MMSD 2020 Facilities Plan

Environmental Assessment

DRAFT

Project Name:
MMSD — 2020 Facility Planning Project

MMSD Contract No.:
M03002P01

Preserving The Environment • Improving Water Quality

Table of Contents

1. Project Summary

This section provides a description of the Milwaukee Metropolitan Sewerage District (MMSD), an overview of the MMSD 2020 Facilities Plan (2020 FP), and required approvals.

1.1 Background

As a regional governmental agency providing wastewater treatment and flood management services for 28 municipalities, MMSD serves 1.1 million people in a 411 square mile planning area (Figure 1-1).

The MMSD is responsible for the construction, operation, and maintenance of interceptor sewers and wastewater treatment facilities within its sewer service area and has permissive authority for flood management and watercourse improvements. The MMSD also has authority to enforce rules and regulations, which may be promulgated by MMSD so long as they are necessary and proper to promote the best operation of the system, prevent damage to the sewerage system, prevent surcharging in all or part of the sewerage system, prevent interference with the process of sewage treatment or disposal, or to comply with federal or state pretreatment requirements (Wis. Stats. sec. 200.45). The MMSD may acquire by gift, purchase, lease (or other like methods), or by condemnation, any land or property necessary for the operations of the Commission (Wis. Stats. sec. 200.43).

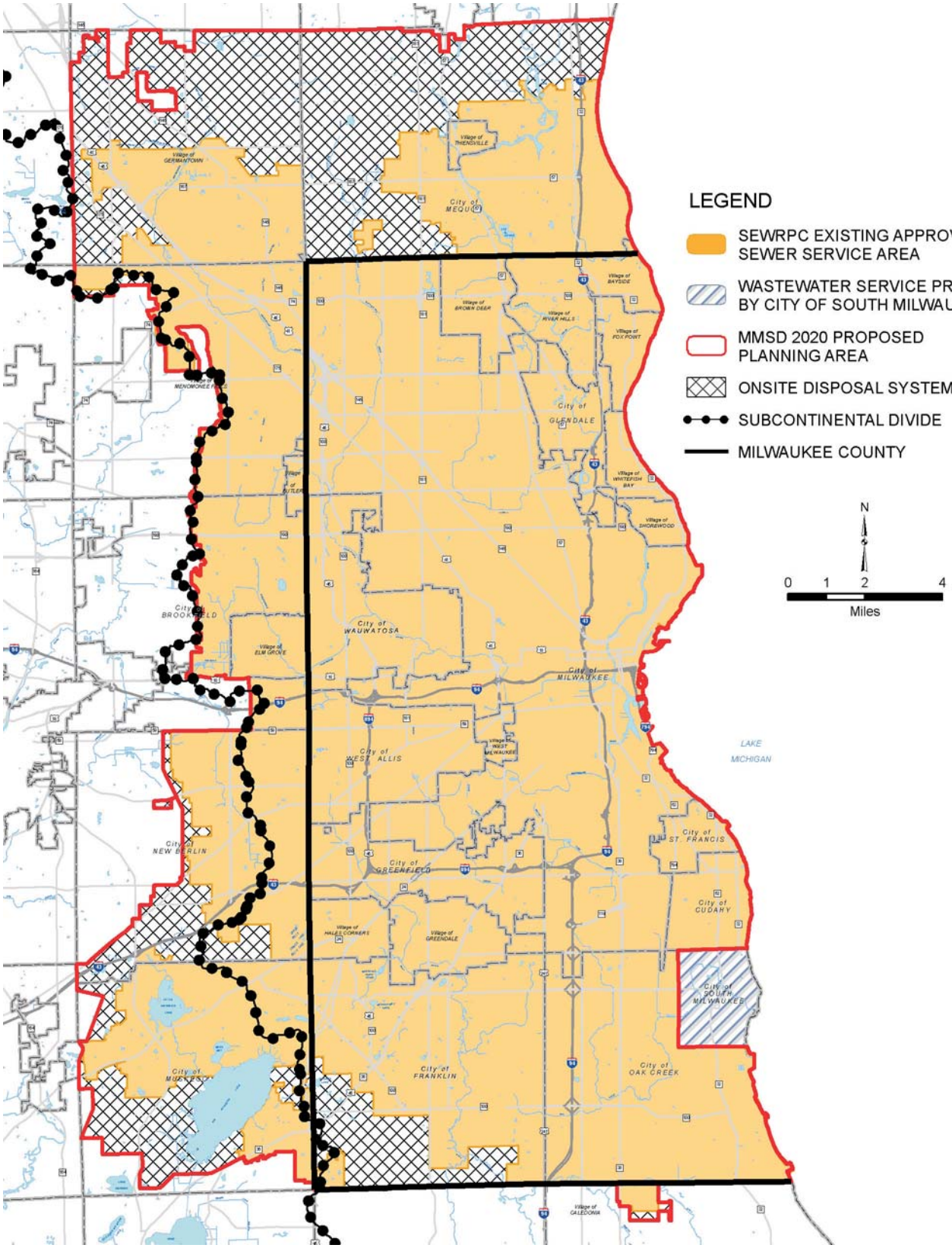
The 2020 FP addresses needed and ongoing water pollution abatement projects for MMSD's planning and sewer service area through the year 2020. It is a long-range comprehensive planning document that identifies improvements to all relevant systems so that these systems can accommodate regional growth and protect water resources.

1.2 Coordination with Regional Water Quality Management Plan Update (RWQMPU)

In 2002, MMSD and the Southeastern Wisconsin Regional Planning Commission (SEWRPC) formed the Water Quality Initiative (WQI). The WQI is a coordinated and collaborative water quality planning effort that has resulted in two plans: a Regional Water Quality Management Plan Update (RWQMPU), as produced by SEWRPC, and a year 2020 Facilities Plan, as produced by MMSD. The RWQMPU evaluates water quality and provides a plan to achieve water quality goals for six watersheds within southeastern Wisconsin. The 2020 FP focuses on MMSD managed facilities, programs, operational improvements, and policies (FPOPs).

The WQI used the U.S. Environmental Protection Agency (USEPA) endorsed watershed approach in developing these two plans. This watershed approach embraces the following key principles:

- Water quality planning is based on natural watershed boundaries rather than political boundaries.
- Use the best available water quality science.
- Involve stakeholders in developing regional water quality goals and objectives and evaluating alternatives.



SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT,
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 1-1
MMSD PLANNING AREA
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
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The SEWRPC effort extends beyond the MMSD planning area, throughout the greater Milwaukee watersheds (GMW). The plans are closely integrated and intend to provide a sound framework for the improvement of water quality.

Due to the interrelationships between MMSD's and SEWRPC's planning efforts, it has been necessary to carefully coordinate and integrate all baseline data, planning activities, public involvement, and approval processes. This coordinated approach used sound public planning and administration to develop a watershed based plan for the abatement of water pollution within the GMW.

It is important to note that the Fox River watershed is not one of the six watersheds that comprise the GMW, is not considered in these planning studies, and is only included in the MMSD planning area because parts of the sewered areas in Muskego, New Berlin, Brookfield, Franklin and Menomonee Falls that discharge to South Shore Wastewater Treatment Plant (SSWWTP) are located within the Fox River watershed.

1.3 Proposed Action

The primary focus of the 2020 FP was to develop a Recommended Plan that meets the regulatory requirements regarding MMSD's point sources (e.g., sanitary sewer overflows (SSOs), combined sewer overflows (CSOs), and wastewater treatment plant effluent discharges). Thus, key 2020 FP recommendations include a target level of protection (LOP – which means the projected frequency of SSO occurrence in terms of the number of events per year) for SSOs and provisions necessary for adequate wastewater treatment under the projected 2020 population and land use conditions. The 2020 FP recommended projects are in addition to the projects required under the 2002 Stipulation between MMSD and the Wisconsin Department of Natural Resources (WDNR). The 2020 FP recommendations fall into three broad categories:

Wet Weather Control Plan – For the 2020 FP, a key regulatory issue is SSO. The 2020 FP recommends using a "level of protection" approach for SSOs: specifically, a 5 year LOP (which means a projection of one event each five years or 20% chance of an SSO in a year) being consistent with regulations. The plan recommends the following facilities may be needed to achieve the 5 year LOP in the year 2020 (depending upon growth).

- Additional 150 million gallons per day (MGD) physical-chemical secondary treatment capacity at SSWWTP after verification project.
- Increase pumping capacity from the Inline Pump Station to Jones Island Wastewater Treatment Plant (JIWWTP) to meet a total firm pumping capacity of 180 MGD.
- Add 10 Metropolitan Interceptor Sewer projects to address hydraulic constraints.
- Construct one MIS in the Franklin, Muskego, New Berlin area, to allow for new development following advanced facility planning.
- Regardless of growth, MMSD should continue development and implementation of a comprehensive sustainable program to manage infiltration and inflow (I/I) in the municipally owned sewer systems served by MMSD.
- The plan indicates that MMSD is able to continue to achieve regulatory requirements for combined sewer overflows (no more than six CSOs/year) without additional facilities through the year 2020.

Interim Biosolids Management Plan - The 2020 FP interim recommendation is to continue the production of Milorganite® while continuing to evaluate the possibility of combining Milorganite® with other technologies, considering cost and environmental impact. Rehabilitation of the existing facility is required.

Other Recommendations and Supportive Programs – The plan outlines recommendations that address a variety of wastewater treatment plant and conveyance system issues.

2. Purpose and Need

2.1 Purpose

The MMSD mission is to protect public health, property and the environment by providing wastewater conveyance and treatment services. In order to meet projected growth while maintaining regulatory compliance, MMSD developed the 2020 FP, which identifies the FPOPs required through the year 2020 to meet the existing regulatory framework and permitting requirements.

The wastewater treatment facilities owned by MMSD include the following:

- Metropolitan Interceptor Sewer (MIS) System
- Inline Storage System (ISS)
- Jones Island Wastewater Treatment Plant
- South Shore Wastewater Treatment Plant

The existing facilities were constructed or upgraded to meet MMSD's needs through the year 2001 as a part of the Milwaukee Water Pollution Abatement Program (MWPAP). In 1998, MMSD adopted the 2010 Facilities Plan to address MMSD's wastewater conveyance, storage and treatment needs through 2010. A stipulation between MMSD and the state of Wisconsin entered as a court order in 2002 requires that the MMSD 2020 FP be adopted by MMSD's Commission and submitted by MMSD to the WDNR by June 30, 2007 (2002 WDNR Stipulation). The Recommended Plan strives to meet all regulatory requirements in the most cost effective manner, and achieve the resulting water quality improvement.

2.2 MMSD Planning Area

The MMSD provides wastewater service for all cities and villages (except the city of South Milwaukee) within Milwaukee County and for all or part of nine municipalities in Ozaukee, Washington, and Waukesha Counties. The MMSD also provides sanitary sewer service to a portion of the village of Caledonia in Racine County. To qualify for service, the areas must be within the multi-county drainage area delineated by SEWRPC and within the sanitary sewer service area approved by SEWRPC and MMSD.

All communities in Milwaukee County (except South Milwaukee) and all or part of ten municipalities in surrounding counties are included in the MMSD planning area. These municipalities include the following: the cities of Brookfield, Muskego, and New Berlin and the villages of Butler, Elm Grove, and Menomonee Falls in Waukesha County; the city of Mequon

and the village of Thiensville in Ozaukee County; a portion of the village of Caledonia in Racine County; and the village of Germantown in Washington County.

2.3 Planning Goals and Objectives

The planning process for the 2020 FP included the development of a set of publicly inspired goals and objectives for regional water quality. Citizens, elected officials, and technical experts developed regional water quality goals and objectives through a multi-step process including education sessions, facilitated workshops, and public meetings. The goals and objectives were then used to guide the formulation of alternatives and select a preferred strategy to improve water quality in the GMW.

The input received during these meetings was recorded and organized into objectives. The objectives were then organized into objective categories. The objective categories were finally grouped into four main goals. Chapter 7, *Goals and Objectives* of the *Facilities Plan Report* contains additional detail. The four main goals with their corresponding objective categories are:

Goal 1 – Improve Water Resources

- Habitat protection and restoration
- Public recreation and access
- Pollution reduction and control
- Natural systems
- Safety
- Commercial navigation
- Aesthetics

Goal 2 – Regional Leadership, Education, and Collaboration

- Stakeholder education and public understanding
- Collaborative relationships
- Advocacy

Goal 3 – Strong Government Role in Environmental Protection

- Policy regulations and enforcement
- Government planning and monitoring

Goal 4 – Effective Planning and Design

- Infrastructure
- Planning
- Research
- Funding and implementation
- Environmental justice

The publicly inspired goals and objectives played two roles in the development and evaluation of alternatives for improved water quality in the GMW:

- Served as the framework for developing the preliminary alternatives
- The goals and objectives were used to evaluate the effectiveness of the alternatives

2.4 Facilities, Programs, Operational Improvements, and Policies

The facilities, programs, operational improvements, and policies (FPOPs) that are aimed at achieving water resource goals inspired by the public and are necessary to comply with regulatory requirements were identified through the alternative analysis. The FPOPs are not limited to MMSD; they apply to stakeholders throughout the six GMW, consistent with the watershed approach. The FPOPs are defined as follows:

- **Facilities** are the structural assets that are part of MMSD's conveyance, treatment and storage systems used to manage water resources. Some examples include treatment plants, sewers and detention basins. Examples of recommended actions related to facilities are improvements to infrastructure such as additional treatment plant capacity or storage tunnel volume.
- **Programs** are systems of services, opportunities and projects or actions taken to implement a policy. Programs are implemented to facilitate the achievement of the overarching mission of MMSD. A broad example of a recommended action related to programs is the development of a public involvement and education program. Another example is the program used to implement the hazardous waste policy called the Household Hazardous Waste Collection Program. Programs may be regulatory tools such as Runoff Management (NR 151) and Storm Water Discharge Permits (NR 216) that are employed to achieve a policy or legislative act.
- **Operational Improvements** are methods or ways to improve the efficiency or effectiveness of procedures or system functions.
- **Policies** are established courses of action (legislation, ordinances and other regulatory actions) to be followed by a government body or institution. An example of a current MMSD policy is to minimize the entrance of clear stormwater to sanitary sewers. This policy seeks to prevent stormwater from taking up much-needed capacity in the system. Policies can be further developed into legislation, an example of which is the CWA.

2.5 Regulations, Approvals, and Court Stipulation

Select legal requirements that are associated with facilities planning include:

- The Clean Water Act (CWA) of 1977
- Chapter NR 110 of the Wisconsin Administrative Code
- State of Wisconsin v. MMSD, Court Stipulation (Case No. 02-CV-2107, Unclassified – Civil: 30703)

For additional detail on descriptions and summaries of the regulations, standards, policies, and permits that govern the private and public entities in the watersheds under the SEWRPC RWQMPU study area can be found in:

- Chapter 6, *Regulation and Permits* of the *Facilities Plan Report*
- Chapter IV of SEWRPC Technical Report No. 39, *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds*(1)
- Chapter VI of SEWRPC Technical Report No. 50, *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds* (2)

Federal Law

There are two sections of the CWA that apply to facilities planning: Section 201 and Section 208.

- **Section 201** of the CWA states that all wastewater treatment facilities shall have a plan to determine the control and treatment requirements needed to meet federal water quality goals. It also authorizes the administration of grants for the construction of publicly-owned waste treatment facilities and mandates the development and implementation of waste treatment management plans using the best practicable waste treatment technology to achieve the goals of the CWA. In order to address the MMSD planning area treatment needs and to provide responsible pollution abatement, MMSD has the goal of facilities planning at 10-year intervals with a 20-year planning horizon. The 2020 FP was prepared pursuant to the requirements of Section 201 of the CWA for the MMSD planning area.
- **Section 208** of the CWA requires the development and implementation of area wide waste treatment management plans. Section 208 planning seeks to identify all sources of point and nonpoint source pollution (NPS) and the means of controlling those sources within a geographic area. Section 208 plans facilitate the administration of grants for publicly-owned treatment facilities under Section 201. Proposed waste treatment facilities under a 201 plan are required to conform to the area wide Section 208 plan. The RWQMPU provides recommendations for the control of water pollution from point sources, nonpoint sources, and is consistent with the requirements of Section 208 of the Federal CWA.

State Regulation

The WDNR is the state level regulating agency for all point sources, including metropolitan sewerage districts. Chapter NR 110 of the Wisconsin Administrative Code outlines the regulation of these sewerage systems; it requires facilities plan development and WDNR approval prior to any submittal of project construction plans and specifications. The Code also requires that the facilities plan conform to approved Section 208 area-wide waste treatment management plans.

2002 Court Stipulation

A court stipulation between MMSD and the state of Wisconsin arose out of litigation from a complaint filed by the state on March 15, 2002 alleging that MMSD violated its Wisconsin Pollution Discharge Elimination System (WPDES) permit. The parties agreed to resolve the litigation by stipulation which established a legally binding long-term corrective action program for future water pollution abatement planning and construction that is consistent with the missions of both agencies, is in accordance with federal and state law, and addresses alleged violations of MMSD's WPDES permit. The 2002 Stipulation (Case No. 02-CV-2107,

Milwaukee County Circuit Court) entered as an Order of the Court on May 29, 2002, outlines the requirements to be met by both parties. The Stipulation requires that the planning would be completed for horizon year 2020, and the required construction projects would include those identified in MMSD's 2010 Facilities Plan already approved by WDNR.

Summary – Legal Requirements

Key regulations, permits, standards, and stipulated agreements that drove the development and evaluation of alternatives are as follows:

- 2002 Stipulation (3)
- USEPA CSO Policy (4)
- Wisconsin Regulatory Requirements (5)
- MMSD Wisconsin Pollutant Discharge Elimination System (WPDES) Permit (6)
- MMSD Chapter 13 Surface Water and Storm Water Rules (7)
- Wisconsin Water Use Objectives and Water Quality Standards (8)
- Federal Clean Water Act requirements and federal regulations

These regulatory programs directed the development and evaluation of the alternatives by regulating:

- Wastewater discharges
- CSO to local waterways
- SSO to local waterways
- Nonpoint stormwater runoff to local waterways
- Receiving water use objectives and water quality standards

Summary - Operating Permits

The MMSD operates under a number of permits issued by WDNR that are directly related to MMSD operations. These include a WPDES permit and two Air Pollution Control Operation Permits, all issued by WDNR to MMSD. These permits are identified as follows:

- WPDES Permit # WI-0036820-02-0
- Air Pollution Control Operation Permit – Jones Island Wastewater Treatment Plant #241029250-P01
- Air Pollution Control Operation Permit – South Shore Wastewater Treatment Plant #241228350-P01

Note that construction activities may trigger requirements to obtain federal or state permits; currently, there is one air construction permit issued.

Under the terms of the 2002 Stipulation, the MMSD Commission-approved 2020 FP is to be submitted to WDNR by June 30, 2007. The WDNR is to issue a final determination on whether or not to approve the 2020 FP by December 31, 2007.

2.6 Public Involvement

The MMSD and SEWRPC recognized that there were overlapping and common goals between their respective plans and that participants and constituents would benefit from the integration of the planning and engineering studies. To complete both plans, an integrated public involvement program was put into place. Both agencies recognized that they needed ongoing involvement from many local community officials; representatives of agencies, industry, commerce and education; and the general public. The two agencies agreed to this joint effort in an attempt to respect the limited time that local officials, the general public, and others have to offer, and in recognition of the amount of integration required for the two studies.

Both agencies involved the public in the development and review of the plans. The plans reflect goals and objectives for the future of water quality in the region, developed with ideas and input inspired by the public and with due consideration of the regulatory setting. This section summarizes the results of the 2020 FP public involvement program.

The WQI proceeded from the following mission statement: *The 2020 FP will identify the facilities, policies, operational improvements and programs that are necessary to accomplish the water resource goals inspired by our public.*

To assist in achieving this mission, the technical team (MMSD staff, SEWRPC staff, and consultants) used a multi-step process that included education sessions, facilitated workshops, and public meetings involving many citizens, elected officials, and technical experts working together to develop regional water quality goals and objectives (summarized in Section 2.3). The goals and objectives were used to formulate the alternatives and select a preferred strategy to achieve the WQI mission in the GMW.

The joint public involvement effort included the following:

Water Quality Initiative Committees

- Citizens Advisory Council (CAC)
- Technical Advisory Team (TAT)
- Watershed Officials Forum (WOF)
- Facilities Planning Policy Committee

Stakeholder Outreach Activities and Materials

- Stakeholder Meetings
- Watershed Planning Conferences: “Clean Rivers, Clean Lakes”
- Newsletters
- Watershed Booklets and Maps
- Project Websites
- Broadcast E-mail Messages
- Media Outreach
- Surveys

Refer to Chapter 7, *Goals and Objectives* of the *Facilities Plan Report* for more information on public involvement.

2.6.1 Evaluation Methodology

Each set of alternatives developed for the 2020 FP underwent an extensive public evaluation process. An evaluation matrix was developed for evaluating the screening alternatives to enable an objective comparison of the alternatives. The matrix was based on a scoring system that awarded points for the number of days an alternative met water quality standards or guidelines. The water quality scoring was based upon "endpoints" that represent achievement of one of the goals and objectives. The evaluation process compared the preliminary and recommended plan alternatives in terms of how effectively they achieved the goals and objectives inspired by the public. Detailed tables presented expected outcomes, derived from modeling the alternatives, with respect to various water resource measures. These results were then summarized to provide "big picture" comparisons that allowed the reviewers, advisory committee members, MMSD and SEWRPC staff, MMSD Commissioners, and citizens an opportunity to compare the benefits and trade-offs of the various alternatives. Several steps were applied to provide a systematic approach to evaluating the alternatives. Additional details on evaluation methodologies are presented in Chapter 9, *Alternatives Development* of the *Facilities Plan Repor*t.

3. Alternatives

3.1 2020 FP Alternatives

This section defines 2020 FP alternatives, discusses how the development of 2020 FP alternatives differs from the more traditional planning approach and summarizes the alternative development process. Refer to Chapter 9, *Alternatives Development* of the *Facilities Plan Report* for more details on 2020 FP alternatives, alternative development, and evaluation of alternatives.

3.1.1 Definition of 2020 FP Alternative

As a critical part of the WQI process, the 2020 technical team developed alternatives and evaluated them using the project's evaluation criteria. An alternative is a combination of actions that aim to achieve one or more goals and objectives. These actions are derived from the four FPOP categories. A series of alternatives were evaluated to determine which alternative best achieves the goals and objectives, regulatory concerns, and water quality improvement while providing a cost benefit.

Once developed, the alternatives were presented to the MMSD Commission as well as public and stakeholder groups for input and review. For the 2020 FP, three sets of alternatives were developed:

1) Screening alternatives
2) Preliminary alternatives
3) Recommended plan alternatives

3.1.2 2020 FP Alternative Development Process versus Traditional Planning

The development of alternatives for the WQI differed from the process used in traditional facilities planning. The traditional approach is to develop alternatives designed to achieve a single defined objective. Typically, several alternatives are developed (using different technologies) to meet a defined objective. The alternative that best meets that objective is then chosen as the preferred alternative.

However, the 2020 FP involved the development of a series of alternatives; from screening to preliminary. This progression of alternatives for the 2020 FP was a function of constant refinement, based on results of previous alternatives analysis. This continual refinement eventually led to developing the Recommended Plan alternatives. A summary of the screening and preliminary alternatives refinement process follows:

1) Develop list of screening alternatives
2) Develop list of preliminary alternatives
3) Identify corresponding technologies for preliminary alternatives
4) Develop preliminary alternatives descriptions
5) Evaluate preliminary alternatives
6) Present preliminary alternatives for evaluation

The 2020 technical team presented the preliminary alternatives to the stakeholder committees, various political entities, and the MMSD Commission for input and evaluation at numerous times throughout the evaluation process.

The 2020 technical team then modified the preliminary alternatives as necessary based on the comments received. Once the preliminary alternatives were finalized, various analyses, including the model production runs (water quality outputs under the different alternatives), effectiveness evaluation, and anticipated cost calculations, were completed.

The process of developing and evaluating screening and preliminary alternatives led to the development of Recommended Plan alternatives. The following summarizes the purpose of each set of alternatives:

- Screening alternatives – The purpose of these alternatives was to provide background data for developing preliminary alternatives and to answer common stakeholder questions. These are referred to as public alternatives 2 through 6.
- Preliminary alternatives – The purpose of these alternatives was to develop a set of technological and program/policy options that includes elements from all four FPOP categories. Each preliminary alternative is designed to achieve one or more publicly inspired goals and objectives. These are referred to as public alternatives 7 through 11.
- Recommended plan alternatives – While the 2020 FP evaluated both point and nonpoint source pollution, the primary focus of the 2020 FP was to address point source management (e.g., wastewater treatment plant (WWTP) discharges, SSOs, and CSOs) in order to meet regulatory requirements. The purpose of the Recommended Plan alternatives was to meet all regulatory requirements and achieve the corresponding water quality improvement. The integrated scientific data produced in

the WQI planning effort, including the water quality modeling evaluations of the screening and preliminary alternatives, directed the development of this set of alternatives that led to the Recommended Plan.

3.2 Screening Alternatives

Screening alternatives were developed and evaluated using combinations of technologies that were first developed to analyze "what-if scenarios" that primarily focus on eliminating overflows or significantly reducing stormwater runoff. They also were developed to respond to publicly discussed "solutions" to MMSD overflows and regional water quality issues such as:

- **Why not separate the combined sewers**?
  - Screening Alternative 1A**,** (Alternative 2) - End all overflows with sewer separation (sewer separation employed to a maximum practical extent)
- **Why not end all the overflows?**
  - Screening Alternative 1B, (Alternative 3) - End all overflows without sewer separation
  - Screening Alternative 1C, (Alternative 4) - End sanitary sewer overflows
- **Why not eliminate all the Infiltration/Inflows and fix the leaky sewers?**
  - Screening Alternative 1D (Alternative 5) - End sanitary sewer overflows exclusively by fixing leaking sewers (reducing I/I)
- **What would happen if we employed a very high level of Best Management Practices (BMPs) to improve water quality by reducing volume/improving quality of urban and rural stormwater runoff?**
  - Screening Alternative 2 (Alternative 6) - Implement a high level of BMPs to reduce non point source pollution from stormwater runoff

3.2.1 Results and Summary of Screening Alternatives Analysis

The purpose of the screening alternatives was twofold. First, the screening alternatives were planned to be "bookends" or extremes in terms of approaches to water quality improvement. Screening alternatives 1A to 1D focused on point source overflow elimination, while screening alternative 2 focused on the opposite extreme – implementation of large scale nonpoint pollution control practices or stormwater best management practices. Second, the set of screening alternatives responded to citizen and media concerns and "silver-bullet type fixes," or all-or-nothing extreme approaches, such as ending all sewer overflows, separating the entire combined sewer service area, fixing all the leaky sewers, and implementing a large scale BMP program.

The screening alternatives were used as a sorting tool, and they did <u>not</u> take into account stakeholder input and a rational evaluation of which technologies would produce the best results based upon a cost benefit analysis considering both stakeholder input and regulatory constraints. These factors were considered later in the process.

In essence, these alternatives provided the first step to understanding the effect of different technologies on water quality and from which to start combining different technologies in conjunction with adhering to regulations and incorporating stakeholder input.

The screening alternatives were evaluated based on the number of days an alternative met water quality standards or guidelines and to enable an objective comparison of the alternatives. The following are key findings from the analysis of the screening alternatives:

- **Nonpoint pollution (e.g., stormwater runoff) is the largest source of fecal coliform bacteria and** of total suspended solids (TSS). The analysis of pollutant sources and loadings revealed that stormwater pollution is primarily responsible for the region's inability to fully comply with WDNR water quality bacterial standards in the rivers and estuary.
- **Reducing (or even eliminating) SSOs will result in little or no water quality improvement on an annual basis.** As a result of the substantial investment that has already been made to reduce both SSOs and CSOs, MMSD has reached a point of diminishing returns in terms of the water quality benefits that would result from additional capital investment to further reduce sewer overflows.
- **It is much more expensive to reduce or end all CSOs than to reduce or end all SSOs.** The volume of wastewater generated in the combined sewer service area (CSSA) is much larger than the volume of SSOs and the flow rates generated by CSOs are much higher than SSO flow rates.

The screening alternatives are not technically feasible and are economically impractical as individual solutions for eliminating overflows and improving water quality. This evaluation of the screening alternatives, along with the analysis completed in the 2020 FP *State of the Art Report* (SOAR), helped to select the most cost effective combination of FPOPs for MMSD SSO and CSO control to be used in the preliminary alternatives analysis. The SOAR also provided the background for selecting the most effective FPOPs for control of pollutants from nonpoint sources. The key findings listed above provided a base from which to develop the next level of alternative development, the preliminary alternatives, as detailed in the next section.

3.3 Preliminary Alternatives

The preliminary alternatives were created using information gathered when evaluating the screening alternatives, and they were developed in response to publicly inspired goals and objectives, regulatory concerns, and water quality standards.

Preliminary alternatives were developed and evaluated using a set of technologies and program/policy options that include elements from all four FPOP categories. Each set of FPOPs is designed to achieve one or more of the publicly inspired goals and objectives.

The three main preliminary alternatives (with sub-alternatives) are:

- **Preliminary Alternative A (Alternative 1) – This alternative represents the 2020 Baseline condition (No Further Action)**
- **Preliminary Alternative B – This alternative focuses on meeting regulatory requirements**
    - Preliminary Alternative B1 (Alternative 7) – Meet all discharge and nonpoint regulations
    - Preliminary Alternative B1 (MMSD Only) (Alternative 8) – Meet all

discharge and nonpoint regulations (MMSD components only)

- Preliminary Alternative B2 (Alternative 9) – Minimize MMSD overflows

- **Preliminary Alternative C – This alternative focuses on meeting water quality objectives**
  - Preliminary Alternative C1 (Alternative 10) – Maximize compliance with water quality criteria
  - Preliminary Alternative C2 (Alternative 11) - Maximize compliance with water quality criteria and enhance habitat, aesthetics and community values

Preliminary Alternative A – The 2020 Baseline, which represents conditions associated with the 2020 projected population and land use (hereafter referred to as "2020 Baseline"), assuming that there are no additional actions taken beyond completion of the following FPOPs:

- MMSD committed projects[a]
- NR 151 compliance (Runoff Regulations)
- Communities hold I/I to current levels from existing development

While this alternative is also referred to as "No Further Action," it is important to note that this alternative includes many actions and significant costs involved with MMSD completing its committed projects, full implementation of the NR 151 runoff management standards for urban areas by regulated communities, and MMSD and the communities holding I/I to current levels.

Preliminary Alternative B1, B1-MMSD Only

Alternative B1 requires that MMSD and local communities meet all state and federal sewer overflow regulations and all regulated entities (agricultural and non-agricultural) to fully implement state mandated stormwater regulations. In contrast, B1-MMSD Only requires only MMSD to meet state and federal sewer overflow regulations and only urban entities to fully implement state mandated stormwater regulations.

Preliminary Alternative B2

This alternative proposes to change the operating strategy for the inline storage system (ISS) so that ISS volume would not be reserved for separate sewage. In this way, the use of the ISS would theoretically be more effectively maximized, with the intent of reducing the total volume of overflows: CSOs and SSOs. Essentially, the tunnel would accept inflow on a "first come, first serve basis." The implementation of this alternative is not currently allowed under the terms of the MMSD discharge permit and would require a change in state and federal law, policies and regulations. It would require a change in the way the USEPA and WDNR view and regulate SSOs.

Preliminary Alternative C1 and C2

Alternative C represents the conditions of the 2020 Baseline plus widespread implementation of nonpoint source controls to maximize the improvement in receiving water quality. Alternative C does not include any additional technologies to reduce MMSD SSOs or CSOs beyond what is

[a] Committed projects are projects identified in Appendix I of the 2002 Stipulation and any other project that MMSD has awarded for construction that has not yet been completed

included in 2020 Baseline. Instead, the FPOPs for Alternative C focus on reducing pollutant loadings from nonpoint sources. In addition to using FPOPs to improve water quality, Alternative C2 uses "green" FPOPs to provide aesthetic, habitat, and community value, such as restoration of wetlands, restoration of prairies, and Leadership in Energy and Environmental Design (LEED) development for 50% of new commercial and industrial development.

3.3.1 Results and Summary of Preliminary Alternatives Analysis

To evaluate the preliminary alternatives, projected costs to implement the alternatives and their modeled performance on numerous water quality measures and endpoints were considered. See Section 9.5 of Chapter 9, *Alternatives Development* of the *Facilities Plan Report* for more information on the findings of the preliminary alternatives evaluation. Their performance was also compared in terms of their potential to reduce pollutants in the GMW as well as their potential to preserve and improve habitat, improve waterway aesthetics, and meet desired social outcomes.

The evaluation of the preliminary alternatives provided "big picture" comparisons that allowed the reviewers, advisory committee members, MMSD and SEWRPC staff, MMSD Commissioners, and citizens an opportunity to compare the benefits and trade-offs of the various alternatives.

The analysis revealed the following key findings:

1) Concentration on meeting current regulatory requirements for CSO and SSO is important, but control of these sources of pollutants will not result in significant water quality improvement or meeting other publicly inspired subjective goals.
2) Alternatives that concentrate on nonpoint stormwater will result in a higher level of water quality improvement and will better meet publicly inspired subjective goals.

3.4 Recommended Plan Alternatives

3.4.1 Development of the Recommended Plan Alternatives

The results of the analysis of the preliminary alternatives were used to develop the Recommended Plan alternatives. Furthermore, MMSD must meet certain requirements even though the primary intent of the WQI is to use the watershed approach to maximize water quality improvements. These requirements include:

- Complying with provisions of the 2002 WDNR Stipulation (as discussed in Chapter 6, *Regulations and Permits* of the *Facilities Plan Report*)
- Meeting requirements of MMSD's WPDES permit (as discussed in Chapter 6, *Regulations and Permits* and Chapter 9, *Alternatives Development* of the *Facilities Plan Report*)
- Complying with USEPA CSO Policy as incorporated into the MMSD WPDES permit (as discussed in Chapter 9, *Alternatives Development* of the *Facilities Plan Report*)
- Complying with state and federal SSO regulations as incorporated into the MMSD WPDES permit (as discussed in Chapter 9, *Alternatives Development* of the *Facilities Plan Report*)

It is important to bear in mind that the Recommended Plan must satisfy these above requirements, regardless of their overall effectiveness in improving water quality. Thus, the 2020 FP must develop a Recommended Plan that first and foremost meets all legal and regulatory requirements.

3.4.2 Overview of Recommended Alternative Development

While the 2020 FP evaluated both point and nonpoint source pollution, the primary focus of the 2020 FP was to address point source management (e.g., WWTP discharges, SSOs, and CSOs) in order to meet regulatory requirements. In consideration of this, the alternative carried forward was derived from Preliminary Alternative B (Meet all discharge and nonpoint regulations).

Other items considered in developing the Recommended Plan alternatives include:

- Additional evaluations of plan alternatives that focus on nonpoint pollution that were completed in the SEWRPC RWQMPU (Planning Report No. 50, Chapter X).
- Assumption of constant I/I levels in currently-developed areas in the MMSD planning area through the year 2020.
- Understanding that MMSD can't limit itself to the facilities planning necessary to achieve the target LOP. The MMSD has many other FPOPs for which it is responsible. Examples include FPOPs associated with MMSD's Watercourse Plan for flood management and biosolids management.

In addition, the development of the Recommended Plan alternatives included the evaluation of several complex and interrelated issues pertaining to the following:

- Future population and land use
- Cost effectiveness of various conveyance and treatment options
- The determination of the cost effective reduction of existing I/I in the local systems
- Regulatory issues
- Operational issues

All the goals and objectives detailed during the public involvement process were considered. The regulatory goals and objectives were regarded as a high priority, but the other goals and objectives were also considered – especially the need to complement and support the combined WQI.

Ultimately, the primary focus of the 2020 FP was to develop a Recommended Plan that meets the regulatory requirements regarding MMSD's point sources (e.g., SSOs, CSOs, wastewater treatment plant effluent discharges). The Recommended Plan strives to meet all regulatory requirements in the most cost effective manner, and achieve the resulting water quality improvement.

3.4.3 Recommended Plan Alternatives

The Recommended Plan analysis includes the evaluation of alternatives that reflect the full range of possible Recommended Plans. The following is the set of potential Recommended Plan Alternatives:

- A Revised 2020 Baseline alternative - This No Further Action alternative uses estimates of population and land use developed by SEWRPC and the 2020 technical team based upon SEWRPC's estimated 2035 population and land use values for each community.(9) It includes the revised population and land use, the committed projects as of the adoption of the MMSD 2007 Annual Budget, and the implementation of the urban portion of NR 151.
- The Revised 2020 Baseline alternative evaluated with revised ISS operation strategy that would not reserve ISS volume for separate sewer inflow. Currently, volume is reserved to minimize the risk of filling the ISS with combined sewage, which would then result in SSOs and a possible violation of the WPDES permit. This alternative does not call for additional facilities beyond those included in the 2020 Baseline.
- A regulatory alternative built on the Revised 2020 Baseline with a 5-year LOP.
- A regulatory alternative built on the Revised 2020 Baseline with a 10-year LOP.
- A watershed water quality based alternative focused on nonpoint stormwater – This alternative is to be detailed and evaluated in the RWQMPU (see SEWRPC Planning Report No. 50, Chapter X for a detailed discussion).

Level of Protection

The LOP is reported as a recurrence interval, which is the long-term average period of time between SSO events. The LOP may also be expressed as a probability of an overflow during any given year. The probability is the numerical inverse of the recurrence interval. Both ways of reporting the LOP are useful, but in the 2020 FP, the recurrence interval form was chosen. The modeled results show that the simulated SSO events are not evenly spaced in time in the 64.5-year period of record used for the modeling. For example:

- A 5-year LOP does not mean that the SSO events are evenly spaced five years apart. The modeling simulation shows that SSO events can occur in adjacent years (as in the case of the simulated 1940 and 1941 events).
- Events can also be spaced much farther apart (for example, from 1960 to 1976 there is a 16-year period between simulated SSO events).
- The variable nature of hydrologic events produces a wide range of time between SSO events. To demonstrate the true recurrence interval, a long period of time is required.

Even though there may be less than five years between SSO events, it does not mean that the system fails to have a 5-year LOP. Similarly, the absence of an SSO for a period over five years does not mean that the system has more than a 5-year LOP.

3.4.4 Results and Summary of Recommended Plan Alternatives Analysis

It is important to note that this analysis does not include the water quality-based alternative that is developed in SEWRPC Report No. 50, Chapter X. If this alternative were scored on a water quality basis, it would show a higher relative water quality improvement score than the alternatives listed above. This is because the RWQMPU recommended plan is a watershed water quality based plan, which is built upon the MMSD Recommended Plan and incorporates many additional watershed level water quality based improvements.

Key findings:

- There is very little difference between the alternatives with regard to absolute water quality measures.
- The alternatives that spend additional funds on SSO control measures make little difference in water quality, but are much higher cost.
- Relative to the Revised 2020 Baseline, there are very small water quality improvements with the 5-year and 10-year LOP alternatives, due to increased SSO control.

The progression of alternatives analysis for the 2020 FP was a function of constant refinement; it was based on results of previous alternatives analyses. This continual refinement eventually led to development of the Recommended Plan. The following key water quality impact findings directed the development of the Recommended Plan:

1) The water quality data and modeling show that bacteria (fecal coliform) is the primary pollutant of concern.
2) Nonpoint pollution (e.g., stormwater runoff) is the largest source of fecal coliform bacteria.
3) Reducing (or even eliminating) SSOs will result in little or no water quality improvement on an annual basis**.**
4) Significant improvements to water quality can only be achieved through regional implementation of extensive measures to reduce pollution from nonpoint sources (10).

The following conclusions and goals were derived from the key findings and were used during the development of the Recommended Plan:

1) The MMSD's primary focus of the 2020 FP must be to develop a Recommended Plan that meets the regulatory requirements regarding MMSD's point sources (e.g., SSOs, CSOs, and WWTP effluent). The Recommended Plan strives to achieve the highest level of water quality improvement in the most cost effective manner, within this basic premise of meeting all regulatory requirements.
2) As the result of this planning process, a minimum 5-year level of protection for SSO control under the projected 2020 population and land use conditions is determined to be consistent with state and federal requirements. This minimum 5-year LOP will be achieved for MMSD's conveyance system; however, a 7-year LOP is projected to be achieved for tunnel-related SSOs.
3) The satellite municipalities must continue efforts to maintain I/I at current levels (within existing development). An I/I allowance, based upon the existing I/I from newer sewersheds, is included for future growth. The municipalities will also need to comply with MMSD I/I standards adopted under revisions to MMSD Rules and Regulations (Chapter 3 revisions).
4) Detailed recommendations for nonpoint control measures are presented by SEWRPC in its RWQMPU rather than in the 2020 FP because MMSD does not have the authority to direct the implementation of regional nonpoint control measures. The RWQMPU concurs with the 2020 FP and recommends the additional MMSD facilities needed to

address SSOs, but also includes regional recommendations regarding the reduction of nonpoint stormwater pollution.

5) The 2020 FP evaluation of the resultant water quality under Screening Alternative 2 and Preliminary Alternatives C1 and C2 were used by SEWRPC to develop its nonpoint source recommendations in the RWQMPU. These were the alternatives that focused on improving water quality using a variety of nonpoint source best management technologies and practices as well as certain "green" technologies. The SEWRPC performed additional modeling to further develop recommendations for nonpoint source controls that could achieve significant improvements in water quality.

6) In addition to the recommendations for the MMSD facilities needed to meet a target LOP for SSO control, MMSD's programs, policies, and operations that support the RWQMPU should become part of the Recommended Plan. Examples of such programs include, but are not limited to the following: MMSD's comprehensive watercourse operations, illicit stormwater connection studies, stormwater best management practice demonstration projects, water quality monitoring, and bacteria research/source identification studies.

3.5 2020 FP Recommended Plan

2020 Facilities Plan Recommendations

Key 2020 FP recommendations are for a target LOP for SSOs and adequate treatment under the projected 2020 population and land use conditions. The 2020 FP recommendations fall into three broad categories:

Wet Weather Control Plan – For the 2020 FP, a key regulatory issue is SSOs. The 2020 FP recommends using a "level of protection" approach for SSOs: specifically, a 5 year LOP (which means a projection of one event each five years or 20% chance of an SSO in a year) being consistent with regulations. The plan recommends the following facilities may be needed to achieve the 5 year LOP in the year 2020 (depending upon growth).

- Additional 150 MGD physical-chemical secondary treatment capacity at SSWWTP after verification project.
- Increase pumping capacity from the Inline Pump Station to JIWWTP to meet a total firm pumping capacity of 180 MGD.
- Add 10 Metropolitan Interceptor Sewer projects to address hydraulic constraints.
- Construct one MIS in the Franklin, Muskego, New Berlin area, to allow for new development following advanced facility planning (actual project to be determined by advanced facilities planning as discussed in Chapter 11 and 12 of the *Facilities Plan Report*).
- Regardless of growth, MMSD should continue development and implementation of a comprehensive sustainable program to manage I/I in the municipally owned sewer systems- served by MMSD.
- The plan indicates that MMSD is able to continue to achieve regulatory requirements for combined sewer overflows (no more than six CSOs/year) without additional facilities through the year 2020.

Interim Biosolids Management Plan - The 2020 FP interim recommendation is to continue the production of Milorganite® while continuing to evaluate the possibility of combining Milorganite® with other technologies, considering cost and environmental impact. Rehabilitation of the existing facility is required.

Other Recommendations and Supportive Programs – The plan outlines recommendations that address a variety of wastewater treatment plant and conveyance system issues.

4. Affected Environment

4.1 Description of Physical Environment

Glaciation has largely determined the physiography or surficial landforms, topography, and soils within Southeastern Wisconsin. The underlying bedrock and overlying glacial deposits form the physical land features and resulting topography.

The topography within the MMSD planning area varies from 550 feet mean sea level (MSL) along river corridors in the Milwaukee harbor area to 950 feet MSL along the west side of the MMSD planning area.

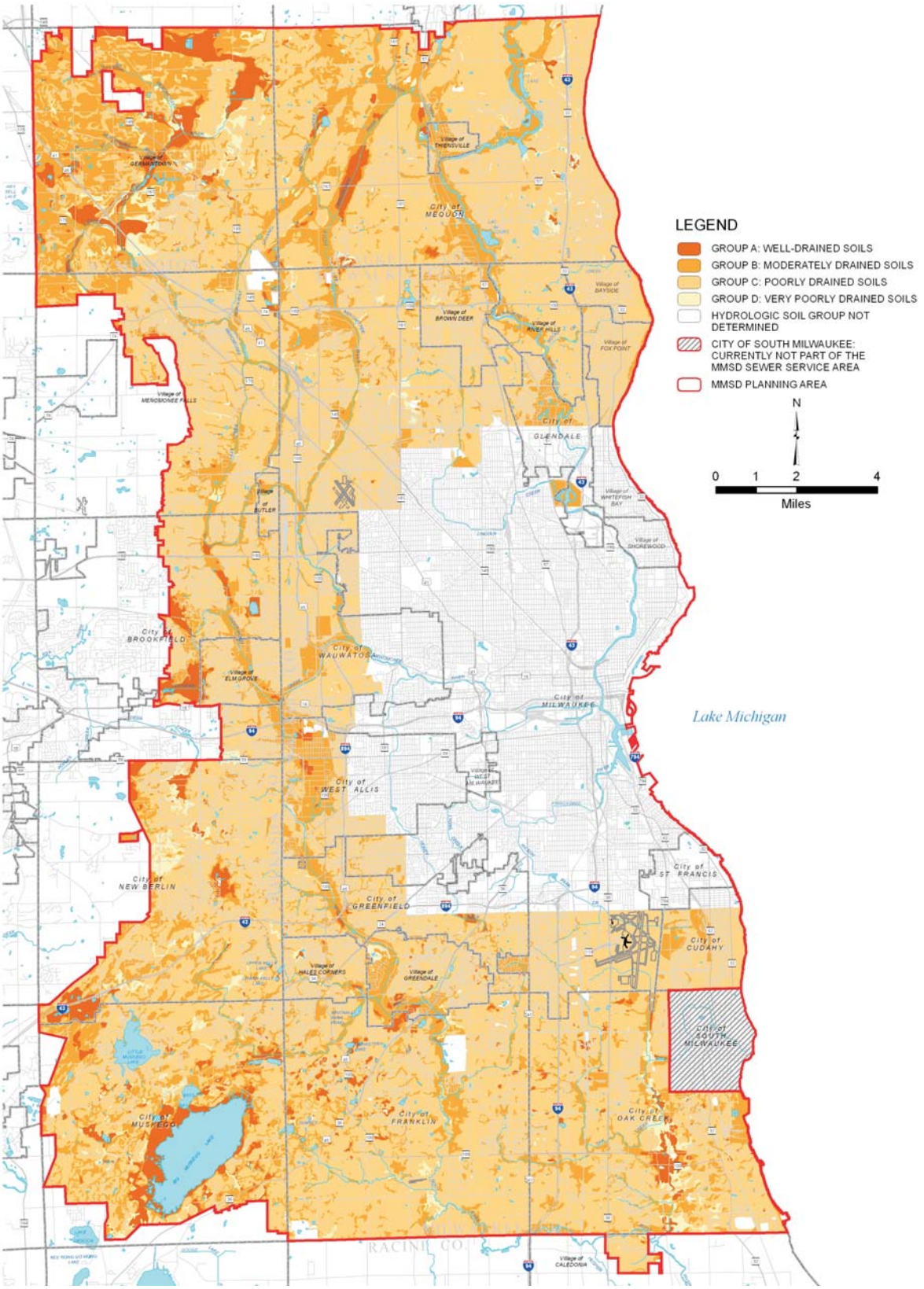
Land slopes in the MMSD planning area may be classified into three groups: slight (0 to 6%), moderate (7 to 12%), and steep (greater than 12%). Approximately 81% of the MMSD planning area is characterized by having slight slopes, 16% has moderate slopes, and 4% has steep slopes. Urban development has altered the natural form and topography of the glacial landscape. The geology of the MMSD planning area consists of Quaternary deposits overlying Paleozoic and Precambrian bedrock.

Approximately 4% of the MMSD planning area is covered by well-drained soils, about 30% by moderately-drained soils, about 57% by poorly drained soils, and about 2% by very poorly drained soils (Figure 4-1). Approximately 7% of the drainage area is covered by disturbed soils that could not be classified. The soils data were used during the hydrologic modeling associated with the 2020 FP. The soils data were also used to identify the following:

1) Areas with limitations for urban development that rely upon onsite waste disposal systems
2) Areas for development using public sanitary sewer service
3) Prime agricultural lands
4) Primary environmental corridors

4.1.1 Floodlands

The natural floodplain of a river is a wide, flat to gently-sloping area adjacent to the river channel that is normally bounded on its outer edges by higher topography. A river or stream may be expected to occupy and flow on its floodplain an average of once every two years and, therefore, the floodplain should be considered an integral part of a natural stream system.



SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT,
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 4-1
HYDROLOGIC SOIL GROUPS WITHIN THE MMSD PLANNING AREA
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The extent of the natural floodplain occupied by any given flood depends upon the severity of that flood and upon the flood elevation or flood stage. The SEWRPC defines the natural floodplains of a river or stream as those lands inundated by a flood having a recurrence interval of 100 years (or a 1% chance of occurrence in any given year). The natural floodlands consist of the river channel and the 100-year floodplain. A floodway is defined as the designated portion of the floodlands that are required to convey the 100-year flood. The floodway, which includes the channel, is least suited for human habitation.

The floodplain fringe is that portion of the 100-year recurrence interval floodplain lying outside the floodway. Floodwater depths and velocities in the floodplain fringe are relatively low compared to those in the floodway.

Mapped floodlands in the MMSD planning area are presented on Figure 4-2.

Park and Open Space

Park and open spaces can encompass important natural areas and critical species habitats. Through infiltration and nutrient cycling, these areas may also protect the quality and quantity of surface waters and groundwater. Figure 4-3 presents the approximate locations of park and open space lands.

Comprehensive inventories of publicly-owned park and open space sites have been conducted throughout the MMSD planning area by SEWRPC.

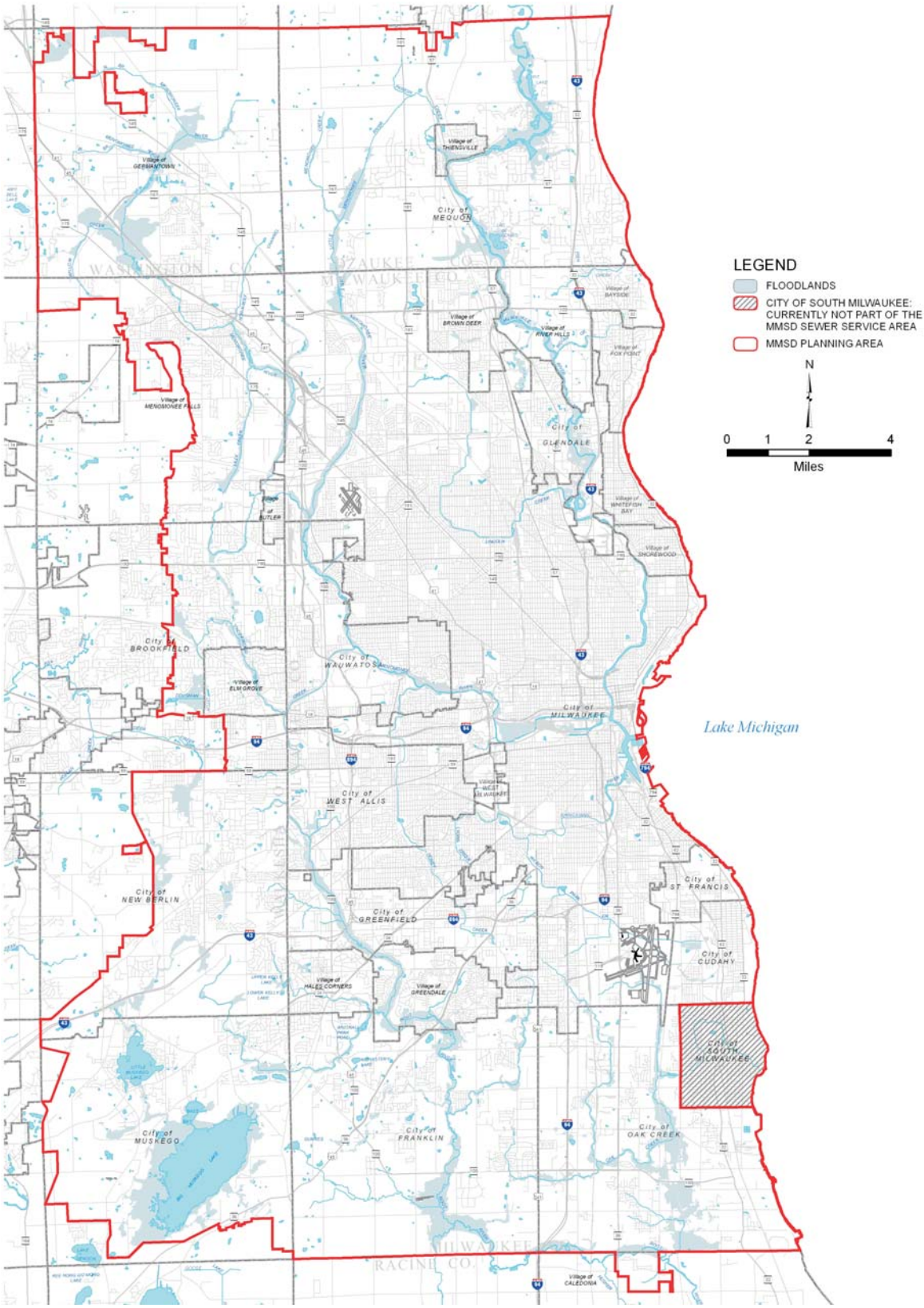
Park and open space sites owned by public agencies, including state, county, or local units of government and school districts, are identified in these inventories, as are lands held in conservation easements by organizations, such as WDNR.

In addition, the inventories include privately-owned resource-oriented outdoor recreation sites, such as golf courses, campgrounds, boating access sites, swimming beaches, hunting clubs, retreat centers, open space areas, and special-use outdoor recreation sites of regional significance. Other resources of recreational significance, such as existing trails, bicycle way, and historic sites listed on the National Register of Historic Places, are identified. Table 4-1 summarizes park and open space features in the MMSD planning area.

TABLE 4-1

PARK AND OPEN SPACE LANDS WITHIN MMSD PLANNING AREA

Watershed	Number of Park and Open Space Sites	Size (Ac)	Location (County)
Lake Michigan Direct Drainage	22	1359	Milwaukee/Ozaukee (7 acres)
Kinnickinnic River	18	741	Milwaukee
Menomonee River	45	4271	Milwaukee/Washington (105 acres)
Milwaukee River	52	2516	Milwaukee/Ozaukee (251 acres)
Oak Creek	10	1504	Milwaukee
Root River	15	5385	Milwaukee
Total Park and Open Space Area	**162**	**15,776**	**--**



SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 4-2
FLOODLANDS WITHIN THE MMSD PLANNING AREA
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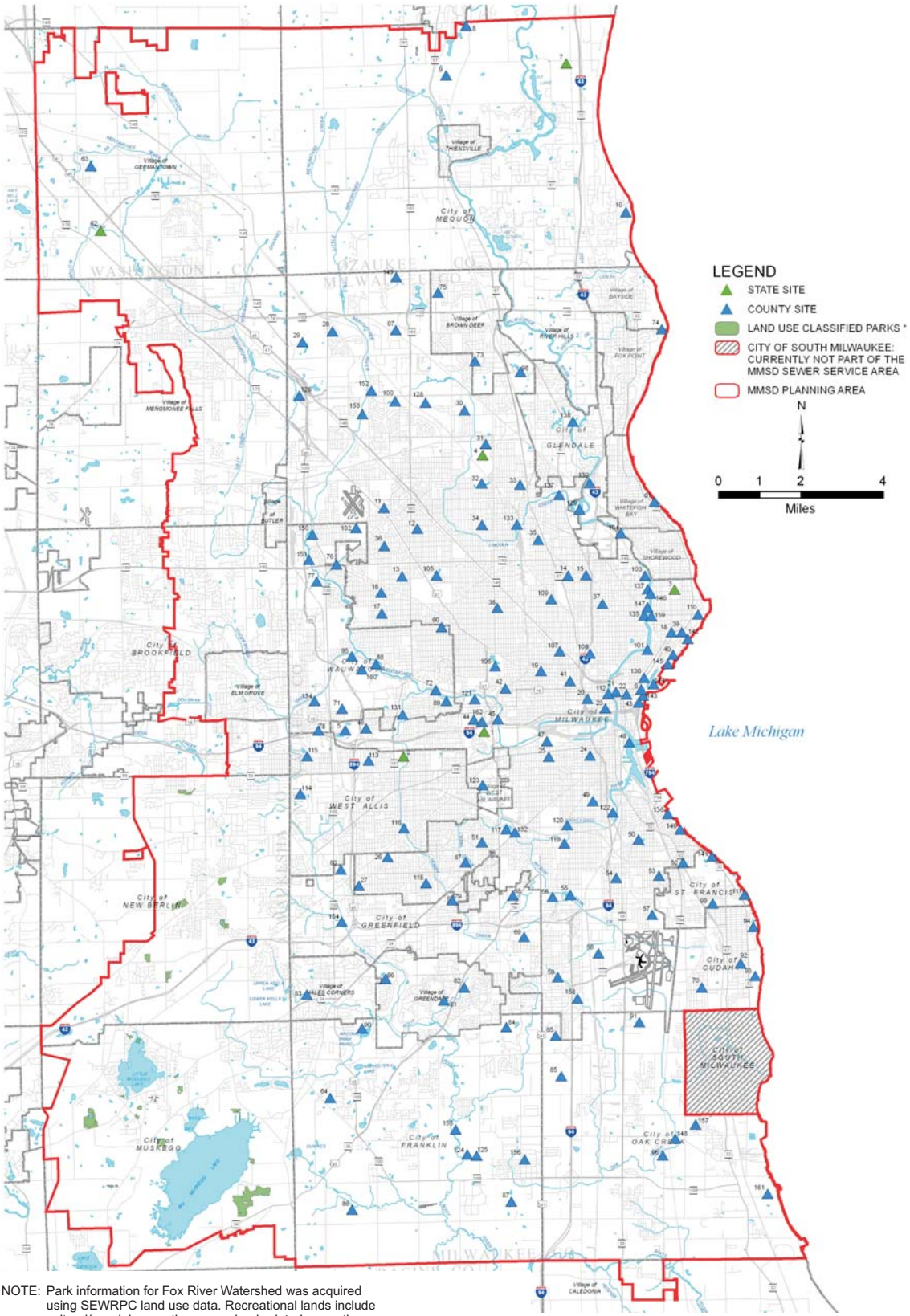

NOTE: Park information for Fox River Watershed was acquired using SEWRPC land use data. Recreational lands include cultural/special recreation areas; land-related recreation areas; and water-related recreation areas. There are no identification numbers associated with these sites.

SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 4-3

STATE AND COUNTY RECREATION AND OPEN SPACE LANDS WITHIN THE MMSD PLANNING AREA

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4/30/07

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Most of the listed park and open space areas are within Milwaukee County, with the few exceptions noted in Table 4-1. Park and open space lands account for approximately 6% of the total land area within the MMSD planning area. Some notable features in some of the watersheds are listed below:

- Within the Menomonee River watershed, three sites (429 acres total) are owned and managed by the state of Wisconsin, including a 117 acre Wisconsin Department of Transportation mitigation site, the 98 acre Miller Park, and the 214 acre Wisconsin State Fairgrounds.
- Within the MMSD planning area, the Milwaukee River watershed, three sites (292 acres total) include the 237 acre Havenwoods State Forest and a 30 acre site maintained by the WDNR, and one 25 acre site owned and managed by University of Wisconsin - Milwaukee.

4.1.2 Groundwater

Groundwater resources constitute another key element of the natural resource base of the MMSD planning area. The groundwater resources of the watersheds are hydraulically connected to the surface water resources inasmuch as the former provide the base flow of streams and sustain lake levels and wetlands. Groundwater also serves as a water supply for domestic, municipal, and industrial water users.

Groundwater occurs within three major aquifers that underlie the MMSD planning area. From the land's surface downward, they are: 1) the sand and gravel deposits in the glacial drift, 2) the shallow dolomite strata in the underlying bedrock, and 3) the deeper sandstone, dolomite, siltstone, and shale strata. Because of their proximity to the land's surface and hydraulic interconnection, the first two aquifers are commonly referred to collectively as the "shallow aquifer," while the latter is referred to as the deep aquifer. Within the MMSD planning area, the shallow and deep aquifers are separated by the Maquoketa shale, which forms a relatively impermeable barrier between the two aquifers.

4.1.3 Environmental Corridors

The SEWRPC identified and delineated areas within the MMSD planning area in which concentrations of recreational, aesthetic, ecological, and cultural resources occur and are considered resources that should be preserved and protected. Such areas normally include one or more of the following elements of the natural resource base that are essential to the ecological balance and natural beauty of the area: 1) lakes, rivers, and streams and their associated shorelands and floodlands, 2) wetlands, 3) woodlands, 4) prairies, 5) wildlife habitat areas, 6) wet, poorly drained, or organic soils, and 7) rugged terrain and high-relief topography. In addition to the foregoing elements, there are five additional elements that, although not part of the natural resource base per se, are a determining factor in identifying and delineating areas with recreational, aesthetic, ecological, and cultural value: 1) existing park and open space sites, 2) potential park and open space sites, 3) historic sites, 4) significant scenic areas and vistas, and 5) natural and scientific areas. The SEWRPC delineated these 12 natural resource and natural resource-related elements on a map, indicating a pattern of relatively narrow, elongated areas that they termed "environmental corridors."

Figure 4-4 and Table 4-2 present information on the environmental corridors and isolated natural resource areas within MMSD's planning area, and are based upon data gathered as part of SEWRPC's inventory of recreational, aesthetic, ecological, and cultural resources.

Primary Environmental Corridors

Primary environmental corridors include a variety of important resources and resource-related elements that are at least 400 acres in size, two miles in length, and 200 feet in width. The primary environmental corridors in the MMSD planning area are primarily located along major stream valleys, lakes, and wetlands. Primary environmental corridors encompassed about 29 square miles, or about 7% of the MMSD planning area in the year 2000. These primary environmental corridors contain nearly all of the best remaining woodlands, wetlands, and wildlife habitat areas in the MMSD planning area, and represent a composite of the best remaining elements of the natural resource base. Based on Figure 4-4, there are concentrations of primary environmental corridors in southern, western and northwestern portions of the MMSD planning area.

Secondary Environmental Corridors

Secondary environmental corridors connect with primary environmental corridors and are at least 100 acres in size and one mile in length. Secondary environmental corridors are generally located along the small perennial and intermittent streams within the MMSD planning area.

Secondary environmental corridors also contain a variety of resource elements, often remnant resources from primary environmental corridors that have been developed for intensive urban or agricultural purposes. Secondary environmental corridors facilitate surface water drainage, maintain pockets of natural resource features, and provide corridors for the movement of wildlife and for the movement and dispersal of seeds for a variety of plant species. There are 12.5 square miles of secondary environmental corridor within the MMSD planning area, or 3% of the total area for the year 2000.

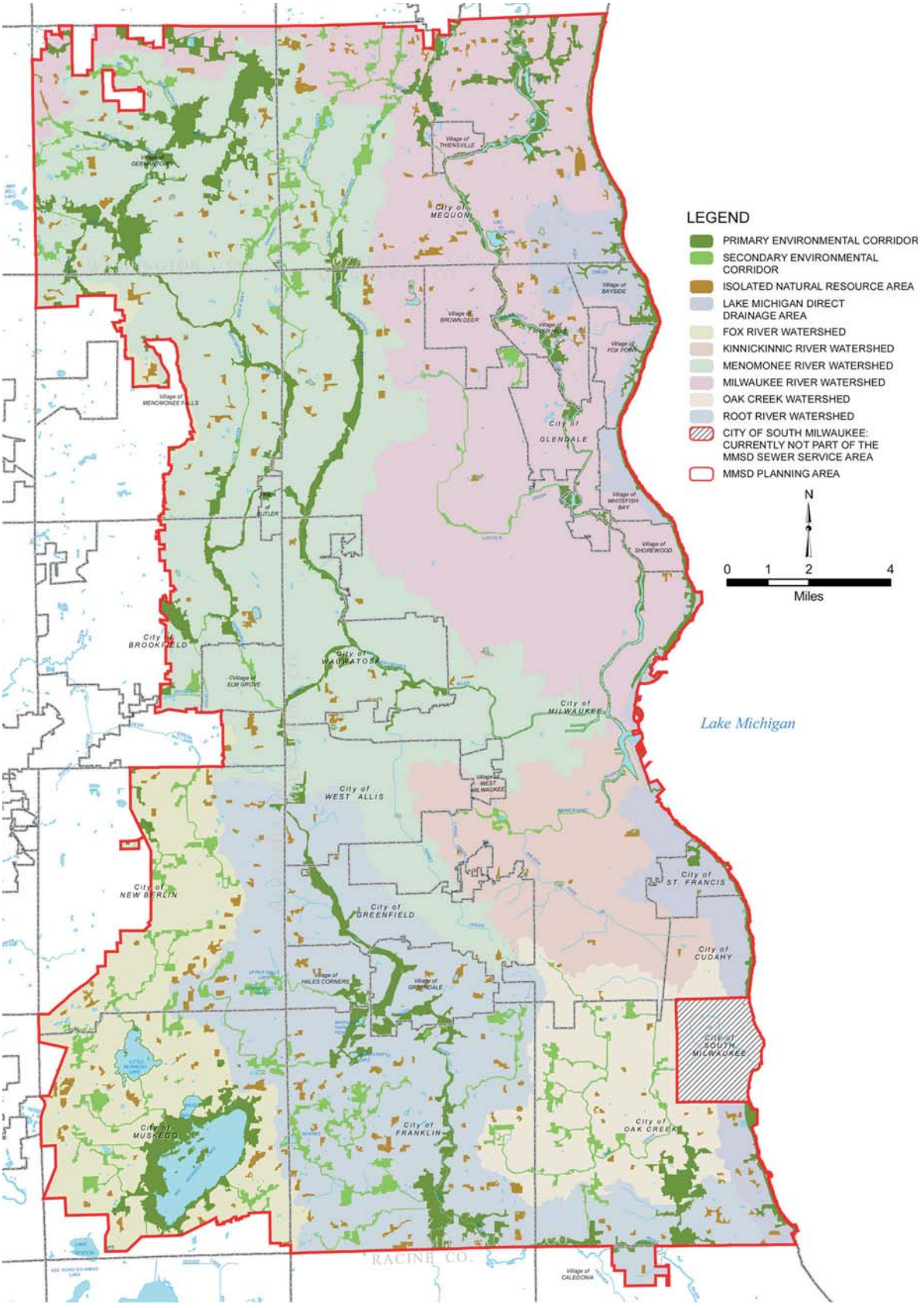
Isolated Natural Resource Areas

The MMSD planning area includes smaller concentrations of natural resource base elements that are separated physically from the environmental corridors by intensive urban or agricultural land uses within the MMSD planning area. These natural areas, which are at least five acres in size, are referred to as isolated natural resource areas. Widely scattered throughout the MMSD planning area, isolated natural resource areas encompassed about 8 square miles, or about 2% of the planning area, in 2000. Isolated natural areas may provide the only available wildlife habitat in an area, provide good locations for local parks and nature study areas, and lend unique aesthetic character or natural diversity to an area.

Woodlands and Wetlands

Three woodland types are recognized in the MMSD planning area: northern upland hardwoods, southern upland hardwoods, and northern upland conifers. The northern and southern upland hardwood types are the most common in the MMSD planning area.

The remaining stands of trees within the MMSD planning area consist largely of even-aged mature or nearly mature specimens, with insufficient reproduction and saplings to maintain the stands when the old trees are harvested or die of disease or age. Woodlands are located largely on ridges and slopes and along lakes and streams.



SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 4-4
ENVIRONMENTAL CORRIDORS WITHIN THE MMSD PLANNING AREA
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Watershed	Primary Environmental Corridors		Secondary Environmental Corridors		Isolated Natural Resource Areas		Total Environmental Corridors and Isolated Natural Resource Areas	
	Acres	*% of Planning Area*	*Acres*	*% of Planning Area*	*Acres*	*% of Planning Area*	*Acres*	*% of Planning Area*
Lake Michigan Direct Drainage	2,309	0.88	0	0	164	0.06	2,474	0.94
Fox River	2,217	0.84	1,735	0.66	826	0.31	4,778	1.82
Kinnickinnic River	67	0.03	184	0.07	99	0.04	349	0.13
Menomonee River	6,535	2.48	2,149	0.82	1,316	0.50	9,999	3.80
Milwaukee River	3,150	1.20	805	0.31	1,183	0.45	5,138	1.95
Oak Creek	519	0.20	1,087	0.41	160	0.06	1,766	0.67
Root River	3,529	1.34	2,076	0.79	1,329	0.51	6,934	2.64
Total	**18,325**	**6.97**	**8,035**	**3.05**	**5,078**	**1.93**	**31,438**	**11.95**

SOURCE: SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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TABLE 4-2

ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL RESOURCE AREAS WITHIN THE MMSD PLANNING AREA

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Upland woodlands encompass about 13 square miles (3%) of the MMSD planning area. It should be noted that lowland wooded areas, such as tamarack swamps, are classified as wetlands. These upland woodlands are identified on Figure 4-5.

Wetlands generally occur in depressions and near the bottom of slopes, particularly along lakeshores and stream banks, and on large land areas that are poorly drained. Wetlands may also, however, occur on slopes and even on hilltops. Wetlands perform an important set of natural functions that include support of a wide variety of desirable, and sometimes unique, forms of plant and animal life; water quality protection; stabilization of lake levels and streamflows; reduction in stormwater runoff by providing areas for floodwater impoundment and storage; protection of shoreline from erosion; and provision of groundwater discharge areas.

As identified in the MMSD planning area land use inventory, wetlands encompassed about 24 square miles, or 6% of the total area, in 2000. Those wetlands are shown in Figure 4-5 and are based upon the Wisconsin Wetland Inventory completed in 1985 by the WDNR, and updated to the year 2000 as part of SEWRPC's RWQMPU land use inventory. It should be noted that other areas have been identified as farmed wetlands by the U.S. Natural Resources Conservation Service. Farmed wetlands are subject to federal wetland regulations. Farmed wetlands are not shown on Figure 4-5, and were not considered as part of the 2020 facilities planning effort.

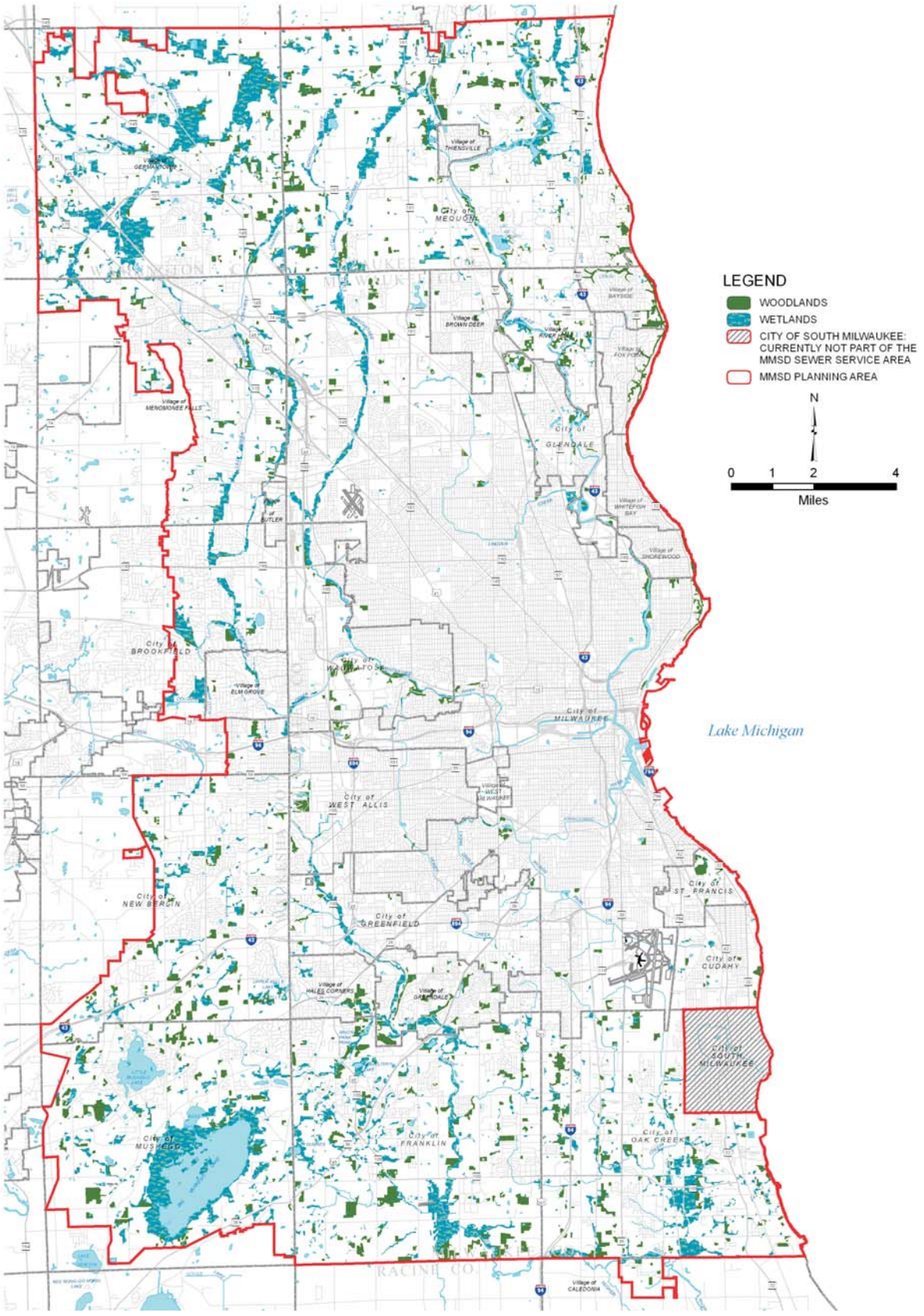
Wetlands and their boundaries are continuously changing in response to changes in drainage patterns and climatic conditions. While wetland inventory maps provide a sound basis for area-wide planning, detailed field investigations are often necessary to identify wetland boundaries for individual tracts of land at a given point in time. As noted with primary environmental corridors, there are concentrations of isolated natural resource areas, woodlands and wetlands in the southern, western and northwestern portions of the MMSD planning area.

Known Natural Areas and Critical Species Habitats

Natural areas, as defined by the Wisconsin Natural Areas Preservation Council, are tracts of land or water so little modified by human activity, or sufficiently recovered from the effects of such activity, that they contain intact native plant and animal communities believed to be representative of the pre-European settlement landscape. Natural areas are classified into one of the following three categories, as shown on Figure 4-6:

1) Natural area of statewide or greater significance (NA-1)
2) Natural area of countywide or regional significance (NA-2)
3) Natural area of local significance (NA-3)

Classification of an area into one of these categories is based upon several factors, including the diversity of plant and animal species and community types present; the structure and integrity of the native plant or animal community; the extent of disturbance by human activity, such as logging, grazing, water level changes, and pollution; the commonness of the plant and animal communities present; any unique natural features within the area; the size of the area; and the educational value. Natural areas form an element of the wildlife habitat base of the MMSD planning area.



SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 4-5

WOODLANDS AND WETLANDS WITHIN THE MMSD PLANNING AREA

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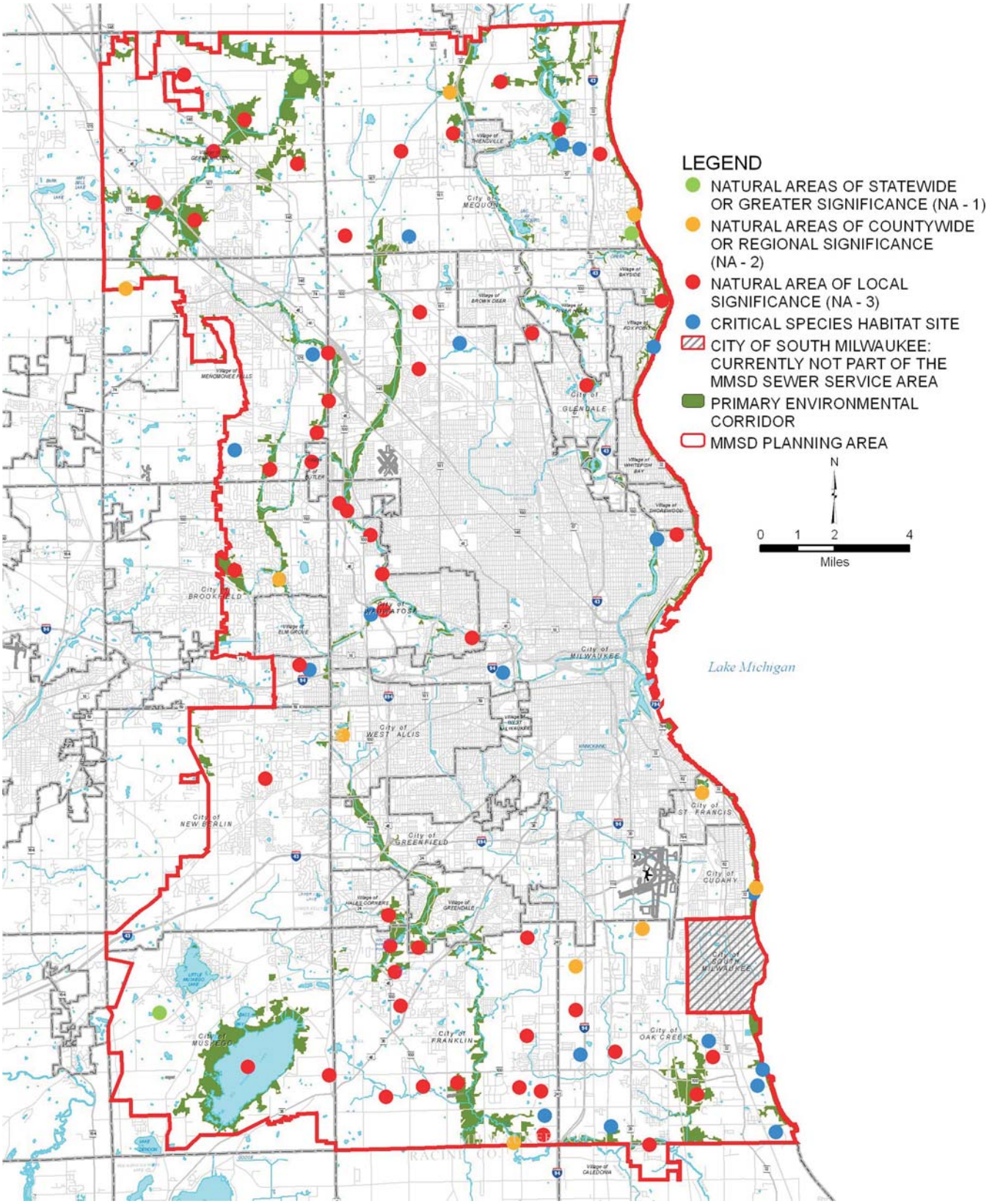

SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 4-6

KNOWN NATURAL AREAS AND CRITICAL SPECIES HABITAT SITES WITHIN THE MMSD PLANNING AREA

2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
4/30/07

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A comprehensive inventory of natural area sites in the MMSD planning area was completed in 1994 by area naturalists and by SEWRPC. There were 66 natural area sites inventoried within the MMSD planning area that encompassed a total of about 5.7 square miles, or approximately 1.4% of the MMSD planning area.

The following summarizes natural area sites by watershed.

- Within the Kinnickinnic River watershed, there were no sites identified as natural areas or critical species habitat sites.
- Within the Menomonee River watershed, 32 natural area sites were identified, six of which were identified as critical species habitat sites. Portions of the Germantown Swamp, totaling 190 acres, were identified as an NA-1 site. Two natural areas that cover approximately 400 acres were identified as NA-2 sites. Twenty-three natural areas that cover approximately 1,450 acres were identified as NA-3 sites. Approximately 60 acres of critical species habitat were also identified.
- The portion of the Milwaukee River watershed located within the MMSD planning area had 12 natural area sites identified, four of which were identified as critical species habitat sites (40 acres). None of these sites was identified as NA-1. One site (81 acres) was classified as NA-2 and seven sites (350 acres) were identified as NA-3.
- Within the Oak Creek watershed, 12 natural area sites were identified, two of which were identified as critical species habitat sites (24 acres). No sites were classified as NA-1. Three natural areas (147 acres) were classified as NA-2, and seven sites (288 acres) were classified as NA-3.
- The portion of the Root River watershed located within the MMSD planning area had 18 natural area sites identified, two of which were identified as critical species habitat sites (38 acres). No sites were classified as NA-1. Two sites, totaling 312 acres, were classified as NA-2 totaling 312 acres, and 14 sites, totaling approximately 975 acres, were classified as NA-3.
- Within the Lake Michigan Direct Drainage area within the MMSD planning area, 17 sites were identified, 10 of which were identified as critical species habitat sites (149 acres). The Fairy Chasm State Natural Area, totaling 80 acres, was identified as an NA-1 site. Three natural areas of countywide or regional significance, totaling approximately 40 acres in aerial extent, were identified as NA-2 sites. Five sites, totaling about 200 acres, were identified as NA-3 sites.

4.1.4 Endangered and Threatened Species and Species of Concern

The complete spectrum of wildlife species originally native to the MMSD planning area, along with their habitat, has undergone significant change in terms of diversity and population size since the European settlement of the area. These changes are a result of the conversion of land by the settlers from its natural state to agricultural and urban uses, beginning with the clearing of the forest and prairies, the draining of wetlands, and the ultimate development of extensive urban areas.

The WDNR records show the following breakdown by watershed of the endangered and threatened species and species of special concern:

- Within the Kinnickinnic River watershed, nine species of plants, one species of fish, one species of herptiles, and one species of invertebrate have been observed since 1975.
- Within the Menomonee River watershed, 32 species of plants, four species of birds, six species of fish, four species of herptiles, and six species of invertebrates are considered endangered and threatened species and species of special concern.
- Within the Milwaukee River watershed, 24 species of plants, 10 species of birds, 10 species of fish, three species of herptiles, and 15 species of invertebrates have been observed since 1975.
- Within the Oak Creek watershed, five species of plants, two species of fish, and two species of birds have been observed since 1975.
- Within the Root River watershed, 17 species of plants, seven species of birds, two species of fish, three species of herptiles, and two species of invertebrates have been observed since 1975.
- Within the Lake Michigan Direct Drainage area there is limited information on endangered and threatened species and species of special concern. However, one species of fish, the greater redhorse, which is a threatened species in the state of Wisconsin, is known to inhabit this area. In 2002, it was documented that Lake Park, which is located within the central portion of the direct drainage area in the city of Milwaukee, contained more than 200 species of birds that consist of both resident breeding populations and migrant birds. Eight of these bird species are listed as threatened or endangered federally and in Wisconsin and 28 bird species are listed as species of special concern within Wisconsin. Lake Park is also part of an important migration corridor for birds in the spring and fall, so it is a very popular location for bird watching. Habitat along the entire Lake Michigan shoreline is an important part of the Central Flyway. For example, bird species, such as peregrine falcons which are federally endangered, use the park at some point as they move along the lakeshore in both resident pairs and migrants. Therefore, it is also likely that many of the corridor areas along the lakeshore also provide essential habitat and refuge for these bird species.

4.2 Description of Demographic and Cultural Environment

4.2.1 Civil Divisions

The MMSD planning area includes and bisects a number of civil divisions. Civil divisions form the basic foundation of the public decision-making framework.

Table 4-3 lists the municipalities that are located both within the GMW and the MMSD planning area. The area of a watershed that is contained within a municipality is presented in square miles and as a percentage of the watershed that is located within the MMSD planning area.

Watershed/Municipality		Square Miles Within Watershed	Percent of Total Watershed Area
Kinnickinnic River	City of Cudahy	1.49	6.05
	City of Greenfield	2.22	8.99
	City of Milwaukee	18.69	75.80
	City of St. Francis	0.10	0.42
	City of West Allis	1.68	6.83
	Village of West Milwaukee	0.47	1.91
	Total	**24.65**	**100.00**
Lake Michigan Direct	City of Cudahy	2.29	5.71
	City of Glendale	0.03	0.07
	City of Mequon	3.89	9.61
	City of Milwaukee	3.70	9.22
	City of Oak Creek	3.02	7.44
	City of St. Francis	2.40	5.99
	Village of Bayside	2.01	4.94
	Village of Fox Point	1.27	3.13
	Village of River Hills	1.04	2.56
	Village of Shorewood	0.11	0.27
	Village of Whitefish Bay	1.37	3.37
	Total	**21.13**	**52.31**
Menomonee River	City of Brookfield	11.82	9.94
	City of Greenfield	2.90	2.14
	City of Mequon	11.61	8.56
	City of Milwaukee	31.55	23.24
	City of New Berlin	0.67	0.50
	City of Wauwatosa	13.23	9.74
	City of West Allis	6.76	4.98
	Town of Germantown	0.76	0.56
	Village of Butler	0.80	0.59
	Village of Elm Grove	3.29	2.42
	Village of Germantown	29.37	21.63
	Village of Greendale	0.11	0.00
	Village of Menomonee Falls	17.97	13.64
	Village of West Milwaukee	0.65	0.48
	Total	**131.49**	**98.42**
Milwaukee River	City of Glendale	5.92	0.85
	City of Mequon	31.47	4.49
	City of Milwaukee	38.84	5.55
	Village of Bayside	0.39	0.06
	Village of Brown Deer	4.40	0.63
	Village of Fox Point	1.61	0.23
	Village of Germantown	5.06	0.72
	Village of River Hills	4.30	0.61
	Village of Shorewood	1.49	0.21
	Village of Thiensville	1.05	0.15
	Village of Whitefish Bay	0.76	0.11
	Total	**95.29**	**13.61**
Oak Creek	City of Cudahy	0.99	3.98
	City of Franklin	2.57	10.31
	City of Greenfield	0.23	0.94
	City of Milwaukee	2.86	11.48
	City of Oak Creek	18.27	73.29
	Total	**24.92**	**100.00**
Root River	City of Franklin	31.67	16.02
	City of Greenfield	6.19	3.13
	City of Milwaukee	1.07	0.54
	City of Muskego	3.93	1.99
	City of New Berlin	9.24	4.67
	City of Oak Creek	7.14	3.61
	City of West Allis	2.96	1.50
	Town of Caledonia	1.00	1.39
	Village of Greendale	5.46	2.76
	Village of Hales Corners	3.20	1.62
	Total	**71.86**	**37.23**
Fox River	City of Brookfield	0.19	0.02
	City of Franklin	0.45	0.05
	City of Muskego	26.26	2.80
	City of New Berlin	14.16	1.51
	Village of Menomonee Falls	1.45	0.15
	Total	**42.51**	**4.53**

Source: US Census Bureau, SEWRPC

Total area for MMSD Planning Area = **411** Square Miles
Total area for Kinnickinnic, Lake Michigan Direct, Menomonee, Milwaukee, Oak, Root, and Fox Watersheds = **2067** Square Miles
Percent of total watershed area 411 sq mi. / 2067 sq mi. = **19.9%**

SOURCE: SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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TABLE 4-3
SQUARE MILES AND PERCENT OF WATERSHEDS BY CIVIL DIVISION WITHIN THE 2020 PLANNING AREA
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
4/30/07 010_tbl_4-3.cdr

Approximately 130 square miles of the Menomonee River watershed falls within the MMSD planning area. This area comprises the largest planning unit and has the greatest number of civil divisions within the MMSD planning area. Land uses within the MMSD planning area is presented on Table 4-4. In terms of residential land uses, the Menomonee, Root, Oak Creek, and Fox River watershed planning units consist primarily of low- to medium-density residential. On the other hand, the Milwaukee and Kinnickinnic River watershed planning units primarily consist of medium and high-density residential land uses. The residential land uses within the Lake Michigan Direct Drainage Area planning unit is distributed evenly over low to high-density residential.

The MMSD planning area contains the Oak Creek and Kinnickinnic River watersheds in their entirety; however, these watersheds are the smallest planning units in the MMSD planning area, ranging in size from 22 to 25 square miles. Between 35% and 50% of the Root River watershed and Lake Michigan Direct Drainage Area are located within the MMSD planning area. Approximately 14% of the Milwaukee River watershed and 5% of the Fox River watershed is located within the MMSD planning area.

It is important to note that the Fox River watershed is not one of the six watersheds that comprise the GMW, is not considered in these planning studies, and is only included in the MMSD planning area because parts of the sewered areas in Muskego, New Berlin, Brookfield, Franklin and Menomonee Falls that discharge to SSWWTP are located within the Fox River watershed

Population

In 2000, the MMSD planning area located within the GMW had a total population of 1,066,978 persons and contained 425,227 households. Table 4-5 presents 2000 population and household data for the MMSD planning area by municipality.

The Milwaukee River and Menomonee River watersheds had the highest populations, with 34% and 30% of the total planning area population, respectively. The population density in the Milwaukee and Menomonee River watersheds is approximately 3,800 and 2,450 people per square mile, respectively. These are mid-range population densities relative to densities calculated for other planning units in the MMSD planning area.

The Kinnickinnic River watershed had 13% and the Root River watershed had 10% of the population in the planning area. The lowest populations were located within the Lake Michigan Direct Drainage area, the Fox River watershed, and the Oak Creek watershed, with approximately 12% of the population of the planning area resided within these areas.

The portion of the Kinnickinnic River watershed in the MMSD planning area had the greatest population density, with approximately 5,850 people per square mile. The lowest population densities were noted in the Fox River, Oak Creek and Root River watershed planning units, with approximately 750, 1,400, and 1,500 people per square mile, respectively.

Chapter 2, *Water Quality Definitions and Issues* of SEWRPC Planning Report No. 50, *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds* contains more information on demographics throughout the GMW.

	Low-Density Residential	Med-Density Residential	High-Density Residential	Suburban/ Rural Residential	Residential Sub-Total	Commercial	Industrial	Institutional & Governmental	Communications & Utility	Commercial Sub-Total	Open Space	Freeway	Transportation (w/out Freeway)	Recreational	Agriculture	Landfill	Open Space Sub-Total	Total
	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles	Sq. Miles
Menomonee River	16.1	13.0	9.3	0.1	38.6	2.8	5.1	4.7	0.7	13.3	23.7	2.6	25.1	4.9	22.1	0.6	78.8	131
Root River	12.2	7.3	1.9	0.0	21.4	1.0	1.2	1.4	0.3	3.9	16.4	0.7	10.1	2.5	16.4	0.4	46.5	72
Oak Creek	2.6	2.4	0.6	0.0	5.6	0.5	0.9	0.7	0.2	2.3	6.3	0.6	5.1	0.5	4.6	0.0	17.0	25
Kinnickinnic River	0.3	3.3	4.9	0.0	8.4	0.9	1.4	1.7	0.3	4.3	1.7	0.8	8.4	1.0	0.1	0.0	12.0	25
Milwaukee River	8.3	9.7	11.2	2.0	31.1	2.4	2.8	3.7	0.4	9.2	15.3	1.2	19.3	4.5	14.4	0.0	54.7	95
Lake Michigan Direct	4.0	1.8	2.3	0.2	8.4	0.2	0.6	0.8	0.7	2.3	4.7	0.2	3.7	1.2	0.5	0.1	10.4	21
Fox River	5.1	3.1	0.0	0.2	8.4	0.5	3.2	0.6	0.2	4.4	13.3	0.4	4.2	0.7	11.9	0.6	31.2	44
Planning Area Total	48.6	40.7	30.2	2.5	121.9	8.2	15.2	13.6	2.6	39.6	81.4	6.6	75.9	15.2	70.1	1.7	250.7	411

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TABLE 4-4

LAND USES BY WATERSHED WITHIN THE MMSD PLANNING AREA

2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT

4/30/07

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Watershed/Municipality		Population	Households
Kinnickinnic River	City of Cudahy	3,932	1,462
	City of Greenfield	8,051	3,590
	City of Milwaukee	116,351	44,714
	City of St. Francis	353	159
	City of West Allis	14,350	6,391
	Village of West Milwaukee	936	453
	Total	**143,973**	**56,769**
Lake Michigan Direct	City of Cudahy	10,414	4,731
	City of Glendale	86	30
	City of Mequon	4,266	1,621
	City of Milwaukee	21,750	10,217
	City of Oak Creek	1,859	725
	City of St. Francis	8,357	3,912
	Village of Bayside	3,747	1,462
	Village of Fox Point	2,131	746
	Village of River Hills	325	118
	Village of Shorewood	373	132
	Village of Whitefish Bay	7,876	2,857
	Total	**61,184**	**26,551**
Menomonee River	City of Brookfield	16,327	5,976
	City of Greenfield	11,092	5,102
	City of Mequon	2,636	887
	City of Milwaukee	153,851	59,445
	City of New Berlin	1,477	592
	City of Wauwatosa	47,333	20,419
	City of West Allis	36,408	16,369
	Town of Germantown	N/A	N/A
	Village of Butler	1,880	914
	Village of Elm Grove	6,270	2,454
	Village of Germantown	17,761	6,720
	Village of Greendale	410	173
	Village of Menomonee Falls	25,440	10,125
	Village of West Milwaukee	3,353	1,626
	Total	**324,238**	**130,802**

Watershed/Municipality		Population	Households
Milwaukee River	City of Glendale	13,338	5,748
	City of Mequon	15,306	5,577
	City of Milwaukee	292,604	113,051
	Village of Bayside	757	294
	Village of Brown Deer	12,121	5,109
	Village of Fox Point	4,706	1,995
	Village of Germantown	529	184
	Village of River Hills	1,609	614
	Village of Shorewood	13,065	6,216
	Village of Thiensville	3,058	1,402
	Village of Whitefish Bay	6076	2,522
	Total	**363,169**	**142,712**
Oak Creek	City of Cudahy	4,092	1,705
	City of Franklin	3,433	1,136
	City of Greenfield	818	431
	City of Milwaukee	4,471	1,768
	City of Oak Creek	21,911	8,997
	Total	**34,725**	**14,037**
Root River	City of Franklin	26,045	9,464
	City of Greenfield	15,637	6,658
	City of Milwaukee	6,761	2,664
	City of Muskego	3,943	1,362
	City of New Berlin	17,463	6,495
	City of Oak Creek	4,519	1,448
	City of West Allis	10,690	4,924
	Town of Caledonia	557	213
	Village of Greendale	13,902	5,798
	Village of Hales Corners	7,728	3,245
	Total	**107,245**	**42,271**
Fox River	City of Brookfield	247	88
	City of Franklin	38	16
	City of Muskego	16200	5752
	City of New Berlin	14447	5622
	Village of Menomonee Falls	1512	607
	Total	**32,444**	**12,085**

Total Population = **1,066,978**
Total Households = **425,227**

Total Population and Households include the Fox, Kinnickinnic, Lake Michigan Direct, Menomonee, Milwaukee, Oak, and Root Watersheds.

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TABLE 4-5
2000 POPULATIONS AND HOUSEHOLDS BY CIVIL DIVISION WITHIN THE MMSD PLANNING AREA
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
4/30/07 012_tbl_4-5.cdr

4.2.2 Areas Served by Sanitary Sewer

Areas served by sanitary sewers in the MMSD planning area in 2000 encompassed about 261 square miles, or about 64% of the total MMSD planning area. In 2004, there were two public sewage treatment plants located in the MMSD planning area. No privately-owned sewage treatment plants are located within the MMSD planning area. Urban development outside of areas served by sanitary sewers encompassed approximately 8 square miles, or about 2% of the MMSD planning area. An estimated 979,077 persons, or about 92% of the population of the watersheds, were served by public sanitary sewers in 2000. Table 4-6 lists the sanitary sewerage facilities in the MMSD planning area.

4.2.3 Planned Sewer Service Areas

Planned or anticipated future sanitary sewer service areas (both combined and separate areas) in the study area in 2000 encompassed approximately 312 square miles, or approximately 76% of the planning area. Figure 4-7 provides an illustration of planned sewer service areas.

4.2.4 Areas Serviced by Water Utilities

Areas served by public water utilities in 2000 encompassed about 219 square miles, or about 53% of the MMSD planning area, as shown in Figure 4-8. An estimated 926,402 persons, or about 87% of the population, were served by public water utilities in 2000. Urban areas not served by public water supplies constitute about 31 square miles, or about 6% of the MMSD planning area. Areas served by privately-or cooperatively-owned water systems typically serve residential subdivisions, apartment or condominium developments, mobile home parks, and institutions. Privately owned water utilities served about 4 square miles, or about 1% of the MMSD planning area.

Figure 4-8 distinguishes those water supply systems that currently use Lake Michigan as a supply source and those systems that use groundwater as a supply source. About 89% of the public water supplies are obtained from Lake Michigan and 11% are obtained from groundwater. All the private water supply systems use groundwater as a supply source.

4.2.5 Stormwater Management Systems

Municipal stormwater management systems are comprised of facilities that provide stormwater drainage and control of nonpoint source pollution. These facilities generally work as part of an integrated system that incorporates the streams, lakes, ponds, and wetlands of the MMSD planning area. Components of a stormwater management system may include subsurface pipes and appurtenant inlets and outlets, streams and engineered open channels, detention basins, retention basins, pumping facilities, infiltration facilities, constructed wetlands for treatment of runoff, and proprietary treatment devices based on settling processes and control of oil and grease. Within the MMSD planning area, the urban portions of the communities indicated on Figure 4-9 are served by engineered stormwater management systems.

Sewage Treatment Facility or Collection System		Watershed within Which System Lies							Sewerage Facilities Type		
Name	Location	Fox River	Kinnickinnic River	Lake Micigan Direct Drainage	Menomonee River	Milwaukee River	Oak Creek	Root River	Public Sewage Treatment Plant	Private Sewage Treatment Plant	Public Sewer Collection/ Conveyance System
Milwaukee County											
City of Cudahy	City of Cudahy	--	X	X	--	--	X	--	--	--	X
City of Franklin	City of Franklin	X	--	--	--	--	X	X	--	--	X
City of Glendale	City of Glendale	--	--	X	--	X	--	--	--	--	X
City of Greenfield	City of Greenfield	--	X	--	X	--	X	X	--	--	X
City of Milwaukee	City of Milwaukee	--	X	X	X	X	X	X	X	--	X
City of Oak Creek	City of Oak Creek	--	--	X	--	--	X	X	X	--	X
City of St. Francis	City of St. Francis	--	X	X	--	--	--	--	--	--	X
City of Wauwatosa	City of Wauwatosa	--	--	--	X	X	--	--	--	--	X
City of West Allis	City of West Allis	--	X	--	X	--	--	X	--	--	X
Village of Bayside	Village of Bayside	--	--	X	--	X	--	--	--	--	X
Village of Brown Deer	Village of Brown Deer	--	--	--	--	X	--	--	--	--	X
Village of Fox Point	Village of Fox Point	--	--	X	--	X	--	--	--	--	X
Village of Greendale	Village of Greendale	--	--	--	X	--	--	X	--	--	X
Village of Hales Corners	Village of Hales Corners	--	--	--	--	--	--	X	--	--	X
Village of River Hills	Village of River Hills	--	--	X	--	X	--	--	--	--	X
Village of Shorewood	Village of Shorewood	--	--	X	--	X	--	--	--	--	X
Village of West Milwaukee	Village of West Milwaukee	--	X	--	X	--	--	--	--	--	X
Village of Whitefish Bay	Village of Whitefish Bay	--	--	X	--	X	--	--	--	--	X

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TABLE 4-6

PUBLIC AND PRIVATE SEWERAGE FACILITIES WITHIN THE MMSD PLANNING AREA

2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
4/30/07 013_tbl_4-6.cdr

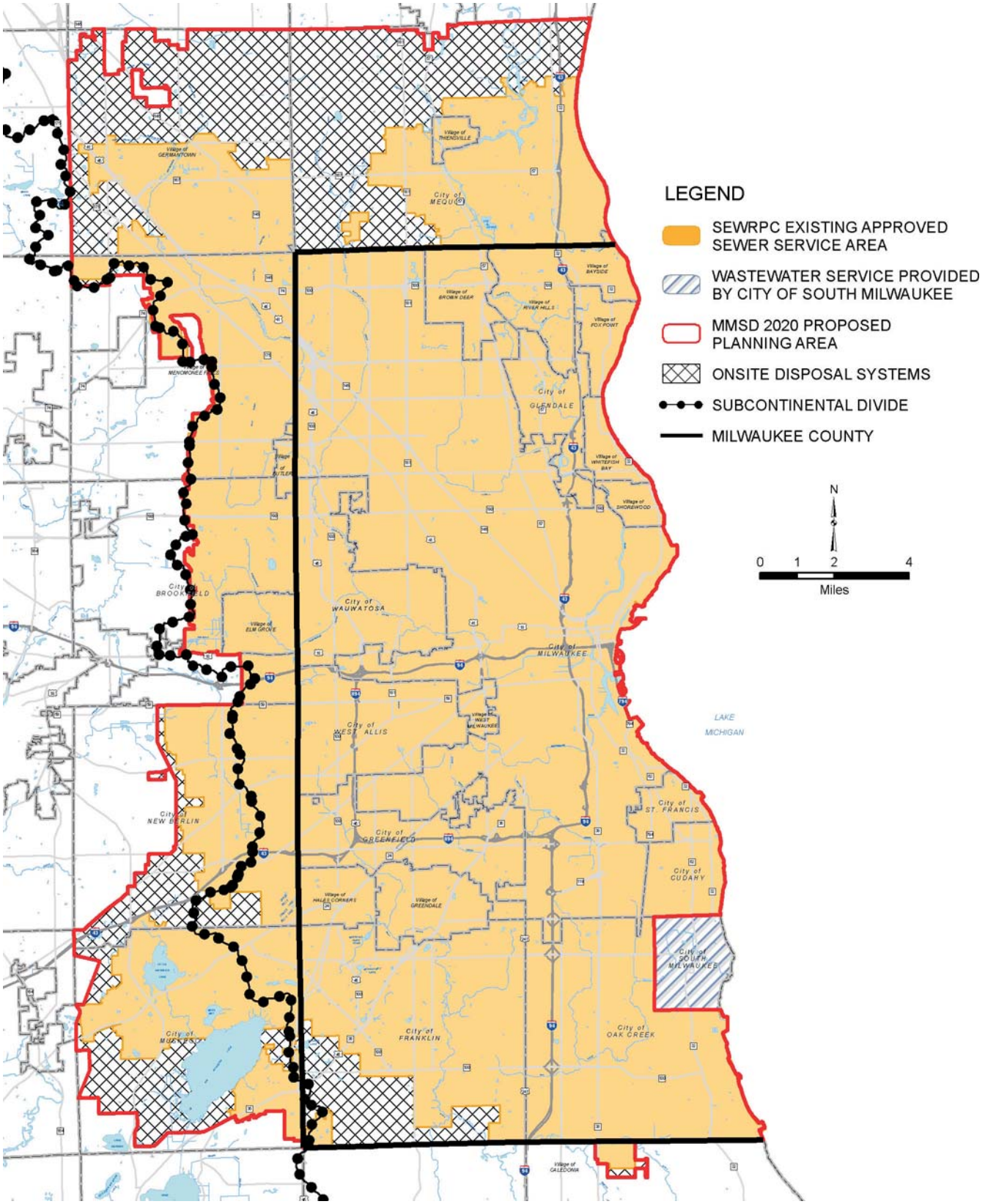

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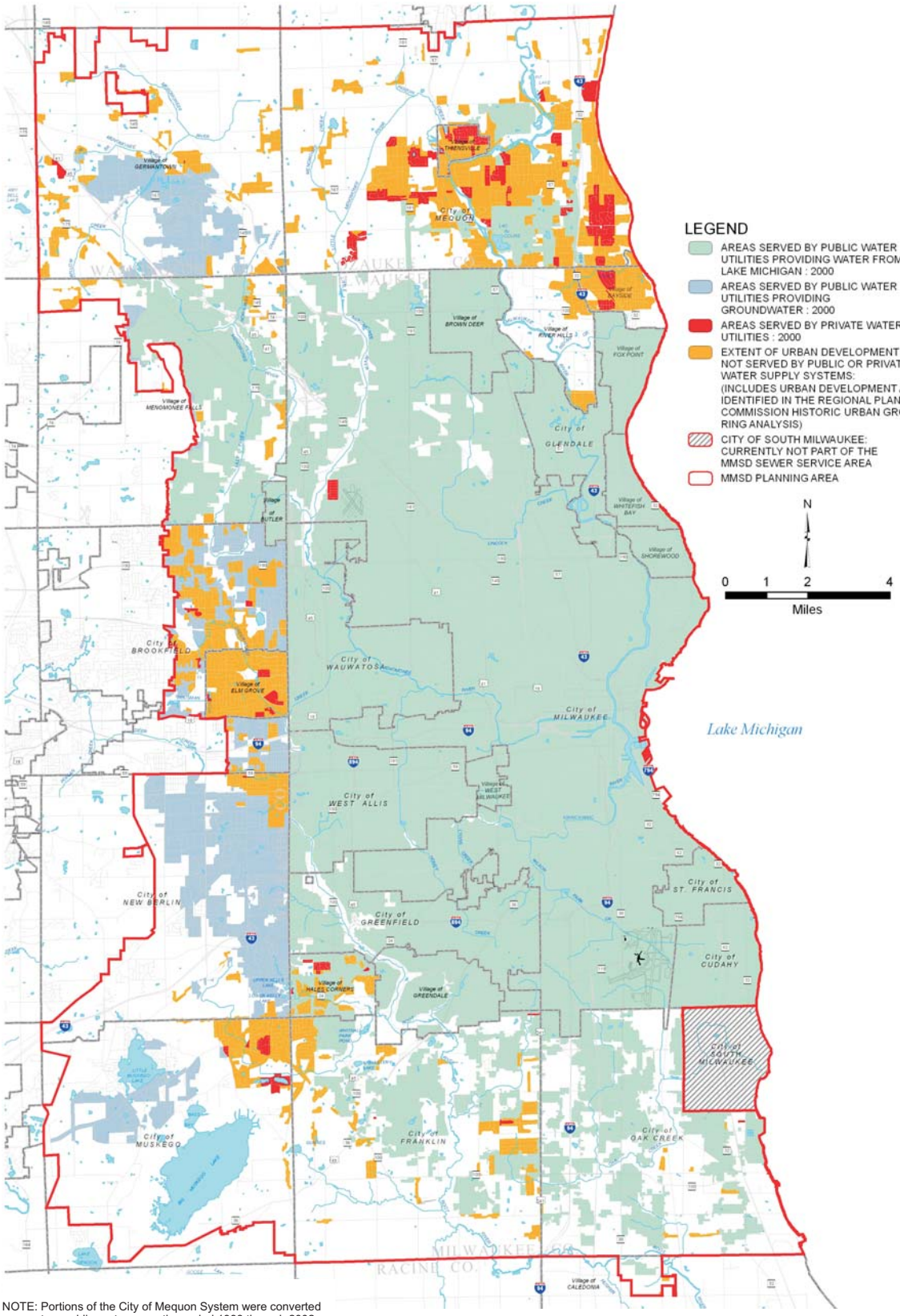
FIGURE 4-7
SEWRPC APPROVED MMSD 2007 BASELINE SEWER SERVICE AREA
EFFECTIVE 01/01/07
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
4/30/07 014_fig_4-7.cdr



NOTE: Portions of the City of Mequon System were converted to a public system over the period 1998 through 2002

SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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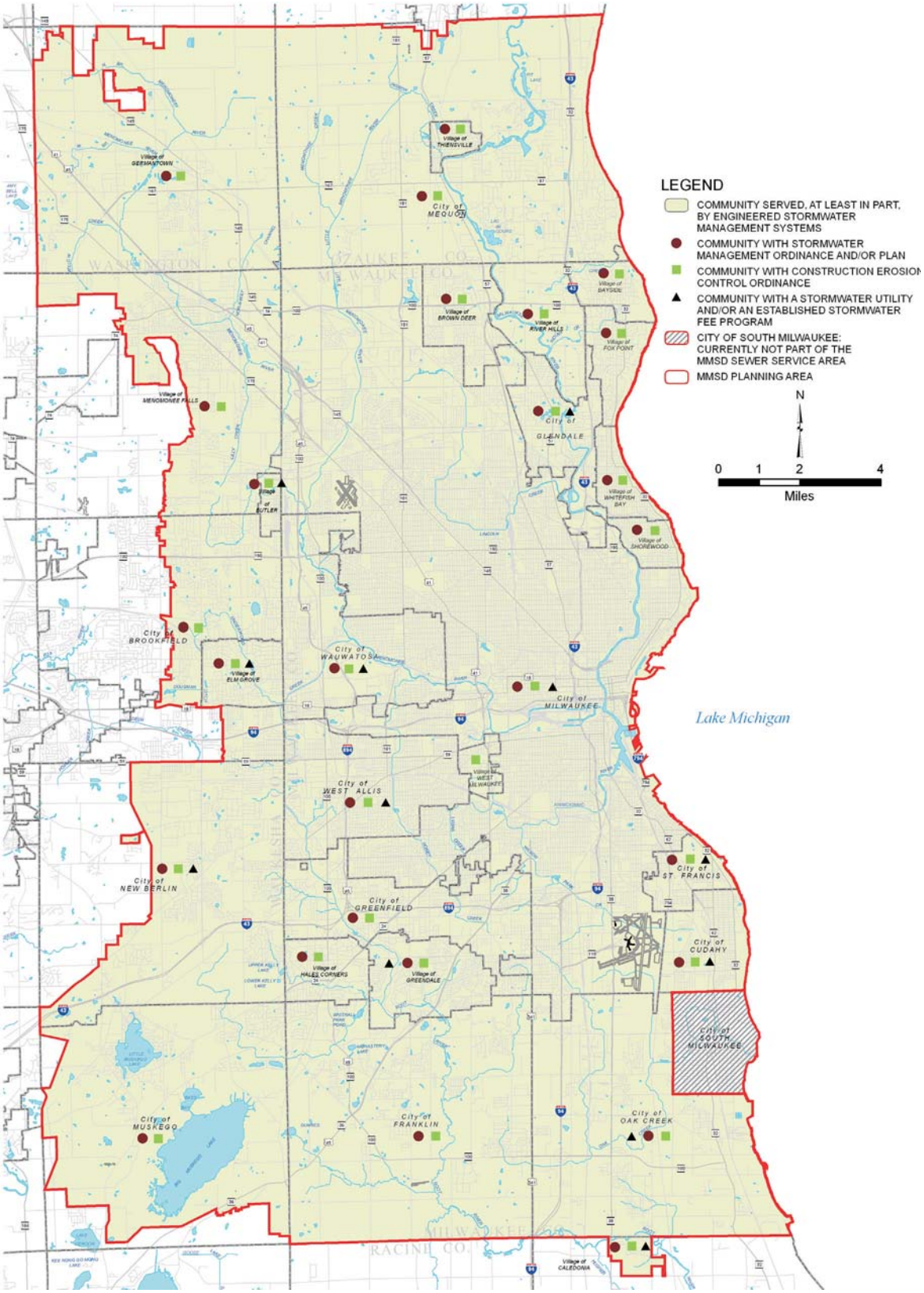
FIGURE 4-8
AREAS SERVED BY PUBLIC AND PRIVATE WATER UTILITIES WITHIN THE MMSD PLANNING AREA
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
4/30/07 015_fig_4-8.cdr



SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT,
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 4-9

SELECTED INFORMATION REGARDING STORMWATER MANAGEMENT SYSTEMS WITHIN THE MMSD PLANNING AREA

2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT

4/30/07

016_fig_4-9.cdr

In order to establish a reliable funding source to meet the requirements of their stormwater discharge permits, nine communities in the planning area have established stormwater utilities and/or stormwater fee programs. Those communities are indicated on Figure 4-9. In addition, each of the communities within the MMSD service area, with the exception of West Milwaukee, and all of the communities with WPDES stormwater discharge permits have a stormwater management ordinance and/or plan and a construction erosion control ordinance.

4.2.6 Active Solid Waste Disposal Sites

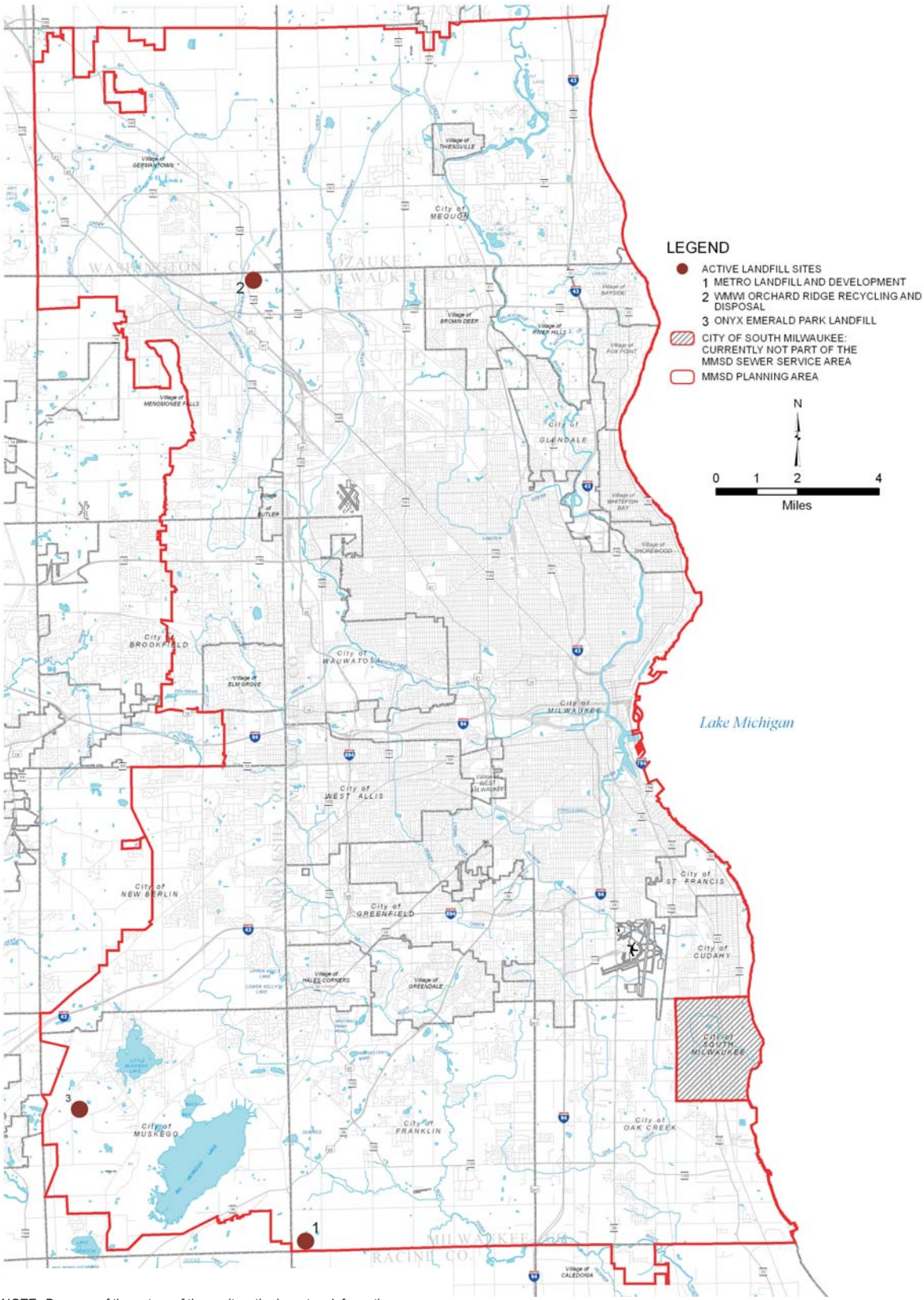
Landfilling and recycling are the primary methods of managing solid wastes generated in the MMSD planning area. As shown on Figure 4-10, as of 2005, there were three active, licensed, privately owned and operated sanitary landfills within the MMSD planning area: the Metro Landfill and Development within Franklin and the Root River watershed, the Waste Management of Wisconsin, Inc. (WMWI) Orchard Ridge Landfill within Menomonee Falls and the Menomonee River watershed, and the Onyx Emerald Park Landfill within Muskego and the Root River watershed. The Metro Landfill and Development and the Orchard Ridge Landfill accept municipal wastes, foundry wastes, publicly owned treatment works sludge, all other solid waste (excluding hazardous wastes), high-volume industrial waste used for daily cover, and treated contaminated soil used for daily cover. The Metro Landfill and Development facility also accepts fee exempt waste used for dikes, berms, etc., and the WMWI Orchard Ridge facility also accepts pulp and paper mill manufacturing wastes. The Onyx Emerald Park Landfill accepts municipal waste, all other solid waste (excluding hazardous wastes), fee exempt waste used for dikes, berms, etc., high-volume industrial waste used for daily cover, shredder fluff used for daily cover, and treated contaminated soil used for daily cover.

Historical Sites

Historic sites within the MMSD planning area often have important recreational, educational, and cultural value. Numerous inventories and surveys of potentially significant historic sites have been conducted by various units and agencies of government within the MMSD planning area. The results of these inventories and surveys are on file at agencies, such as the Wisconsin Historical Society, as well as county and local agencies. Certain sites of known historic significance are listed on the National Register of Historic Places.

In 2004, there were 123 individual sites and 18 historic districts within the MMSD planning area, excluding the Fox River watershed, listed on the National Register. The Lake Michigan Direct Drainage and the Oak Creek watersheds contain 14 and four historical sites, respectively. Neither of these watersheds contains historic districts. The Kinnickinnic River watershed has six historic sites and one historic district. There are 56 individual sites and five historic districts in the Menomonee River watershed. The Milwaukee River watershed has 43 historic sites and 11 historic districts.

The 2020 Recommended Plan identifies projects that will impact the Kinnickinnic River Flushing Station and watercourses within the MMSD planning area. A number of watercourses within the MMSD planning area contain Works Progress Administration (WPA) walls. Some of these walls, along with the Kinnickinnic River Flushing Station, have historical importance.



NOTE: Because of the nature of these sites, the inventory information changes periodically, the Wisconsin Department of Natural Resources should be contacted for the most recent data.

SOURCE: MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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FIGURE 4-10
ACTIVE SOLID WASTE SITES WITHIN THE MMSD PLANNING AREA
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
4/30/07 017_fig_4-10.cdr

4.2.7 Existing Water Quality and Pollutant Loading

Water Quality

The water quality of the greater Milwaukee area rivers has improved dramatically since 1993, due in large part to sewerage system improvements made by MMSD and its 28 satellite municipalities. Most significantly, since MMSD's deep tunnel system went into operation in February 1994, point source pollutant loads of fecal coliform bacteria have been reduced by over 90% in the Menomonee, Milwaukee, and Kinnickinnic River watersheds. These improvements, which were driven by regulatory requirements for control of SSOs and CSOs, have substantially reduced the frequency and volume of overflows.

Water quality is affected by both point and nonpoint source pollution. Point source pollution is defined as pollution that is discharged to surface waters from a discrete location. The other source of pollution addressed by the 2020 FP is nonpoint source pollution. Nonpoint source pollution consists of various discharges of pollutants to surface waters that cannot be readily identified as point sources. Nonpoint source pollution is transported from both rural and urban land areas to surface waters during and shortly after rainfall and snowmelt events

There are hundreds of physical, chemical and biological parameters that can be used to measure or describe water quality. Only a few of these parameters are typically useful in evaluating natural surface water and wastewater quality, and for indicating pollution. For the purpose of evaluating water quality in the 2020 FP, several parameters were employed to compare data to adopted water quality standards. To maintain consistency, these same parameters were used to evaluate the quality of point and nonpoint source discharges and ultimately to determine the effects of those discharges on receiving waters. The following parameters were modeled and/or evaluated to characterize watercourse water quality in the MMSD planning area

- Fecal coliform bacteria
- Total suspended solids (TSS)
- Total Phosphorus (Total P)
- Biochemical oxygen demand (BOD)
- Total Nitrogen (Total N)
- Total Copper

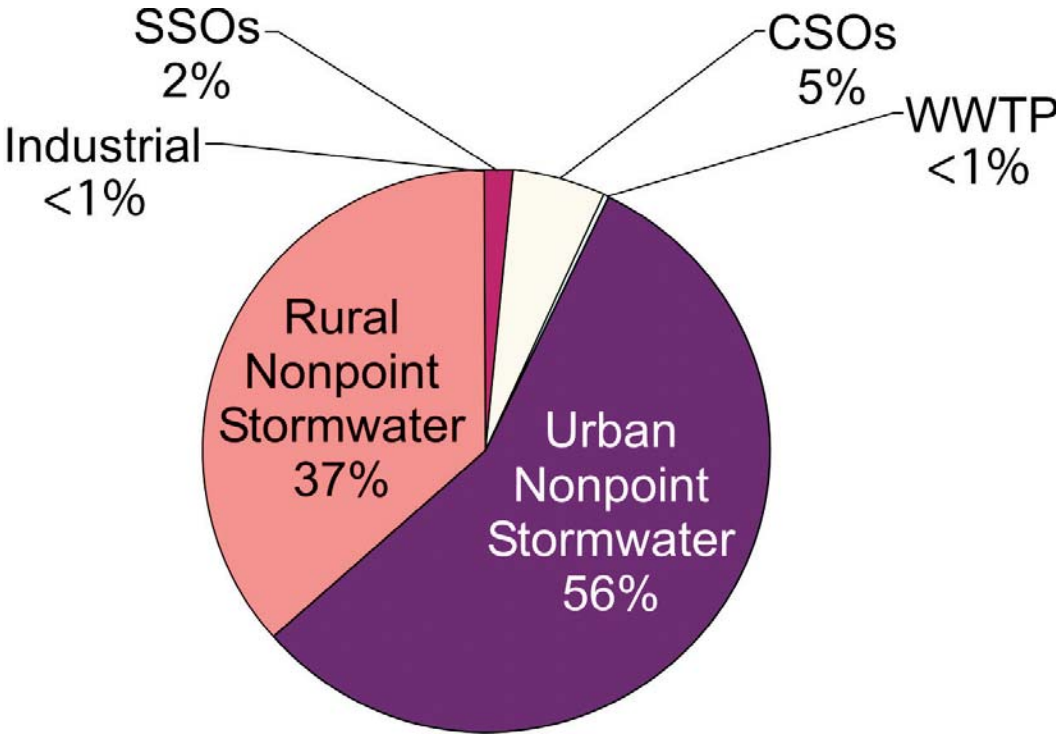
Fecal coliform is the criterion used to determine attainment of the full recreational and limited (body contact) recreational use regulatory standards; fecal coliform is the primary pollutant of concern. The 2020 FP planning process revealed that nonpoint pollution in the form of stormwater runoff, is now the largest source of fecal coliform bacteria. Furthermore, reducing (or even eliminating) sanitary sewer overflows (SSOs) will result in little or no water quality improvement on an annual basis.

For detailed information on modeled water quality at assessment points throughout the MMSD planning area, see Chapter 4, *Existing Conditions* of the *Facilities Plan Report*. For detailed information on historical trends and water quality sampling results, see SEWRPC Technical Report No. 39, Chapters V through X. These chapters present water quality conditions and sources of pollution in the GMW.

Pollutant Loading

Table 4-7 presents existing pollutant loading data for the GMW. It is estimated that over 81,700 trillion fecal coliform cells enter the GMW surface waters on an annual basis (Figure 4-11). Water quality modeling indicates that 93% of the existing fecal coliform pollution is a function of nonpoint sources. Approximately 37% of the total fecal coliform loads can be attributed to rural nonpoint sources and 56% to urban nonpoint sources. As for the point source contribution, sanitary and combined sewer overflows account for 2 and 5% and industrial and wastewater treatment plants account of less than 1% of the fecal coliform loading.

Watercourse Reach	Location	Length
Underwood Creek Reach 1	Upstream of the confluence with the Menomonee River to Mayfair Rd.	RM 0.1-1.5 (1.4 Miles)
Menomonee River Reach 1	I-94 to Pacific Rail Road Bridge	RM 3.6-4.3 (0.7 miles)
KK River Reach 1	Chase Ave. to 16th St.	RM 2.4-3.6 (1.2 Miles)
KK River Reach 2	16th St.-27th St.	RM 3.6-4.9 (1.3 Miles)
Wilson Park Creek Reach 2	27th St.-S. 20th St.	RM 0.9-1.7 (0.8 Miles)
Wilson Park Creek Reach 3	S. 20th St. to W. Layton Ave.	RM 1.7-3.5 (1.8 Miles)
S. Branch Underwood Creek Reach 1	Bluemound Rd. to Robinwood/ Schlinger St.	RM 0.0-1.1 (1.1 Miles)
Honey Creek Reach 6	Howard Ave. to I-894	RM 6.5-7.5 (1.0 Miles)
Honey Creek Reach 5	Oklahoma Ave. to Howard Ave,	RM 5.3-6.5 (1.2 Miles)
Honey Creek Reach 4	Arthur Ave. to Oklahoma Ave.	RM 4.3-5.3 (1.0 Miles)
Woods Creek Reach 1	55th St. to Menomonee River	RM 0.0-1.1 (1.1 Miles)
Honey Creek Reach 1	Upstream of Portland Ave. to North of I-94	RM 0.7-1.9 (1.2 Miles)
KK River Reach 3	27th St. to Drop Structure East of 43rd St. in Jackson Park	RM 4.9-6.3 (1.4 Miles)
Underwood Creek Reach 2	Mayfair Rd. to just downstream of Bluemound Rd.	RM 1.5-2.8 (1.3 Miles)
Lyons Creek Reach 1	Drop structure near the confluence with the KK River in Jackson Park to Forest Home Ave.	RM 0.0-1.3 (1.3 Miles)
Wilson Park Creek Reach 1	Confluence with the KK River West of St. Luke's Medical Center to 27th St. Tunnel Outlet	RM 0.0-0.9 (0.9 Miles)
Wilson Park Creek Reach 4	Layton Ave. to Chicago and North Western Railway Bridge	RM 3.5-5.4 (0.9 Miles)
Edgerton Channel Reach 1	Chicago and North Western Railway Bridge to Whitnall Ave.	RM 5.4-6.1 (0.7 Miles)
Villa Mann Creek Reach 1	Mouth at Wilson Park to confluence with Villa Mann Creek Tributary	RM 0.0-0.6 (0.6 Miles)
43rd Street Ditch Reach 1	Chicago and Northwestern Railway Tunnel Outlet S. 43rd St. tunnel outlet	RM 0.0-0.7 (0.7 Miles)
S. Branch Underwood Crk Reach 2	Robinwood/ Schlinger Street to Greenfield Ave.	RM 1.1-1.8 (0.7 Miles)
Total		**22.3 Miles**



SOURCE: SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION
(PRELIMINARY DATA)

Preserving The Environment •
Improving Water Quality

FIGURE 4-11
EXISTING ESTIMATED ANNUAL BACTERIA LOADS TO THE GREATER MILWAUKEE WATERSHEDS
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
4/30/07 019_fig_4-11.cdr

5. Environmental Consequences

The 2020 Recommended Plan organizes its recommendations into the following key elements:

1) Wet Weather Control Plan
2) Plan for Potential Improvements to Existing MMSD Facilities
3) Existing MMSD Programs and Policies to be Maintained
4) Existing MMSD Operations to be Continued
5) MMSD Committed Projects
6) New MMSD Programs and Policies to be Implemented
7) Interim Biosolids Plan
8) Watercourse Plan
9) Best Management Practices Plan
10) Community Based Elements

Chapter 10, *Recommended 2020 Facilities Plan* of the *Facilities Plan Report* presents additional information on the 2020 Recommended Plan. For the purposes of discussion of the impacts of the Recommended Plan, nine of the ten elements are partitioned into three general actions. The remaining element is characterized by community-based actions. The three general actions are:

1) Wet Weather Control General Action

Elements 1 thru 5 involve existing facilities and allow MMSD to continue to provide adequate sewage conveyance and treatment, protect public health and the environment, and meet LOP regulatory requirements under 2020 conditions. These elements include the Wet Weather Control Plan (includes the 5-year LOP facilities) and the programs, operational improvements and policies (POPs) to support the recommended facilities.

2) Biosolids General Action

This is an interim plan that recommends continued Milorganite® production as well as continued evaluation of other options. The recommendations also include the completion of additional analysis to facilitate future decision-making and implementation of some projects.

3) Watercourse General Action

This plan consists of current MMSD programs and policies that are designed to improve water quality, reduce municipal I/I and enhance flood mitigation. The watercourse general action includes Elements 8 (Watercourse Plan), 9 (Best Management Practices Plan) and portions of Element 6 (New MMSD Programs and Policies to be Implemented).

Community Based

The remaining element (Community Based Elements) does not fall neatly into any of the three general actions above. The Community Based Elements are not direct MMSD actions. However, the Recommended Plan assumes that by 2020, NR 151 (nonpoint control of TSS) is fully implemented by regulated parties (communities in the GMW) in urban areas. In addition, the modeling assumes that I/I will be managed by the satellite municipalities so that it does not

grow beyond existing levels from existing development. The community-based components include the following:

- Implementation of NR 151 as required
- I/I management for the satellite municipalities

5.1 Wet Weather Control General Action

As noted above, Elements 1 thru 5 primarily focus on maximizing the capture and treatment of sewage during wet weather events and effectively maintaining and monitoring MMSD systems to ensure compliance with LOP regulatory requirements under 2020 conditions. The elements of the Recommended Plan geared toward wet weather control and their impacts are presented in more detail in the following section.

- Wet Weather Control Plan
- Plan for Potential Improvements to Existing MMSD Facilities
- Existing MMSD Programs and Policies to be Maintained
- Existing MMSD Operations to be Continued
- MMSD Committed Projects

Additionally, the impacts of the new MMSD programs and policies and the community-based elements that deal with opportunistic sewer separation are also presented in the following section.

The 2020 FP includes a *Wet Weather Control Plan* to identify the set of FPOPs that are required by state and federal regulations under the current discharge permit for the anticipated 2020 population and land use. The components of the *Wet Weather Control Plan* are dependent on future population growth, land use, and operation of the existing system. The MMSD *Wet Weather Control Plan* consists of FPOPs that are focused on maximizing capture of sewage during wet weather events.

The following analyses, facilities improvements, programs, operations and policies are recommended for construction or implementation by MMSD in order to maximize capture and treatment of sewage during wet weather.

Wet Weather Control Plan – Recommended Analyses and Facilities

- Perform Capacity Analysis of South Shore Wastewater Treatment Plant
- Increase South Shore Wastewater Treatment Plant Capacity
- Increase Inline Storage System Pump Station Capacity to Jones Island Wastewater Treatment Plant
- Implement Improvements to Flow Monitoring Program and Rain Gauge System
- Hydraulic Analysis of Jones Island Wastewater Treatment Plant
- Add Metropolitan Interceptor Sewer Capacity as Necessary

Wet Weather Control Plan - Recommended Programs, Operational Improvements and Policies

- Implement the Milwaukee Metropolitan Sewerage District's Wet Weather Peak Flow Management Plan to Control Infiltration and Inflow Growth
- Implement Milwaukee Metropolitan Sewerage District's Capacity, Management, Operations and Maintenance Program (CMOM)
- Support the implementation of CMOM by Municipalities and Milwaukee County
- Implement Milwaukee Metropolitan Sewerage District's System Evaluation and Capacity Assurance Plan (SECAP)
- Support the implementation of SECAP by Municipalities
- Continue to implement Flow Monitoring for High Priority Sewersheds
- Continue Operation of Real-Time Control
- Evaluate Need for Operational Improvement at South 6th Street and West Oklahoma Avenue Drop Structure

Plan for Potential Improvement to Existing MMSD Facilities

- Rehabilitate the Inline Storage System Pump Station
- Rehabilitate Dewatering and Drying at Jones Island Wastewater Treatment Plant
- Complete Preliminary Engineering Analysis for Additional Force Main
- Complete Evaluation of Jones Island Wastewater Treatment Plant Aeration System
- Ongoing Treatment and Conveyance Upgrades
- Geotechnical/Structural Analysis of Wastewater Treatment Plants
- Additional Treatment Recommendations
- Recommended Treatment and Conveyance Projects - Included in the MMSD 2007 Annual Budget

Existing Milwaukee Metropolitan Sewerage District Programs and Policies to be Maintained

- Monitor United States Environmental Protection Agency Blending Policies
- CSO Long-Term Control Plan
- Water Quality Sampling Program
- Bacteria Research and Pathogen Source Identification Study
- Illicit Connection Program Support
- Water Conservation
- Bacteria Measurement Assessments
- Stormwater Best Management Practices Research and Implementation
- United States Geological Survey Monitoring Stations
- Maintain the 2020 Facilities Plan Modeling Tools

- Continue to Monitor Sanitary Sewer Overflow Rulemaking
- Monitor Air Emission Regulations
- Monitor Research on Emerging Contaminants, Pharmaceuticals and Personal Care Products
- Maintain All Other Water Quality Programs
  - *Household Hazardous Waste Collection Program*
  - *Stormwater Reduction Program*
  - *Stormwater Disconnection Program*
  - *Industrial Waste Pretreatment Program*
- MMSD Chapter 2 Implementation - Planning, Design, and Construction of Sewers and Ancillary Facilities
- Watercourse Policy

Existing Milwaukee Metropolitan Sewerage District Operations to be Maintained

- Jones Island Wastewater Treatment Plant Wet Weather Blending
- Skimmer Boat Operation
- Watercourse Operations
  - *Jurisdictional Stream Inspections*
  - *Culvert Inspections*
  - *Flow-impeding Debris Removal*
  - *Debris Removal from Natural or Concrete Channels on Milwaukee Metropolitan Sewerage District Property*
  - *Vegetative Maintenance on Milwaukee Metropolitan Sewerage District Property*
  - *Structural Controls Repairs*
  - *Mechanical/Electrical Controls Repairs*
  - *Concrete and Natural Channel Repairs*

Milwaukee Metropolitan Sewerage District Committed Projects

- Projects that were identified in 2002 WDNR Stipulation (but were not yet completed as of the end of 2006)
- Projects that were already in construction

New Milwaukee Metropolitan Sewerage District Programs and Policies to be Implemented

- Opportunistic Sewer Separation

Summary

Sanitary sewer overflows are a key regulatory issue for the 2020 FP. The 2020 FP recommends using a "level of protection" approach for SSOs: specifically, a 5-year LOP (which means a projection of one event every five years or a 20% chance of an SSO in a year) being consistent with regulations. The plan recommends the following facilities may be needed to achieve the 5-year LOP in the year 2020 (depending upon growth):

- Additional 150 MGD physical-chemical secondary treatment capacity at SSWWTP after verification project.
- Increase pumping capacity from the Inline Pump Station to JIWWTP to meet a total firm pumping capacity of 180 MGD.
- Add 10 Metropolitan Interceptor Sewer projects to address hydraulic constraints.
- Construct one MIS in the Franklin, Muskego, New Berlin area, to allow for new development following advanced facility planning.
- Regardless of growth, MMSD should continue development and implementation of a comprehensive sustainable program to manage I/I in the municipally owned sewer systems- served by MMSD.
- The plan indicates that MMSD is able to continue to achieve regulatory requirements for combined sewer overflows (no more than six CSOs/year) without additional facilities through the year 2020.

Note that the *Conveyance Report* explains that this list of MIS relief sewers is a watch list rather than an absolute recommendation. Potential capacity enhancements may be needed at the following sites:

- North 91st Street MIS
- Milwaukee River MIS
- North Range Line Road MIS
- River Hills MIS
- Green Bay Avenue / Mill Road MIS
- Menomonee River MIS
- South 81st Street MIS
- South Howell Avenue MIS
- Ryan Road MIS
- Franklin/Muskego Interceptor (or another project in this area, which will be determined after an Advanced Facilities Planning effort)

The 2020 FP also recommends that municipalities implement a Wet Weather Control Plan to prevent increases in current levels of I/I from existing development and identify and correct local sewer system hydraulic bottlenecks. This effort will be part of a municipal CMOM and SECAP effort.

In addition to the above, the Wet Weather Control component of the Recommended Plan would also include capital expenditures required to maintain the MMSD infrastructure that is already in place.

Impacts of Wet Weather Control General Action

The Wet Weather Control component of the Recommended Plan is not expected to result in major impacts to the physical, biological or social/economic environments. The impacts to the physical and biological environments would be minimized as the Recommended Plan seeks to minimize construction of new facilities and to maximize the use of existing infrastructure. While some of the elements of the Wet Weather Control Plan would be implemented outside of MMSD's treatment plant facilities, none of the elements are expected to involve extensive land disturbances. Furthermore, the potential impacts of individual projects would be minimized by construction site controls, design considerations, and agency coordination (if applicable). The potential impacts resulting from the Wet Weather Control components of the Recommended Plan to soils, topography, aesthetics, and air, along with aquatic, riparian, wetland and terrestrial biota and habitat are expected to be minor.

The improvements and expenditures on FPOPs will result in MMSD's continued compliance with regulatory requirements for the control of CSOs and SSOs for planned 2020 conditions. The average annual flow treated from 1999-2003 was approximately 74,100 million gallons (Table 5-1). The Revised 2020 Baseline average annual flow is projected to be approximately 78,300 million gallons; this represents a 6% increase in flow treated. This increased flow could result in minor incremental increases in emissions, biosolids production, and energy use. The Recommended Plan would be implemented to allow MMSD to continue to provide adequate sewage conveyance and treatment, protect public health and the environment, and meet LOP regulatory requirements under 2020 conditions.

Furthermore, as summarized in Table 5-1, by the year 2020, the Recommended Plan would allow MMSD to further reduce CSO volumes by 50 million gallons on an average year, when comparing the CSO volumes between the Revised 2020 Baseline with committed facilities (820 million gallons/yr) and the Recommended Plan (770 million gallons/yr). The Recommended Plan would reduce SSO volumes by 91 million gallons in an average year, from 110 million gallons to 19 million gallons.

TABLE 5-1

ESTIMATED REDUCTION IN SSO AND CSO WITH 2020 FP

	Average Annual Flow (million gallons)	SSO (million gallons)	CSO (million gallons)
Existing 2000	74,100	110	820
Future 2020	78,300	19	770
Difference	**4,200**	**(91)**	**(50)**

Water Quality

While meeting current regulatory requirements for control of CSO and SSO is necessary, the control of these sources of pollutants will not result in significant water quality improvement or in meeting other publicly-inspired goals and objectives. The water quality differences between the Revised 2020 Baseline (no further actions beyond the committed situation) and the Recommend Plan are very minor. Therefore, the maintenance of the 5-year LOP over the planning period will result in little improvement in water quality over what is already assumed to occur with committed facilities and the implementation of NR 151, and considering population growth and land use changes.

Water quality was modeled at assessment points on the Kinnickinnic, Menomonee, Milwaukee, and Root Rivers; Oak Creek; and within the Lake Michigan Direct Drainage area. A key statistic is the mean coliform concentration at the Hoan Bridge location, which is the terminus of the Milwaukee, Menomonee, and Kinnickinnic River watersheds. At this location, the fecal coliform concentrations improve by 4% when comparing the fecal coliform concentrations between the Recommended Plan (5-year LOP) and the Revised 2020 Baseline (no further actions beyond the committed). The mean fecal coliform concentration decreases from 362 counts / 100 ml to 348 counts / 100 ml. At this same assessment point, the Recommended Plan increased the number of days in compliance with the geomean fecal coliform standard from 251 to 252 days per year. When the fecal coliform Maximum Standard is used for comparison, the Recommended Plan made no difference in the number of days in compliance annually. The fecal coliform Maximum Standard was met 270 days per year for the Revised 2020 Baseline and the Recommended Plan. The differences noted above are much lower than the accuracy of the models with regard to fecal coliform. Actual concentrations may vary by plus or minus 25%; conclusions need to be tempered by this reality.

In general, over the MMSD planning area, the Recommended Plan will not result in any material improvement in water quality when evaluated in terms of number of days per year when instream water quality standards are met. The pollutant loading data that influences the water quality results support the above conclusion. The total annual loads of fecal coliform cells (to all watersheds) with the Recommended Plan would be 68,576 trillion cells, down 3.6% from 71,173 trillion cells.

Other

Additional MIS capacity may be required at select locations due to additional flow metering data and/or future growth in population and/or land use. Nine locations have been identified in which additional MIS could be required as a function of growth. All the MIS capacity projects would be dependant upon growth; the one exception is the Franklin-Muskego MIS. This interceptor would allow growth in the area. Population growth and development is a potential impact of the addition of MIS capacity at the Franklin-Muskego MIS. It is important to note that the Franklin-Muskego MIS and projects identified during advanced facilities planning would not only allow growth and development within the existing-approved sewer service area, but they would also allow future growth and development in sanitary sewer service areas to be added to the existing-approved sanitary sewer service area. While the impact would be consistent with existing land use plans, growth and development in the southern portion of MMSD's planning area could impact natural resources such as, wetlands, woodlands, isolated natural resource areas, and primary environmental corridors. According to Figures 4-4 and 4-5, these natural resources are

concentrated in the southern, western and northwestern portions of the MMSD planning area. As noted earlier, environmental corridors tend to harbor the last remaining contiguous tracts of wetlands and wooded wetlands in the MMSD planning area. The potential impacts to these natural resources, either from the construction of the future projects or the resulting growth and development, are important considerations that are regulated under local zoning and land use regulations, and federal and state permit requirements.

As with any construction project, there would be a potential for impacts to groundwater, soil, and natural resources, along with fuel and energy use during construction. Construction projects undertaken in the southern, western and northwestern portions in the remaining undeveloped portions of the MMSD planning area would have a potential to affect wetlands, woodlands, isolated natural resource areas, and primary environmental corridors.

There would also be a potential for short term impacts to air from emissions and noise during construction. The potential impacts would be mitigated through best management practices, equipment maintenance, and contract specifications.

5.2 Biosolids Plan

Treatment plants process wastewater through physical, chemical, and biological technologies and then return clean water back into rivers and lakes. Before wastewater is returned to natural water bodies, it must be treated to avoid releasing raw sewage and other hazardous materials and to meet water quality standards. Wastewater that flows into MMSD's treatment plants is processed and cleaned in four stages:

1) In the first stage, wastewater enters the plant through **preliminary treatment** where screens and grates remove solids and large objects. Sand, gravel, and other grit are also removed from the wastewater during this first phase of treatment.

2) In step two, **primary treatment**, the wastewater enters large settling tanks where grease and oil float to the top and are removed. Heavier pollution sinks to the bottom of the tank and is removed.

3) Next, **secondary treatment** uses microscopic organisms, or "bugs," to breakdown the majority of the organic material that remains in the wastewater. Keeping organic material out of rivers and lakes is important, because it can consume large amounts of oxygen that fish and plants need to live.

4) Finally, all water that flows into MMSD's treatment plants goes through the last stage of treatment, **disinfection** where chemicals kill disease-causing organisms. The chemicals are then removed before the water is discharged to Lake Michigan.

One byproduct of the waste treatment process is called biosolids, which are semisolid, nutrient-rich organic material. Biosolids are regulated material that must undergo additional processing to remove any hazardous materials or disease-causing pathogens. Following further treatment, they can be landfilled, incinerated, or recycled into a fertilizer that is used on agricultural fields, home gardens, and parklands.

Currently, different processes are used at JIWWTP and SSWWTP for treatment of biosolids. To allow greater flexibility in solids processing, biosolids from each plant can be pumped to the other via an approximately 11-mile long interplant solids pipeline.

The MMSD recycles biosolids and makes it commercially available as a fertilizer and soil conditioner. At JIWWTP, biosolids are formed into an organic fertilizer sold as Milorganite®. The biosolids at SSWWTP are processed via anaerobic digesters into Agri-Life®, a natural organic product that is applied to the soil at area farms to provide nutrients for crops. Microorganisms convert a large part of the biosolids into methane gas during anaerobic digestion, which is collected and burned to produce electricity for SSWWTP. Any remaining biosolids not used for the production of Milorganite® or Agri-Life® are made into filter cake, which can be land applied or landfilled.

Biosolids management is an important part of the wastewater treatment process. The MMSD's two treatment plants produce an average of over 150 tons of untreated biosolids (from primary and secondary treatment) each day. After processing, an average of over 120 tons per day (over 44,000 tons per year) of biosolids remain in the form of Milorganite®, Agri-Life®, and chaff from Milorganite® production.

Milorganite® production, and corresponding sales and revenue, are expected to decrease in the coming years due to the decrease in waste loads flows from industries. Therefore, it was necessary to analyze the long-term trends in Milorganite® production and prepare a future plan for biosolids.

The cost to manage biosolids represents approximately 45% of the total MMSD operating budget. Selection of a reliable cost effective method of biosolids treatment and disposal significantly affects the overall costs of wastewater treatment. In addition, proper biosolids disposal is important to the public, from its beneficial reuse possibilities to its potential impact on the environment if not properly disposed.

The MMSD will continue investigating possible changes from the existing biosolids operations to determine if there are any more cost effective and environmentally sound means to dispose of biosolids. The existing biosolids program of Milorganite® and Agri-life®, with landfill as a backup has sufficient capacity to process current and future loads, with only the anaerobic digestion process at SSWWTP requiring any expansion to meet Revised 2020 Baseline loads. The biosolids alternatives that were evaluated after an initial screening process are listed below and discussed in more detail under Analysis of Biosolids Alternatives.

Biosolids Alternatives evaluated in the Plan:

- All landfill
- All glass fusion technology (GFT) - where sludge is processed in a newly constructed glass furnace facility to produce glass aggregate product
- All Milorganite® with a less than 6% nitrogen content product
- All Milorganite® product with less than 6% nitrogen content land applied
- Combination of Milorganite® and GFT
- Combination of Milorganite® and landfill

Interim Biosolids Management Plan

The 2020 FP recommends that MMSD continue with existing operations for an interim period. The MMSD should use the interim period to continue to evaluate the other potential biosolids options and to fully understand the impacts of the loss of LeSaffre Yeast. These impacts are

important to understand as they directly impact the nature of the influent flow to MMSD treatment plants. For example, after LeSaffre Yeast left the MMSD service area in December 2005, influent soluble waste material (BOD) to JIWWTP dropped by 24% and the amount of waste activated sludge produced dropped by 20%.

The MMSD's study of alternative biosolids treatment would provide additional detailed information, the costs, advantages, and disadvantages of moving forward with a new biosolids program versus continuing the current program. During this extended evaluation period, more detailed consideration can be given to combining Milorganite® production with other potential alternatives (see below).

The recommendation to continue with the existing biosolids program for this interim period while further evaluating future biosolids management options is based on the following key non-monetary factors:

- The change in wasteload and wasteload composition resulting from the relocation of the LeSaffre Yeast is not fully understood.
- Additional time to assess new potential biosolids programs allows better understanding of the long-term impacts.
- The additional evaluation allows MMSD to continue with improvements common to all remaining future biosolids program options.
- Continuing current biosolids management provides the greatest certainty in that Milorganite® and other operations are well understood based on past experience.
- More information must be gathered regarding the costs, implementation issues and guarantees involved in the implementation of the GFT alternative.
- Milorganite® can continue to be made.
- The beneficial re-use of MMSD biosolids can continue.
- The facilities required for landfilling and land applying biosolids can still be available as a backup to the Milorganite® process.

The specific evaluations to be conducted in the interim period to move towards the development of a final biosolids management plan are described in the next section. Currently recommended facilities and operational improvements are also discussed.

Interim Biosolids Management Plan Recommendations

Additional Analysis

Throughout the interim period, additional analyses are recommended. These additional analyses will allow for a better assessment of the remaining future biosolids options. The effects of influent changes and nitrogen and energy balances require further study prior to the development of the Final Biosolids Management Plan. The following is a list of additional studies that are recommended in the Interim Biosolids Management Plan:

- Conduct Milorganite® marketing study assuming 5% or less nitrogen content; the market implications of the lower nitrogen content need to be understood.
- Evaluate Milorganite® nitrogen balance to better manage the use and blend of biosolids to ensure the nitrogen guarantee is met.

- Develop overall Assessment Report on Energy and Energy Management and Power Supply/Power Generation as energy costs make up a significant percentage of the costs to process biosolids.

Facilities Improvements

The existing biosolids processing equipment will continue to be used for the production of Milorganite®. However, there is a continuous need to repair and replace worn equipment. The following is a list of other facilities improvements that are included in the Interim Biosolids Management Plan:

- Rehabilitation of Jones Island Wastewater Treatment Plant Dewatering and Drying Facilities
- New Milorganite® Locomotive for Movement of Biosolids in Railcars
- New Turbine Building
- Interplant Sludge Pumping
- New Gravity Belt Thickeners for South Shore Wastewater Treatment Plant Sludge
- Upgrade and Maintain South Shore Wastewater Treatment Plant Plate and Frame Presses
- South Shore Wastewater Treatment Plant Digester Rehabilitation

Operational Improvements

- Maximize Operation of Primary Clarifiers

Interim Biosolids Management Plan Summary

All of the elements of the Interim Biosolids Management Plan are recommended, regardless of whether or not Milorganite® production is combined with another biosolids technology in the final recommended plan.

The total capital cost of the additional studies, facilities improvements, and operational improvements included in the Interim Biosolids Management Plan is $251 million.

Once a Final Recommended Plan for biosolids management is completed, it should be used to develop a focused preliminary engineering effort for the various recommended projects. Through preliminary engineering analysis, the project elements can be refined and expanded to include all of the detailed elements required to optimize the Recommended Plan to provide a fully functioning biosolids and energy management program.

Analysis of Biosolids Alternatives

A comprehensive biosolids handling evaluation (including energy needs) was performed as a part of the 2020 facilities planning effort. This biosolids evaluation initially reviewed six screening alternatives. Two technologies, fluid bed incineration and composting, were eliminated from further consideration based upon the advantages and disadvantages of each process. The main reason for elimination of compost was the land requirements at SSWWTP. As discussed in Chapter 9, *Alternative Analysis* of the *Treatment Report*, the main reason for the elimination of incineration is that the GFT process carried forward an "incineration – like" technology with much less potential negative environmental impacts regarding air emissions, and with lower capital costs.

The estimated operation and maintenance (O&M) costs shown in this section reflect the total MMSD O&M costs, not the incremental cost. This means that the estimated costs reflected in this section are not additional costs to be added on to existing MMSD biosolids management costs. The reason the estimated costs are presented in this fashion is that it allows for a more complete and accurate comparison of alternative costs.

Based on the review of the screening alternatives, three final alternative technologies were further evaluated (landfill, glass fusion technology, and Milorganite®). The following biosolids alternatives were evaluated in detail (they are the three final alternative technologies and combinations thereof):

- All landfill
- All "glass fusion technology"
- All Milorganite® with a less than 6% nitrogen content product
- All Milorganite® product with product less than 6% nitrogen content land applied
- Combination of Milorganite® and glass fusion technology
- Combination of Milorganite® and landfill

Each of these alternatives was evaluated in terms of the following parameters:

- Cost (present value and capital)
- Sensitivity to natural gas and electricity prices
- Operational experience
- Energy use
- Sensitivity to regulatory limits
- Marketability of final product
- Beneficial reuse of biosolids
- Community acceptance

Biosolids Alternatives Summaries

The information presented in the biosolids alternatives summaries is based on chapter 9 of the Treatment Report

Alternative 1 - Landfill

In this alternative, Milorganite® and Agri-Life® production are eliminated and all biosolids are disposed of at a landfill. This alternative would require a number of process changes, including adjustments to electrical service. No long term storage would be required because it is assumed that landfills are available year-round. Sludge trucking to the landfill would be continuous. Improvements would also be required for the interplant sludge pumps and pipeline to ensure reliable service throughout the planning period.

Alternative 2 - Glass Furnace Technology

In this alternative, all sludge is processed in a newly constructed glass furnace facility to produce glass aggregate product. In this process, the organic content of the sludge is burned (producing heat energy) and the inorganic component is melted into a glass aggregate. Waste heat from the glass furnace facility – obtained through combustion of organics in the dried sludge – is used to dry the incoming sludge. A glass furnace facility, including a melter, oxygen supply, and building(s) would be constructed. This technology was developed and is owned by WE Energies. WE Energies would be a sole-source technology provider.

Alternative 3 - Maintain Existing Milorganite® Program

This alternative discontinues the Agri-Life® program and continues the Milorganite® program to convert all of the sludge to a Milorganite® fertilizer product that contains less than 6% nitrogen (estimates for annual average nitrogen content are slightly less than 5%). This alternative takes advantage of existing facilities with minor modifications at both JIWWTP and SSWWTP. The electrical service at JIWWTP would be upgraded through the addition of one turbine, housed in a new, separate building. A new locomotive is also included for JIWWTP in this alternative for the transportation of finished Milorganite® in railcars.

Alternative 4 - Combine Milorganite® Program with Land Application

This alternative combines a Milorganite® program to produce as much 6% nitrogen product as possible with a land application program to recycle the Milorganite® that does not meet the 6% nitrogen requirement. Approximately 45% of the Milorganite® produced would meet the nitrogen criterion and be suitable for traditional sales, though this amount will vary depending on the quality of influent biosolids. The capital improvements necessary to implement this alternative are identical to the improvements described for Plan Alternative 3 because they both process all of the influent biosolids into a Milorganite® product.

Alternative 5 - Combine Milorganite® Program with Glass Furnace Technology

This alternative combines a Milorganite® program with a glass furnace technology facility to treat the biosolids load. This alternative will use the Milorganite® program to produce Milorganite® for sale or for further processing in the glass aggregate facility. Approximately 45% of the Milorganite® produced will be sold with the remaining 55% treated in a glass aggregate facility. This approach combines two compatible technologies to take advantage of the benefits of each.

Alternative 6 - Combine Milorganite® Program with Landfill Disposal

This alternative combines a Milorganite® program with a landfill program to treat the influent sludge load. Approximately 46% of the finished biosolids will be Milorganite® product with the remaining 54% being sent to a landfill after thickening and dewatering at SSWWTP. This approach combines two proven technologies to take advantage of the benefits of each.

Table 5-2 summarizes the estimated costs of the biosolids alternatives. It is important to note that the costs presented in Table 5-2 are estimates. The actual costs could be up to 50% higher or up to 30% lower than the estimate. Given this range of accuracy, cost comparison is not meaningful. However, at this point, the highest cost alternative is Alternative 4, the all-Milorganite® alternative with 6% nitrogen product being sold and the balance being land-applied. Based on the current cost estimates, this alternative is approximately 8% more

expensive that the lowest cost alternative, which is Alternative 5, the Milorganite® and GFT combination alternative.

TABLE 5-2
BIOSOLIDS ALTERNATIVES ESTIMATED COST SUMMARY ($ M)

	Alternative	Capital	Operation and Maintenance	Present Value	% of Lowest Cost Alternative
1.	All Landfill	$288	$34.2	$710	103%
2.	All Glass Furnace	335	31.5	724	105%
3.	All Milorganite® - Less Than 6% Nitrogen Product	246	37.8	712	103%
4.	All Milorganite® - 6% Nitrogen Product Sold, Rest to Land Application	246	40.5	746	108%
5.	Combination of Milorganite® and Glass Furnace Technology	287	32.7	691	100%
6.	Combination of Milorganite® and Landfill	289	35.6	728	105%

Notes:
O&M impact from the biosolids alternatives is estimated at approximately $10 to $18 million per year above current O&M costs.
These costs are facilities planning level estimates and have an accuracy of +50%/-30%.
Capital costs include construction cost plus 25% for contingencies and 35% for technical services and administration.

Potential Impacts of Biosolids Alternatives

The biosolids alternatives are still being studied. There is no strong financial basis for making a 2020 FP recommendation on biosolids based on the similar estimated present value costs of the six biosolids alternatives. The 2020 FP recommends that MMSD continue with its existing operations for an interim period in order further evaluate the biosolids alternatives and to fully understand the impacts of the influent changes, primarily from the loss of wet industries such as LeSaffre yeast. The benefit and impact of each of the alternatives will be more fully understood with a comprehensive evaluation.

The potential environmental impacts of the biosolids alternatives vary since the alternatives employ diverse technologies, including landfilling, GFT, and Milorganite®, plus combinations of these technologies. Potential gas and electricity needs vary among the six biosolids alternatives. Among the biosolids alternatives, the potential natural gas uses range from approximately 30% greater use to up to 70% lower use, relative to the current situation. The biosolids alternatives that are expected to use less natural gas are generally expected to require greater amounts of electricity. Across the six alternatives, the potential electricity requirements range from 300% greater use relative to the existing electricity use, to a nearly complete cessation of electricity requirements.

The biosolids alternatives could affect air emissions, including toxic air emissions such as mercury, ranging from higher to lower emission rates than the current operations. The potential impacts on emissions will be better defined when the analyses of the biosolids alternatives is completed. Depending upon the alternative chosen, there could also be an impact on the volume of cooling water required to manage biosolids.

Some of the biosolids alternatives result in products that could be beneficially reused. The glass aggregate produced with GFT could be used during the manufacturing of roofing and paving materials. The production and distribution of Milorganite® is considered a beneficial reuse. Milorganite® is an organic nitrogen fertilizer that resists leaching and exceeds USEPA "Exceptional Quality" standards; these are stringent safety regulations in the fertilizer industry for environmental and health standards. The potential future markets for glass aggregate and Milorganite® would need to be considered. For the alternatives that involve Milorganite® production, the potential sales competition from other Midwestern sludge drying facilities will be considered. The biosolids alternatives that involve landfilling are not considered as reuse of the biosolids. The public may be more likely to support a biosolids alternative that produces a product that could be sold or beneficially reused.

Capital and O&M costs, economic risks associated with energy availability, reliance on single biosolids technologies, and unknown long term costs associated with new technologies will also be considered during the biosolids alternatives evaluation. Furthermore, potential future regulatory and financial constraints on the disposal of organic materials in landfills, along with the availability of landfill space, would need to be considered during the biosolids alternatives analysis.

None of the biosolids alternatives nor the Interim Biosolids Plan is expected to result in major economic impacts. The projected financial impacts of biosolids management are presented, along with economics impacts for the entire Recommended Plan, in Section 5.4. Furthermore, the additional analyses along with the operational and facilities improvements associated with the Interim Biosolids Plan are not expected to result in major physical, biological or social/economic impacts.

In summary, the impacts and benefits of the biosolids alternatives will be better defined following the completion of additional biosolids alternatives analyses. When the additional analyses are complete, MMSD will select and, after WDNR review and approval, will implement the Recommended Plan for biosolids management. The Biosolids Recommended Plan will better position MMSD to reliably process and dispose of biosolids in the most cost effective manner.

5.3 Watercourse General Actions

In general, the projects included in the watercourse general actions are pre-existing projects which are continued with the Recommended Plan. These projects are recommended to be continued in order to improve water quality, reduce municipal I/I, and enhance flood mitigation. The watercourse general actions include Recommended Plan elements 8 (Watercourse Management Plan) and 9 (Best Management Practices) and three sub-elements of Element 6 (New Milwaukee Metropolitan Sewerage District Programs and Policies to be Implemented). These items are as follows:

Watercourse Plan

- Watercourse Flood Management Plan to manage flooding but to also control municipal I/I and SSOs
- Concrete Channel Renovation and Rehabilitation for the 26 miles of concrete channelized waterways under MMSD jurisdiction are in need of repair or replacement
- Renovation of the Kinnickinnic River Flushing Station
- Greenseams Project to purchase natural wetlands to retain stormwater

Best Management Practices

- The MMSD is currently developing and implementing BMP projects that demonstrate the benefits of BMPs on managing the volume, rate, and quality of stormwater runoff

New Milwaukee Metropolitan Sewerage District Programs and Policies to be Implemented

- Watershed approach implementation tactics to address water quality on a watershed basis.
- Policies to support the Regional Water Quality Management Plan Update
- Milwaukee Metropolitan Sewerage District Chapter 13 Revisions

Impacts

The primary impact of watercourse actions relate to enhanced flood management in accordance with MMSD's mission, which is to protect public health, property, and the environment by providing wastewater conveyance, treatment, and flood management services.

The MMSD is under obligation to maintain the conveyance capacity of the watercourses under its jurisdiction. All MMSD flood management projects are designed to provide a level of protection for the one-percent probability flood, commonly referred to as the 100-year flood.

The MMSD addresses this obligation with flood management projects that include structural and non-structural measures. The structural measures include projects such as the construction of floodwater basins, floodproofing, earthen berms and floodwalls, and the renovation and rehabilitation of concrete channels. The non-structural measures include property acquisitions and structure buyouts.

Specifically, the Recommended Plan includes a watercourse flood management plan that may include specific projects to address the following:

- Milwaukee River Flood Management
- Indian Creek Flood Management
- Lower Wauwatosa Flood Control and Restoration Floodproofing
- Milwaukee County Grounds Detention Basins
- Western Milwaukee Flood Management

The Recommended Plan also includes concrete channel renovation and rehabilitation projects. There are approximately 22 miles of concrete channelized waterways that are in need of repair or replacement, under MMSD's jurisdiction (Figure 5-1). Table 5-3 lists proposed concrete-lined channel projects in order of priority. These channels were lined with concrete to improve the conveyance of the natural waterways to avoid flood conditions impacting riparian properties.

The Greenseams Project is a non-structural component of the Recommended Plan (Figure 5-2). This project includes purchasing natural wetlands to retain stormwater with the intention of reducing risks of localized flooding. Greenseams is an innovative flood management program that permanently protects key lands containing water absorbing soils. Greenseams provides a beneficial impact to floodwater management by naturally storing and infiltrating water into the ground. In this way, Greenseams provides added support for MMSD's structural flood management projects - infrastructure investments worth hundreds of millions of dollars.

These flood management projects, both structural and non-structural, would result in beneficial impacts by protecting homes and businesses from flooding. The beneficial impacts include flood hazard mitigation and public safety benefit from reduced risks of drowning during high flows for people living in hazardous situations. It also provides economic benefits from reduced flood losses. The enhancement of watercourse flood management also provides an asset protection program for property tax-based funding and provides more options for reducing flood hazards. Finally, these projects reduce public costs for disaster assistance, emergency relief and emergency operations during flood disasters.

In addition to enhanced flood management, the watercourse general action projects help keep floodwaters out of the sewer systems. Most buildings have floor drains that are direct connections to the sanitary sewer system. When a basement floods, floor drains funnel water into the sanitary sewer system. The reduction of I/I would result in a beneficial impact to water quality as I/I reduction would serve to reduce the risk of sewer overflows and water pollution.

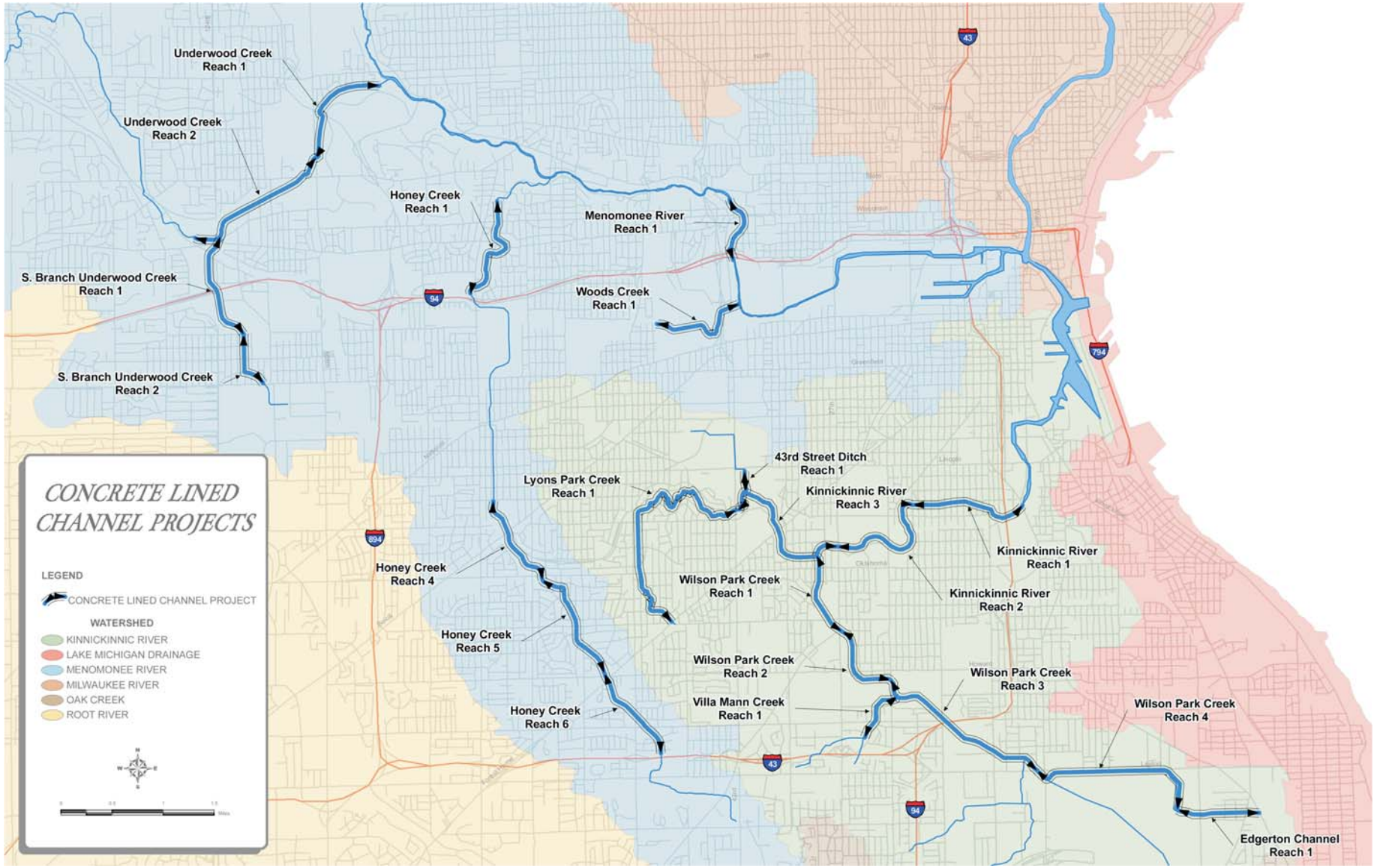


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FIGURE 5-1
CONCRETE LINED CHANNEL PROJECTS
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
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Watercourse Reach	Location	Length
Underwood Creek Reach 1	Upstream of the confluence with the Menomonee River to Mayfair Rd.	RM 0.1-1.5 (1.4 Miles)
Menomonee River Reach 1	I-94 to Pacific Rail Road Bridge	RM 3.6-4.3 (0.7 miles)
KK River Reach 1	Chase Ave. to 16th St.	RM 2.4-3.6 (1.2 Miles)
KK River Reach 2	16th St.-27th St.	RM 3.6-4.9 (1.3 Miles)
Wilson Park Creek Reach 2	27th St.-S. 20th St.	RM 0.9-1.7 (0.8 Miles)
Wilson Park Creek Reach 3	S. 20th St. to W. Layton Ave.	RM 1.7-3.5 (1.8 Miles)
S. Branch Underwood Creek Reach 1	Bluemound Rd. to Robinwood/ Schlinger St.	RM 0.0-1.1 (1.1 Miles)
Honey Creek Reach 6	Howard Ave. to I-894	RM 6.5-7.5 (1.0 Miles)
Honey Creek Reach 5	Oklahoma Ave. to Howard Ave,	RM 5.3-6.5 (1.2 Miles)
Honey Creek Reach 4	Arthur Ave. to Oklahoma Ave.	RM 4.3-5.3 (1.0 Miles)
Woods Creek Reach 1	55th St. to Menomonee River	RM 0.0-1.1 (1.1 Miles)
Honey Creek Reach 1	Upstream of Portland Ave. to North of I-94	RM 0.7-1.9 (1.2 Miles)
KK River Reach 3	27th St. to Drop Structure East of 43rd St. in Jackson Park	RM 4.9-6.3 (1.4 Miles)
Underwood Creek Reach 2	Mayfair Rd. to just downstream of Bluemound Rd.	RM 1.5-2.8 (1.3 Miles)
Lyons Creek Reach 1	Drop structure near the confluence with the KK River in Jackson Park to Forest Home Ave.	RM 0.0-1.3 (1.3 Miles)
Wilson Park Creek Reach 1	Confluence with the KK River West of St. Luke's Medical Center to 27th St. Tunnel Outlet	RM 0.0-0.9 (0.9 Miles)
Wilson Park Creek Reach 4	Layton Ave. to Chicago and North Western Railway Bridge	RM 3.5-5.4 (0.9 Miles)
Edgerton Channel Reach 1	Chicago and North Western Railway Bridge to Whitnall Ave.	RM 5.4-6.1 (0.7 Miles)
Villa Mann Creek Reach 1	Mouth at Wilson Park to confluence with Villa Mann Creek Tributary	RM 0.0-0.6 (0.6 Miles)
43rd Street Ditch Reach 1	Chicago and Northwestern Railway Tunnel Outlet S. 43rd St. tunnel outlet	RM 0.0-0.7 (0.7 Miles)
S. Branch Underwood Crk Reach 2	Robinwood/ Schlinger Street to Greenfield Ave.	RM 1.1-1.8 (0.7 Miles)
Total		**22.3 Miles**

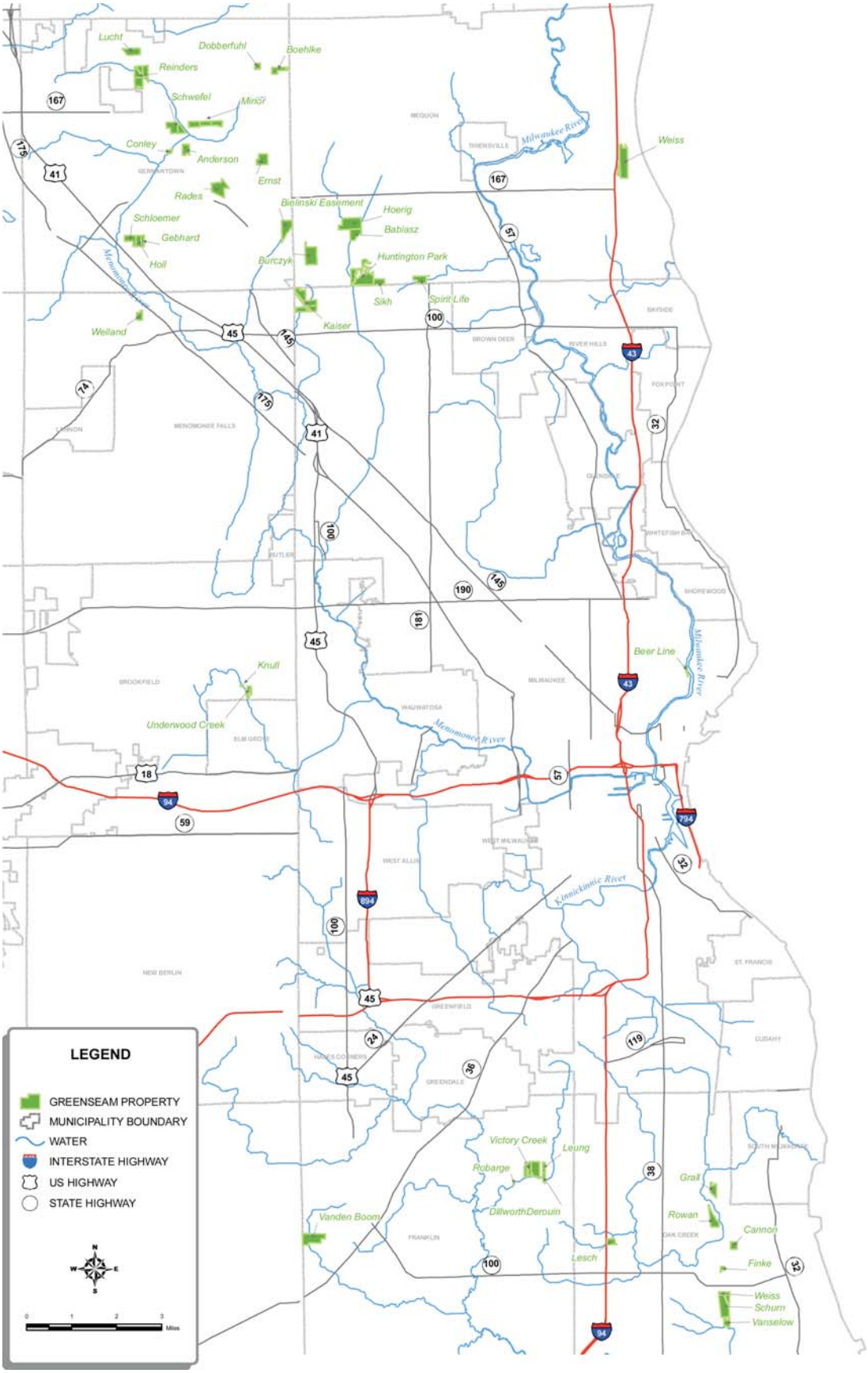

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FIGURE 5-2
GREENSEAM PROPERTIES
2020 FACILITIES PLAN
ENVIRONMENTAL ASSESSMENT
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The Recommended Plan's watershed-based actions would likely result in long term beneficial impacts to water quality. While expected to be minor, the structural flood enhancement measures, including the bioengineered rehabilitation of concrete channels coupled with the non-structural measures would potentially impact water quality by:

- Reducing flow velocities, flow depths, and flood peaks
- Implementing BMPs that manage the volume, rate and quality of stormwater runoff
- Enhancing water quality by reducing downstream turbidity and sediment load

The rehabilitation and continued operation of the Kinnickinnic Flushing Station would continue to provide beneficial impacts to water quality and aquatic biota within the lower reaches of the Kinnickinnic River by raising the dissolved oxygen concentration.

These projects would also result in a broad range of benefits and impacts to the biological environment, including aquatic and terrestrial biota and aquatic, riparian, wetland, and terrestrial habitats. Benefits to the biological environment would result from:

- Protecting terrestrial habitat by providing and preserving natural open space
- Maintaining and preserving natural floodplain habitats, including wetlands
- Allowing floodplains to function more naturally
- Providing conditions within rehabilitated channels that are suitable for the passage of targeted fish species, for a variety of seasonal flow regimes
- Rehabilitating concrete-lined channels to enhance riparian areas and restore the natural connection between uplands and watercourses
- Increasing infiltration in the natural channels and enhancing groundwater recharge

As noted earlier, the watercourse general action component of the Recommended Plan would result in a beneficial impact to the social/economic environment in the region. In addition to realizing economic and safety benefits, the region would also benefit from enhanced recreational opportunities and aesthetics from these projects.

As an example, hydrologic modeling for year 2020 land use conditions estimated that 375 structures and 425 properties would be flooded during a one percent probability event within the Menomonee River watershed. Total damages, as a result of this flood event, are estimated to approach $13 million. The majority of the structures projected to be damaged, including 190 residential structures, were located in the Hart Park area of the city of Wauwatosa and the Western Milwaukee and Valley Park Neighborhood areas in the city of Milwaukee. Eleven floodwater management projects were identified in the Menomonee River Watercourse Management Plan to abate flooding problems along the mainstem and tributary rivers. In the lower portion of the Menomonee River, there are approximately 289 structures located within the existing one percent probability event Federal Emergency Management Agency (FEMA) floodplain that are required to have flood insurance. Once the floodwater management projects are functioning, approximately 281 structures would be removed from the one percent probability event and no longer be required by FEMA regulations to obtain National Flood Insurance as part of the National Flood Insurance Program (NFIP). Prior to having the requirement removed, the MMSD floodwater management projects would need to be functioning

and a new flood insurance rate map (FIRM) or letter of map revision (LOMR) would need to be approved by FEMA and WDNR.

The projects included in the watercourse general action would not be confined to MMSD's SSWWTP and JIWWTP. Consequently, these actions could result in potential impacts to geographically scarce resources, such as historic or cultural resources, scenic or recreational resources, prime agricultural land, aquatic and terrestrial biota, threatened or endangered resources, and ecologically sensitive areas such as aquatic, riparian, wetland and terrestrial habitats. For example, the construction of floodwater basins and the rehabilitation of concrete-lined channels could potentially impact threatened or endangered species, wetlands and riparian areas through short term construction activities.

On the other hand, these projects could potentially result in long term consequences as watercourse projects have the potential to permanently impact or be located in the vicinity of the geographically scarce resources, threatened or endangered resources, and ecologically sensitive areas such as aquatic, riparian, wetland and terrestrial habitats. For example, the Kinnickinnic River Flushing Station was constructed in the early 1900s and could have historical interest. The renovation of the Kinnickinnic River Flushing Station could require formal consultation with the Wisconsin Historical Society.

Many of these potential long term impacts would be mitigated through agency permit requirements, public involvement, and design considerations.

The watercourse projects described in the watercourse general action component of the Recommended Plan are existing programs. The Recommended Plan supports the continuation of these projects. The costs for these projects are accounted for independently of the Recommended Plan cost estimates.

5.4 Summary of Financial Impacts of the Recommended Plan

Two implementation plans have been developed for the 2020 FP. The two plans are referred to as the Adaptive Implementation Plan and Full Implementation Plan. The primary difference between the two plans is related to assumptions of population growth and the facilities required to accommodate population growth. Furthermore, the need for many of the recommended facilities in the 2020 FP is also dependant upon regulations, the gathering of additional data and evaluation, and preliminary engineering work.

The Adaptive Implementation Plan represents estimated costs through 2020 based upon slower growth in population and land use than assumed in the 2020 FP. This adaptive plan is reasonable because it is based upon proceeding slowly on costly new expenditures to prevent building facilities which may not be needed before 2020. The Adaptive Implementation Plan may be financed from property tax charges that are essentially unchanged from the charges projected by MMSD for the 2007 to 2012 Capital Financing Plan presented and approved by the MMSD Commission in October 2006 as part of the 2007 Capital Budget (4.7% increase annually).

The Full Implementation Plan represents estimated costs assuming all growth occurs by 2020 as assumed in the 2020 FP revised baseline population estimates. On the other hand, the Full Implementation Plan is expected to require property tax charges that are higher than projected by MMSD for the 2007 to 2012 Financing Plan (8.45% increase annually to 2018). Details of the financial impacts on the typical household are shown in Table 12-11 in Chapter 12 of the

Facilities Plan Report.

Neither plan for implementation is expected to result in significant economic impacts within the MMSD planning area. The incremental user charge (operation and maintenance) cost impact on the average household is about $2.00 per year (starting in 2014) for the adaptive plan and about $5.00 per year (with $2.00 in 2014 and the remaining $3.00 in 2020) for Full Implementation Plan.

5.5 Evaluation of Significance

Wet Weather Control General Actions

There are no major environmental impacts associated with the Wet Weather Control general actions. The Wet Weather Control actions are either improvements or additions to existing facilities to ensure operational reliability, accommodate increased capacity, or replace equipment. Potential impacts would likely be short term and related to construction and installation activities. Furthermore, many of these projects would be confined to MMSD facilities at JIWWTP and SSWWTP.

The key regulatory issue is SSOs. The 2020 FP recommends using a "level of protection" approach for SSOs: specifically, a 5-year LOP (which means a projection of one event each five years or 20% chance of an SSO in a year) being consistent with regulations. The plan recommends the following facilities may be needed to achieve the 5-year LOP in the year 2020 (depending upon growth):

- Additional 150 MGD physical-chemical secondary treatment capacity at SSWWTP after verification project.
- Increase pumping capacity from the Inline Pump Station to JIWWTP to meet a total firm pumping capacity of 180 MGD.
- Add 10 Metropolitan Interceptor Sewer projects to address hydraulic constraints.
- Construct one MIS in the Franklin, Muskego, New Berlin area, to allow for new development following advanced facility planning.
- Regardless of growth, MMSD should continue development and implementation of a comprehensive sustainable program to manage I/I in the municipally owned sewer systems served by MMSD.
- The plan indicates that MMSD is able to continue to achieve regulatory requirements for combined sewer overflows (no more than 6 CSOs/year) without additional facilities through the year 2020.

As a result of the Wet Weather Control Plan, MMSD would have sufficient capacity to accommodate the planned increase in wastewater flow expected by 2020. The plan will also result in a reduction of SSO volume; estimated to be reduced from 110 million gallons per year to 19 million gallons per year, under 2020 conditions. This plan would lead to long term benefits to the MMSD planning area as they allow MMSD to continue to provide reliable wastewater treatment, protect water quality and allow planned growth and development.

The construction of the Franklin-Muskego MIS would allow population growth and development in the area. The new growth would be consistent with existing land use plans.

Biosolids General Action

The 2020 FP Interim Biosolids Plan recommendation calls for the continued production of Milorganite®, while continuing to evaluate the cost and impact of combining Milorganite® with other technologies. The potential impacts resulting from the biosolids alternatives will be better defined when the additional analyses of the biosolids alternatives are completed. Once the additional biosolids analyses are completed, the 2020 FP would need to be amended to incorporate the Recommended Biosolids Plan.

The potential impacts of the Interim Biosolids Plan to the physical and biological environments are expected to be related to construction activities. For the most part, the impacts would be confined to existing MMSD facilities. The Interim Biosolids Plan is not expected to result in long term impacts to geographically scarce resources such as historic or cultural resources, scenic or recreational resources, prime agricultural lands, threatened or endangered resources, aquatic, riparian, or terrestrial environments, or ecologically sensitive areas.

Watercourse General Action

There would likely be short term impacts to the physical and biological environment associated with watercourse construction activities. On the other hand, there would be long term, beneficial social/economic impacts associated with floodwater management, I/I reduction efforts and improved water quality.

Furthermore, there's the potential for long term impacts to cultural resources, aquatic and terrestrial biota and aquatic, terrestrial, riparian, and wetland habitats resulting from these watercourse projects. However, these potential impacts, both short and long term, could be mitigated through agency permitting requirements and design considerations.

Summary Recommended Plan

Additional details on short and long term benefits and impacts of the Recommended Plan would be determined as individual projects are planned for implementation. Design would first seek to avoid and minimize impacts. For unavoidable impacts, MMSD will work with the appropriate agencies, municipalities, and public stakeholders to determine mitigation that best minimizes unavoidable impacts.

The long term impacts of the Recommended Plan would be irreversible. The newly constructed and installed facilities would be permanent and preclude other land uses or facilities. The social and economic impacts would be irreversible considering the long term debt financing requirements and the fact that the Recommended Plan would allow planned population growth and development.

Cumulative Impacts

By itself, the Recommended Plan would result in little or no water quality improvement on an annual basis. However, the Recommended Plan would likely contribute to cumulative beneficial impacts to water quality in consideration of other reasonably foreseeable actions. The implementation of the 2020 Recommended Plan would lead to a reduction in SSOs. The Recommended Plan actions, coupled with the following reasonably foreseeable actions would benefit water quality in southeastern Wisconsin:

- Recommendations in SEWRPC's RWQMPU throughout the GMW
- Sewer maintenance and I/I control by municipalities throughout the MMSD planning area
- NR 151 (Runoff Management) implemented in urban areas throughout the state of Wisconsin

These programs and actions would cumulatively benefit water quality, either by point or nonpoint source controls.

Each one of the actions above has a cost associated with it. There are two different costs for the

Recommended Plan, depending upon population growth and development. The costs range from $319 million for the adaptive implementation plan to $699 million for the full implementation plan. There would be a cumulative social/economic impact to residents of both the MMSD planning area and the SEWRPC study area as these residents would bear the following costs of other reasonably foreseeable actions:

- The present worth cost to maintain sewers and control I/I is $400 million
- The present worth cost to construct relief sewers is $105 million
- The present worth cost to implement NR 151 is expected to range from $460 to $580 million
- Developers within the MMSD planning area would bear an additional present worth cost of $140 million to implement NR 151

The cost of implementing the RWQMPU recommended plan would be born throughout the SEWRPC study area (GMW) and not limited to the MMSD planning area. The capital cost of implementing the RWQMPU recommended plan for the GMW is estimated to be $1.423 billion. The annual operation and maintenance costs are estimated to be $28.5 million.

Significance of Risk - Unknowns

The development of the 2020 FP required nearly five years to complete. While MMSD led the planning effort, USEPA, WDNR, SEWRPC, and the 28 satellite municipalities in the MMSD planning area were consulted as the 2020 FP recommendations developed. Consequently, there is little to no risk of significant unknowns that would create substantial uncertainty in predicting effects on the quality of the environment. There would be little financial risk due to such unknowns to municipalities as a result of the 2020 Recommended Plan. From a financial standpoint, I/I control is the main component of the 2020 Recommended Plan for which the 28 satellite municipalities are responsible. The municipalities would be required to control I/I regardless of the 2020 Recommended Plan. In December 2005, the state of Wisconsin and the MMSD satellite municipalities entered into a stipulation. This Satellite Stipulation (distinct from the previously referenced 2002 WDNR Stipulation) requires that all 29 (28 municipalities plus Milwaukee County) MMSD satellite municipalities perform or agree to several general activities that would serve the purpose of reducing SSOs. The Satellite Stipulation calls for satellite municipality CMOM implementation within two years of the implementation of MMSD's CMOM program.

Significance of Risk - Hazards

As with any facility, the potential would exist for operating problems such as malfunctions, spills, fires and other hazards. However, the FPOPs identified in the Recommended Plan are expected to reduce these risks by optimizing the capacity and reliability of MMSD's systems. The Recommended Plan identifies FPOPs that would allow MMSD to continue to effectively and reliably treat wastewater for planned population and development. Naturally, the potential for human error always exists, but the Recommended Plan would not increase the likelihood that human error would occur above the existing situation.

Significance of Precedent

Essentially, the approval of the 2020 FP is a compliance-based decision involving wastewater treatment recommendations to account for planned population and development growth. The implementation of the Recommended Plan allows MMSD to meet projected future growth while maintaining regulatory compliance. The decision on the proposed Recommended Plan would not influence future decisions or foreclose options that may additionally affect the quality of the environment. The Recommended Plan is consistent with SEWRPC's RWQMPU, complies with the conditions of the 2002 WDNR Stipulation, and was developed pursuant to key regulations, regulatory programs, permits and standards associated with MMSD's regulatory climate. The Recommended Plan also anticipates and is consistent with the 2005 Satellite Stipulation affecting MMSD's satellite municipalities.

Significance of Controversy

The approval of the 2020 FP is a compliance-based decision. The implementation of the Recommended Plan would allow MMSD to stay in compliance with regulations, considering planned growth and development. The primary controversy surrounding the Recommended Plan is that some members of the community would prefer that MMSD adopt a more rational and regional approach to improving water quality. Using this suggested approach, MMSD would recognize that the substantial investment that has already been made and that it has reached a point of diminishing returns in terms of achieving water quality improvements through additional expenditures on SSO and CSO control. Presumably, MMSD would focus on coordinated water quality improvements in lieu of additional capital expenditures to control SSOs. On the other hand, some community members assert that a 5-year LOP for SSOs is illegal and that SSOs need to be eliminated. Using this approach, MMSD would focus on capital expenditures to eliminate SSOs beyond the 5-year LOP, with little or no water quality improvements. These two suggested approaches reside on opposite ends of the spectrum in terms of providing direction on where MMSD and the community should focus resources.

Ultimately, MMSD must continue to meet the requirements of its discharge permit. The MMSD must meet its permit requirements regarding CSO and SSO control and MMSD's permit does not address nonpoint sources. The 2020 FP is a plan that complies with the law and with regulations, including the use of the 5-year LOP for SSOs. Chapters 9 and 12 of the *Facilities Plan Report* present additional discussion of SSO level of protection, permit requirements and public review comments on the draft 2020 FP.

In addition, the potential exists for some controversy regarding MMSD's implementation of individual projects, depending on site-specific and community-specific costs and impacts.

References

(1) Southeastern Wisconsin Regional Planning Commission, Technical Report No. 39, *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds,* Chapter IV (Water Use Objectives and Water Quality Standards) *Add'l detail to be added once SEWRPC completes report*

(2) Southeastern Wisconsin Regional Planning Commission, Technical Report No. 50, *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds,* Chapter VI (Legal Structures Affecting the Regional Water Quality Management Plan Update) *Add'l detail to be added once SEWRPC completes report*

(3) U.S. Environmental Protection Agency, *Proposed Blending Policy* (Federal Register: December 22, 2005, Volume 70, Number 245, Proposed Rules, page 76013-76018)

(4) U.S. Environmental Protection Agency, *CSO Policy* (Federal Register: April 19, 1994, Volume 59, Number 18, pages 693-18694)

(5) Wisconsin Department of Natural Resources, Wisconsin Administrative Code Natural Resources (NR) Chapters 120 (Nonpoint source pollution abatement program), 151 (Runoff management), 152 (Model ordinances for construction site erosion control and post-construction stormwater management), 153 (Targeted runoff management grant program), 154 (Best management practices and cost share conditions), 155 (Urban nonpoint source pollution abatement and storm water grant program), 216 (Stormwater discharge permits), and 243 (Animal feeding operations)

(6) Milwaukee Metropolitan Sewerage District, Wisconsin Pollutant Discharge Elimination System (WPDES) Permit WI-036820-2 (issued April 1, 2003, expiring March 31, 2008)

(7) Milwaukee Metropolitan Sewerage District, Chapter 13 Rule "Surface Water and Storm Water" (adopted September 24, 2001, effective January 1, 2002)

(8) Wisconsin Department of Natural Resources, Wisconsin Administrative Code Natural Resources (NR) Chapters 102 (Water quality standards for Wisconsin waters), 103 (Water quality standards for wetlands), 104 (Uses and designated standards and secondary values), and 105 (Surface water quality criteria for toxic substances)

(9) Southeastern Wisconsin Regional Planning Commission, Planning Report No. 48, *A Regional Land Use Plan for Southeastern Wisconsin: 2035* (June 2006)

(10) Southeastern Wisconsin Regional Planning Commission, Planning Report No. 50, *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds,* Chapter X