8 Identification of streets.

2.9 Annual Report

The permittee shall submit an annual report for each calendar year to the Department by **March 31 of the following year**. The permittee shall invite the municipal governing body, interest groups and the general public to review and comment on the annual report. The annual report shall include:

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

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

2.9.3 A summary of the number and nature of inspections and enforcement actions conducted to ensure compliance with the required ordinances.

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

2.9.5 An evaluation of program compliance, the appropriateness of identified BMPs, and progress towards achieving identified measurable goals. Any program changes made as a result of this evaluation shall be identified and described in the annual report. For any identified deficiencies towards achieving the requirements under section 2 of this permit or lack of progress towards meeting a measurable goal, the permittee shall initiate program changes to improve their effectiveness.

2.9.6 If applicable, notice that the permittee is relying on another municipality or entity to satisfy any of the permit requirements and a description of the arrangement where a permit requirement is being met in this manner.

2.9.7 A duly authorized representative of the permittee shall sign and certify the annual report and include a statement or resolution that the permittee's governing body or delegated representatives have reviewed or been apprised of the content of the annual report.

2.9.8. The annual report and other required reports, and permit compliance documents shall be submitted electronically through the Department's electronic reporting system.

Note: The Department's electronic reporting system is Internet-based and available at: https://dnr.wi.gov/permits/water/. Municipal storm water permit eReporting information and user support tools can be found at: https://dnr.wi.gov/topic/stormwater/municipal/eReporting.html

2.10 Cooperation

The permittee may, by written agreement, implement this permit with another municipality or contract with another entity to perform one or more of the conditions of this permit. The permittee is ultimately responsible for compliance with the conditions of this permit. The permittee may rely on another municipality or contract with another entity to satisfy a condition of this permit if all of the following are met:

2.10.1 The other municipality or entity implements the required control measure or permit requirement.

2.10.2 A particular control measure, or component thereof, is at least as stringent as the corresponding permit requirement.

2.10.3 The other municipality or entity agrees to implement a control measure or permit requirement on the permittee's behalf. This shall be shown by formal written agreement, signed by both parties' authorized representatives. The agreement shall be explicit as to which specific permit conditions are being covered by which municipality or other entity. Copies of current agreements shall be submitted with the annual report or to the Department upon request.

Note: If a county is implementing and enforcing adequate storm water ordinances within a town, the town would then not have to adopt its own ordinance. However, the town, as the permittee, is still expected to evaluate how the county is implementing and enforcing the ordinance in the town's permitted area, to verify the county is meeting the permit condition. Another example, if another entity agrees to implement the permit condition of long-term maintenance inspections, the permittee must

evaluate that the entity is completing inspections as agree upon. The permittee should not assume that another entity is implementing a permit condition as required because the permittee remains responsible for compliance with the conditions of this permit.

2.11 Amendments

The permittee shall amend a program required under this permit as soon as possible if the permittee becomes aware that it does not meet a requirement of this permit. The permittee shall amend its program if notified by the Department that a program or procedure is insufficient or ineffective in meeting a requirement of this permit. The Department notice to the permittee may include a deadline for amending and implementing the amendment.

2.12 Reapplication for Permit Coverage

To remain covered after the expiration date of this permit, pursuant to s. NR 216.09, Wis. Adm. Code, the permittee shall reapply to the Department at least 180 days prior to the expiration date of this permit for continued coverage under a reissued version of this permit.

3. COMPLIANCE SCHEDULE

The permittee shall comply with the specific permit conditions contained in sections 1 and 2 according to the schedule in this section 3 and Table 4. The permittee shall begin implementing any updates to its storm water management programs no later than March 31, 2021. Required reports and permit compliance documents shall be submitted electronically through the Department's electronic reporting system.

Note: The Department's electronic reporting system is Internet-based and available at: https://dnr.wi.gov/permits/water/. Municipal storm water permit eReporting information and user support tools can be found at: https://dnr.wi.gov/topic/stormwater/municipal/eReporting.html

3.1 Impaired Waterbodies and Total Maximum Daily Loads

3.1.1 The permittee shall determine whether any part of its MS4 discharges to an impaired waterbody as required under section 1.5.1 of this permit **by March 31 of each odd-numbered year**.

3.1.2 If the permittee is subject to TMDL requirements under section 1.5 of this permit, the permittee shall submit information to the Department in accordance with the schedule as required in the applicable appendix of this permit.

3.2 Public Outreach and Education

The permittee shall submit to the Department the public education and outreach program developed for the term of this permit as required under section 2.1 of this permit by **March 31, 2021**.

3.3 Public Involvement and Participation

The permittee shall submit to the Department the public involvement and participation program developed for the term of this permit as required under section 2.2 of this permit by **March 31, 2021**.

3.4 Illicit Discharge Detection and Elimination

The permittee shall submit to the Department the illicit discharge detection and elimination program developed for the term of this permit as required under section 2.3.2 to 2.3.6 of this permit by **March 31, 2021**.

3.5 Construction Site Pollutant Control

The permittee shall submit to the Department the construction site pollutant control program developed for the term of this permit as required under sections 2.4.2 to 2.4.4 of this permit by **March 31, 2021**.

3.6 Post-Construction Storm Water Management

The permittee shall submit to the Department the post-construction storm water management program developed for the term of this permit as required under sections 2.5.2 to 2.5.4 of this permit by **March 31, 2021**.

3.7 Pollution Prevention

3.7.1 The permittee shall submit to the Department the municipal storm water management facility inventory as required under section 2.6.1 of this permit by **March 31, 2021**. Include with the annual report submittal via the Department's electronic reporting system. When the inventory is updated, it shall be submitted by **March 31 of each year** to the Department.

3.7.2 The permittee shall submit to the Department the maintenance plan for municipal storm water management facilities as required under section 2.6.2 of this permit by **March 31, 2021**.

3.7.3 The permittee shall update SWPPPs for municipally owned properties as needed as required under section 2.6.3 of this permit. When a SWPPP is updated, it shall be submitted by **March 31 of each year** to the Department.

3.8 Storm Water Quality Management

The permittee shall report compliance with the developed urban area performance standards as required under section 2.7 of this permit by **March 31 of each year**.

3.9 Storm Sewer System Map

The permittee shall update the storm sewer system map as needed as required under section 2.8 of this permit. When the MS4 map is updated, it shall be submitted by **March 31 of each year** to the Department.

3.10 Annual Report

The permittee shall submit to the Department an annual report as required under section 2.9 of this permit for each calendar year by **March 31 of the following year**. The annual report and other required reports, and permit compliance documents shall be submitted electronically through the Department's electronic reporting system.

Table 4: Compliance Schedule for Permit Requirements

PERMIT SECTION	ACTIVITY	COMPLIANCE DATE	COMMENTS
Section 1.5.1	Identify discharges to an impaired waterbody	By March 31 of each odd-numbered year thereafter	All permittees
Section 1.5.2	Total maximum daily load implementation	See applicable Appendix.	Applies to a permittee with an MS4 discharge of a pollutant of concern to a waterbody subject to an USEPA approved TMDL that assigns the permittee a wasteload allocation.
Section 2.1	Public Education and Outreach – Submit public education and outreach program for the permit term with annual report	March 31, 2021	All permittees
Section 2.2	Public Involvement and Participation – Submit public involvement and participation program for the permit term with annual report	March 31, 2021	All permittees
Section 2.3.2 to 2.3.6	Illicit Discharge Detection and Elimination – Submit illicit discharge detection and elimination program for the permit term with annual report	March 31, 2021	All permittees
Section 2.4.2 to 2.4.4	Construction Site Pollutant Control – Submit construction site pollutant control program for the permit term with annual report	March 31, 2021	All permittees
Section 2.5.2 to 2.5.4	Post-Construction Storm Water Management – Submit post-construction storm water management program for the permit term with annual report	March 31, 2021	All permittees
Section 2.6	Pollution Prevention – Section 2.6.1, submit the municipal storm water management facility inventory with annual report	March 31, 2021, and annually thereafter (if updates)	All permittees
	Pollution Prevention – Section 2.6.2, submit the maintenance plan for municipal storm water management facilities with annual report	March 31, 2021	All permittees
	Pollution Prevention – Section 2.6.3, submit SWPPPs for municipally owned properties with annual report	March 31 of each year reporting on previous calendar year (if updates)	All permittees

Section 2.7	Storm Water Quality Management – Report TSS percent reduction	March 31 of each year reporting on previous calendar year	All permittees
Section 2.8	Storm sewer system map - Submit map with annual report	March 31 of each year reporting on previous calendar year (if updates)	All permittees
Section 2.9	Submit Annual Report	March 31 of each year reporting on previous calendar year	All permittees

4. GENERAL CONDITIONS

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

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

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

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

4.4 Noncompliance

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

4.4.2 Reports of any other noncompliance not covered under General Conditions sections 3.3, 3.4.1, or 3.6. shall be submitted with the annual report. The reports shall contain all the information listed in General Conditions section 3.4.1.

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

4.6 Spill Reporting: The permittee shall immediately notify the Department, in accordance with s. 292.11(2)(a), Wis. Stats., which requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the DNR immediately of any discharge not

authorized by the permit. The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill. To report a hazardous substance spill, call the DNR's 24-hour HOTLINE at 1-800-943-0003.

Note: For details on state and federal reportable quantities, visit:
https://dnr.wi.gov/topic/Spills/define.html

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

4.8 Bypass: The permittee may temporarily bypass a storm water treatment facility if necessary for human safety or maintenance to assure efficient operation. A bypass shall comply with the general storm water discharge limitations in Section 1.9 of this permit. Notification of the Department is not required for these types of bypasses. Any other bypass is prohibited.

Note: A discharge from a storm water treatment facility that exceeds the operational design capacity of the facility is not considered a bypass.

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

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

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

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

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

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

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

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

4.13 Duty to Provide Information: The permittee shall furnish the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, terminating, suspending revoking or reissuing the permit or to determine compliance with the permit. The permittee shall give advance notice to the Department of any planned changes to the storm water management program which may result in noncompliance with permit requirements. The permittee shall also furnish the Department, upon request, copies of records required to be kept by the permittee.

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

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

4.16 Records Retention: The permittee shall retain records of all monitoring information, copies of all reports required by the permit, and records of all data used to complete the notice of intent for a period of at least 5 years from the date of the sample, measurement, report or application. The permittee shall retain records documenting implementation of the minimum control measures in sections 2.1 through 2.6 of this permit for a period of at least 5 years from the date the record was generated.

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

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

4.19 Attainment of Water Quality Standards after Authorization: At any time after authorization, the Department may determine that the discharge of storm water from a permittee's MS4 may cause, have

the reasonable potential to cause, or contribute to an excursion of any applicable water quality standard. If such determination is made, the Department may require the permittee to do one of the following:

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

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

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

4.20 Continuation of the Expired General Permit: The Department's goal is to reissue this general permit prior to its expiration date. However, in accordance with s. NR 216.09, Wis. Adm. Code, a permittee shall reapply to the Department at least 180 days prior to the expiration date for continued coverage under this permit after its expiration. If the permit is not reissued by the time the existing permit expires, the existing permit remains in effect.

4.21 Need to Halt or Reduce Activity not a Defense: It is not a defense for a permittee in an enforcement action to claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

5. DEFINITIONS USED IN THIS PERMIT

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

5.1 Department means the Wisconsin Department of Natural Resources.

5.2 Development means residential, commercial, industrial and institutional land uses and associated roads.

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

5.4 Hazardous substance means any substance or combination of substances including any waste of a solid, semisolid, liquid or gaseous form which may cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness or which may pose a substantial present or potential hazard to human health or the environment because of its quantity, concentration or physical, chemical or infectious characteristics. This term includes, but is not limited to, substances which are toxic, corrosive, flammable, irritants, strong sensitizers or explosives as determined by the Department.

5.5 Illicit connection means any man-made conveyance connecting an illicit discharge to a municipal separate storm sewer system.

5.6 Illicit discharge means any discharge to a municipal separate storm sewer system that is not composed entirely of storm water except discharges authorized by a WPDES permit or other discharge not requiring a WPDES permit such as landscape irrigation, individual residential car washing, fire fighting, diverted stream flows, uncontaminated groundwater infiltration, uncontaminated pumped groundwater, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, lawn watering, flows from riparian habitats and wetlands, and similar discharges. However, the occurrence of a discharge listed above may be considered an illicit discharge on a case-by-case basis if the permittee or the Department identifies it as a significant source of a pollutant to waters of the state.

5.7 Impaired water means a waterbody impaired in whole or in part and listed by the Department pursuant to 33 USC § 1313(d)(1)(A) and 40 CFR 130.7, for not meeting a water quality standard, including a water quality standard for a specific substance or the waterbody's designated use.

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

5.9 Jurisdiction means the area where the permittee has authority to enforce its ordinances or otherwise has authority to exercise control over a particular activity of concern.

5.10 Land disturbing construction activity means any man-made alteration of the land surface resulting in a change in the topography or existing vegetative or non-vegetative soil cover that may result in storm water runoff and lead to increased soil erosion and movement of sediment into waters of the state. Land disturbing construction activity includes clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities.

5.11 Maximum Extent Practicable has the meaning given it in s. NR 151.002(25), Wis. Adm. Code.

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

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

5.12.2 A municipal separate storm sewer system that receives storm water runoff from lands zoned for industrial activity that is associated with a drainage area of more than 2 acres or from other lands with 2 or more acres of industrial activity, but not land zoned for industrial activity that does not have any industrial activity present.

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

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

5.14.1 Owned or operated by a municipality.

5.14.2 Designed or used for collecting or conveying storm water.

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

5.14.4 Which is not part of a publicly owned wastewater treatment works that provides secondary or more stringent treatment.

5.15 New MS4 discharge of a pollutant means an MS4 discharge that would first occur after the permittee's original date of initial coverage under an MS4 permit to a surface water to which the MS4 did not previously discharge storm water, and does not include an increase in an MS4's discharge to a surface water to which the MS4 discharged on or before coverage under this permit.

5.16 Outfall means the point at which storm water is discharged to waters of the state or to a storm sewer (e.g., leaves one municipality and enters another).

5.17 Permittee means a person who has applied for and received WPDES permit coverage for storm water discharge. For the purposes of this permit, permittee is the owner or operator of a municipal separate storm sewer system authorized to discharge storm water into waters of the state.

5.18 Permitted area means the areas of land under the jurisdiction of the permittee that drains into a municipal separate storm sewer system, which is regulated under a permit issued pursuant to subch. I of NR 216, Wis. Adm. Code.

5.19 Pollutants of concern means a pollutant that is causing impairment of a waterbody.

5.20 Reach means a specific stream segment, lake or reservoir as identified in a TMDL.

5.21 Reachshed means the drainage area contributing runoff to a given reach.

5.22 Redevelopment means areas where development is replacing older development.

5.23 Riparian landowners are the owners of lands bordering lakes and rivers.

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

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

5.26 Storm water management practice means structural or non-structural measures, practices, techniques or devices employed to avoid or minimize soil, sediment or pollutants carried in runoff to waters of the state.

5.27 Storm Water Pollution Prevention Plan or SWPPP refers to the development of a site-specific plan that describes the measures and controls that will be used to prevent and/or minimize pollution of storm water.

5.28 Structural storm water management facilities are engineered and constructed systems that are designed to provide storm water quality control such as wet detention ponds, constructed wetlands, infiltration basins and grassed swales.

5.29 Total maximum daily load or **TMDL** means the amount of pollutants specified as a function of one or more water quality parameters, that can be discharged per day into a water quality limited segment and still ensure attainment of the applicable water quality standard.

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

5.31 Wasteload Allocation or **WLA** means the allocation resulting from the process of distributing or apportioning the total maximum load to each individual point source discharge.

5.32 Waters of the State has the meaning given it in s. 283.01(20), Wis. Stats.

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

Appendix A: MS4 Permittees Subject to a TMDL Approved Prior to May 1, 2014 including Applicable Updates

A.1 Applicability and Structure of Appendix.

A.1.1 Applicability. In accordance with section 1.5.2.a, this Appendix A applies to permittees subject to a total maximum daily load (TMDL) approved by the United States Environmental Protection Agency (USEPA) prior to May 1, 2014, that includes the following:

- "Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Rock River Basin," approved by USEPA September 2011
- "Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay," approved by USEPA May 2012
- "Lake St. Croix Nutrient Total Maximum Daily Load," approved by USEPA August 2012
- "Phosphorus Total Maximum Daily Loads (TMDLs) Tainter Lake and Lake Menomin, Dunn County Wisconsin," approved by USEPA September 2012

In addition to the TMDLs listed above, Appendix A also applies to the following:

- "Beaver Dam Lake Total Maximum Daily Load for Total Phosphorus," approved by USEPA August 2018

  Note: The Beaver Dam Lake TMDL updates allocations from the Rock River Basin TMDL for the City of Beaver Dam and provides higher allocations, lower percent reductions, than those contained in the Rock River Basin TMDL approved in September 2011.

Note: If the MS4 area extends into or discharges to other basins with a USEPA approved TMDL, a permittee could be subject to more than one TMDL and thus the requirements under Appendices B and/or C.

A.1.2 Structure of Appendix. This appendix is structured to provide permittees with several compliance options. Section A.2 defines full TMDL compliance while sections A.3, A.4, and A.5 provide different compliance options. Section A.3 applies to permittees that submitted a plan meeting the requirements contained in sections 1.5.4.4 and 1.5.4.5 of WDPES Permit No. WI-S050075-2 or WI-S050181-1 and received Department concurrence regarding the plan. Section A.3 also applies to permittees that are participating in an approved adaptive management plan. Section A.4 details requirements for permittees that can comply with the TMDL during this permit term. Section A.5 applies to permittees who have not been able to utilize sections A.3 or A.4. Section A.5 contains two compliance tracks; permittees may choose between the requirements stipulated under section A.5.2 or meet the requirements under section A.5.3. Section A.6 outlines reporting requirements.

A.2 Full TMDL Compliance.

A.2.1 USEPA is allowing the Department to evaluate MS4 compliance with TMDL Wasteload Allocations (WLAs) using a percent reduction framework consistent with Wisconsin's storm

water program. For consistency with existing storm water program requirements, demonstration of TMDL compliance will use the percent reduction measured from the no runoff management controls (no-controls) condition. The percent reduction from no-controls, for each pollutant of concern and reachshed, necessary to meet the TMDL WLAs for the USEPA approved TMDLs are listed in Tables A1-A4. The no-controls modeling condition means taking no (zero) credit for existing storm water control measures that reduce the discharge of pollutants. Existing practices can then be applied and counted toward meeting the TMDL reductions.

A.2.2 TMDLs may assign a percent reduction for one or more reachsheds for each pollutant of concern (i.e., total suspended solids (TSS) and total phosphorus (TP)). Full TMDL compliance is achieved by the permittee provided all of the following conditions are met:

a. By October 31, 2023, the permittee submits the necessary data and documentation to the Department that demonstrates that the permittee meets the percent reductions stipulated in Tables A1-A4 for each reachshed that the MS4 discharges to and for each pollutant of concern.

b. The documentation summitted by the permittee includes the policies, procedures, and regulatory mechanisms that the permittee will employ to ensure that storm water controls and management measures will continue to be operated and maintained so that their pollutant removal efficiency continues to be met.

c. Based upon the data and documentation and any necessary subsequent information requested by the Department, the permittee receives written concurrence from the Department by April 30, 2024, that the permittee has achieved full TMDL compliance.

A.3 Implementation of TMDL Compliance Plan or Participation in an Approved Adaptive Management Plan.

A.3.1 If the permittee submitted a TMDL Implementation Plan meeting the requirements contained in sections 1.5.4.4 and 1.5.4.5 of WDPES Permit No. WI-S050075-2 or WI-S050181-1 and has received Department concurrence regarding the plan, the permittee shall implement the plan as its TMDL Compliance Plan.

A.3.2 In accordance with s. 283.13(7), Wis. Stats., and s. NR 217.18, Wis. Adm. Code, if by the effective date of this permit the permittee has chosen to participate in an Adaptive Management project that has been approved by the Department the permittee shall continue to participate in the implementation of the Adaptive Management project.

A.4 Compliance During the Term of This Permit. If the permittee determines that it can meet the requirements stipulated in section A.2.2 by October 31, 2023, the permittee shall meet all the following:

A.4.1 By March 31, 2020, the permittee shall notify the Department if compliance will be achieved by October 31, 2023.

A.4.2 Consistent with the reporting requirements contained in section A.6, the permittee shall submit written verification that it is has met the applicable requirements contained in section A.2.2.

A.5 Compliance Over Multiple Permit Terms. If the permittee cannot meet the requirements stipulated under sections A.3 or A.4, the permittee shall demonstrate continued progress towards compliance with the requirements contained in section A.2.2. During the term of this permit, the following are required:

A.5.1 By March 31, 2020, if the permittee determines that the applicable requirements contained in section A.2.2 will not be achieved by October 31, 2023, then the permittee shall notify the Department in writing which reachsheds and pollutants of concern are not in compliance with the requirements contained in section A.2.2.

A.5.2 By October 31, 2021, the permittee shall submit a TMDL Implementation Plan to the Department identifying and describing the actions that the permittee shall undertake, including a proposed schedule and milestones, to achieve the following by the end of the term of this permit:

a. A level of reduction that achieves at least 20% of the remaining reduction needed beyond the current 20% TSS reduction required under s. NR 151.13 (2)(b)1.b., Wis. Adm. Code, to achieve full compliance in sediment or TSS.

b. A level of reduction that achieves at least 10% of the remaining reduction needed beyond 15% TP reduction to achieve full compliance in TP.

Note: The reductions stipulated under section A.5.2 are interim compliance targets set for this permit term. Future permit reduction targets may taper off or vary between municipalities based on individual plans as it is expected that municipalities will rely more on reductions obtained through redevelopment.

Note: Unlike full compliance as outlined in section A.2.2, compliance with the reductions stipulated under sections A.5.2.a and A.5.2.b can be achieved utilizing an averaged reduction calculated from individual reductions achieved in one or multiple reachsheds and spanning the entire MS4 area that is impacted by the TMDL.

Note: Reductions obtained through a permittee's participation in a water quality trading project, in accordance with s. 283.84, Wis. Stats., and that has been reviewed and approved by the Department, may be counted toward credit in meeting the requirements stipulated under sections A.5.2.a and A.5.2.b. Additional information on water quality trading is available from the Department's Internet site at:
https://dnr.wi.gov/topic/surfacewater/waterqualitytrading.html

Note: Example calculation to meet section A.5.2.a for total suspended solids (TSS)
"Municipality A" has modeled a no-controls TSS load of 50 tons/year for Reachshed 2 and 100 tons/ year for Reachshed 3.

Determine Calculated Wasteload Allocation
"Municipality A" has area in Rock River TMDL Reachsheds 2 and 3. From Table A.1, the TMDL requires the following reductions from no controls which under section A.2 must ultimately achieve a mass reduction as follows:

TMDL Reachshed	Modeled TSS from No-Controls (tons/yr)	TMDL TSS Reduction from No-Controls	Ultimate Mass Reduction Required for Full TMDL Compliance (tons/yr)	Calculated Wasteload Allocation (tons/yr)
2	50	40.6%	50*0.406 = 20.3	50-20.3 = 29.7
3	100	55.6%	100*0.556 = 55.6	100-55.6 = 44.4

Determine Minimum Control Required under Section NR 151.13(2)(b)1.b., Wis. Adm. Code

TMDL Reachshed	No Controls TSS (tons/yr)	NR 151 Required Reduction (tons/yr)	NR 151 Allowable Load (tons/yr)
2	50	50*0.20 = 10	50-10 = 40
3	100	100*0.20 = 20	100-20 = 80
Total		30.0	

Calculate 20% Additional Reduction from Section NR 151.13(2)(b)1.b., Wis. Adm. Code
Under section A.5.2.a, "Municipality A" must achieve an additional 20% reduction from the current 20% TSS reduction required under s. 151.13 (2)(b)1.b., Wis. Adm. Code. As shown below, "Municipality A" needs to achieve a 20% reduction of the remaining 45.9 tons results in "Municipality A" needing to achieve an additional 9.18 tons/year in reduction.

Reachshed	NR 151 Allowable Load (tons/yr)	Calculated Wasteload Allocation (tons/yr)	Additional Reduction from NR 151 (tons/yr)	20% Additional Reduction from NR 151 (tons/yr)
2	40	29.7	40-29.7 = 10.3	10.3*0.2 = 2.06
3	80	44.4	80-44.4 = 35.6	35.6*0.2 = 7.12
Total			45.9	9.18

Load reduction at the end of permit term
At the end of the permit term, "Municipality A" should demonstrate a minimum reduction from no controls of 39.18 (30 tons plus 9.18 tons). "Municipality A" has the flexibility to decide how much of that reduction is provided in TMDL Reachshed 2 and/or 3 over the next permit term. "Municipality A" will still require additional reductions in each reachshed over subsequent permit terms to reach the calculated wasteload allocation of 29.7 tons in TMDL Reachshed 2 and 44.4 tons in TMDL Reachshed 3.

The calculation process is similar for total phosphorus (TP).

A.5.3 If the permittee determines by October 31, 2021, that it is unable to achieve the reductions stipulated under sections A.5.2.a and A.5.2.b, the permittee shall meet the following requirements by October 31, 2023:

Note: The permittee may optimize deployment of resources between the requirements listed below to maximize reductions for the least cost. In some cases, permittees may already be meeting these requirements.

a. Pursuant to the permittee's authority under s. 281.33(6)(a)2., Wis. Stats., the permittee shall create or revise and promulgate a municipal storm water management ordinance applicable to redevelopment that requires compliance with post-construction storm water management performance standards that are stricter than the uniform statewide standards established by the Department. When reporting to the Department under section A.6.3, the permittee shall include a justification for the level of pollutant reduction in the ordinance with an assessment of the progress it achieves towards full compliance with the TMDL. The redevelopment reductions may be adjusted to account for other storm water control measures that may exist. The permittee may also establish TP reduction levels for redevelopment projects.

Note: The permittee may enact an ordinance that is municipal-wide, targets individual TMDL reachsheds, or designated areas within the permitted MS4, balancing required TMDL reductions, parcel size, and the impact of other treatment options. Increasing redevelopment reductions is one tool in moving toward TMDL compliance.

b. The permittee shall create or revise a municipal ordinance that requires the development and implementation of a maintenance plan for all privately-owned storm water treatment facilities for which the permittee takes a TSS and/or TP reduction credit. The permittee shall develop and implement procedures and measures to verify and track that the storm water treatment facilities are inspected on a regular schedule and maintained in the intended working condition in accordance with the plans. The permittee shall require that maintenance agreements be recorded with the appropriate property records that obligates the current and future owners to implement the maintenance plans.

c. The permittee shall revise or promulgate a municipal ordinance that requires the submittal of record drawings for storm water management facility that the permittee takes a TSS and/or TP reduction credit. The permittee shall require submittal of the record drawing prior to close-out of the local permit or upon final approval and shall maintain appropriate records and tracking of the plans.

d. If the pollutant of concern is TP, the permittee shall implement, expand, or optimize a municipal leaf collection program coupled with street cleaning to serve areas where municipal leaf collection is not currently provided within the MS4 but for which a phosphorus reduction has been assigned and additional reductions could be achieved.

Note: The Department's "Interim Municipal Phosphorus Reduction Credit for Leaf Management Programs" guidance document includes recommendations on how the permittee's municipal leaf collection program should be designed and implemented.

The guidance is available from the Department's Internet site at:
https://dnr.wi.gov/topic/stormwater/standards/ms4_modeling.html

e. Within the MS4 permitted area, the permittee shall inventory the condition of the conveyance systems and outfalls. Where erosion or scour is occurring, the permittee shall develop a schedule to stabilize the identified areas over a 5-year period.

f. The permittee shall install at least one new structural BMP or enhance one or more existing structural BMPs to reduce a pollutant of concern discharged via storm water runoff to an impaired waterbody for which a WLA has been assigned to the permittee. The permittee shall develop and implement a maintenance plan for each new structural BMP.

g. The permittee shall conduct an analysis of the current municipal street cleaning program, to determine if additional pollutant loading reductions can be achieved. The permittee shall evaluate optimizing sweeping frequency, targeting of critical areas and time periods, and instituting parking restrictions. If a pollutant reduction can be achieved through optimizing the existing street cleaning program, the permittee shall adopt the optimized program the next calendar year or provide a written explanation to the Department explaining why the optimize street cleaning program is not feasible and provide alternative options to achieve similar pollutant reductions.

A.6 Reporting Requirements. For the term of this permit, the permittee shall meet the following reporting requirements:

A.6.1 Compliance Determination Reporting. The permittee shall submit the information requested in this appendix in accordance with the following schedule:

a. By March 31, 2020, for sections A.4.1 and A.5.1.

b. By October 31, 2021, for section A.5.2.

c. By October 31, 2023, for sections A.2.2.a and A.5.3.

A.6.2 Annual Reporting. For compliance options outlined under sections A.3, A.4, and A.5, the permittee shall include a description and the status of progress toward implementing the identified actions and activities in their MS4 annual reports due by March 31 of each year.

A.6.3 Final Documentation. Except for permittees complying with a Department approved adaptive management plan under section A.3.2, by October 31, 2023, the permittee shall submit documentation to the Department to verify that the permittee has completed all actions required under this appendix including the following:

a. An updated storm sewer system map that identifies:

(1) The current municipal boundary. For a permittee that is not a city or village, identify the permitted area.

Note: The permitted area for towns, counties and non-traditional MS4s pertains to the area within an urbanized area or the area served by its storm sewer system, such as a university campus.

(2) The TMDL reachshed boundaries within the municipal boundary, and the area of each TMDL reachshed in acres within the municipal boundary.

(3) The MS4 drainage boundary associated with each TMDL reachshed, and the area in acres of the MS4 drainage boundary associated with each TMDL reachshed.

b. The permittee shall submit an updated tabular summary that includes the following for each MS4 drainage boundary associated with each TMDL reachshed as identified under section A.6.3.a and for each pollutant of concern:

(1) The permittee's percent reduction needed to comply with its TMDL WLA from the no-controls modeling condition.

(2) The modeled MS4 annual average pollutant load without any storm water control measures.

(3) The modeled MS4 annual average pollutant load with existing storm water control measures.

(4) The percent reduction in pollutant load achieved calculated from the no-controls condition determined under section A.6.3.a(2) and the existing controls condition determined under section A.6.3.a(3).

(5) The existing storm water control measures, including the type of measure, area treated in acres, the pollutant load reduction efficiency, and confirmation of the permittee's authority for long-term maintenance of each practice.

c. If the updated tabular summary required under section A.6.3.b shows that the permittee is not achieving the requirements stipulated in section A.2, the permittee shall submit an updated written TMDL Implementation Plan to the Department that describes how the permittee will make progress toward achieving compliance. The TMDL Implementation Plan shall include the following information:

(1) A list of management options and an implementation schedule that over the next permit term achieves, to the maximum extent practicable, an additional 20% reduction in sediment or TSS and an additional 10% reduction in TP. The percent reductions shall be applied to the difference measured from loading conditions at the end of this permit to the total reductions listed in Tables A1-A4. The reductions can be achieved utilizing an averaged reduction calculated from individual reductions achieved in one or multiple reachsheds and spanning the entire MS4 area impacted by a TMDL.

Note: Reductions that occur through stricter redevelopment standards or through water quality trading can be counted toward meeting the reduction requirements under this section.

Note: Unlike full compliance as outlined in section A.2.2, interim compliance under this section can be based on an average reduction measured across the MS4 area impacted by a TMDL.

(2) Recommendations and options with supporting analysis for storm water control measures that will be installed or implemented in future permit terms to achieve the requirements, to the maximum extent possible, stipulated in section A.2.

(3) A proposed schedule for implementation of the recommendations and options identified under section A.6.3.c(1). The proposed schedule may extend into future permit terms.

(4) A cost effectiveness analysis for implementation of the recommendations and options identified under section A.6.3.c(1).

Table A1: Rock River Basin TMDL Load Reductions Necessary to Meet TMDL Wasteload Allocations by TMDL Reachshed

Reachshed Number (TMDL Subbasin)	Waterbody Name	County	TSS % Reduction from No-controls	TP % Reduction from No-controls
2	South Branch Rock River	Dodge, Fond du Lac, Green Lake	40.6	48.2
3	South Branch Rock River	Dodge, Fond du Lac	55.6	86.9
20	Rock River	Dodge, Jefferson, Washington, Waukesha	40.0	37.2
21	Rock River	Dodge, Jefferson, Washington, Waukesha	40.0	34.3
23	Oconomowoc River	Washington, Waukesha	46.6	35.8
24	Mason Creek	Dodge, Washington, Waukesha	47.2	35.0
25	Oconomowoc River	Jefferson, Waukesha	59.2	73.7
26	Battle Creek	Waukesha	57.4	52.6
27	Oconomowoc River	Jefferson, Waukesha	40.0	27.0
28	Rock River	Dodge, Jefferson	40.0	27.7
29	Rock River	Dodge, Jefferson	44.2	64.2
30	Johnson Creek	Jefferson	40.0	27.0
33	Mill Creek, Beaver Dam Lake	Columbia, Dodge	45.4	48.2
34	Beaver Dam River	Columbia	58.6	86.1
37	Park Creek	Columbia	72.4	75.2
39	Shaw Brook	Columbia	40.0	27.0
45	Maunesha River	Columbia	44.8	36.5
51	Crawfish River	Columbia	40.0	37.2
54	Rock River	Columbia, Dodge, Jefferson	43.6	71.5
55	Bark River	Waukesha	65.8	76.6
56	Bark River	Jefferson, Waukesha	40.0	40.9

Reachshed Number (TMDL Subbasin)	Waterbody Name	County	TSS % Reduction from No-controls	TP % Reduction from No-controls
59	Steel Brook, Scuppernong River, Bark River	Jefferson, Walworth, Rock	49.0	66.4
60	Rock River	Jefferson, Rock	40.6	48.2
61	Rock River	Dane, Rock	41.2	31.4
62	Pheasant Branch Creek	Dane	82.0	78.1
63	Spring (Dorn) Creek	Dane	46.6	37.2
64	Yahara River, Lake Mendota, Lake Monona	Dane, Columbia	73.0	61.3
65	Nine Springs Creek	Dane	67.6	62.8
66	Yahara River, Lake Waubesa, Lake Kegonsa	Dane	62.2	54.0
67	Yahara River	Dane	40.0	27.0
68	Yahara River	Dane, Rock	50.8	65.0
69	Yahara River	Dane, Rock	52.6	79.6
70	Rock River	Rock	40.6	27.7
71	Rock River	Rock	58.6	48.2
72	Blackhawk Creek	Rock, Walworth	40.0	27.0
73	Blackhawk Creek	Rock	69.4	64.2
74	Rock River	Rock	52.0	39.4
75	Markham Creek	Rock	51.4	38.0
76	Rock River	Rock	57.4	81.8
78	Bass Creek	Rock	40.0	29.9
79	Rock River	Rock	62.2	66.4
80*	Turtle Creek	Rock, Walworth	55.0	62.8
81	Turtle Creek	Rock, Walworth	44.2	41.6
83	Lake Koshkonong	Dane, Jefferson, Rock	55.0	54.0

Note: *MS4 Reachshed 80 reductions are based on Non-Point Source annual average reductions as TMDL had not assigned a separate MS4 reduction for MS4s in this reach.

Table A2: Lower Fox River Basin and Lower Green Bay TMDL Load Reductions Necessary to Meet TMDL Wasteload Allocations by TMDL Reachshed

Reachshed Name (Subbasin)	County	Subbasin ID	TSS % Reduction from No-controls	TP % Reduction from No-controls
Lower Green Bay	Brown	LFS7 & LFS8	52%	41%
Lower Fox River Main Stem	Brown, Outagamie, Winnebago	LFM	72%	41%
East River	Brown, Calumet	LF01	52%	41%
Baird Creek	Brown	LF01	52%	41%
Bower Creek	Brown	LF01	52%	41%
Dutchman Creek	Brown	LF02	52%	41%
Ashwaubenon Creek	Brown	LF02	52%	41%
Apple Creek	Brown, Outagamie	LF02	52%	41%
Plum Creek	Brown, Calumet	LF03	52%	41%
Kankapot Creek	Calumet, Outagamie	LF03	52%	41%
Garners Creek	Outagamie	LF03	60%	69%
Mud Creek	Outagamie, Winnebago	LF04	43%	48%
Neenah Slough	Winnebago	LF06	52%	41%
Duck Creek	Brown, Outagamie	LF05	52%	41%
Trout Creek	Brown	LF05	52%	41%

Note: % TSS reduction from No Controls = 20 + [0.80 x (% TSS Control Lower Fox TMDL Report)
% TP reduction from No Controls = 15 + [0.85 x (% TP Control Lower Fox TMDL Report)

Table A3: Lake St. Croix Nutrient TMDL Load Reductions Necessary to Meet TMDL Wasteload Allocations by TMDL Reachshed

Waterbody Name	County	WBIC	MS4 TP % Reduction from No Controls
Lake St. Croix	St. Croix, Pierce	2601500	46.0

Table A4: Red Cedar River (Tainter Lake, Menomin Lake) TMDL Load Reductions Necessary to Meet TMDL Wasteload Allocations by TMDL Reachshed

Waterbody Name	County	WBIC	MS4 TP % Reduction from No Controls*
Tainter Lake	Dunn	2068000	$\frac{Load_{2025\ No\ Controls} - 1700\frac{lbs}{yr}}{Load_{2025\ No\ Controls}}$
Lake Menomin	Dunn	2065900	39.2

**Note: ***The TMDL allocations and necessary reduction are calculated using the 2025 projected MS4 build out area. The 2025 area modeled in a No Controls condition compared against the WLA written in the TMDL yields the percent reduction.

Appendix B: MS4 Permittees Subject to Milwaukee River Basin TMDL

B.1 Applicability. In accordance with section 1.5.2.b, this Appendix B applies to permittees subject to a total maximum daily load (TMDL) approved by the United States Environmental Protection Agency (USEPA) that includes the following:

- "Total Maximum Daily Loads for Total Phosphorus, Total Suspended Solids, and Fecal Coliform Milwaukee River Basin, Wisconsin," approved by USEPA March 2018

Note: If the MS4 area extends into or discharges to other basins with a USEPA approved TMDL, a permittee could be subject to more than one TMDL and thus the requirements under Appendices A and/or C.

B.2 Full TMDL Compliance for Total Suspended Solids (TSS) and Total Phosphorus (TP) WLAs.

B.2.1 USEPA is allowing the Department to evaluate MS4 compliance with TMDL Wasteload Allocations (WLAs) using a percent reduction framework consistent with Wisconsin's storm water program. For consistency with existing storm water program requirements, TMDL compliance will use the percent reduction basis from the no runoff management controls (no-controls) condition. The percent reduction from no-controls, for TSS and TP for each reachshed, necessary to meet the TMDL WLAs for the USEPA approved TMDLs are listed on Table B1. The no-controls modeling condition means taking no (zero) credit for existing storm water control measures that reduce the discharge of pollutants. Existing practices can then be applied and counted toward meeting the TMDL reductions.

B.2.2 TMDLs may assign a percent reduction for one or more reachsheds for each pollutant of concern (i.e., total suspended solids (TSS) and total phosphorus (TP)). Full TMDL compliance is achieved by the permittee provided all of the following conditions are met:

a. By October 31, 2023, the permittee submits the necessary data and documentation to the Department that demonstrates that the permittee meets the percent reductions stipulated in Table B1 for each reachshed that the MS4 discharges to and for each pollutant of concern.

b. The documentation summitted by the permittee includes the policies, procedures, and regulatory mechanisms that the permittee ill employ to ensure that storm water controls and management measures will continue to be operated and maintained so that their pollutant removal efficiency continues to be met.

c. Based upon the data and documentation and any necessary subsequent information requested by the Department, the permittee receives written concurrence from the Department by April 30, 2024, that the permittee has achieved full TMDL compliance.

B.3 Participation in an Approved Adaptive Management Plan for Total Suspended Solids (TSS) and Total Phosphorus (TP) WLAs. In accordance with s. 283.13(7), Wis. Stats., and s. NR 217.18, Wis. Adm. Code, if the permittee chooses to participate in an Adaptive Management project, the permittee shall submit the plan to the Department by March 31, 2022 for approval.

Note: Information on adaptive management is available from the Department's Internet site at: https://dnr.wi.gov/topic/SurfaceWater/AdaptiveManagement.html

B.4 TMDL Implementation Plan for Total Suspended Solids (TSS) and Total Phosphorus (TP) WLAs. If the permittee has chosen not to participate in an adaptive management plan as stipulated in section B.3, the permittee shall perform the following activities:

B.4.1 By March 31, 2022, the permittee shall determine if the applicable requirements contained in section B.2.2 will be achieved during the term of this permit. The permittee shall notify the Department which reachsheds and pollutants of concern are not in compliance with the requirements contained in section B.2.2 with the tabular summary created under section B.4.2(b) and develop a TMDL Implementation Plan per section B.4.2(c).

B.4.2 The permittee shall develop and submit the following documentation to meet the requirements stipulated in section B.2.2:

a. By March 31, 2020, an updated storm sewer system map that identifies:

(1) The current municipal boundary. For a permittee that is not a city or village, identify the permitted area.

Note: The permitted area for towns, counties and non-traditional MS4s pertains to the area within an urbanized area or the area served by its storm sewer system, such as a university campus.

(2) The TMDL reachshed boundaries within the municipal boundary, and the area of each TMDL reachshed in acres within the municipal boundary.

(3) The MS4 drainage boundary associated with each TMDL reachshed, and the area in acres of the MS4 drainage boundary associated with each TMDL reachshed.

(4) Identification of areas on a map and the acreage of those areas within the municipal boundary that the permittee believes should be excluded from its analysis to show compliance with the TMDL WLA. In addition, the permittee shall provide an explanation of why these areas should not be its responsibility.

Note: An example of an area within a municipal boundary that may not be subject to a TMDL WLA for the permittee is an area that does not drain through the permittee's MS4.

(5) Flow paths of storm water through the storm sewer system.

(6) The location and associated drainage basin of structural BMPs the MS4 uses for TSS and TP treatment.

b. By March 31, 2022, the permittee shall submit a tabular summary that includes the following for each MS4 drainage boundary associated with each TMDL reachshed as identified under section B.4.2.a(2) and for each pollutant of concern listed in Table B1:

(1) The permittee's percent reduction needed to comply with its TSS and TP WLA from the no-controls modeling condition. The no-controls modeling condition means taking no (zero) credit for storm water control measures that reduce the discharge of pollutants.

Note: This model run is comparable to the no-controls condition modeled for the developed urban area performance standard of s. NR 151.13, Wis. Adm. Code.

(2) The modeled annual average pollutant load without any storm water control measures for each reachshed which the MS4 discharge to.

(3) The modeled MS4 annual average pollutant load with existing and current storm water control measures for each reachshed which the MS4 discharges to.

(4) The percent reduction in pollutant load achieved calculated from the no-controls condition determined under section B.4.2.b(2) and the existing controls condition determined under section B.4.2.b(3).

(5) The existing storm water control measures including the type of measure, area treated in acres, the pollutant load reduction efficiency, and confirmation of the permittee's authority for long-term maintenance of each practice.

c. By March 31, 2022, if the tabular summary required under section B.4.2.b shows that the permittee is not achieving the applicable percent reductions needed to comply with section B.2.2, then the permittee shall submit a written TMDL Implementation Plan to the Department that describes how the permittee will make progress toward achieving compliance. The plan shall include the following information:

(1) Recommendations and options for storm water control measures that will be considered to reduce the discharge of each pollutant of concern. At a minimum, the following shall be evaluated: all post-construction BMPs for which the Department has a technical standard, optimizing or retrofitting all existing public and private storm water control practices, regional practices, optimization or improvements to existing BMPs, incorporation of storm water control for all road reconstruction projects, more restrictive post-construction ordinances, updated development and redevelopment standards.

(2) A proposed schedule for implementation of the alternatives identified under section B.4.2.c(1). The proposed schedule may extend beyond the expiration date of this permit. The schedule should aim to achieve, to the maximum extent practicable, a level of reduction that achieves at least 20% of the remaining reduction needed beyond baseline to achieve full compliance in TSS and a level of reduction that achieves at least 10% of the remaining reduction needed

beyond baseline to achieve full compliance in TP over the next permit term. The reductions can be achieved utilizing an averaged reduction calculated from individual reductions achieved in one or multiple reachsheds and spanning the entire MS4 area impacted by a TMDL.

Note: The reductions stipulated under B.4.2.c(2) are interim compliance targets set as a planning target for the next permit term. Future permit reduction targets may tapper off or vary between municipalities based on individual plans as it is expected that municipalities will rely more on reductions obtained through redevelopment.

(3) A cost effectiveness analysis for implementation of the recommendations and options identified under section B.4.2.c(1).

Note: The Department has developed the guidance document "TMDL Guidance for MS4 Permits: Planning, Implementation, and Modeling Guidance." The guidance is available on the Department's Internet site: https://dnr.wi.gov/topic/stormwater/standards/ms4_modeling.html, and is available to assist a permittee with complying with the requirements of section B.4.

Note: Reductions obtained through a permittee's participation in a water quality trading project, in accordance with s. 283.84, Wis. Stats., and that has been reviewed and approved by the Department, can be counted toward credit in meeting the requirements stipulated under section B.4.2.c(2). Additional information on water quality trading is available from the Department's Internet site at: https://dnr.wi.gov/topic/surfacewater/waterqualitytrading.html

B.4.3 TMDL Compliance During the Term of This Permit for Total Suspended Solids (TSS) and Total Phosphorus (TP) WLAs. If the permittee has chosen not to participate in an adaptive management plan as stipulated in section B.3, the permittee shall select and implement a minimum of three of the activities listed below, in addition to the planning requirements contained in section B.4.2, by October 31, 2023:

Note: The permittee may optimize deployment of resources between the requirements listed below to maximize reductions for the least cost. In some cases, permittees may already be meeting these requirements.

a. Pursuant to the permittee's authority under s. 281.33(6)(a)2., Wis. Stats., the permittee shall create or revise and promulgate a municipal storm water management ordinance applicable to redevelopment that requires compliance with post-construction storm water management performance standards that are stricter than the uniform statewide standards established by the Department. When reporting to the Department under section B.6.3, the permittee shall include a justification for the level of pollutant reduction in the ordinance with an assessment of the progress it achieves towards full compliance with the TMDL. The redevelopment TSS reduction may be adjusted to account for other storm water controls measures that may exist. The permittee may also establish TP reduction levels for redevelopment projects.

Note: The permittee may enact an ordinance that is municipal wide, targets individual TMDL reachsheds, or designated areas within the permitted MS4 balancing required TMDL reductions, parcel size, and the impact of other treatment options. Increasing redevelopment reductions is one tool in moving toward TMDL compliance.

b. The permittee shall create or revise a municipal ordinance that requires the development and implementation of a maintenance plan for all privately-owned storm water treatment facilities for which the permittee takes a TSS and/or TP reduction credit. The permittee shall develop and implement procedures and measures to verify and track that the storm water treatment facilities are inspected on a regular schedule and maintained in the intended working condition in accordance with the plans. The permittee shall require that maintenance agreements be recorded with the appropriate property records that obligates the current and future owners to implement the maintenance plans.

c. The permittee shall revise or promulgate a municipal ordinance that requires the submittal of record drawings for which the permittee takes a TSS and/or TP reduction credit. The permittee shall require submittal of the record drawing prior to close-out of the local permit or upon final approval and shall maintain appropriate records and tracking of the plans.

d. If the pollutant of concern is TP, implement, expand, or optimize a municipal leaf collection program coupled with street cleaning to serve areas where municipal leaf collection is not currently provided within the MS4 but for which a phosphorus WLA has been assigned and additional reductions could be achieved.

Note: The Department's "Interim Municipal Phosphorus Reduction Credit for Leaf Management Programs" guidance document includes recommendations on how the permittee's municipal leaf collection program should be designed and implemented. The guidance is available from the Department's Internet site at: https://dnr.wi.gov/topic/stormwater/standards/ms4_modeling.html

e. Within the MS4 permitted area, the permittee shall inventory the condition of the conveyance systems and outfalls. Where erosion or scour is occurring, the permittee shall develop a schedule to stabilize the identified areas.

f. Install one new structural BMP or enhance one existing structural BMPs to reduce a pollutant of concern discharged via storm water runoff to an impaired waterbody for which a WLA has been assigned to the permittee. The permittee shall develop and implement a maintenance plan for each new structural BMP.

Note: This option can be counted each time the permittee installs or enhances a structural BMP to satisfy the required activities. A permittee could meet the requirement if they solely chose this option and installed or enhanced three BMPs.

g. Permittee shall conduct an analysis of the current municipal street cleaning program, to determine if additional pollutant loading reductions can be achieved. The permittee shall evaluate optimizing sweeping frequency, targeting of critical areas and time

periods, and instituting parking restrictions. If a pollutant reduction can be achieved through optimizing the existing street cleaning program, the permittee shall adopt the optimized program the next calendar year or provide a written explanation to the Department explaining why the optimize street cleaning program is not feasible and provide alternative options to achieve similar pollutant reductions.

Note: The permittee may optimize deployment of resources between the requirements listed above to maximize reductions for the least cost; for example, only increase street sweeping where structural practices do not already exist to treat the runoff for the area.

B.5 TMDL Compliance and Implementation for Bacteria WLAs. This section applies to all permittees with a bacteria WLA specified in the Milwaukee River Basin TMDL Final Report dated March 19, 2018. The permittee shall do all of the following:

B.5.1 As part of its program to address illicit discharges under section 2.3 of this permit, by March 31, 2021, the permittee shall begin to conduct ongoing public education and outreach activities specifically to increase awareness of bacterial pollution problems, potential sources, proper pet waste management, and the impacts of urban wildlife and pests.

B.5.2 In addition to complying with the requirements in section 2.3 of this permit, the permittee shall comply with the following:

a. By March 31, 2022, the permittee shall develop and submit to the Department an inventory of bacteria sources and a map indicating the locations of the potential sources of fecal coliform and *E. coli* entering its MS4. The inventory shall be in a tabular format and include a label code, the name of the source, the physical address or location description of the source, and the ownership of the source (i.e., public or private). The map shall be to scale, identify all municipal streets, and indicate the locations of the sources using the label codes. The permittee shall consider the variation in flow conditions in its identification of potential sources. The inventory and map shall include the following potential sources of bacteria:

- Known or suspected leaking or failing septic systems.
- Sanitary sewer overflow locations.
- Livestock and domesticated animals housed or raised within the MS4 permitted area and discharging to the MS4, but not including household pets.
- Zoos, kennels, animal breeders, pet stores, and dog training facilities.
- Waste hauling, storage, and transfer facilities.
- Areas that attract congregations of nuisance urban birds and wildlife.
- Known or suspected properties with inadequate food or organic waste handling or storage.
- Composting sites or facilities.
- Known or suspected areas with improper human sanitation use.
- Any other source that the permittee or the Department has a reason to believe is discharging bacteria to the MS4.

b. By October 31, 2023, the permittee shall develop and submit to the Department a bacteria source elimination plan. The plan shall consist of a strategy and prioritization

scheme to eliminate each source of bacteria identified under section B.5.2.2. The plan shall include the BMPs to be used, cost estimates, sources of funding, and a schedule to eliminate the sources. BMPs identified in the plan may be structural, non-structural, targeted outreach, and/or additional ordinances, but the plan shall include the rationale for using each BMP, the reason for selected a BMP over another, and the expected outcome from implementing each BMP.

Note: While the TMDL allocations in the Milwaukee River Basin TMDL are expressed only in terms of fecal coliform, both fecal coliform and *E. coli* have been listed as sources of recreational use impairments that the TMDL was completed to address.

B.5.3 By March 31, 2023, the permittee shall adopt local ordinances to address the requirements for proper pet waste management, the restrictions on feeding of urban wildlife that are potential sources of bacteria entering the MS4, the requirements for property owners to cooperate with identifying and eliminating illicit sanitary sewerage cross-connections with the MS4, and the requirements for property owners to address other potential sources of bacteria that may enter the MS4 (e.g., refuse management, pest control).

B.6 Reporting Requirements. For the term of this permit, the permittee shall meet the following reporting requirements:

B.6.1 Compliance Determination Reporting. The permittee shall submit the information requested in this appendix in accordance with the following schedule:

a. By March 31, 2020, for section B.4.2.a.

b. By March 31, 2021, for sections B.5.1.

c. By March 31, 2022, for sections B.4.1, B.4.2.b, and B.5.2.a.

d. By March 31, 2023, for section B.5.3.

e. By October 31, 2023, for section B.2.2.a, B.4.3, and B.5.2.b.

B.6.2 Annual Reporting. For requirements outlined under sections B.3, B.4, and B.5 the permittee shall include a description and the status of progress toward implementing the identified actions and activities in their MS4 annual reports due by March 31 of each year.

B.6.3 Final Documentation. By October 31, 2023, the permittee shall submit documentation to the Department to verify that the permittee has completed all actions required under this appendix including submittal of the TMDL Implementation Plan required under section B.4 and documentation that the three activities selected under section B.4.3 have been completed.

Table B1: Milwaukee River Basin TMDL Load Reductions Necessary to Meet TMDL Wasteload Allocations by TMDL Reachshed

Kinnickinnic River Basin:

Reachshed (TMDL Subbasin)	Waterbody Name	Waterbody Extents	TSS % Reduction from No-controls	TP % Reduction from No-controls
KK-1	Lyons Park Creek	Entire Length	78.4%	68.1%
KK-2	Kinnickinnic River	From Wilson Park Creek to Lyons Park Creek	77.6%	68.1%
KK-3	South 43rd St. Ditch	Entire Length	76.8%	78.7%
KK-4	Edgerton Channel, Wilson Park Creek, Villa Mann Creek	Entire Length	84.0%	89.4%
KK-5	Holmes Avenue Creek	Entire Length	80.0%	78.7%
KK-6	Cherokee Park Creek	Entire Length	77.6%	69.0%
KK-7	Kinnickinnic River	Estuary to Wilson Park Creek	75.2%	45.0%

Menomonee River Basin:

Reachshed (TMDL Subbasin)	Waterbody Name	Waterbody Extents	TSS % Reduction from No-controls	TP % Reduction from No-controls
MN-1	Menomonee River	From Nor-X-Way Channel to Headwaters	66.4%	63.6%
MN-2	Goldendale Creek	Entire Length	63.2%	47.7%
MN-3	West Branch Menomonee River	Entire Length	65.6%	60.1%
MN-4	Willow Creek	Entire Length	64.0%	51.2%
MN-5	Nor-X-Way Channel	Entire Length	70.4%	72.5%
MN-6	Menomonee River and Dretzka Park Creek	From Little Menomonee River to Nor-X-Way Channel	73.6%	69.0%
MN-7	Lilly Creek	Entire Length	70.4%	64.5%
MN-8	Butler Ditch	Entire Length	69.6%	58.3%
MN-9	Little Menomonee River	Entire Length	70.4%	64.5%
MN-10	Menomonee River	From Underwood Creek to Little Menomonee River	67.2%	31.7%
MN-11	Underwood Creek and Dousman Ditch	From South Branch Underwood Creek to Headwaters	72.0%	62.7%

Reachshed (TMDL Subbasin)	Waterbody Name	Waterbody Extents	TSS % Reduction from No-controls	TP % Reduction from No-controls
MN-12	Underwood Creek	From Menomonee River to South Branch Underwood Creek	80.0%	76.1%
MN-13	South Branch Underwood Creek	Entire Length	76.8%	69.8%
MN-14	Menomonee River	From Honey Creek to Underwood Creek	64.8%	49.4%
MN-15	Honey Creek	Entire Length	73.6%	67.2%
MN-16	Menomonee River	From Estuary to Honey Creek	72.0%	49.4%

Milwaukee River Basin:

Reachshed (TMDL Subbasin)	Waterbody Name	Waterbody Extents	TSS % Reduction from No-controls	TP % Reduction from No-controls
MI-1	Upper Milwaukee River	From Campbellsport to Headwaters	**	**
MI-2	Upper Milwaukee River	From Kewaskum To Campbellsport and Auburn	73.6%	71.6%
MI-3	West Branch Milwaukee River	Entire Length	77.6%	48.6%
MI-4	Kewaskum Creek	Entire Length	76.8%	55.7%
MI-5	Watercress Creek and East Branch Milwaukee River	Entire Length	73.6%	51.2%
MI-6	Quass Creek and Milwaukee River	Near West Bend	73.6%	86.7%
MI-7	Myra Creek and Milwaukee River	From North Branch Milwaukee River to West Bend	79.2%	67.2%
MI-8	North Branch Milwaukee River	from Adell Tributary to Headwaters	**	**
MI-9	Adell Tributary	Entire Length	**	**
MI-10	Chambers Creek, Batabia Creek, and North Branch Milwaukee River	Near Sherman	**	**
MI-11	Melius Creek	Entire Length	**	**
MI-12	Mink Creek	Entire Length	**	**

Reachshed (TMDL Subbasin)	Waterbody Name	Waterbody Extents	TSS % Reduction from No-controls	TP % Reduction from No-controls
MI-13	Stony Creek, Wallace Creek, and North Branch Milwaukee River	Near Farmington	74.4%	46.8%
MI-14	Silver Creek	Entire Length	**	**
MI-15	Milwaukee River	Near Fredonia	**	**
MI-16	Milwaukee River	Near Saukville	75.2%	77.8%
MI-17	Milwaukee River	From Cedar Creek to Saukville	76.0%	83.1%
MI-18	Cedar Creek	From Jackson Creek to Headwaters	76.8%	71.6%
MI-19	Lehner Creek	Entire Length	77.6%	61.0%
MI-20	Jackson Creek	Entire Length	80.8%	77.8%
MI-21	Little Cedar Creek	Entire Length	80.8%	77.8%
MI-22	Cedar Creek	Near Jackson	76.8%	54.8%
MI-23	Evergreen Creek	Near Jackson	79.2%	53.0%
MI-24	North Branch Cedar Creek and Cedar Creek	From Milwaukee River to Myra Creek	73.6%	79.6%
MI-25	Milwaukee River	From Pigeon Creek to Cedar Creek	81.6%	43.2%
MI-26	Pigeon Creek	Entire Length	90.4%	88.5%
MI-27	Milwaukee River	From Lincoln Creek to Pigeon Creek	72.8%	53.9%
MI-28	Beaver Creek	Entire Length	72.8%	88.5%
MI-29	South Branch Creek	Entire Length	71.2%	87.6%
MI-30	Indian Creek	Entire Length	65.6%	76.1%
MI-31	Lincoln Creek	Entire Length	71.2%	85.8%
MI-32	Milwaukee River	From Estuary to Lincoln Creek	58.4%	23.7%

Note: **The TMDL did not assign a percent reduction for these reachsheds because modeling indicated that there is no direct MS4 discharge to this subbasin. If more detailed analysis conducted by the permittee indicates the presence of an MS4 discharge, contact your DNR storm water engineer or specialist for more information on how best to proceed.

Appendix C: MS4 Permittees Subject to the Wisconsin River Basin TMDL or a TMDL Approved After May 1, 2019

C.1 Applicability. In accordance with section 1.5.2.c, this Appendix C applies to permittees subject to a total maximum daily load (TMDL) approved by the United States Environmental Protection Agency (USEPA) that includes the following:

- "Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin," approved by USEPA April 2019

  Note: The Wisconsin River Basin TMDL has two sets of allocations. Table J-4 of Appendix J of the TMDL report lists the allocations and corresponding percent reductions based on current water quality criteria and Table K-4 of Appendix K of the TMDL report lists the allocations and corresponding percent reductions based on recommended site-specific criteria. Both tables provide the percent reductions measured from no-controls and the TMDL baseline. Under this permit term, the allocations listed in Appendix J of the TMDL report apply. If the recommended site-specific criteria are approved by USEPA, the allocations and percent reductions listed in Appendix K of the TMDL report will become applicable. However, permittees may use the allocations from either Appendix J or Appendix K of the TMDL report for planning purposes under sections C.3 and C.4 below.

- A TMDL approved by the USEPA on or after May 1, 2019

Note: If the MS4 area extends into or discharges to other basins with a USEPA approved TMDL, a permittee could be subject to more than one TMDL and thus the requirements under Appendices A and/or B.

C.2 Full TMDL Compliance.

C.2.1 USEPA is allowing the Department to evaluate MS4 compliance with TMDL Wasteload Allocations (WLA) using a percent reduction framework consistent with Wisconsin's storm water program. For consistency with existing storm water program requirements, TMDL compliance will use the percent reduction measured from the no runoff management controls (no-controls) condition. The percent reduction from no-controls, for each pollutant of concern and reachshed, necessary to meet the TMDL WLAs for the USEPA approved TMDLs are listed in the approved TMDLs. The no-controls modeling condition means taking no (zero) credit for existing storm water control measures that reduce the discharge of pollutants. Existing practices can then be applied and counted toward meeting the TMDL reduction reductions.

C.2.2 TMDLs may assign a percent reduction for one or more reachsheds for each pollutant of concern (i.e., total suspended solids (TSS) and total phosphorus (TP)). Full TMDL compliance is achieved by the permittee provided all of the following conditions are met:

a. The permittee submits the necessary data and documentation to the Department that demonstrates that the permittee meets the percent reductions stipulated in the USEPA approved TMDL for each reachshed that the MS4 discharges to and for each pollutant of concern.

b. The documentation summitted by the permittee includes the policies, procedures, and regulatory mechanisms that the permittee ill employ to ensure that storm water controls and management measures will continue to be operated and maintained so that their pollutant removal efficiency continues to be met.

c. Based upon the data and documentation and any necessary subsequent information requested by the Department, the permittee receives written concurrence from the Department that the permittee has achieved full TMDL compliance.

C.3 Participation in an approved Adaptive Management Plan. In accordance with s. 283.13(7), Wis. Stats., and s. NR 217.18, Wis. Adm. Code, if the permittee has chosen to participate in an Adaptive Management project that has been approved by the Department the permittee shall continue to participate in the implementation of the Adaptive Management project.

Note: Information on adaptive management is available from the Department's Internet site at: https://dnr.wi.gov/topic/SurfaceWater/AdaptiveManagement.html

C.4 TMDL Implementation Plan. If the permittee is not participating in a Department approved adaptive management plan as stipulated in section C.3, a permittee with MS4s discharging to TMDL reachsheds shall do all the following to demonstrate progress towards achieving the TMDL reductions stipulated in section C.2.2 and shall submit the following documentation:

C.4.1 Within 36 months of the approval date of the TMDL, an updated storm sewer system map that identifies:

a. The current municipal boundary. For a permittee that is not a city or village, identify the permitted area.

Note: The permitted area for towns, counties and non-traditional MS4s pertains to the area within an urbanized area or the area served by its storm sewer system, such as a university campus.

b. The TMDL reachshed boundaries within the municipal boundary, and the area of each TMDL reachshed in acres within the municipal boundary.

c. The MS4 drainage boundary associated with each TMDL reachshed, and the area in acres of the MS4 drainage boundary associated with each TMDL reachshed.

d. Identification of areas on a map and the acreage of those areas within the municipal boundary that the permittee believes should be excluded from its analysis to show compliance with the TMDL WLA. In addition, the permittee shall provide an explanation of why these areas should not be its responsibility.

Note: An example of an area within a municipal boundary that may not be subject to a TMDL WLA for the permittee is an area that does not drain through the permittee's MS4.

e. Flow paths of storm water through the storm sewer system.

f. The location and associated drainage basin of structural BMPs the MS4 uses for TSS and TP treatment.

C.4.2 Within 36 months of the approval date of the TMDL, the permittee shall submit a tabular summary that includes the following for each MS4 drainage boundary associated with each TMDL reachshed as identified under section C.4.1 and for each TMDL WLA:

a. The permittee's percent reduction needed to comply with its TMDL WLA from the no-controls modeling condition. The no-controls modeling condition means taking no (zero) credit for storm water control measures that reduce the discharge of pollutants.

b. The modeled annual average pollutant load without any storm water control measures for each subbasin which the MS4 discharges to as previously identified in section C.4.1.

c. The modeled annual average pollutant load with existing storm water control measures for each subbasin with the MS4 discharges to as previously identified in section C.4.1.

d. The percent reduction in pollutant load achieved from the no-controls condition and the existing controls condition.

e. The existing storm water control measures including the type of measure, area treated in acres, the pollutant load reduction efficiency, and documentation of the permittee's authority for long-term maintenance of each practice.

f. If applicable, the remaining pollutant load reduction for each pollutant of concern and reachshed to meet the TMDL reduction goals.

C.4.3 Within 48 months of the approval date of the TMDL, if the tabular summary required under section C.4.2 shows that the permittee is not achieving the applicable percent reductions needed to comply with its TMDL WLA for each TMDL reachshed, then the permittee shall submit a written TMDL Implementation Plan to the Department that describes how the permittee will make progress toward achieving compliance with the TMDL WLA. The plan shall include the following information:

a. Recommendations and options for storm water control measures that will be considered to reduce the discharge of each pollutant of concern. At a minimum, the following shall be evaluated: all post-construction BMPs for which the Department has a technical standard, optimizing or retrofitting all existing public and private storm water control practices, regional practices, optimization or improvements to existing BMPs, incorporation of storm water control for all road reconstruction projects, more restrictive post-construction ordinances, updated development and redevelopment standards. Focus should be placed on those areas identified in section C.4.2 without any controls.

b. A proposed schedule for implementation of the alternatives identified under section C.4.3.a. The proposed schedule may extend beyond the expiration date of this permit. The schedule should aim to achieve, to the maximum extent practicable, a level of reduction that achieves at least 20% of the remaining reduction needed beyond baseline to achieve full compliance in TSS and a level of reduction that achieves at least 10% of the remaining reduction needed beyond baseline to achieve full compliance in TP over the next permit term. The reductions can be achieved utilizing an averaged reduction calculated from individual reductions achieved in one or multiple reachsheds and spanning the entire MS4 area impacted by a TMDL.

Note: The reductions stipulated under C.4.3.b are interim compliance targets set as a planning target for the next permit term. Future permit reduction targets may taper off or vary between municipalities based on individual plans as it is expected that municipalities will rely more on reductions obtained through redevelopment. In many some cases, reductions that occur through redevelopment activities as outlined in section C.4.3.d may provide the most economical and practical method toward eventually achieving the reduction goals.

c. A cost effectiveness analysis for implementation of the recommendations and options identified under section C.4.3.a.

Note: The Department has developed the guidance document "TMDL Guidance for MS4 Permits: Planning, Implementation, and Modeling Guidance." The guidance is available on the Department's Internet site: https://dnr.wi.gov/topic/stormwater/standards/ms4_modeling.html, and is available to assist a permittee with complying with the requirements of section C.4.

Note: Reductions obtained through a permittee's participation in a water quality trading project, in accordance with s. 283.84, Wis. Stats., and that has been reviewed and approved by the Department, can be counted toward credit in meeting the requirements stipulated under section C.2.2. Additional information on water quality trading is available from the Department's Internet site at: https://dnr.wi.gov/topic/surfacewater/waterqualitytrading.html

C.5 Annual Reporting. For requirements outlined under sections C.3 and C.4 the permittee shall include a description and the status of progress toward implementing the identified actions and activities in their MS4 annual reports due by March 31 of each year.

Appendix F: WDNR Correspondence

Chuck Boehm

Subject: FW: 2 questions on city-wide plan and grant

From: Zimmerman, Jacob L - DNR <Jacob.Zimmerman@wisconsin.gov>
Sent: Friday, August 13, 2021 8:07 AM
To: Chuck Boehm <CBoehm@BrwnCald.com>; Sue Olson <Sue.Olson@Appleton.org>; Minser, Amy J - DNR <Amy.Minser@wisconsin.gov>; Fischer, Anthony R - DNR <Anthony.Fischer@wisconsin.gov>
Subject: RE: 2 questions on city-wide plan and grant

Good Morning Chuck,
I agree with you assessment of the Special Condition in the grant contract. The 3 bullets below are sufficient analysis for stormwater management planning grant purposes.

Let us know if you have any other questions,
Jake

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Jacob Zimmerman, PE
(262) 888-0578
Jacob.zimmerman@wisconsin.gov

From: Chuck Boehm <CBoehm@BrwnCald.com>
Sent: Thursday, August 12, 2021 10:54 AM
To: Zimmerman, Jacob L - DNR <Jacob.Zimmerman@wisconsin.gov>; Olson, Sue <sue.olson@appleton.org>; Limberg, Suzan C - DNR <Suzan.Limberg@wisconsin.gov>; Minser, Amy J - DNR <Amy.Minser@wisconsin.gov>; Fischer, Anthony R - DNR <Anthony.Fischer@wisconsin.gov>
Subject: RE: 2 questions on city-wide plan and grant

Greetings Jake,

Thank you for your feedback.

Regarding the grant contract requirements question, we wanted to seek confirmation or direction as needed for the grant item B – Special Condition at the top of page 6 of the attached pdf.

To address this item for potential structural stormwater management practices (SMPs) the following items are being conducted:

- Review of WDNR surface viewer data viewer (SWDV) for waterways, mapped wetlands, and wetland indicator soils (no wetland delineations are being conducted, and the presence of indicator soils does not necessarily rule out a potential future SMP at this stage of high level master planning – wetland delineations would be conducted in the future as part of more detailed site planning if a site is identified for implementation consideration)
- Search on NHI portal for endangered resources preliminary assessment (if a site indicated that further actions are required to ensure compliance, those have not currently been conducted but would be conducted in the future as part of more detailed site planning if a site is identified for implementation consideration)
- Review of WDNR BRRTS site for potential contamination issues

We would appreciate a review of our actions and confirmation that they are sufficient for compliance or direction if needed on an expansion of our efforts during this citywide master plan to comply with the grant requirement.

Thanks for your review and support,

Chuck Boehm, PE
Director, Client Services
Brown and Caldwell | Milwaukee
T 414.203.2899 | C 262.488.3350 | CBoehm@brwncald.com

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From: Zimmerman, Jacob L - DNR <Jacob.Zimmerman@wisconsin.gov>
Sent: Tuesday, August 10, 2021 5:20 PM
To: Sue Olson <sue.olson@appleton.org>; Limberg, Suzan C - DNR <Suzan.Limberg@wisconsin.gov>; Minser, Amy J - DNR <amy.minser@wisconsin.gov>
Cc: Chuck Boehm <CBoehm@BrwnCald.com>
Subject: RE: 2 questions on city-wide plan and grant

Hi Sue,
For your first question, I don't believe that section A.5.3.a applies to the City. Based upon our records (see attached letter), the City had a concurred with TMDL implementation plan prior to the permit being issued. Thus the City is required to follow it's plan per Section A.3.1. Permit Section A.5.3 only applies to those permittees who did not have a DNR concurred with plan prior to the permit being issued.

The city still can elect to increase the development and redevelopment pollutant control requirements in the City ordinance, but is not required to at this time. That said, it may be worth evaluating if the City cannot meet the TMDL goals with BMPs on public land alone.

As for the grant contract, can you send me that specific document you are referring to? That will help me give you an answer on "preliminary determinations."

Best,
Jake

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Jacob Zimmerman, PE
(262) 888-0578
Jacob.zimmerman@wisconsin.gov

From: Sue Olson <Sue.Olson@Appleton.org>
Sent: Tuesday, August 10, 2021 11:11 AM
To: Limberg, Suzan C - DNR <Suzan.Limberg@wisconsin.gov>; Zimmerman, Jacob L - DNR <Jacob.Zimmerman@wisconsin.gov>; Minser, Amy J - DNR <Amy.Minser@wisconsin.gov>

Cc: Chuck Boehm <CBoehm@BrwnCald.com>
Subject: 2 questions on city-wide plan and grant

Amy, Susy and Jake - I wasn't sure who to send these questions to so sending to all of you. We have two questions on our City-wide stormwater plan update and the associated grant.

1. The MS4 permit Appendix A Section A.5.3.a regarding the ordinance. The first sentence states that we are required to make our ordinance more restrictive than statewide standards. The next sentence states that we are to justify the level of pollutant reduction in the ordinance. The Director has asked for an email from WNDR clarifying whether or not we are required to change our ordinance to the TMDL numbers. At this time our ordinance meets NR 151/216. Originally (2004) it was more restrictive than NR 151/216 but now they are the same.

   We are beginning discussions with our Community Development Department (who traditionally oppose further regulation as an obstacle to development and redevelopment) and will then take the conversation to the elected officials. If we are required to include the TMDL numbers in the ordinance, we expect to allow MEP for most projects, since cost effective technology does not yet exist, especially for smaller sites, and economic .

2. The last sentence of the grant contract B -Special Condition. This was not known to us when our scope and application were prepared and will be substantial additional effort and cost. Please provide some guidance to define "preliminary determinations" so that we are able to complete the necessary work prior to submitting our plan to DNR for review.

Thank you!
Sue

Sue Olson, PE
Project Engineer
100 N. Appleton Street
Appleton, WI 54911
920-832-6473 direct
sue.olson@appleton.org

Attention: This message was sent from a source external to the City of Appleton. Please use caution when opening attachments or clicking links.

Chuck Boehm

From: Zimmerman, Jacob L - DNR <Jacob.Zimmerman@wisconsin.gov>
Sent: Friday, June 4, 2021 2:37 PM
To: Chuck Boehm
Cc: Sue Olson; Doug Joachim
Subject: RE: City of Appleton eReporting Submittal

Good Afternoon,
Based upon the submitted response and our discussion on Wednesday, I do not have any further comments on the draft report. I agree with the proposed modeling methodology and the City can continue with the alternatives analysis and implementation plan develop using the load reduction values in the Draft report. Please let me know if you have any question.
Have a great weekend,
Jake

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Jacob Zimmerman, PE
(262) 888-0578
Jacob.zimmerman@wisconsin.gov

From: Chuck Boehm <CBoehm@BrwnCald.com>
Sent: Wednesday, May 26, 2021 3:17 PM
To: Zimmerman, Jacob L - DNR <Jacob.Zimmerman@wisconsin.gov>
Cc: Olson, Sue <sue.olson@appleton.org>; Doug Joachim <djoachim@BrwnCald.com>
Subject: RE: City of Appleton eReporting Submittal

Greetings Jake,

Thanks again for your review and subsequent questions and comments.

I have copied your items from below into the attached MS Word document and hopefully have responses in there that answer your questions. I also have some tables attached (pdf document) that relate back to Question 2. Please take a look and let us know if anything needs further clarification. Feel free to add to the MS Word file to document if our responses are acceptable or if there are follow-up questions or detail needed. We'd be happy to talk anything over with you and we also would like to get some more clarification on the trading component.

Have a great day!

Chuck Boehm, PE
Director, Client Services
Brown and Caldwell | Milwaukee
T 414.203.2899 | C 262.488.3350 | CBoehm@brwncald.com

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From: Zimmerman, Jacob L - DNR <Jacob.Zimmerman@wisconsin.gov>
Sent: Thursday, May 20, 2021 1:43 PM
To: Chuck Boehm <CBoehm@BrwnCald.com>
Cc: Sue Olson <sue.olson@appleton.org>; Doug Joachim <djoachim@BrwnCald.com>
Subject: RE: City of Appleton eReporting Submittal

Good Afternoon,
I've finished up review of the submitted documents and have a few questions and comments which are listed below.

1. Page 3-10, 3rd to last paragraph. Can you provide an example where you adjusted the treatment percentage to account for changes in developed area vs creating a new private BMP model?
2. Table 3-7 & 8. Are you meeting the required TSS or TP TMDL load reductions if you exclude the BMPs for which a model is still needed as identified in Table 3-5B at the end of the report? Can you represent the current load reduction without the SMPs that need a model? I ask because you are inquiring about water quality trading, and we require demonstration of load reduction beyond that which is required in the TMDL, so I don't think we can rely on assumed reduction efficiency of the BMPs. All the BMPs used to achieve the TMDL reduction goal will need to be modeled before trading could occur.
3. Table 3-7 &8. I have note that in the previous report, the City transferred some reduction from Apple Creek to the Lower Fox Mainstem via the municipal cooperation allowance in NR 151. Is that still happening in this update? If so, can you not how many pounds of TSS and TP.
4. How are you computing total load reduction in a reach or BMP contributing area when there are multiple BMPs treating a source area? How are practices in series demonstrated?
    a. HSDs upstream of a pond
    b. HSD + Street Sweeping
    c. Street Sweeping + Pond
    d. Kensington/Plank Road pond, 3 ponds in series
5. Meade+ Evergreen + Ballard Ponds. Similar to above, are the individual pond models just developed to populate Table 3-5B, but all the ponds in series are actually used to tabulate the reach load reduction? I'm guessing you are doing this on a separate spreadsheet.
6. Ballard Pond. Table 3-5B says the TSS and TP reductions are 87% and 59% respectively. However when you run the model, the TSS and TP reductions are 90.8% and 69.3% respectively. What is causing this difference?
7. No specific issues with the WinSlamm Models for the ponds or HSDs themselves.
8. Post construction ordinance and program documents look good.
9. Remaining items to complete per the scope of services. Please let me know if I missed any of these
    a. 3.5 2) Graphical depiction of TSS/TP loading/acre
    b. Tasks 4.0-4.13
    c. Task 5.0
    d. Task 7.0
10. As you evaluate the WQT items in more detail, feel free to reach out. I spent time last week talking with Keith Marquardt on both Fox River TMDLs to better familiarize myself and can help you determine where credits can be generated and used.

Please let me know if you would like to discuss any of these comments or you need additional clarification. My schedule is looking pretty good for the next two weeks if you want to set up some time to talk. Note, I will be taking a vacation from 6/8-6/21st .

Best,
Jake

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Jacob Zimmerman, PE
(262) 888-0578
Jacob.zimmerman@wisconsin.gov

From: Chuck Boehm <CBoehm@BrwnCald.com>
Sent: Thursday, February 25, 2021 3:25 PM
To: Zimmerman, Jacob L - DNR <Jacob.Zimmerman@wisconsin.gov>
Cc: Olson, Sue <sue.olson@appleton.org>; Doug Joachim <djoachim@BrwnCald.com>
Subject: City of Appleton eReporting Submittal

Greetings Jake,

I have uploaded the interim draft City of Appleton Citywide Stormwater Management Plan Report that documents our updated TMDL water quality analysis for no-controls and with-controls as discussed in the WDNR eReporting system, and Sue Olson will be submitting it in the near term.

The supporting model files got too large in some instances with the backup pdf documentation to submit through the system, so I will get those posted on OneDrive and you will get a link to access and download the files for your review.

As you look them over, please let us know if you need additional information. Doug Joachim is our model lead and WinSLAMM guru and also keeper of our overall data for the modeling effort and is included on this email and probably the best resource for any model specific questions.

Let me know if this all works OK for you.

Thanks!

Chuck Boehm
Director, Client Services
Milwaukee Office Lead
Brown and Caldwell | Milwaukee, WI
CBoehm@brwncald.com
T 414.203.2899 | **C** 262.488.3350

Table 3-7. With-Controls TSS Reduction Results
Stormwater Management Plan Update
City of Appleton, WI

Lower Fox River TMDL							
Reachshed	GIS Name	Total Treated Area (acres)	No-Controls TSS Load (tons/year)	With-Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With-Controls TSS Reduction % (compared to no-controls total load)	Is TSS Load Reduction Target Met?
Apple Creek	Apple Creek	3,388	332.3	233.7	52%	70.3%	Yes
Duck Creek	Duck Creek	57	3.8	2.8	52%	73.7%	Yes
Garners Creek	Garners Creek	1,576	236.7	179.7	60%	75.9%	Yes
Lower Fox River Mainstem (DS)	Lower Fox River (DS)	5,966	830.6	298.7	72%	36.0%	No
Lower Fox River Mainstem (US)	Lower Fox River (US)	1,506	214.3	44.9	72%	21.0%	No
Mud Creek	Mud Creek	1,055	164.7	75.6	43%	45.9%	Yes
Totals		**13,548**	**1,782.5**	**835.3**		**46.9%**	
Upper Fox-Wolf TMDL							
Reachshed		Total Treated Area (acres)	No-Controls TSS Load (tons/year)	With-Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With-Controls TSS Reduction % (compared to no-controls total load)	Is TSS Load Reduction Target Met?
Bear Creek	Bear Creek	137	4.6	1.2	84%	25.8%	No
Lake Winnebago	Lake Winnebago	586	62.0	23.6	20%	38.0%	Yes
Totals		**723**	**66.7**	**24.8**		**37.2%**	

Table 3-7x. With-Controls TSS Reduction Results Excluding Regional Practices without Documented WinSLAMM Models

Stormwater Management Plan Update

City of Appleton, WI

Lower Fox River TMDL							
Reachshed	GIS Name	Total Treated Area (acres)	No-Controls TSS Load (tons/year)	With-Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With-Controls TSS Reduction % (compared to no-controls total load)	Is TSS Load Reduction Target Met?
Apple Creek	Apple Creek	3,388	332.3	140.8	52%	42.4%	No
Duck Creek	Duck Creek	57	3.8	2.2	52%	57.5%	Yes
Garners Creek	Garners Creek	1,576	236.7	144.3	60%	61.0%	Yes
Lower Fox River Mainstem (DS)	Lower Fox River (DS)	5,966	830.6	187.6	72%	22.6%	No
Lower Fox River Mainstem (US)	Lower Fox River (US)	1,506	214.3	44.9	72%	21.0%	No
Mud Creek	Mud Creek	1,055	164.7	75.3	43%	45.7%	Yes
Totals		**13,548**	**1,782.5**	**595.2**		**33.4%**	
Upper Fox-Wolf TMDL							
Reachshed		Total Treated Area (acres)	No-Controls TSS Load (tons/year)	With-Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With-Controls TSS Reduction % (compared to no-controls total load)	Is TSS Load Reduction Target Met?
Bear Creek	Bear Creek	137	4.6	1.2	84%	25.8%	No
Lake Winnebago	Lake Winnebago	586	62.0	23.6	20%	38.0%	Yes
Totals		**723**	**66.7**	**24.8**		**37.2%**	

Table 3-8. With-Controls TP Reduction Results
Stormwater Management Plan Update
City of Appleton, WI

Lower Fox River TMDL							
Reachshed	GIS Name	Total Treated Area (acres)	No-Controls TSS Load (tons/year)	With-Controls TP Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With-Controls TP Reduction % (compared to no-controls total load)	Is TSS Load Reduction Target Met?
Apple Creek	Apple Creek	3,388	2,277.2	1,107.9	40.5%	48.6%	Yes
Duck Creek	Duck Creek	57	33.7	16.4	40.5%	48.5%	Yes
Garners Creek	Garners Creek	1,576	1,280.0	717.3	68.6%	56.0%	No
Lower Fox River Mainstem (DS)	Lower Fox River (DS)	5,966	5,015.6	1,179.9	40.5%	23.5%	No
Lower Fox River Mainstem (US)	Lower Fox River (US)	1,506	1,281.0	168.5	40.5%	13.2%	No
Mud Creek	Mud Creek	1,055	868.0	326.5	48.2%	37.6%	No
Totals		**13,548**	**10,755.5**	**3,516.3**		**32.7%**	
Upper Fox-Wolf TMDL							
Reachshed		Total Treated Area (acres)	No-Controls TSS Load (tons/year)	With-Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With-Controls TSS Reduction % (compared to no-controls total load)	Is TSS Load Reduction Target Met?
Bear Creek	Bear Creek	137	46.9	5.4	85.6%	11.4%	No
Lake Winnebago	Lake Winnebago	586	456.1	98.3	85.6%	21.6%	No
Totals		**723**	**503.0**	**103.7**		**20.6%**	

Table 3-8x. With-Controls TP Reduction Results Excluding Regional Practices without Documented WinSLAMM Models

Stormwater Management Plan Update

City of Appleton, WI

Lower Fox River TMDL							
Reachshed	GIS Name	Total Treated Area (acres)	No-Controls TSS Load (tons/year)	With-Controls TP Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With-Controls TP Reduction % (compared to no-controls total load)	Is TSS Load Reduction Target Met?
Apple Creek	Apple Creek	3,388	2,277.2	697.3	40.5%	30.6%	No
Duck Creek	Duck Creek	57	33.7	12.4	40.5%	36.8%	No
Garners Creek	Garners Creek	1,576	1,280.0	610.4	68.6%	47.7%	No
Lower Fox River Mainstem (DS)	Lower Fox River (DS)	5,966	5,015.6	723.5	40.5%	14.4%	No
Lower Fox River Mainstem (US)	Lower Fox River (US)	1,506	1,281.0	168.5	40.5%	13.2%	No
Mud Creek	Mud Creek	1,055	868.0	324.6	48.2%	37.4%	No
Totals		**13,548**	**10,755.5**	**2,536.7**		**23.6%**	
Upper Fox-Wolf TMDL							
Reachshed		Total Treated Area (acres)	No-Controls TSS Load (tons/year)	With-Controls TSS Load Reduction (tons/year)	TMDL Target TSS Load Reduction %	With-Controls TSS Reduction % (compared to no-controls total load)	Is TSS Load Reduction Target Met?
Bear Creek	Bear Creek	137	46.9	5.4	85.6%	11.4%	No
Lake Winnebago	Lake Winnebago	586	456.1	98.3	85.6%	21.6%	No
Totals		**723**	**503.0**	**103.7**		**20.6%**	

Legend

- Appleton Municipal Limits

Lower Fox River TMDL Reachsheds

- Apple Creek
- Duck Creek
- Garners Creek
- Lower Fox River (DS)
- Lower Fox River (US)
- Mud Creek

Upper Fox Wolf TMDL Reachsheds

- Bear Creek
- Lake Winnebago

N

Ballard Rd

Meade St

USH 41

Northland Ave

Wisconsin Ave

W College Ave

E College Ave

Memorial Dr

USH 441

1/17/2022

Figure 1-1
TMDL Reachsheds
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Appleton Municipal Limits

TMDL Excluded Area

- Agriculture
- WisDOT Right-of-Way
- Open Water
- Riparian
- Permitted Industrial

N

Ballard Rd

Meade St

USH 41

Northland Ave

Wisconsin Ave

W College Ave

E College Ave

Memorial Dr

USH 441

1/17/2022

Figure 2-1
TMDL Excluded Areas
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

Appleton Municipal Limits

Land Use Category

- Cemetery
- Commercial
- Industrial
- Institutional
- Parks and Open Space
- Railroad
- Residential

N

Ballard Rd

Meade St

USH 41

Northland Ave

Wisconsin Ave

W College Ave

E College Ave

Memorial Dr

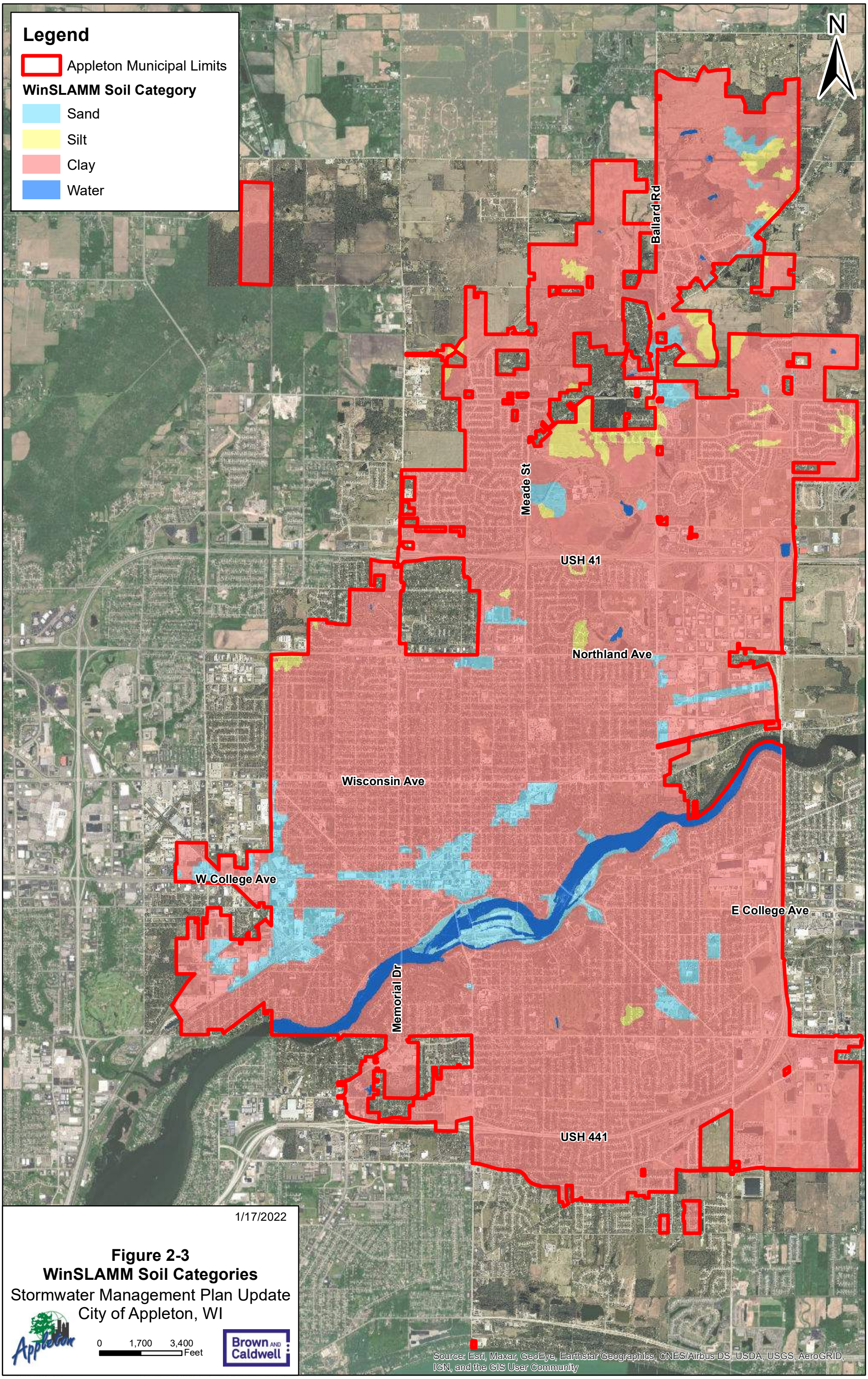
USH 441

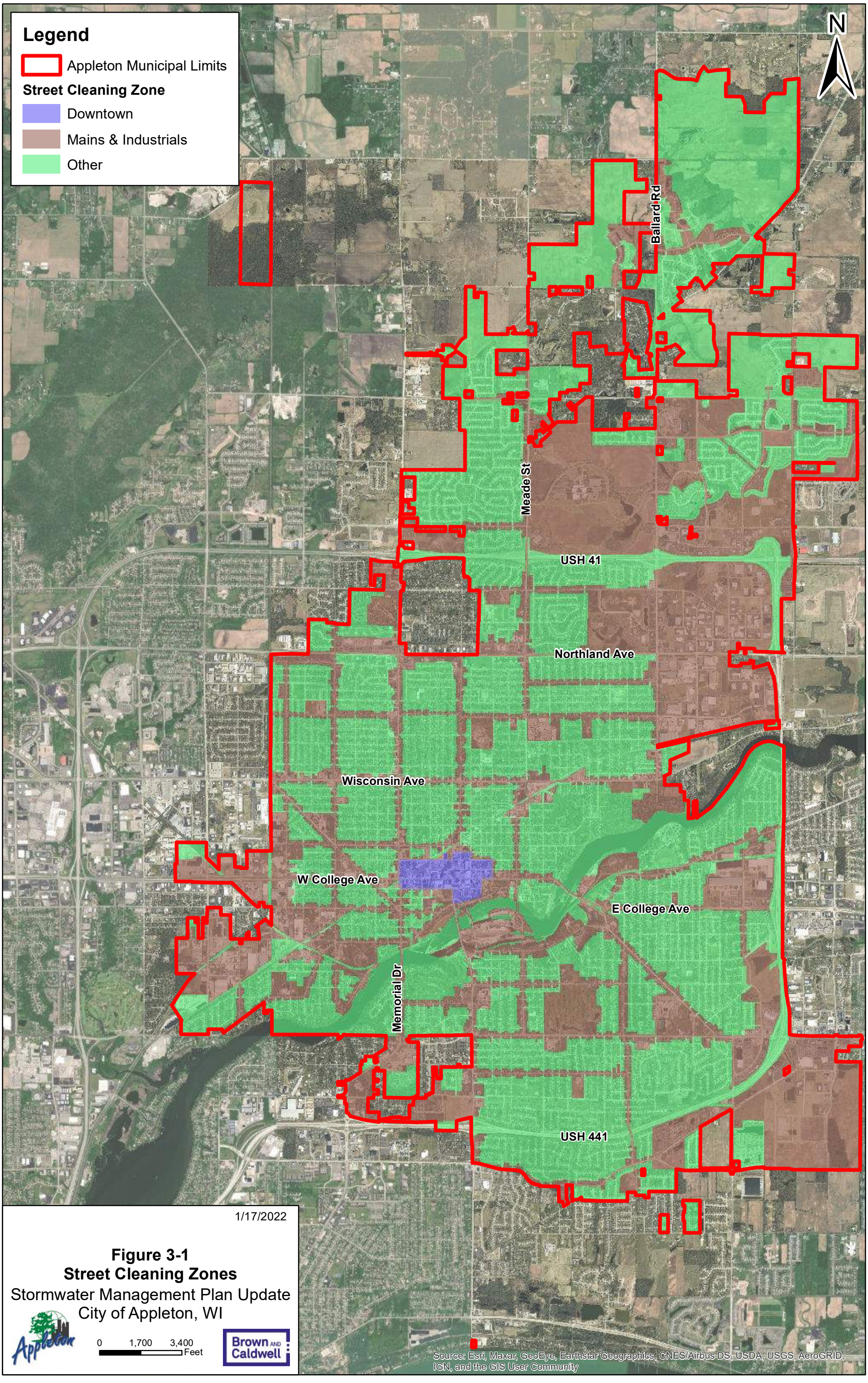
1/17/2022

Figure 2-2
TMDL Land Use Category
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Legend
Appleton Municipal Limits
WinSLAMM Soil Category
Sand
Silt
Clay
Water
N
Ballard Rd
Meade St
USH 41
Northland Ave
Wisconsin Ave
W College Ave
E College Ave
Memorial Dr
USH 441
1/17/2022
Figure 2-3
WinSLAMM Soil Categories
Stormwater Management Plan Update
City of Appleton, WI
0
1,700
3,400
Feet
Brown AND Caldwell
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Legend
Appleton Municipal Limits
Street Cleaning Zone
Downtown
Mains & Industrials
Other
N
Ballard Rd
Meade St
USH 41
Northland Ave
Wisconsin Ave
W College Ave
E College Ave
Memorial Dr
USH 441
1/17/2022
Figure 3-1
Street Cleaning Zones
Stormwater Management Plan Update
City of Appleton, WI
0
1,700
3,400
Feet
Brown AND Caldwell
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Appleton Municipal Limits
- Water Quality Swales

Water Quality Swale ID

- 1-A
- 2-A
- 3-A
- 4-A
- 5-A
- 6-A
- 7-A
- 8-A

N

Ballard Rd
8-A
6-A
6-A
7-A
7-A
Meade St
4-A
5-A
USH 41
3-A
3-A
Northland Ave
Wisconsin Ave
W College Ave
1-A
1-A
E College Ave
Memorial Dr
USH 441
2-A

1/17/2022

Figure 3-2
Water Quality Swales
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Appleton Municipal Limits
- Regional SMP Drainage Areas

N

Ballard Rd
Meade St
USH 41
Northland Ave
Wisconsin Ave
W College Ave
E College Ave
Memorial Dr
USH 441

1/17/2022

Figure 3-3
Regional SMPs
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Appleton Municipal Limits
- Non-Regional SMP
- Public HSD

N

Ballard Rd
Meade St
Memorial Dr
USH 41
USH 441
Northland Ave
Wisconsin Ave
W College Ave
E College Ave

1/17/2022

Figure 3-4
Non-Regional SMPs and Public HSDs
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- TMDL Reachshed Boundaries
- Areas Not Meeting WDNR Guidance
- Areas That Meet WDNR Guidance

Sweeper Zone

- North 1
- North 2
- North 3
- North 4
- South 1
- South 2
- South 3
- South 4

*Excludes areas that drain to stormwater management practices other than street cleaning.

N

Duck Creek
Bear Creek
Apple Creek
Mud Creek
Lower Fox River (DS)
Lower Fox River (US)
Garners Creek
Lake Winnebago

Ballard Rd
Meade St
USH 41
Northland Ave
Wisconsin Ave
W College Ave
E College Ave
Memorial Dr
USH 441

1/17/2022

Figure 4-1
Areas Evaluated for WDNR Leaf Management Phosphorus Credit
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Appleton Municipal Limits
- Drainage Areas of SMPs Identified For Future Implementation
- Other SMP Drainage Areas
- Potential SMP Location

Lower Fox River TMDL Reachsheds

- Lower Fox River (DS)
- Lower Fox River (US)
- Mud Creek

Potential SMP Number	Potential SMP Name
1	Bellaire Court
2	Everett Street (Includes SMP #11 Drainage Area)
3	Hillock Court
4	Kensington Underground Storage
5	Meade & Wisconsin Underground Storage
6	Winslow Avenue
7	Northland Ave & Highway 441 (Includes SMP #6 Drainage Area)
8	Pierce Park
9	Riverview Gardens
10	Wisconsin Avenue
11	RGL Warehouse

N

Meade St
USH 41
#3
#6
Northland A
#7
#5
Wisconsin Ave
#10
#1
#4
W College Ave
E College Ave
#2
#8
#9
#11
Memorial Dr
USH 441

2/2/2022

Figure 4-2
Potential Regional SMPs
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Brown AND Caldwell

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Appleton Municipal Limits

TMDL Reachsheds

- Lower Fox River (DS)
- Lower Fox River (US)
- Mud Creek
- Lake Winnebago

Potential HSD Drainage Area

- No Regional SMP Downstream
- Regional SMP Downstream

N

Ballard Rd

Meade St

USH 41

Northland Ave

Wisconsin Ave

W College Ave

E College Ave

Memorial Dr

USH 441

1/17/2022

Figure 4-3
Potential HSDs
Stormwater Management Plan Update
City of Appleton, WI

0 1,750 3,500 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Appleton Municipal Limits
- Potential Non-Regional Parcels

TMDL Reachshed

- Lower Fox River (DS)
- Lower Fox River (US)
- Mud Creek

N

1

2

3

4

5

Wisconsin Ave

W College Ave

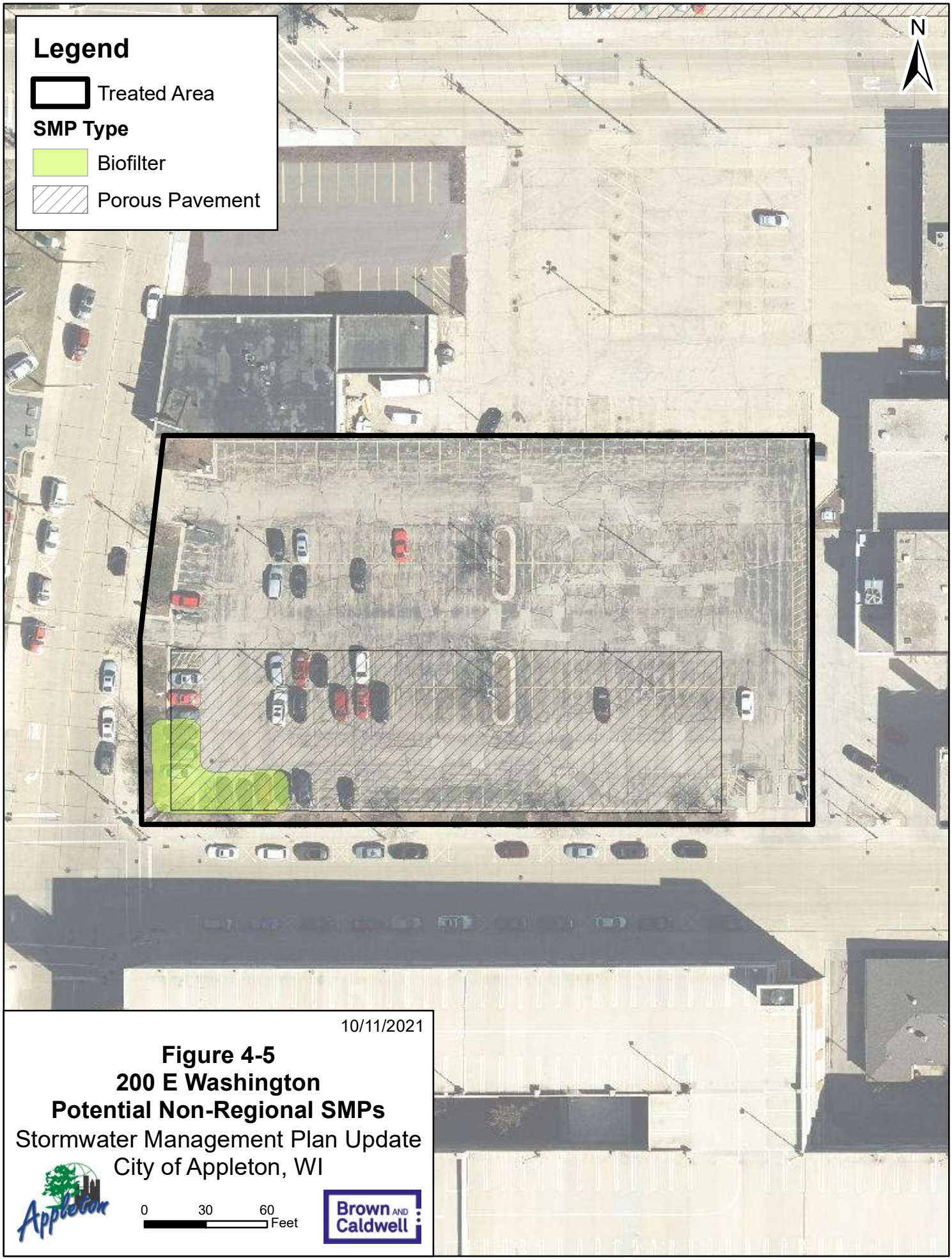
Memorial Dr

1/17/2022

Figure 4-4
Potential Non-Regional SMPs
Stormwater Management Plan Update
City of Appleton, WI

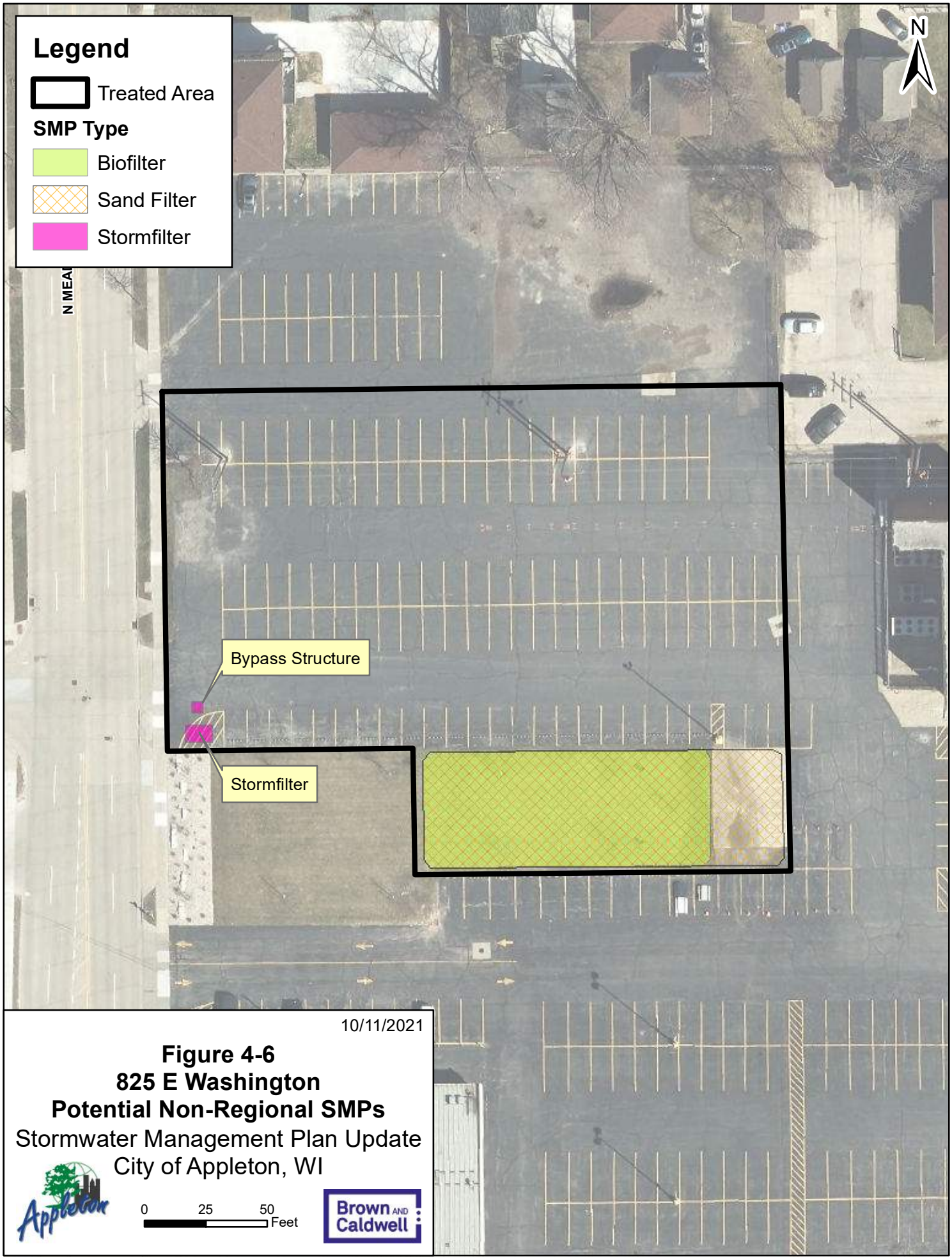
0 740 1,480 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



10/11/2021

Figure 4-5
200 E Washington
Potential Non-Regional SMPs
Stormwater Management Plan Update
City of Appleton, WI

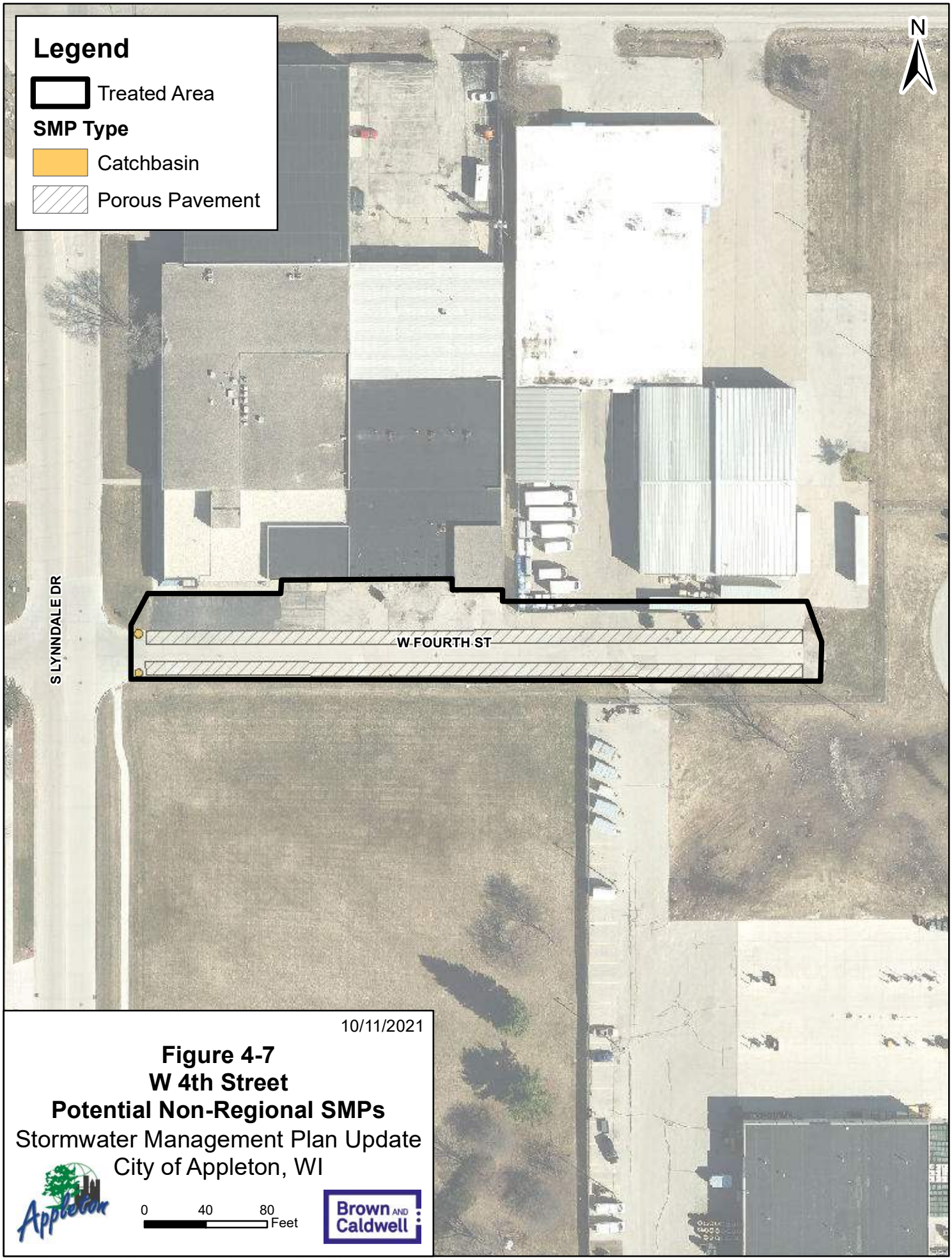


10/11/2021

Figure 4-6
825 E Washington
Potential Non-Regional SMPs
Stormwater Management Plan Update
City of Appleton, WI

0 25 50 Feet

Brown AND Caldwell



10/11/2021

Figure 4-7
W 4th Street
Potential Non-Regional SMPs
Stormwater Management Plan Update
City of Appleton, WI

0 40 80 Feet

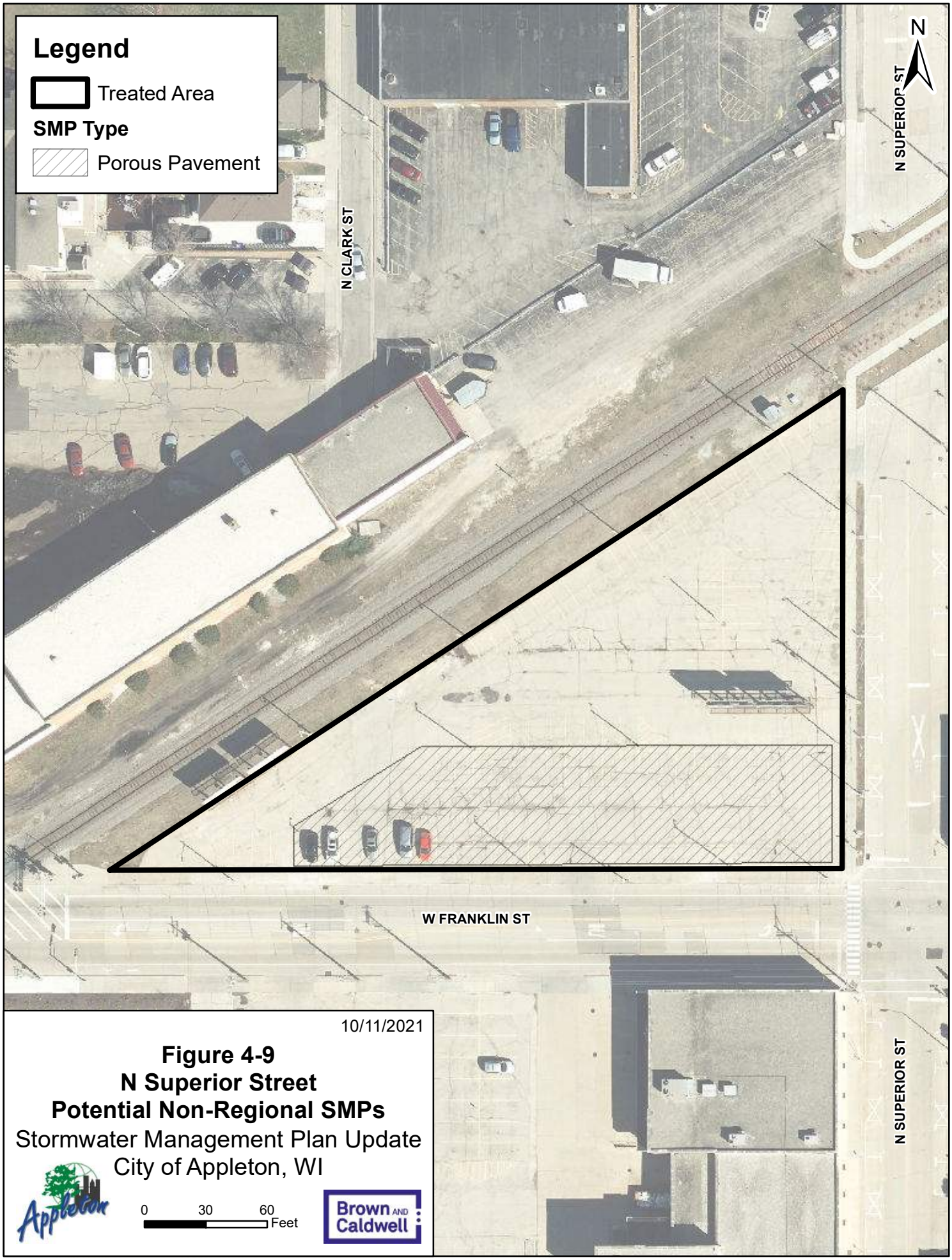
Brown AND Caldwell

10/11/2021

Figure 4-8
116 N Linwood
Potential Non-Regional SMPs
Stormwater Management Plan Update
City of Appleton, WI

0 30 60 Feet

Brown AND Caldwell



10/11/2021

Figure 4-9
N Superior Street
Potential Non-Regional SMPs
Stormwater Management Plan Update
City of Appleton, WI

Brown AND Caldwell

"…meeting community needs…enhancing quality of life."

DEPARTMENT OF PUBLIC WORKS
Engineering Division
100 North Appleton Street
Appleton, WI 54911
TEL (920) 832-6474
FAX (920) 832-6489

DRAFT For Committee: 7/26/22

LEAD AND GALVANIZED STEEL WATER SERVICE LINE REPLACEMENT PROGRAM ELIGIBILITY AND PARTICIPATION POLICY

In conjunction with **Municipal Code Section 20-44**, the Lead and Galvanized Steel Water Service Replacement Program has been established to provide financial assistance to eligible property owners. Eligibility criteria, eligible costs, non-eligible costs, and conditions of participation are outlined within this policy.

Eligible property owners may make a request to participate in the program by contacting the Department of Public Works at 920-832-5580. Requests do not guarantee acceptance into the program. Invitation to the program will be prioritized by the city, factoring in those who are most vulnerable and at-risk from lead exposure, underserved areas, and City planned construction activities.

ELIGIBILITY REQUIREMENTS

- Must have a City confirmed qualifying water service line (Lead or Galvanized Steel).
- Must receive water from the City of Appleton Water Utility.
- Must not have an active water service line leak. (See Service Leak Disclaimer below).
- Must not have commenced replacement of the private lead or galvanized water service line prior to invitation to the program by the City.
- Must have current and paid property taxes at the time of replacement.
- Must not be delinquent in any fees or payments to the City of Appleton at the time of replacement.
- Must use city selected licensed contractor to complete replacement.

ELIGIBILE COSTS

- Costs of location, excavation, and exposure of the private water service, pipe materials, and internal plumbing modifications up to the meter.
- Cost of trenching and concrete wall and/or floor repairs.
- Cost of concrete replacement on sidewalks and aprons if removed to access curb box.
- Cost of grass seeding to restore disturbed grass/lawns.
- Applicable permit fees.

NON-ELIGIBILE COSTS

- Removal and replacement of interior walls and finishes.
- Use of materials not meeting the requirements of the City's specifications or City codes.
- Ancillary property owner improvements to include interior plumbing and fixtures not necessary in the replacement of the lead or galvanized steel water service line.
- Replacement or restoration of private landscaping, bushes, trees, sod, fences, walls, etc. disturbed during construction.

CONDITIONS OF PARTICIPATION AND AGREEMENT TO HOLD CITY HARMLESS

As a condition of participation, the City shall have no liability for any of the work of the Contractor(s), including but not limited to, defective work or other damage, injury and/or loss on account of any act or omission of the Contractor in the performance of their work, and the like. The Property Owner shall make any claim for such matters directly against the Contractor or Contractor's insurance carrier. The property owner further hereby agrees to indemnify, defend, and hold the City harmless against any and all liability, loss, damage, expense, costs, including attorney's fees, arising out of the activities described herein. Property Owner is responsible for all maintenance of system, including but not limited to, replacement parts, pumps, circuit breakers, valves, pipes, and the like.

By participating in the program, the property owner here by accepts all conditions and details set forth within the ordinance and the Lead and Galvanized Steel Water Service Line Replacement Program Eligibility and Participation Policy.

SERVICE LEAK DISCLAIMER

In the event the water service line at the property participating in the program develops a leak before the scheduled replacement date, that property, in accordance with the **Department of Public Works Water Leak Policy,** will become ineligible to participate and will be removed from the program. The Department of Public Works will send notice of the service leak to the property owner instructing that the leak be repaired as soon as possible to avoid wasting of water, potential property damage, and/or health and safety issues.

The City, in partnership with Service Line Warranties of America (SLWA), offers optional repair service plans to property owners to protect them from the inconvenience of home repair emergencies, including water service leaks on their property. More information about these optional plans and SWLA can be found at www.slwofa.com or by calling toll-free 1-866-922-9006.

Appleton Wastewater Treatment Plant
Operations Synopsis
April 2022 – June 2022

Wastewater Treatment Program

- The Appleton Wastewater Treatment Plant (AWWTP) final effluent met Wisconsin Department of Natural Resources (WDNR) discharge monitoring reporting limits for carbonaceous biochemical oxygen demand (CBOD), total suspended solids (TSS), phosphorous, and ammonia. The plant maintained good treatment and a healthy microbiological population with a sludge retention time of 9.2 days. Dewatering processes functioned well and converted 18.3 million gallons (MG) of primary digested sludge to biosolids.

Summary of Treatment

Parameter	April	May	June	Average
Industrial Flow (MG)	28.8	23.6	23.2	25.2
Domestic Flow (MG)	542.9	342.2	332.1	405.7
Total Flow (MG)	571.7	365.8	355.3	430.9
Influent CBOD Load (Avg Daily lbs)	17,661	19,106	17,711	18,159
Influent TSS Load (Avg Daily lbs)	42,723	46,371	44,990	44,695
Influent Phosphorous Load (Avg Daily lbs)	459	441	446	449
Influent Ammonia Load (Avg Daily lbs)	1,614	1,892	1,765	1,757
Effluent CBOD Load (Avg Daily lbs)	752	472	385	536
Effluent TSS Load (Avg Daily lbs)	371	171	118	220
Effluent Phosphorous Load (Avg Daily lbs)	20	13	14	16
Effluent Ammonia Load (Avg Daily lbs)	77	11	11	33
% Treatment Removal of CBOD	95.7	97.5	97.8	97.0
% Treatment Removal of TSS	99.1	99.6	99.7	99.5
% Treatment Removal of Phosphorous	95.6	97.1	96.9	96.5
% Treatment Removal of Ammonia	95.2	99.4	99.4	98.0

Work in Progress:

- 2019 Appleton Wastewater Plant Improvement Projects: The project includes replacement of the Return Activated Sludge (RAS) pumps, process piping modifications (e.g., blended sludge, filtrate, waste gas flare), outside secondary chemical offloading containment repairs, primary clarifiers #5 & #6 drive replacements (2020 CIP), and H-Building effluent pump replacements (2020 CIP). During the reporting period, Staab Construction (Staab) completed the remaining RAS Pumps installation and worked on miscellaneous punch list items. Final project completion is expected to be extended beyond the June 30, 2022, contract date. This delay is attributed to change orders, equipment purchases, and shipment delays.
- Appleton Wastewater Plant Sludge Storage Building Addition: Applied Technologies, Inc. (ATI) advanced preliminary design work on the concept selected by the Project Team, which best met the needs of the AWWTP from a regulatory, functionality, reliability, efficiency, and capital cost standpoint. The public bidding phase was initiated June 1, 2022, and closed on June 15, 2022, with Miron Construction as the least cost bidder at $5,330,989 which was below the engineer's estimate of $5,869,000. Contract award is pending Common Council authorization on July 20, 2022.

- 2021 Appleton Wastewater Plant Solids Dewatering Equipment Upgrades: McMahon Associates, Inc. (McMahon) continued engineering services as part of the Solids Dewatering Equipment Upgrades project. The AWWTP will be adding one additional BFP (for a total of four new) which will provide the required dewatering capacity based on future growth projections and redundancy to facilitate critical maintenance events. McMahon proceeded with developing design plans during the reporting period following the Sludge Storage Building Addition project bid opening. The public bidding phase for the Dewatering Equipment Upgrades project is now expected in the 3rd quarter of 2022.
- 2021 Secondary Clarifier Drive Rebuild Project: On June 2, 2021, Common Council approved contract award for the removal, rebuilding, and reinstallation of drive equipment on Secondary Clarifiers #1 through #6 to Sabel Mechanical. Common Council also approved the sole source purchase of the associated rebuild parts through the original equipment manufacturer, Evoqua. Sabel Mechanical resumed work in early June 2022 removing the drives on Secondary Clarifiers #1 and #2. Final project completion is not anticipated to occur until late August.

Regulatory Summary

- Monthly Discharge Monitoring reports for April, May, and June were filed electronically on time for regulatory compliance.
- The AWWTP Wisconsin Pollution Discharge Elimination System (WPDES) electronic permit application was submitted on October 2, 2021, as part of reissuance. The current WPDES permit expired on March 31, 2022. The AWWTP continues to operate under the expired permit limits until DNR reissues a permit. Procedurally, the DNR has yet to submit a draft permit for review and public comment. The exact timeline is not yet known for when that step will occur, but the DNR is anticipating that the reissued permit will be administered in January 2023.

Laboratory

- All sampling and laboratory testing procedures were performed in accordance with requirements outlined in the AWWTP WPDES permit.
- Discharge Monitoring Report (DMR) and Health Department testing program objectives associated with sampling and analysis were met during the reporting period.
- Sampling of influent in support of Wisconsin State Lab of Hygiene COVID Sewage Surveillance continued during the reporting period.

EFFLUENT QUALITY SUMMARY
January 2021/2022 – June 2021/2022

Table 1 – 2021 Monthly Permit Summary

Month	CBOD (mg/L)	TSS (mg/L)	TSS (lbs/day)	P (mg/L)	P[3] (lbs/day)	NH3-N [1] (mg/L)	Fecal[2] Coliform Colonies/ (100 ml)	Chlorine[2] Residual (mg/L)	pH (s.u.)
Permit Limit	*25*	*30*	*1,322 [3]*	*1*	*23 [3]*	*10, 11, 4.4, 18*	*400 col/100ml Geo.Mean*	*0.038 mg/L daily*	*6.0 - 9.0 daily limit*
January 2021	7	2	161	0.27	19	11.70	NA	NA	6.9/7.3
February 2021	8	6	420	0.33	24	14.20	NA	NA	7.0/7.3
March 2021	7	4	473	0.22	25	1.74	NA	NA	7.0/7.2
April 2021	5	3	344	0.19	21	1.62	NA	NA	7.1/7.2
May 2021	5	2	180	0.21	21	1.00	4	<0.032	6.9/7.1
June 2021	5	2	206	0.25	22	0.52	4	<0.032	6.9/7.2
		Nov - April Period Average[3]			21.0				
		May - October Period Average[3]			21.1				

Table 2 – 2022 Monthly Permit Summary

Month	CBOD (mg/L)	TSS (mg/L)	TSS (lbs/day)	P (mg/L)	P[3] (lbs/day)	NH3-N [1] (mg/L)	Fecal[2] Coliform Colonies/ (100 ml)	Chlorine[2] Residual (mg/L)	pH (s.u.)
January 2022	6	4	250	0.20	14	1.43	NA	NA	6.1/7.1
February 2022	6	5	345	0.20	13	1.03	NA	NA	6.8/7.0
March 2022	5	4	604	0.19	26	0.66	NA	NA	6.8/7.2
April 2022	5	2	371	0.13	20	0.42	NA	NA	7.1/7.2
May 2022	5	2	171	0.13	13	0.10	168	<0.032	7.0/7.3
June 2022	4	1	118	0.12	14	0.11	5	<0.032	6.9/7.2
		Nov - April Period Average[3]			17.3				
		May - October Period Average[3]			13.4				

NOTES:

1) Seasonal NH3-N limits: 10 mg/L Jan. 1 – Mar. 31, 11 mg/L Apr. 1 – May 31, 4.4 mg/L June 1 – Sep 30, 18 mg/L Oct 1 – Dec 31.

2) Seasonal fecal and residual chlorine limits are in effect May 1st through September 30th. Limit of Detection 0.032 mg/L.

3) April 1, 2017 WPDES Reissuance with new TSS limits expressed as monthly concentration limit (mg/L) and loading limit (lbs).

The future TMDL phosphorus limit will be 23 lbs/day expressed as a 6-month average during the months of May – October and November – April.

YEAR 2022 RECEIVING STATION REVENUE

Hauler	January	February	March	April	May	June	July	August	September	October	November	December	Y-T-D Total
A & B Leist Trucking	$ 155,140.59	$130,533.65	$ 156,997.30	$ 182,013.10	$ 144,798.81	$ 152,868.28							$ 922,351.73
Buttles Custom Ag	$ -	$ -	$ -	$ -	$ -	$ -							$ -
Hickory Meadows	$ 24,903.48	$ 20,475.06	$ 32,031.60	$ 42,276.54	$ 26,113.02	$ 34,735.80							$ 180,535.50
Holland Sanitary Dist. 1	$ -	$ -	$ -	$ -	$ -	$ -							$ -
Jeff Waldvogel Trkg.	$ 34,629.34	$ 34,267.37	$ 38,307.65	$ 39,227.94	$ 45,610.75	$ 45,195.54							$ 237,238.59
Movin Materials	$ -	$ -	$ -	$ -	$ -	$ -							$ -
Waldvogel Trucking	$ 1,638.34	$ 1,815.63	$ 1,789.65	$ 1,722.67	$ 1,876.88	$ 1,622.57							$ 10,465.74
2022 Total	$ 216,311.75	$187,091.71	$ 229,126.20	$ 265,240.25	$ 218,399.46	$ 234,422.19	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,350,591.56
2021 Total	$160,614.00	$157,415.55	$178,568.93	$193,304.25	$197,959.99	$183,861.33	$240,826.87	$261,064.97	$231,369.79	$217,146.14	$172,718.91	$ 173,227.16	$ 2,368,077.89

3% Rate Increase effective 1/1/18
1% Rate Increase effective 1/1/19
5% Rate Increase effective 10/1/20
4% Rate Increase effective 01/01/22

Date: July 19, 2022
Copies: K. Rindt (via email)
C. Shaw (via email)
B. Kreski
Utilities Committee

Appleton Water Treatment Plant
Operations Synopsis
April, May, June 2022

Performance Summary

The table below presents selected water production and quality performance metrics for the current and previous reporting period.

Treated Water Quality. All compliance parameters met or exceeded regulatory requirements.

Water Production. Compared with Q1 of 2022 (Q/Q) average production increased by over 2%.

Raw Water Quality. Average Q/Q lake turbidity nearly quadrupled consistent with seasonal change. Y/Y levels also increased but not outside the range expected.

Energy Efficiency. Applied electrical energy efficiency Q/Q increased by over 4% from Q1 2022.

WATER PLANT PARAMETERS	Previous (Q1 2022)			Current (Q2 2022)		
	January	February	March	April	May	June
Water Treated						
Finished (million gallons), total	276.2	253.7	271.5	259.4	300.5	294.1
Finished (million gallons / day), average	8.9	9.1	8.8	8.6	9.7	9.8
Electrical Energy (WTF)						
Consumption (Megawatt-hours)	514.8	458.9	489.8	450.1	494.0	505.8
MWH / million gallons produced	1.86	1.81	1.8	1.7	1.6	1.7
Lake Turbidity (NTU), average	2.44	1.68	2.35	21.54	11.00	9.23
Water System Microbial Quality						
Total Coliform Samples	81	81	81	81	81	81
Compliance with Standard	100%	100%	100%	100%	100%	100%
Finished Water Quality						
Water Temperature (Degrees F)	33.6	35.9	37.3	40.7	57.3	70.6
Turbidity (NTU), average	0.02	0.02	0.02	0.01	0.01	0.04
%<0.15 NTU standard	100	100	100	100	100	100
pH (SU), average	8.9	8.9	8.9	8.9	8.7	8.6
Total Chlorine (mg/L)	2.16	2.11	2.00	2.01	1.92	1.86
Fluoride (mg/L)	0.69	0.7	0.68	0.69	0.67	0.67
Orthophosphate (mg/L)	0.6	0.65	0.65	0.63	0.66	0.69

Laboratory

- In support of plant operations, staff conducted analyses according to method protocols for pH, turbidity, alkalinity, hardness, free/total chlorine, ammonia, phosphorus, potassium permanganate, and fluoride.
- In support of distribution operations, staff performed required 81+ monthly Coliform bacteria analyses along with heterotrophic plate count (HPC) testing.
- In support of OCCT demonstration project, all daily samples and orthophosphate analyses have ceased now that AWTP has received WI DNR approval.
- Quarterly disinfection by-product rule monitoring with wholesale water customers (DBPR-2) was completed.

Safety

- Maintained WTF Safety programs by completing scheduled safety inspections, fire prevention inspections, and monthly meetings. No significant incidents to report.
- Applied appropriate COVID-19 countermeasures as directed by city policy.

Operations

- Operated two UV Disinfection reactors continuously during the quarter.
- Maintained Main Pressure Zone pressure increases as recommended by Water Distribution System Master Plan.
- Completed verification of both plant discharge flow meters.
- Moved Orthophosphate injection point to CT basins inlets.
- Completed cleaning and inspecting North Reservoir.
- Completed cleaning #2 Softener and placed online.
- Drained and cleaned all tanks and lines that contained sodium hydroxide.
- New gas supply line to Lake Station successfully installed.

Staffing & Training

- Staffing levels at capacity with addition of new Water Plant Operator and new Relief Operator.
- Maintained normal staff schedules and work assignments.

WATER MAIN BREAK/ JOINT LEAK REPORT - JUNE

YEARLY WATER MAIN BREAK COMPARISON

JUNE 21	JUNE 22	YTD 21	YTD 22	COST YTD 21	COST YTD 22
9	6	65	76	$ 1,572,368.55	$ 1,687,339.11

LOCATION	BREAK DATE	WORK ORDER	TYPE OF PIPE	SIZE	YEAR	BREAK	ESTIMATED DURATION	ESTIMATED WATER LOSS IN GALLONS	DOLLAR VALUE OF WATER REVENUE LOSS**	DOLLAR VALUE FOR BREAK* (Water Costs + Repair Costs)
1101 E. Meadow Grove Blvd.	6/2/2022	308639	DIP	12"	1979	3" Hole	7 Hours	663,212	$4,032.33	$13,032.33
NOTES: Break was found by a call that reported water bubbling out of road. Length of time determined by the time of call and soil saturation.										
807 S. Matthias St.	6/3/2022	308700	CIP	8"	1962	15" x 1/32" Split	95 Days	11,418,976	$69,427.37	$78,427.37
NOTES: Break was found by noise on hydrant. Length of time determined by the last time tested as the leak never surfaced.										
329 W. Summer St.	6/13/2022	309034	DIP	12"	1970	4" Hole	6 Hours	972,458	$5,912.54	$14,912.54
NOTES: Break was found due to a call in by APD. Length of time determined by the amount of water bubbling and road damage.										
1401 W. Homestead Dr.	6/22/2022	309269	DIP	8"	1978	14"x1/4" Split & 1" Hole	30 Days	32,297,135	$196,366.58	$205,366.58
NOTES: Break was found due to a call in by resident. Length of time was determined due to resident noticing water a day before time she called in, water running into manhole, and very saturated soil.										
1611 E Fremont St.	6/26/2022	309269	DIP	12"	1971	4" Hole	6 Hours	991,717	$6,029.64	$15,029.64
NOTES: Break was found due to water bubbling. Length of time was determined by soil saturation and when the call came in to PD.										

**Water Loss is calculated at the residential rate of $6.08 per 1000 gallons.

LOCATION	BREAK DATE	WORK ORDER	TYPE OF PIPE	SIZE	YEAR	BREAK	ESTIMATED DURATION	ESTIMATED WATER LOSS IN GALLONS	DOLLAR VALUE OF WATER REVENUE LOSS**	DOLLAR VALUE FOR BREAK* (Water Costs + Repair Costs)
1610 Schaefer Cir.	6/29/2022	309269	DIP	8"	1971	2" Hole	6 Hours	243,115	$1,478.14	$10,478.14
NOTES: Break was found by a call in by a sanitation worker who saw water bubbling. Length of time determined by soil saturation and when it was called in.										
									Total Cost =	**$337,246.61**

*In addition to the dollar value of water revenue lost, there is an average cost of $9,000 to repair each water main break (including final restoration) and an average cost of $630 to produce the lost water for each main break.

**Water Loss is calculated at the residential rate of $6.08 per 1000 gallons.