



A REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE FOR THE GREATER MILWAUKEE WATERSHEDS

PLAN SUMMARY

REVISED JANUARY 2009

INTRODUCTION

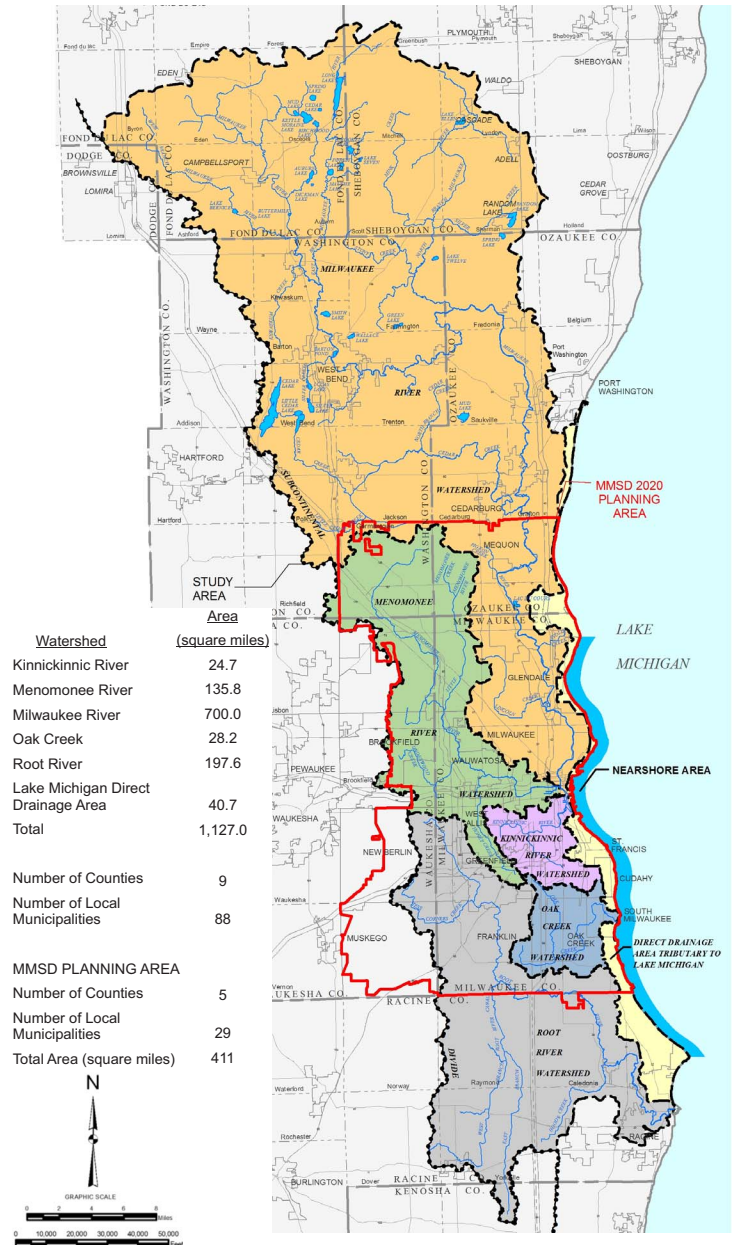
On December 5, 2007, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) adopted a regional water quality management plan update for the greater Milwaukee watersheds. The plan update is for the design year 2020 and represents a major amendment to the regional water quality management plan for Southeastern Wisconsin¹. The Commission prepared the plan in its role as the State-designated and Federally-recognized areawide water quality management planning agency for the Region. This plan, which was prepared in conjunction with the Milwaukee Metropolitan Sewerage District's (MMSD) 2020 Facilities Plan under a joint effort designated as the "Water Quality Initiative," is documented in SEWRPC Planning Report No. 50, *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds*. That report, and a companion report, SEWRPC Technical Report No. 39, *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds*, can be accessed at www.sewrpc.org.

The study report is being provided to all local, county, and special-purpose units of government and State and Federal agencies that are designated as management agencies with certain plan implementation responsibilities. Those entities have been asked to endorse the plan. In addition, the Wisconsin Department of Natural Resources (WDNR) has the responsibility of reviewing and approving the plan and making recommendations to the Governor as to the certification of all or parts of the plan. The Governor has the responsibility of certifying to the U.S. Environmental Protection Agency areawide plans for water quality management.

The plan update includes major plan elements addressing 1) land use, 2) surface water quality, including point and nonpoint source pollution abatement, and 3) groundwater management.

Map 1

REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE STUDY AREA



Source: SEWRPC

¹SEWRPC Planning Report No. 30, *A Regional Water Quality Management Plan for Southeastern Wisconsin—2000, Volume One, Inventory Findings, September 1978; Volume Two, Alternative Plans, February 1979; and Volume Three, Recommended Plan, June 1979.*

STUDY AREA

The 1,127 square mile greater Milwaukee watersheds study area, as shown on Map 1, includes:

- The Kinnickinnic River watershed,
- The Menomonee River watershed,
- The Milwaukee River watershed,
- The Oak Creek watershed,
- The Root River watershed,
- The Lake Michigan direct drainage area, and
- The Milwaukee Harbor estuary and nearshore Lake Michigan area.

About 861 square miles of these watersheds, or about 76 percent of the study area, are located within the seven-county Southeastern Wisconsin Region, representing about 32 percent of the Region. Within the Region, the study area includes all or part of Kenosha, Milwaukee, Ozaukee, Racine, Washington, and Waukesha Counties. In addition, approximately 266 square miles of the greater Milwaukee watersheds, or about 24 percent of the study area, are located outside of the Region. This portion of the study area consists of the upper reaches of the Milwaukee River watershed, located in Dodge, Fond du Lac, and Sheboygan Counties. The greater Milwaukee watersheds are drained by approximately 1,010 miles of stream. In addition to the nine counties listed above, the study area includes 88 cities, villages, or towns.

PREVIOUS REGIONAL WATER QUALITY PLANNING EFFORTS

The regional water quality management plan update builds on and refines the following major water quality management planning efforts:

- The original SEWRPC regional water quality management plan for southeastern Wisconsin that was adopted in 1979,
- The SEWRPC amendment to the regional water quality management plan which addressed water quality issues in the Milwaukee Harbor estuary and was adopted in 1987, and
- A 1995 SEWRPC report documenting the implementation status of the regional water quality management plan as amended over the approximately 15 years since the initial adoption of the plan.

Since completion of the initial regional water quality management plan, SEWRPC and the WDNR have cooperatively conducted a continuing water quality management planning effort which has focused on sanitary sewer service area planning, groundwater inventories and analyses, and selected plan implementation activities.

ORGANIZATIONAL STRUCTURE FOR THE PLAN UPDATE

For selected activities, the work on the regional water quality management planning program and the MMSD facilities plan was carried out under a single, coordinated work effort using shared staff. These activities included three specific areas: 1) watercourse modeling, 2) Milwaukee Harbor estuary and nearshore Lake Michigan water quality modeling, and 3) state-of-the-art evaluation and report on pollution abatement practices. These three work elements were conducted under a cooperative effort involving SEWRPC, the MMSD, and the MMSD 2020 facilities planning consultant team. The MMSD 2020 consultant team conducted the modeling work involved, with oversight being provided by SEWRPC and MMSD staffs. The work was developed in an integrated manner to meet the needs of both the regional plan update and the MMSD facilities plan.

Also, SEWRPC, with assistance from the WDNR and USEPA, contracted with the U.S. Geological Survey to conduct water quality monitoring and analyses at six locations in the upper portion of the Milwaukee River watershed and three locations in the lower portion of the Root River watershed.

Public Involvement for the Plan Update

Public involvement activities were an important component of the plan preparation. The public involvement activities were focused through the use of advisory committees, cooperative actions with other related ongoing public involvement activities, and other watershed education programming. The SEWRPC plan update was prepared under the guidance of a Technical Advisory Committee (see back cover), drawing members from a wide range of organizations dealing with water quality issues. The water quality modeling effort was periodically reviewed with a Modeling Subcommittee that was convened by SEWRPC and which provided valuable input. A joint MMSD/SEWRPC Citizens Advisory Council met periodically to receive updates on both the regional water quality

management plan update and the MMSD facilities plan, and to provide input to the planning process. Finally, a Watershed Officials Forum, including the chief elected officials or their representative from the 88 cities, villages, or towns and the nine counties in the study area was established.

PLANNING OBJECTIVES

The plan objectives are listed below. More detailed descriptions of the objectives, along with the associated principles and standards, are presented in the plan report.

Land Use Development Objectives

The land use development objectives adopted under the regional water quality management plan update program are:

1. Achievement of a Balanced Land Use Allocation
2. Protection and Wise Use of Natural Resources
3. Land Use Compatible with Economical Provision of Public Services
4. Preservation of Land for Agriculture, Habitat, and Orderly Development

Water Quality Management Objectives

Four water quality management objectives similar to those adopted by SEWRPC under its comprehensive watershed and regional water quality management planning program are directly applicable to the regional water quality management plan update effort. These are:

1. Development of Facilities, Programs, and Policies to Serve the Regional Development Pattern
2. Development of Policies and Practices to Meet Water Use Objectives
3. Enhancement of the Quality of Natural and Man-Made Environments
4. Reduction of Sedimentation, Other Water Pollution, and Eutrophication

Outdoor Recreation and Open Space Preservation Objectives

Two outdoor recreation and open space preservation objectives similar to those adopted by SEWRPC under its regional park and open space planning program and under county planning programs are directly applicable to the regional water quality management plan update planning program. These are:

1. Provision of Outdoor Recreation Sites
2. Preservation of Open Space

Water Control Facility Development Objective

One water control facility development objective similar to that adopted by SEWRPC in its watershed planning program has been adopted for use in the current plan. It is:

1. Development of a System to Reduce Flood Damage

Plan Structure and Monitoring Objectives

Six plan structure and monitoring objectives were developed for use in the planning program. The first two of these objectives are similar to objectives adopted by SEWRPC under its comprehensive watershed and regional water quality management planning programs. The other four objectives were developed in response to the public input received under the current planning program. These objectives are:

1. Development of Economical and Efficient Programs
2. Development of Strong Institutions for Plan Implementation
3. Support of Economic Development and Job Creation
4. Responsiveness of Adaptive and Flexible Plans
5. Improvement of Assessment and Management
6. Support of a Collaborative Approach to Water Quality Management

Educational and Informational Programming Objectives

One educational and informational programming objective was developed for use in the current planning program in response to the public input received under the current planning program. It is:

1. Support of an Informed and Educated Public

Water Use Objectives/Classification and Water Quality Standards/Criteria

Section 281.15(1) of the *Wisconsin Statutes* requires that the WDNR prepare and adopt water use objectives and supporting water quality standards, or criteria, that apply to all surface waters of the State. Such authority is essential if the State is to meet the requirements of the Clean Water Act. The objectives or classifications for fish and aquatic life for all of the streams in the study area are set forth on Map 2.

EVALUATION OF EXISTING WATER QUALITY

The study included an evaluation of water quality conditions and sources of pollution that indicates that 1) the MMSD Inline Storage System (deep tunnel), controls on nonpoint source pollution, and treatment of industrial discharges have improved water quality over time and 2) because of advances in point source pollution abatement, nonpoint sources contribute significant proportions of the pollutant load to the streams and rivers of the study area and to Lake Michigan. Thus, the plan considers both point and nonpoint source pollution, but it focuses on abatement of nonpoint pollution to achieve the greatest improvement in water quality in a cost-effective manner.

ALTERNATIVE WATER QUALITY MANAGEMENT PLANS

Screening Alternatives

An early step in the planning process was development of Screening Alternatives designed to address two basic issues: upgrades to the MMSD sewage conveyance, storage, and treatment system to eliminate overflows, and widespread implementation of best management practices (BMP) for treatment of nonpoint source pollution. These screening alternatives were intended to broadly assess certain approaches to improving water quality and to establish a framework through which alternative water quality management plans could be developed for the entire study area. The following screening alternatives were evaluated:

- Screening Alternative 1A: Elimination of Separate Sewer Overflows (SSOs) and Combined Sewer Overflows (CSOs) Using Sewer Separation

This screening alternative has an estimated capital cost of \$5.136 billion and an annual operation and maintenance cost of \$75.0 million. Based upon an analysis period of 50 years and an annual interest rate of 6 percent, the estimated equivalent annual cost of this screening alternative is \$406.3 million.

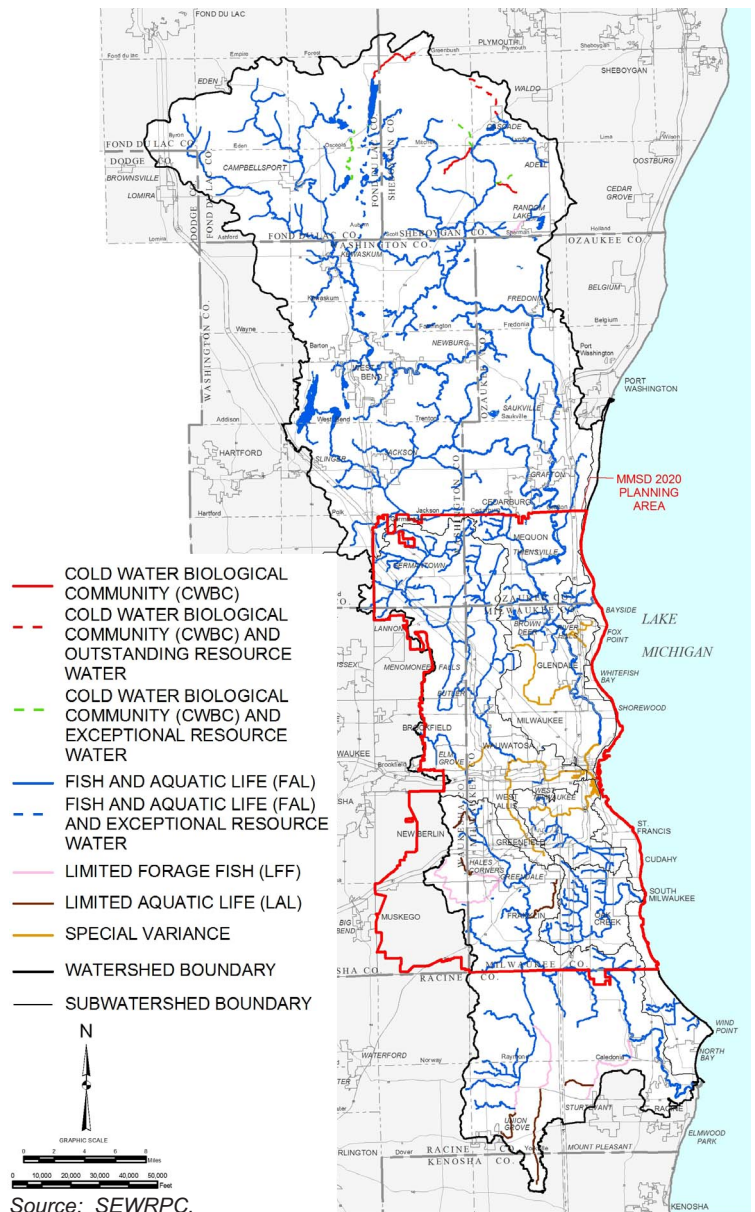
- Screening Alternative 1B: Elimination of SSOs and CSOs Using Enhanced Treatment and Storage

This screening alternative has an estimated capital cost of \$5.807 billion and an annual operation and maintenance cost of \$75.0 million. The estimated equivalent annual cost of this screening alternative is \$444.9 million.

- Screening Alternative 1C: Elimination of SSOs Using Enhanced Treatment and Storage

Map 2

CURRENT REGULATORY WATER USE CLASSIFICATIONS FOR SURFACE WATERS WITHIN THE REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE STUDY AREA: 2000



This screening alternative has an estimated capital cost of \$2.217 billion and an annual operation and maintenance cost of \$75.0 million. The estimated equivalent annual cost of this screening alternative is \$221.4 million.

- Screening Alternative 1D: Elimination of SSOs through Infiltration and Inflow Reduction

This screening alternative has an estimated capital cost of \$7.705 billion and an annual operation and maintenance cost of \$68.0 million. The estimated equivalent annual cost of this screening alternative is \$577.2 million.

- Screening Alternative 2: Implementation of a High Level of Best Management Practices to Control Nonpoint Source Pollution

This screening alternative has an estimated capital cost of \$2.004 billion and an annual operation and maintenance cost of \$111.7 million. The estimated equivalent annual cost of this screening alternative is \$242.7 million.

The ability of each screening alternative to improve water quality was evaluated using simulation models, and those water quality effects along with estimated equivalent annual costs were compared to provide guidance on the most effective components to include in the next step of the plan development process—synthesis of alternative water quality management plans.

Description and Evaluation of Alternative Water Quality Management Plans

Five Alternative Water Quality Management Plans were developed in consideration of both the regulatory requirements regarding SSOs and CSOs and the potential for achieving the largest improvements in water quality through implementation of controls on nonpoint source pollution. The first plan considered was used as a baseline condition against which to assess the effectiveness of the other four plans. This baseline, or alternative future situation, included the effect of implementing projects that are already committed, including current regulatory programs, while also taking into account future population and land development projections. The remaining four plans—as well as the five screening alternatives described above—each included the components of the baseline alternative and were grouped into two distinct categories: regulatory-based alternatives and water quality-based alternatives. The following alternative plans were developed and evaluated:

Alternative A: Baseline Alternative

This alternative includes only those measures that are already committed by various agencies within the study area, particularly those projects committed to be carried out by the MMSD by the design year of 2020. Also included are actions required under current regulatory programs, including State and local rules governing nonpoint source pollutant runoff.

This alternative has an estimated capital cost of \$1.035 billion and an annual operation and maintenance cost of \$68.0 million. Based upon an analysis period of 50 years and an annual interest rate of 6 percent, the estimated equivalent annual cost of this alternative is \$134.4 million.

The components of this alternative are described in detail in the plan report.

Alternative B1: Regulatory-Based Alternative

Under this alternative it was assumed that all current regulations governing discharge from municipal sanitary sewer overflows and control of nonpoint source pollution would be met. This alternative was built on baseline Alternative A. A five-year recurrence interval level of protection (LOP) from SSOs was assumed.

This alternative has an estimated capital cost of \$1.999 billion and an annual operation and maintenance cost of \$91.3 million. The estimated equivalent annual cost of this alternative is \$223.1 million.

Alternative B2: Regulatory-Based Alternative with Revised ISS Operating Procedure

This alternative is similar in concept to Alternative B1, with the exception of a change in the operation of the MMSD Inline Storage System (ISS) so that volume does not always need to be reserved for wastewater from the separate sewer systems. In this way, the use of the ISS may be maximized, with the intent of reducing the total volume of overflows from both combined and separate sewers.

Current regulations do not allow for separate sewer overflow discharges except in special situations. The change in operating procedures under this alternative would result in a reduction in the number and volume of CSOs at the expense of an increase in the number and volume of SSOs. Implementation of this alternative would require a change in Federal law with regard to SSOs; however, neither this alternative, nor such a change in Federal law, is recommended.

This alternative also has an estimated capital cost of \$1.999 billion and an annual operation and maintenance cost of \$91.3 million. The estimated equivalent annual cost of this alternative is \$223.1 million.

Alternative C1: Water Quality-Based Alternative

This alternative and Alternative C2 were developed with an emphasis on maximizing compliance with water quality standards and criteria, rather than simply meeting regulatory requirements. To this end, both of these alternatives emphasized control of nonpoint source pollution. As with Alternatives B1 and B2, this alternative was built on Alternative A and includes the same features regarding future committed projects and the common package.

This alternative has an estimated capital cost of \$2.564 billion and an annual operation and maintenance cost of \$116.5 million. The estimated equivalent annual cost of this alternative is \$293.7 million.

Alternative C2: Water Quality-Based Alternative with Green Measures

This alternative differs from Alternative C1 in that it includes more emphasis on “green” technologies that more directly address reduction of sources of pollution.

This alternative has an estimated capital cost of \$2.227 billion and an annual operation and maintenance cost of \$113.2 million. The estimated equivalent annual cost of this alternative is \$279.8 million.

Comparative Evaluation of Alternative Water Quality Management Plans

A detailed comparison was made of the major features of the alternative water quality management plans, including consideration of the pollutant loading analyses, instream water quality conditions and the ability of a given alternative to meet water use objectives, economic characteristics, and implementability. That evaluation was the basis for the development of a preliminary recommended plan which was refined to represent the final recommended water quality management plan.

RECOMMENDED WATER QUALITY MANAGEMENT PLAN

The recommended plan calls for the implementation of a comprehensive set of specific actions devised to ensure the enhancement and/or preservation of the surface water quality of the streams and lakes in the greater Milwaukee watersheds study area, including Lake Michigan, and to preserve the quality of the groundwater which provides the baseflow for those streams and lakes and also serves as a source of drinking water in the Southeastern Wisconsin Region. A primary consideration in the selection of the components of the recommended plan was the degree to which those measures, functioning together as a watershed-based system, would be expected to achieve the agreed-upon water use objectives in a cost-effective manner. The selection of the recommended plan followed an extensive review by the Technical Advisory Committee of the technical feasibility, economic viability, environmental impacts, potential public acceptance, and practicality of the various alternative water quality management plans considered. Those factors were also considered, with an emphasis on the technical aspects of the water quality models, by the Modeling Subcommittee. In addition public input was formally solicited over the course of the planning period and that input was considered in formulating the screening alternatives, the alternative water quality management plans, and the recommended plan that was built from those alternatives.

The development of the recommended plan focused primarily on identifying cost-effective ways to meet the water use objectives and supporting water quality standards/criteria to the degree possible. Consideration was also given to the existing regulatory framework regarding wastewater discharges and abatement of nonpoint source pollution. Accordingly, the plan was developed to include all components of the future baseline condition (Alternative A) along with elements from both Alternative B-1 (regulatory-based) and the C alternatives (water quality-based). The plan incorporates most actions identified in the MMSD 2020 facilities plan, as well as additional measures directed towards improving water quality through reducing point and urban and rural nonpoint source pollutant loads.

The comprehensive recommended plan is comprised of the following major elements:

- A land use plan element,
- A surface water quality plan element, including point and nonpoint source pollution abatement subelements, and
- A groundwater management plan element.

A detailed analysis of the estimated costs of plan implementation is presented in the plan report as is an evaluation of the ability of the recommended plan to meet the adopted water resource management goals, objectives, and standards, with particular emphasis on the ability to meet the surface water use objectives and water quality standards/criteria. No water resource plan element can fully satisfy all desirable water resource objectives. The recommended comprehensive plan, therefore, consists of a combination of individual plan elements, with each element contributing to the satisfaction of the plan objectives. The recommended plan elements are complementary in nature, and the recommended water quality management plan represents a synthesis of carefully coordinated individual plan elements which together are intended to achieve the adopted plan objectives to the degree practicable.

Land Use Plan Element

The most fundamental and basic element of the regional water quality management plan update is the land use element. The future distribution of urban and rural land uses will largely determine the character, magnitude, and distribution of nonpoint sources of pollution and ultimately, the quality of surface waters in the greater Milwaukee watersheds.

Population and Land Use in the Study Area

One of the major elements of the regional water quality management plan update is the incorporation of updated land use information, including both an inventory of existing (2000) development and the identification of planned year 2020 development. In addition, projections of buildout land use conditions were developed for municipalities within the MMSD planning area.

Year 2020 and buildout population and land use estimates were initially developed by the SEWRPC staff and the communities served by the MMSD based on future land use information provided by those communities. Planned land use data from the SEWRPC 2020 regional land use plan and available county and local land use information for the area outside the Southeastern Wisconsin Region were applied for communities in the study area that are not served by MMSD. The initial year 2020 population and land development assessments provided by the MMSD communities were used for sizing the conveyance components of the MMSD Metropolitan Interceptor System under both the year 2020 MMSD facilities plan and the recommended regional water quality management plan update. When data from the SEWRPC 2035 regional land use plan became available later in the water quality planning process, 2020 land use and population estimates for the MMSD communities were revised using a 2020 stage of those data and the revised data were used to develop the wastewater treatment components called for under the recommended MMSD 2020 facilities plan which is incorporated in the regional plan. Similarly refined population estimates were used for the 2020 condition evaluation of all of the public wastewater treatment plants in the study area. Revised 2020 industrial and commercial land use estimates were also applied for the development of revised nonpoint source pollution loads used in modeling the instream and in-lake water quality conditions under revised future year 2020 and recommended water quality plan conditions.

Year 2020 planned land uses for the greater Milwaukee watersheds, based on the original 2020 land use data provided by the communities within the MMSD planning area and on the SEWRPC 2020 regional land use plan and available State, county, and local plans outside the MMSD area, are set forth on Map 3.

Environmentally Significant Lands

Recommendations Regarding Environmentally Significant Lands

Consistent with the objectives and standards adopted under this regional water quality management plan update, it is recommended that primary environmental corridors be preserved in essentially natural, open uses, forming an integrated system of open space lands in the study area. Also, in the design of the recommended land use plan, other than for a limited number of exceptions, incremental urban and rural development was not allocated to primary or secondary environmental corridors or isolated natural resource areas.

Consistent with the regional land use plan, the regional water quality management plan update recommends the preservation of all of the identified natural areas and critical species habitat sites and, as called for under the regional natural areas and critical species habitat protection and management plan, it recommends acquisition of those sites not in existing public or public-interest ownership.

Highly Productive Agricultural Land

The regional water quality management plan update land use objectives and standards call for the preservation, to the extent practicable, of the most productive farmland, identified as farmland covered by agricultural capability Class I and Class II soils as classified by the U.S. Natural Resources Conservation Service.

Surface Water Quality Plan Elements

The surface water quality element includes the recommended point and nonpoint source pollution control measures, instream water quality measures, and auxiliary measures for the greater Milwaukee watersheds.

Point Source Pollution Abatement Plan Subelement

This subelement includes recommendations related to public wastewater treatment and associated sewer service areas, private wastewater treatment plants, and other point sources of pollution.

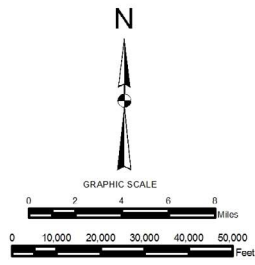
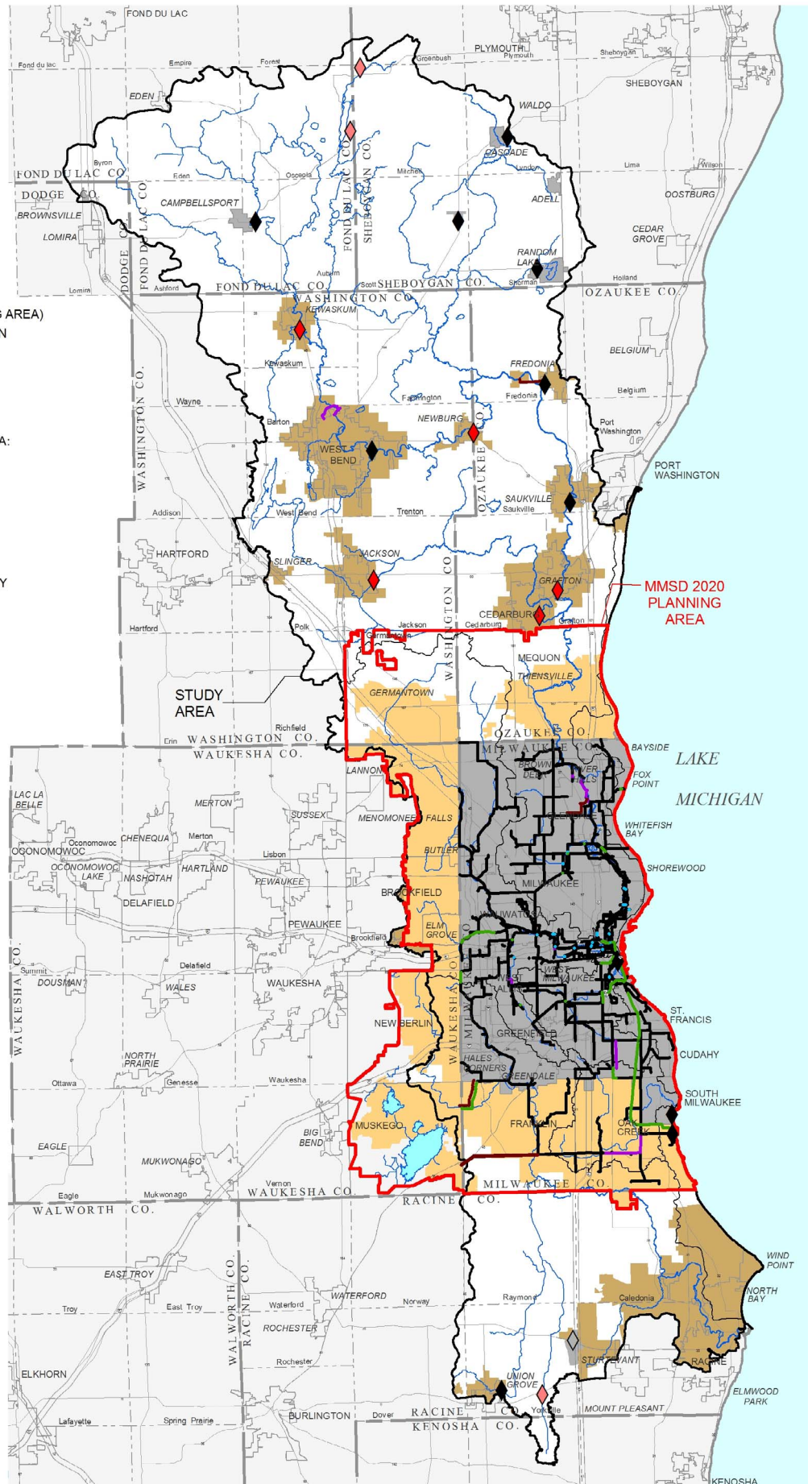
Public Wastewater Treatment Plants and Associated Sewer Service Areas

Map 4 shows the planned sanitary sewer service areas within the study area and the MMSD planning area outside the study area. With the exception of most of the MMSD service area within Milwaukee County; the City of South Milwaukee service area; the Villages of Adell, Campbellsport, Cascade, Lomira, and Random Lake; the Town of Scott Sanitary District No. 1 service area; and the Town of Yorkville Sanitary District No. 1 service area, all sewer service areas within the greater Milwaukee watersheds have been refined. It is recommended that the MMSD, South Milwaukee, Adell, Campbellsport, Cascade, Lomira, Random Lake, Scott, and Yorkville service areas be refined through a joint effort involving the municipalities; the appropriate regional, county, or local agencies; and the WDNR.

Map 4

RECOMMENDED POINT SOURCE CONTROL MEASURES WITHIN THE REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE STUDY AREA

- MMSD 2020 PLANNING AREA
- EXISTING GRAVITY SEWER (MMSD PLANNING AREA)
- EXISTING PRESSURE SEWER OR FORCE MAIN (MMSD PLANNING AREA)
- EXISTING SIPHON (MMSD PLANNING AREA)
- PROPOSED NEW OR REPLACEMENT TRUNK OR RELIEF SEWER
- PROPOSED FORCE MAIN
- UNREFINED SANITARY SEWER SERVICE AREA: DECEMBER 31, 2006
- REFINED SANITARY SEWER SERVICE AREA: DECEMBER 31, 2006
- REFINED SANITARY SEWER SERVICE AREA OUTSIDE MMSD PLANNING AREA: DECEMBER 31, 2006
- ◆ PUBLIC WASTEWATER TREATMENT FACILITY
- ◆ PRIVATE WASTEWATER TREATMENT FACILITY
- ◆ PUBLIC WASTEWATER TREATMENT PLANT FOR WHICH FACILITIES PLANNING SHOULD BE DONE BY 2020
- ◆ PUBLIC WASTEWATER TREATMENT PLANT FOR WHICH FACILITIES PLANNING SHOULD BE CONDUCTED WHEN THE PLANT NEARS THE END OF ITS USEFUL LIFE. FACILITIES PLANNING SHOULD CONSIDER ABANDONMENT AND CONNECTION TO THE RACINE WASTEWATER TREATMENT PLANT.
- SURFACE WATER
- STUDY AREA BOUNDARY



Source: SEWRPC.

Public Wastewater Treatment Systems Outside of the Milwaukee Metropolitan Sewerage District Planning Area

It is recommended that communities in the study area, but outside of the MMSD planning area, continue to assess their wastewater conveyance and treatment systems so as to provide the capacity necessary to allow for future development as it occurs while adhering to the conditions of their operating permits. The regional water quality management plan update evaluated facilities planning needs based on a criterion that facilities planning should be initiated when the average daily flow to a wastewater treatment plant reaches 80 percent of the plant design capacity. It is estimated that by the year 2020, assuming existing wastewater treatment plant design capacities:

- Sewage flows to the Village of Grafton plant would be nearing 80 percent of the plant design capacity,
- Sewage flows to the Village of Kewaskum and Village of Newburg plants would have exceeded the 80 percent threshold and would be approaching, or equaling, the plant design capacities, and
- Sewage flows to the City of Cedarburg and Village of Jackson plants would have exceeded plant design capacities.

Based on the preceding evaluation it is recommended that the communities listed above monitor development and population levels in their sewer service areas and that they prepare facilities plans prior to, or by, 2020 in order to provide adequate treatment capacity to meet future needs. It is also recommended that, when facilities planning is first initiated for either the City of Cedarburg or the Village of Grafton, that the plan include cost-effectiveness analyses to evaluate upgrading the individual treatment plants versus construction of a new regional wastewater treatment plant to serve both communities.

The Village of Caledonia recently completed a study to determine the most cost-effective way to provide sanitary sewer service to portions of the Village that are anticipated to be developed by the year 2035. The study also involved the City of Racine, Villages of Mt. Pleasant and Sturtevant, and the Towns of Raymond and Yorkville. Wastewater from the City of Racine and the Villages of Caledonia, Mt. Pleasant, and Sturtevant is currently treated at the plant operated by the Racine Water and Wastewater Utility. Wastewater flows from the Town of Yorkville sewer service area are treated at the plant operated by the Town of Yorkville Sanitary District No. 1. Pursuant to the cost-effectiveness analysis, a sewer service area amendment was adopted that expands the boundaries of the sewer service area for the City of Racine and environs to include additional areas in the Villages of Caledonia and Mt. Pleasant.² Future amendments may expand the sewer service area to other parts of the study area. At some time following adoption of the sewer service area amendments for Racine and environs, it is recommended that detailed facilities planning be undertaken to establish what new conveyance, pumping, and storage facilities would be needed to provide service.

It is recommended that the Town of Yorkville Sanitary District No. 1 sewerage system be connected to the system tributary to the Racine wastewater treatment plant and that the Yorkville plant be abandoned when the Yorkville plant reaches the end of its useful life. Based on capacity projections set forth in the plan report, abandonment of the Yorkville plant may not occur until after the year 2020.

Recommended Intercommunity Trunk Sewers

Map 4 shows recommended new intercommunity trunk sewers for the MMSD, the City of West Bend, and the Waubeka/Village of Fredonia area.

Implement Local Programs to Ensure Maintenance of Adequate Sewage Collection System Capacity

In order to ensure the maintenance of adequate sanitary sewage collection system capacity, it is recommended that the municipalities outside the MMSD service area implement locally-designed programs similar to the Capacity, Management, Operations, and Maintenance (CMOM) program that is currently being promoted by the U.S. Environmental Protection Agency as a means of evaluating and maintaining sewage collection systems.

Recommended 2020 Facilities Plan for the Milwaukee Metropolitan Sewerage District

As noted in the introduction, the regional water quality management plan update was prepared as part of a coordinated planning effort that also involved preparation of the 2020 facilities plan for the MMSD. A detailed description of the development of the recommended MMSD facilities plan is set forth in the regional water quality management plan update report.

The following facilities, programs, operations, and policies that are recommended under the MMSD facilities plan are also incorporated as components under the regional water quality management plan update:

- Facilities recommended under the wet-weather control plan that is designed to meet MMSD's discharge permit requirements,
- MMSD programs and policies to maximize capture and treatment of sewage during wet weather,

²SEWRPC, Amendment to the Regional Water Quality Management Plan—Villages of Caledonia and Mt. Pleasant, June 2007.

- Improvement of existing MMSD facilities to ensure the continued provision of adequate sewage treatment,
- A biosolids plan,
- Watercourse projects directed toward improving instream water quality and reducing municipal infiltration and inflow (I/I) through reducing overland flooding in developed areas,
- Best management practice (BMP) demonstration projects intended to assess the effectiveness of specific BMPs in reducing nonpoint source pollution and improving water quality consistent with the urban nonpoint source pollution control recommendations of the regional water quality management plan update,
- New MMSD programs and policies implemented to support other elements of the recommended plan,
- Existing MMSD programs and policies that are to be continued,
- Existing MMSD operations that are to be continued,
- MMSD committed projects, and
- Community-based components.

MMSD WET WEATHER CONTROL PLAN

The wet weather control plan is designed to meet State and Federal regulatory requirements regarding sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs).

The following projects are incorporated into the MMSD facilities plan to be constructed or further improved in order to maximize capture and treatment of sewage during wet weather. These recommended facilities would have the primary function of reducing overflows from either the separate sewer area or the combined sewer area.

- Increasing capacity to pump from the inline storage system (ISS) to the Jones Island wastewater treatment plant
- Increasing South Shore wastewater treatment plant capacity³
- Adding metropolitan interceptor system sewer capacity as necessary

The MMSD facilities plan recommends that the following MMSD operational and monitoring programs be implemented and hydraulic analyses be performed as part of the program to maximize capture and treatment of sewage during wet weather.

- Improvements to flow monitoring and rain gauge system
- Capacity analysis of the South Shore wastewater treatment plant
- Hydraulic analysis of the Jones Island wastewater treatment plant

The MMSD facilities plan recommends that the following MMSD programs and policies be implemented as part of the program to maximize capture and treatment of sewage during wet weather.

- MMSD's wet weather peak flow management plan to control the growth of infiltration and inflow
- MMSD's Capacity, Management, Operations, and Maintenance (CMOM) Program
- CMOM Programs for MMSD member and contract municipalities and for Milwaukee County
- System Evaluation and Capacity Assurance Plans for MMSD municipalities
- Flow monitoring for high-priority areas
- Continued operation of real-time control system

The MMSD facilities plan recommends that the following rehabilitation projects, routine facility upgrades, and engineering studies and evaluations be implemented in order to continue to provide adequate sewage treatment for the MMSD service area.

- Rehabilitating dewatering and drying systems at the Jones Island wastewater treatment plant
- Completing preliminary engineering study for additional force main from the ISS pump station to diversion chamber DC0103 at S. 6th Street and W. Oklahoma Avenue

³This is the only component of the MMSD 2020 facilities plan listed herein that was modified under the recommended regional water quality management plan update. The regional plan recommendations relative to the South Shore plant are set forth below.

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- Evaluating Jones Island wastewater treatment plant aeration system
 - Ongoing treatment and conveyance upgrades
 - Geotechnical/structural analysis of wastewater treatment plants

*Recommendations of the Regional Water Quality Management Plan
Relative to the MMSD South Shore Wastewater Treatment Plant*

The MMSD 2020 facilities plan defines a process for evaluating the need to upgrade the capacity of the South Shore wastewater treatment plant in a manner that meets regulatory requirements and is consistent with MMSD's current operating permit. The recommended regional water quality management plan update recommends a similar approach with the exception that the possibility of blending at the South Shore plant is included in the approach outlined under the regional plan. The regional water quality management plan update calls for the following relative to the MMSD South Shore plant:

- The need for physical-chemical treatment with chemical flocculation should be evaluated at a later date, following determination of 1) the degree to which MMSD can successfully implement a variable volume reserved for sanitary sewer inflow (VRSSI) operating strategy, 2) actual system capacities at the Jones Island and South Shore plants, 3) actual population and land use changes within the planning area, and 4) the success of the wet weather peak flow management planning effort. If it were found that additional treatment capacity was not needed, a capital cost saving of from \$97 million to \$152 million could be realized through not adding physical-chemical treatment.
- Continued efforts by MMSD to successfully implement a variable VRSSI operating strategy based on refinement and improvement of the prediction algorithm developed under the MMSD Real Time Control Project and with upgraded pumping capacity from the ISS. The MMSD system is an integrated system and the current regulatory bifurcation with regard to CSOs and SSOs makes MMSD's operation of its system very complex and difficult. The regulatory requirement that a distinction be drawn between SSOs and CSOs from the MMSD system creates a situation under which the capacity of the ISS may be underutilized despite MMSD's best efforts to apply a variable VRSSI operating strategy to avoid overflows. Therefore, it is recommended that MMSD and its customer communities work with the WDNR and USEPA to obtain formal regulatory recognition of the integrated nature of the MMSD system, perhaps extending to elimination of the present distinction between ISS-related SSOs and CSOs.
- Consideration of additional study of blending at the South Shore plant, perhaps as part of the recommended capacity study and/or the long-term demonstration project. This recommendation is consistent with the MMSD 2020 facilities plan recommendation calling for evaluation of blending as a means to prevent possible basement backups under certain conditions.
- Possible implementation of physical-chemical treatment to increase the treatment capacity of the South Shore plant if it were ultimately found that additional capacity was needed at South Shore and favorable results were obtained from the recommended long-term demonstration project of physical-chemical treatment with chemical flocculation. As indicated previously, this element may not be needed if favorable results are obtained from further analyses of the variable VRSSI operating strategy and the capacity of the South Shore plant.
- Possible implementation of blending at the South Shore plant if it were ultimately found that additional capacity was needed and the recommended long-term demonstration project of physical-chemical treatment with chemical flocculation results in a conclusion that such a treatment option is not feasible. The estimated capital, annual operation and maintenance, and equivalent annual costs of blending are \$60 million, \$1.0 million, and \$6.1 million, respectively, less than the corresponding costs of the other remaining option, which is physical-chemical treatment with ballasted flocculation. In this case, it is recommended that additional funds be spent on achieving water quality improvements through control of nonpoint source pollution at a level beyond that of the base nonpoint source pollution control component of the regional plan, rather than on physical-chemical treatment with ballasted flocculation.⁴ Once again, this element may not be needed depending on the results of analyses of the variable VRSSI operating strategy and the capacity of the South Shore plant.
- Revision of the USEPA draft policy regarding blending to specifically establish that it is acceptable to evaluate the water quality impacts of blending as part of a watershed-based approach to water quality management and to use that evaluation as a factor to be considered in determining if blending is to be allowed.

Cost-Effectiveness Analysis of Wastewater Treatment Options for the City of South Milwaukee

The City of South Milwaukee is the only community in Milwaukee County that maintains its own wastewater treatment facility and does not belong to the Milwaukee Metropolitan Sewerage District. The regional water quality management plan update includes a detailed analysis to determine if it would be more cost effective for the City to continue to maintain its own treatment facility or to

⁴Although a cost savings would accrue to the MMSD if certain components of the MMSD 2020 facilities plan were foregone, the additional funds that could be applied to more effective nonpoint source pollution control measures would not necessarily be provided by MMSD.

abandon it and connect to the MMSD system. That analysis includes consideration of continued operation of an upgraded treatment facility by the City and possible future connection of the city sewerage system to the MMSD South Shore wastewater treatment plant.

As a result of the analyses set forth in detail the plan report, it is recommended that:

- The City of South Milwaukee continue its program of wastewater treatment plant upgrades.
- The City of South Milwaukee discuss with the WDNR the likelihood of an ammonia limit being required under the next permit which is to be issued in 2011. Should it appear likely that such a limit will be imposed, the City should conduct detailed facilities planning to evaluate all reasonable alternatives.

Private Wastewater Treatment Facilities

There are three private wastewater treatment plants in the study area: one serving the Long Lake Recreational Area in the Town of Osceola in Fond du Lac County and one serving the Kettle Moraine Correctional Institution in the Town of Greenbush in Sheboygan County, both in the Milwaukee River watershed, and one serving an isolated enclave of urban land use in Fonks Mobile Home Park in the Town of Yorkville in Racine County in the Root River watershed. These facilities are located beyond the current limits of planned public sanitary sewer service areas and are recommended to be retained. The need for upgrading these plants and the level of treatment should be formulated on a case-by-case basis as part of the WPDES permitting process.

Regulation of Wastewater Treatment Facilities and Industrial Discharges

It is recommended that these sources of wastewater continue to be regulated and their effluent concentrations be controlled to acceptable levels on a case-by-case basis through the operation of the WPDES.

Industrial Noncontact Cooling Water Discharges

An additional point source issue identified under the regional water quality management plan update is that of phosphorus loads from some industrial noncontact cooling water discharges. It is believed that the phosphorus is contained in the source water since some water utilities, such as the Cities of Cudahy, Milwaukee, New Berlin, and South Milwaukee, add orthophosphate or polyphosphate as a corrosion control to prevent certain metals from leaching from distribution systems and building plumbing materials into the treated water. Given the public health benefits involved and the reliability of the current technology, the Milwaukee Water Works has indicated that it would not consider changing its current practice. Recognizing the benefits involved, it is not recommended that the water utilities end their current practice. It is, however, recommended that water utilities in the study area give further consideration to changing to an alternative technology that does not result in increased phosphorus loading if such a technology is both effective in controlling corrosion in pipes and cost-effective for the utility to implement.

Nonpoint Source Pollution Abatement Plan Subelement

Recommended Rural Nonpoint Source Pollution Control Measures

Rural nonpoint source control measures are recommended in the following general categories:

- Reducing soil erosion from cropland,
- Managing manure and nutrients through provision of six months of manure storage and application of manure and any supplemental nutrients in accordance with a nutrient management plan,
- Achieving greater control of barnyard runoff through increased levels of State cost-share funding,
- Establishing or expanding riparian buffers along streams adjacent to agricultural land to achieve a minimum buffer width of about 75 feet,
- Converting a total of 10 percent of existing farmland and pasture to either wetland or prairie conditions, focusing that effort on marginally productive land,
- Restricting livestock access to streams through fencing or other means,
- Implementing measures to ensure proper handling and treatment of milking center wastewater,
- Instituting county-enforced inspection and maintenance programs for all new or replacement private onsite wastewater treatment systems (POWTS) constructed after the date on which the counties adopted private sewage system programs,
- Establishing voluntary county programs to inventory and inspect POWTS that were constructed prior to the dates on which the counties adopted private sewage system programs, and
- Working to strengthen oversight and enforcement of regulations for disposal of septage and to increase funding to adequately staff and implement such programs.

Recommended Urban Nonpoint Source Pollution Abatement Measures

Urban nonpoint source control measures are recommended in the following general categories:

- Implementing the nonagricultural (urban) performance standards of Chapter NR 151 to address the following:
 - Controlling construction site erosion;
 - Controlling stormwater pollution from areas of existing and planned urban development, redevelopment, and infill; and
 - Infiltrating stormwater runoff from areas of new development.
- Implementing coordinated programs to detect and eliminate illicit discharges to storm sewer systems and to control urban-sourced pathogens that are harmful to human health.

Based on review of recommended plan water quality model results for the streams of the study area and Lake Michigan, it was decided to recommend enhanced urban illicit discharge control and/or innovative methods to identify and control possible pathogen sources in stormwater runoff from all urban areas in the study area. To address the threats to human health and degradation of water quality resulting from human-specific pathogens and viruses entering stormwater systems, it is recommended that each municipality in the study area implement a program consisting of:

- Enhanced storm sewer outfall monitoring to test for fecal coliform bacteria in dry- and wet-weather discharges,
- Molecular tests for presence or absence of human-specific strains of *Bacteroides*, an indicator of human fecal contamination, at outfalls where high fecal coliform counts are found in the initial dry-weather screenings,
- Additional dry-weather screening upstream of outfalls where human-specific strains of *Bacteroides* are found to be present, with the goal of isolating the source of the illicit discharge, and
- Elimination of illicit discharges that were detected through the program described in the preceding three steps.

It is anticipated that the program outlined above would also identify cases where illicit connections are not the primary source of bacteria, indicating that stormwater runoff is the main source. To adequately assess the appropriate way to deal with such bacteria sources (and the potentially associated pathogens), it is recommended that human health and ecological risk assessments be conducted to address pathogens in stormwater runoff. Depending on the findings of the risk assessments, consideration should be given to pursuing innovative means of identifying and controlling possible pathogen sources in stormwater runoff.⁵

- Implementing chloride reduction programs

Water quality monitoring data set forth in SEWRPC Technical Report No. 39 indicated that chloride concentrations in the streams of the study area are increasing over time. Observed instream chloride concentrations sometimes exceed the 250 mg/l secondary drinking water standard. Instream concentrations generally do not exceed the chronic toxicity criterion of 395 mg/l or the acute toxicity criterion of 757 mg/l established by the WDNR. Chloride concentrations are generally below 200 mg/l in the outer harbor and the nearshore Lake Michigan area. In the lakes of the Milwaukee River watershed for which data are available, chloride concentrations are generally less than 50 mg/l, although concentrations appear to be increasing over time. Also, chlorides used in water softeners can increase instream chloride concentrations and they can also pose problems with elevated concentrations at wastewater treatment plants. Overall, the increasing trends in instream and in-lake concentrations are a cause for concern.

Thus, it is recommended that:

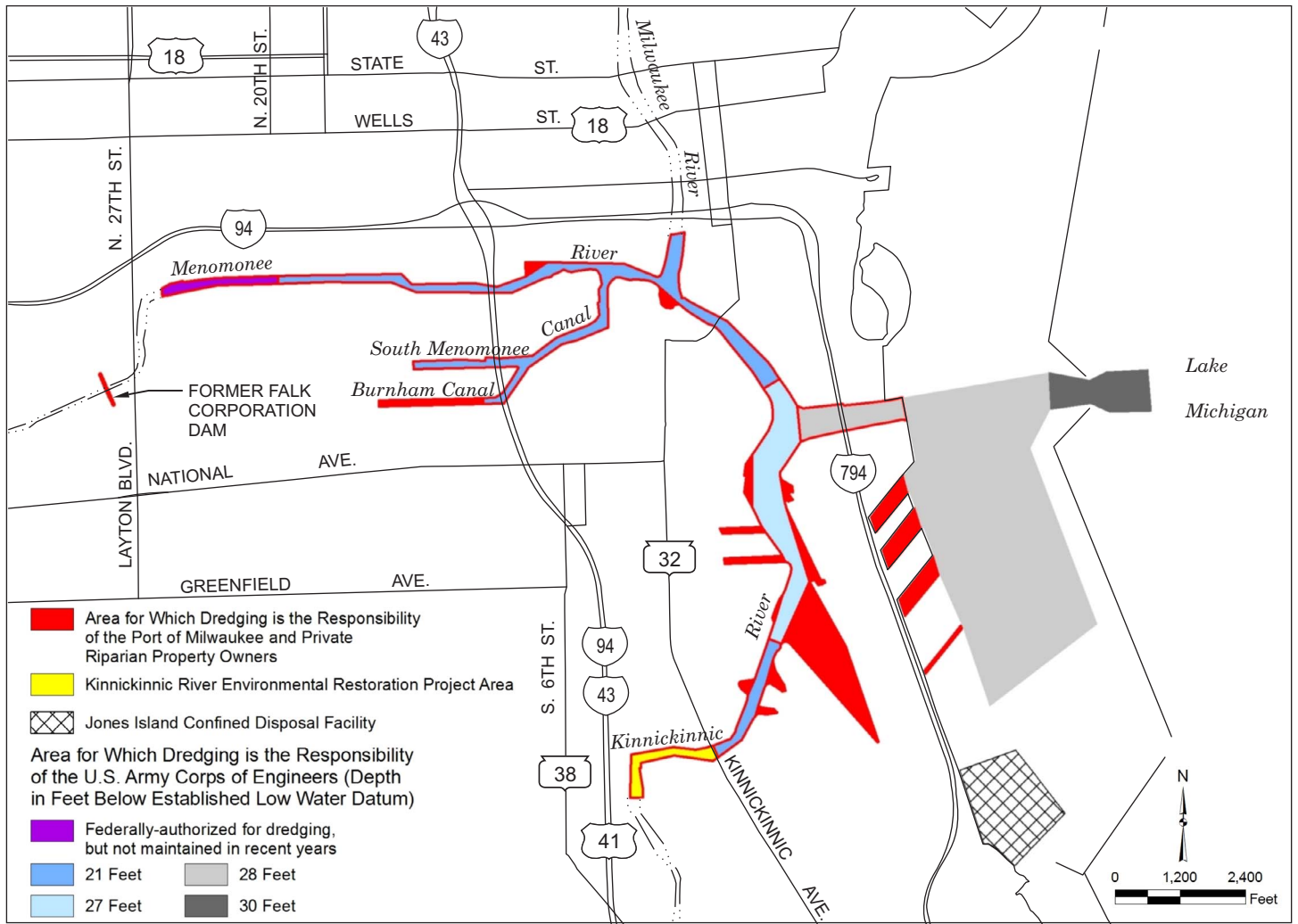
- The municipalities and counties in the study area continue to evaluate their practices regarding the application of chlorides for ice and snow control and strive to obtain optimal application rates to ensure public safety without applying more chlorides than necessary for that purpose,
 - Municipalities consider alternatives to current ice and snow control programs,
 - Education programs be implemented to provide information about 1) alternative ice and snow control measures in public and private parking lots, 2) optimal application rates in such areas, 3) alternative water softening media, and 4) the use of more-efficient water softeners which are regenerated based upon the amount of water used and the quality of the water.
- Implementing fertilizer management through:
 - The use of low- or no-phosphorus fertilizers be encouraged in areas tributary to inland lakes and ponds and that consideration be given to adopting low- or no-phosphorus fertilizer ordinances in those areas⁶ and

⁵*It is not expected that municipalities would conduct individual risk assessments. It is envisioned that such assessments would be done at a watershed scale.*

⁶*It is appropriate for no-phosphorus ordinances to allow the use of compost-based fertilizers with relatively low phosphorus concentrations, such as Milorganite®.*

Map 5

RECOMMENDED DREDGING ELEMENT OF THE REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE



Source: SEWRPC.

- Information and education programs required under municipal WPDES stormwater discharge permits promoting voluntary practices that optimize urban fertilizer application
- Disconnecting residential roof drains from sanitary and combined sewers and infiltrating roof runoff

Instream Water Quality Measures Plan Subelement

Instream measures are recommended in the following general categories:

- Renovating and rehabilitating concrete channels where concrete lining removal can be accomplished without creating flood or erosion hazards,
- Considering renovation of the MMSD Kinnickinnic River Flushing Station,
- Preparing abandonment and associated riverine restoration plans for dams, specifically addressing sedimentation issues,
- Limiting culverts, bridges, drop structures, and channelized stream segments and designing such necessary features to allow the passage of aquatic organisms,
- Developing restoration and remediation programs for riverine and impoundment sites with contaminated sediments,
- Extending the Milwaukee Estuary Area of Concern to include reaches of the Little Menomonee River and Cedar Creek and additional reaches of the Menomonee and Milwaukee Rivers and Lincoln Creek,
- Dredging for navigation maintenance in the inner harbor as shown on Map 5,

-
- Implementing the Kinnickinnic River Environmental Restoration Project, which will result in the removal of up to 170,000 cubic yards of sediments contaminated with polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs), removing about 90 percent of the PCB mass in the project area, during 2008 and 2009,
 - Expanding the existing Jones Island Confined Disposal Facility by constructing a raised perimeter dike, consistent with the 2007 recommendation of the U.S. Army Corps of Engineers, Detroit District, and
 - Improving the habitat of stream systems by:
 - Enhancing streambank stability,
 - Limiting instream sediment deposition,
 - Implementing techniques to moderate the effects of channelization, and
 - Restoring instream and riparian habitat.

Inland Lake Water Quality Measures Plan Subelement

The following recommendations are made for inland lakes:

- Achieving lake-specific reductions in both urban and rural nonpoint source pollutant loads and refining those loads through detailed lake-focused planning programs,
- Implementing the recommendations of the Washington and Waukesha County lake and stream classification projects that were conducted by SEWRPC for those counties,
- Preparing lake plans for the remaining major lakes in the study area without such plans,
- Pursuing implementation of the recommendations in the 2005 Milwaukee County pond and lagoon management plan,
- Encouraging the use of low- or no-phosphorus fertilizers in areas tributary to inland lakes and ponds and considering adoption of low- or no-phosphorus fertilizer ordinances in those areas,
- Establishing long-term-trend lake monitoring programs for the major lakes of the study area,
- Continuing participation by lake associations and public inland lake protection and rehabilitation districts in the WDNR Self-Help Monitoring Program,
- Implementing community-based informational programs and school-based curricula using available information from agencies and organizations, such as the WDNR and University of Wisconsin-Extension, and
- Reviewing and evaluating land use changes for potential lake-related impacts at the time local planning and zoning decisions are made.

Auxiliary Water Quality Management Plan Subelement

Auxiliary measures are recommended in the following general categories:

- Maintaining or expanding current public health monitoring programs at public beaches along Lake Michigan and inland waterbodies,
- Managing the Coastal Zone,
- Collecting household hazardous waste,
- Maintaining and developing collection programs for pharmaceuticals and personal care products,
- Continuing and supporting programs to provide public education on exotic invasive species and to reduce such species,
- Developing a State policy regarding water temperature and thermal discharges,
- Considering the possible effects of global climate change in the development of future updates to the regional water quality management plan, and
- Water quality monitoring

It is recommended that:

- The surface water quality monitoring and stream gauging programs currently being conducted by the WDNR, the USGS, and the MMSD be supported, continued, and refined, including standardizing sampling and analysis protocols, adopting common quality control procedures, and addressing data gaps identified under the regional water quality management plan update effort,

-
- Long-term fisheries, macroinvertebrate, habitat, and lake-trend monitoring stations/programs be established, and
 - Citizen-based monitoring efforts such as the WDNR's Wisconsin Citizen Lake Monitoring Network, the UW-Extension's Water Action Volunteers Program, Riveredge Nature Center's Testing the Waters Program, and the Friends of Milwaukee's Rivers program be continued and supported, and that methods and protocols continue to be upgraded.

Ability of the Recommended Water Quality Management Plan to Meet Adopted Objectives and Standards

Evaluation of Water Quality Modeling Analysis Results Relative to the Adopted Water Use Objectives and Water Quality Standards

Water quality summary statistics were developed for 106 water quality assessment points distributed along streams throughout the 1,127-square mile study area and in the nearshore area of Lake Michigan. Compliance with selected water quality standards/criteria for streams within the Milwaukee River watershed is represented in Map 6. The plan report presents similar maps for the other watersheds studied.

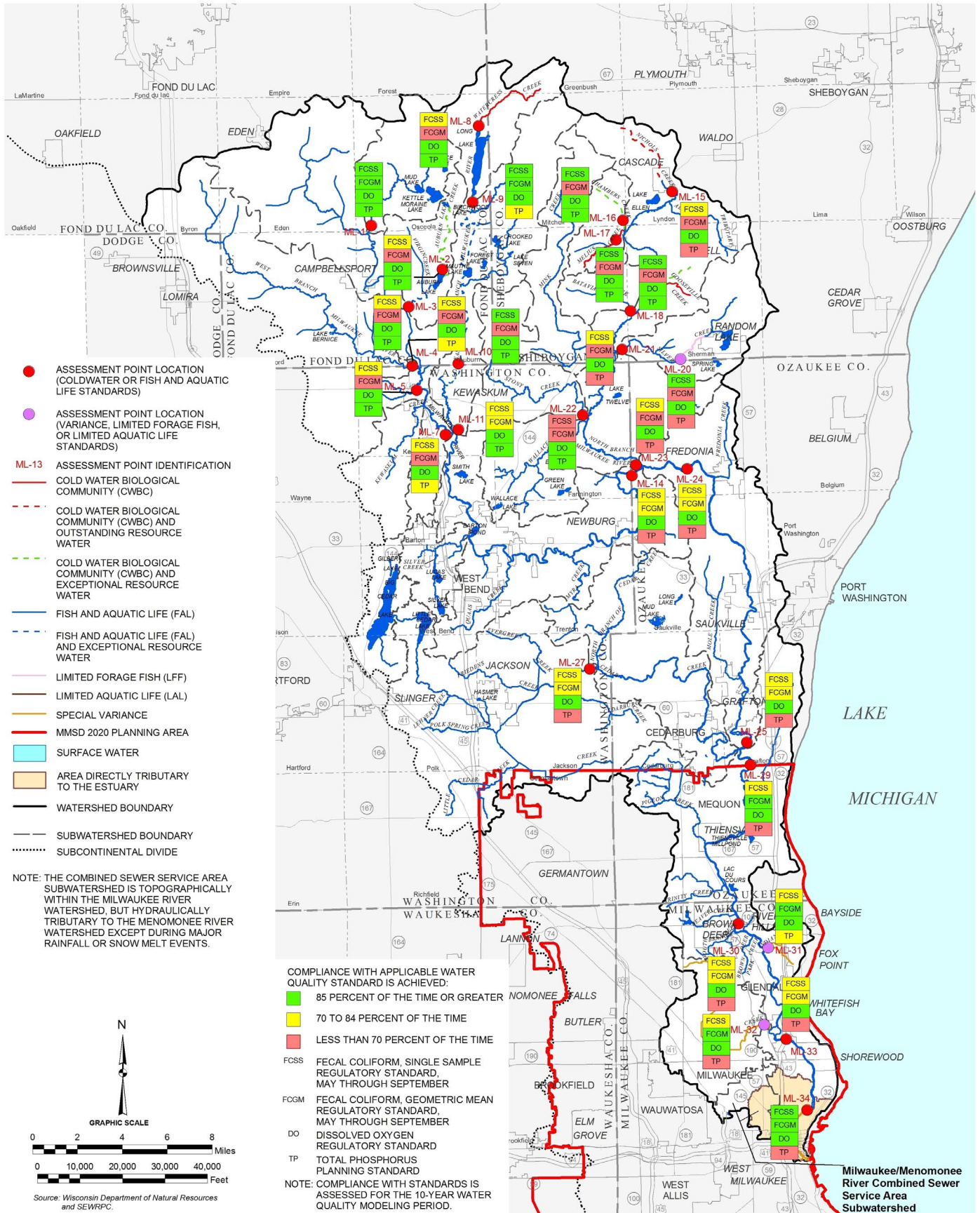
Instream water quality conditions were assessed through modeling existing (year 2000), planned (year 2020), and recommended plan conditions.

The following general conclusions can be drawn from review of the water quality data:

- **Fecal Coliform Bacteria**
 - Marked reductions in concentration may be achieved under recommended plan conditions.
 - Improvements in compliance with the applicable standards/criteria are not as pronounced because of the existing high concentrations.
- **Dissolved Oxygen**
 - Compliance with the applicable standards is generally good under existing conditions.
 - Little change is projected to occur under the recommended plan.
- **Total Phosphorus**
 - The most significant reductions in concentration generally occur under 2020 conditions relative to existing conditions, possibly attributable to the effects of implementation of NR 151 stormwater runoff controls and construction of MMSD committed projects.
 - The recommended plan is projected to produce marked reductions in concentrations relative to 2020 conditions in the Lake Michigan inner and outer harbor areas.
- **Total Nitrogen**
 - In the Kinnickinnic River, Menomonee River, and Oak Creek watersheds, the most significant reductions in concentrations occur under 2020 conditions relative to existing conditions.
 - In the Milwaukee and Root River watersheds, the most significant reductions in concentrations occur under recommended plan conditions relative to 2020 conditions.
 - In the Lake Michigan inner and outer harbor, significant reductions in concentrations occur both under 2020 conditions relative to existing conditions and under recommended plan conditions relative to 2020 conditions.
 - In the nearshore Lake Michigan area little change in concentrations would be expected among the conditions considered.
- **Total Suspended Solids**
 - In the Kinnickinnic River, Menomonee River, and Oak Creek watersheds, the most significant reductions in concentrations occur under 2020 conditions relative to existing conditions, possibly attributable to the effects of implementation of NR 151 stormwater runoff controls and completion of MMSD committed projects.
 - In the Milwaukee River watershed, the greatest reductions in concentrations occur under recommended plan conditions relative to 2020 conditions.
 - In the urban areas of the Root River watershed in Milwaukee County, significant reductions in concentrations are anticipated under 2020 conditions relative to existing conditions.
 - In the remainder of the Root River watershed and in the Lake Michigan inner and outer harbor areas, reductions in concentrations would be anticipated to occur under recommended plan conditions relative to existing and 2020 conditions.

Map 6

ASSESSMENT POINTS WITHIN THE MILWAUKEE RIVER WATERSHED FOR THE RECOMMENDED WATER QUALITY MANAGEMENT PLAN



MEASURABLE WATER QUALITY IMPROVEMENT GOALS

In general, the degree of improvement in water quality resulting from implementation of the plan recommendations will be evaluated through comparison over time of existing measured water quality conditions with conditions measured in the future. Expansion of the monitoring network in the study area, as recommended under the plan, would facilitate such comparisons.

In addition, the plan establishes certain measurable goals for implementation that can serve as indicators of progress being made toward improving water quality conditions. Those goals, which are to be achieved by 2020, include:

- Converting 48 square miles of marginal cropland to prairie or wetland conditions
- Establishing or expanding riparian buffers along about 325 miles of streambank
- Reducing the loads of the following pollutants to streams and inland lakes in the study area, relative to existing conditions, as follows:
 - Total Phosphorus: 15 percent (57,000 pound reduction)
 - Total Suspended Solids: 40 percent (69 million pound reduction)
 - Fecal Coliform Bacteria: 50 percent (36,780 trillion cell reduction)
 - Total Nitrogen: 30 percent (1.1 million pound reduction)
 - Biochemical Oxygen Demand: 15 percent (1.8 million pound reduction)
 - Copper: 15 percent (1,300 pound reduction)
- Reducing the loads of the following pollutants to Lake Michigan as follows:
 - Total Phosphorus: 5 percent (38,000 pound reduction)
 - Total Suspended Solids: 40 percent (70 million pound reduction)
 - Fecal Coliform Bacteria: 45 percent (38,500 trillion cell reduction)
 - Total Nitrogen: 5 percent (0.6 million pound reduction)
 - Biochemical Oxygen Demand: 10 percent (1.5 million pound reduction)
 - Copper: 5 percent (900 pound reduction)

- **Copper**

- In the Kinnickinnic River, Menomonee River, Oak Creek, and Root River watersheds and in the Lake Michigan inner and outer harbor areas, the most significant reductions in concentrations generally occur under the 2020 conditions relative to existing conditions.
- In most locations in the Milwaukee River watershed and the nearshore Lake Michigan area no significant changes in concentrations relative to existing conditions would be expected under the recommended plan.

GROUNDWATER MANAGEMENT PLAN ELEMENT

This plan element was coordinated with the regional water supply plan, which is documented in SEWRPC Planning Report No. 52, *A Regional Water Supply Plan for Southeastern Wisconsin*.

Plan recommendations related to groundwater were made in the following general categories:

- Groundwater recharge areas,
- Groundwater sustainability,
- Mapping of groundwater contamination potential in study area counties outside the Region,
- Stormwater management measures affecting groundwater quality,
- Issues related to the effects of emergency and unregulated contaminants on groundwater quality, and
- Water conservation

COST ANALYSIS

In order to assist public officials in evaluating the recommended regional water quality management plan update for the greater Milwaukee watersheds, estimates were prepared of capital costs and attendant annual operation and maintenance costs.

The capital cost of implementing the recommended plan for the greater Milwaukee watersheds is estimated at \$1.492 billion and annual operation and maintenance costs are estimated to be \$28.4 million. With the exception of an estimated \$50,000 for additional studies recommended under the groundwater management plan element, that entire capital cost is for surface water quality measures.

An additional \$1.228 billion is estimated for 1) existing programs that are to continue, 2) plan elements that have been committed under other planning efforts, and 3) programs that are to be implemented to meet regulatory requirements. The estimated annual operation and maintenance costs for those programs is \$33.0 million. Because these costs are for water quality programs that are to be implemented regardless of whether they are called for under the regional water quality management plan update, they were not directly assigned to the plan update. However, those programs and elements are very important to achieving improvements in water quality within the study area.

The plan report includes detailed cost assignments to public and private sector entities as summarized in Table 1.

PLAN IMPLEMENTATION

While the recommended regional water quality management plan update is designed to attain, to the extent practicable, the agreed upon water quality and related objectives, the plan is not complete in a practical sense until the steps required to implement the plan—that is, to convert the plan into action policies and programs—are specified. The implementation plan outlines the actions which must be taken by the various levels and agencies of government in concert with private sector organizations if the recommended water quality plan is to be fully carried out by the design year 2020. Designated management agencies (cities, villages, towns, special-purpose units of government, and State and Federal agencies) are specified for the following recommended plan elements or subelements :

- Point source pollution abatement (62 agencies),
- Rural nonpoint source pollution abatement (61 agencies and four private land trusts),
- Urban nonpoint source pollution abatement (121 agencies and two nongovernmental organizations),
- Instream water quality measures (104 agencies),
- Inland lake water quality management (35 agencies),
- Auxiliary water quality management (49 agencies and two nongovernmental organizations), and
- Groundwater quality management (95 agencies).

All but 35 of the designated management agencies currently exist. Depending on how many counties in the study area have adequate existing programs to provide the additional oversight of private onsite wastewater treatment systems (POWTS) that is recommended to be performed by existing or new town utility districts, up to 28 new utility districts could be established to provide additional oversight of POWTS. In addition, seven of the proposed new agencies would be lake protection and rehabilitation districts.

The implementation recommendations contained in the plan are, to the maximum extent possible, based upon and related to year 2007 government programs and private sector initiatives and are predicated upon existing enabling legislation. Because of the possibility of unforeseen changes in economic conditions, State and Federal legislation, case law decisions, governmental organization, and tax and fiscal policies, it is not possible to determine exactly how a process as complex as watershed-based water quality plan implementation should be administered and financed. In the continuing regional planning program for southeastern Wisconsin, it will, therefore, be necessary to periodically update not only the water quality management plan elements and the data and forecasts on which these plan elements are based, but the recommendations contained herein for plan implementation. That approach is consistent with the “adaptive management” approach adopted by the Milwaukee Metropolitan Sewerage District (MMSD) for implementation of the MMSD 2020 wastewater treatment facilities plan component.

The ongoing comprehensive planning program being conducted pursuant to legislation enacted by the Wisconsin Legislature in 1999 and set forth in Section 66.1001 of the *Wisconsin Statutes* (often referred to as the State's "Smart Growth" law), provides a new framework for the development, adoption, and implementation of comprehensive plans by regional planning commissions and by

Table 1

**PRIVATE AND PUBLIC SECTOR COSTS FOR COMPONENTS OF THE
RECOMMENDED REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE**

Plan Element	Plan Subelement	Description	Component	Public Sector Capital Cost (thousands)	Public Sector Annual Operation and Maintenance Cost (thousands)	Private Sector Capital Cost (thousands) ^a	Private Sector Annual Operation and Maintenance Cost (thousands) ^a	Total Capital Cost (thousands)	Total Annual Operation and Maintenance Cost (thousands)
Surface Water Quality Plan Element	Point Source Pollution Abatement Plan Subelement	Public Wastewater Treatment Plants and Associated Sewer Service Areas	3. Implementation of the Village of Kewaskum WWTP Facilities Plan	\$ 3,440	\$ 97	--	--	\$ 3,440	\$ 97
			4. Prepare facilities plans for the Villages of Jackson and Newburg	200	--	--	--	200	--
			5. Prepare facilities plans for the City of Cedarburg and Village of Grafton, including consideration of merging operations into a single, regional treatment facility	175	--	--	--	175	--
			6. Prepare facilities plan for City of Racine and environs upon completion of amendment to sewer service area	250	--	--	--	250	--
			7. Capacity, Management, Operations, and Maintenance (CMOM) programs for municipalities outside of the MMSD service area	1,425	--	--	--	1,425	--
			8. City of West Bend Northwest Interceptor	4,091	3	--	--	4,091	3
			9. Force main from Waubeka in the Town of Fredonia to the Village of Fredonia sewerage system	1,549	11	--	--	1,549	11
			10. Ryan Creek interceptor sewer	51,386	70	--	--	51,386	70
			11. Implementation of MMSD 2020 Facilities Plan as Recommended under the RWQMPSU	954,900	900	--	--	954,900	900
			12. Implementation of wastewater treatment plant upgrades for City of South Milwaukee	4,298	575	--	--	4,298	575
	Nonpoint Source Pollution Abatement Plan Subelement	Recommended Rural Nonpoint Source Pollution Control Measures	2. Provide six months of manure storage for livestock operations	--	--	\$ 47,050	\$ 3,072	47,050	3,072
			3. Prepare and/or implement nutrient management plans	--	--	1,526	1,308	1,526	1,308
			5. Control barnyard runoff	--	--	2,280	--	2,280	--
			6. Expand riparian buffers	--	--	1,747	389	1,747	389
			7. Convert marginal cropland and pasture to wetlands and prairies	--	--	72,253	16,250	72,253	16,250
			8. Restrict livestock access to streams	--	--	969	48	969	48
			9. Manage milking center wastewater	--	--	3,799	83	3,799	83
			10. Expand oversight and maintenance of private onsite wastewater treatment systems (POWTS)	--	--	113,660	663	113,660	663
			Recommended Urban Nonpoint Source Pollution Control Measures	1. Implementation of the nonagricultural (urban) performance standards of Chapter NR 151	121,720	8,625	75,256	23,583	196,976
2. Programs to detect and eliminate illicit discharges and control pathogens that are harmful to human health				19,524	--	--	--	19,524	--
3. Chloride reduction programs	499	1,496		--	--	499	1,496		
4. Implement fertilizer management programs	160	--		--	--	160	--		
5. Disconnect residential roof drains from sanitary and combined sewers and infiltrate roof runoff	--	--		22,171	350	22,171	350		
7. Beach and riparian litter and debris control	--	596		--	--	--	596		

Table 1 (continued)

Plan Element	Plan Subelement	Description	Component	Public Sector Capital Cost (thousands)	Public Sector Annual Operation and Maintenance Cost (thousands)	Private Sector Capital Cost (thousands) ^a	Private Sector Annual Operation and Maintenance Cost (thousands) ^a	Total Capital Cost (thousands)	Total Annual Operation and Maintenance Cost (thousands)		
Surface Water Quality Plan Element (continued)	Instream Water Quality Measures Plan Subelement	Hydrologic and Hydraulic Management	1. Concrete channel renovation and rehabilitation	\$ 175,200	--	--	--	\$ 175,200	--		
			2. Renovation of the MMSD Kinnickinnic River flushing station	3,400	\$ 600	--	--	3,400	\$ 600		
			3. Dam abandonment and restoration plans	1,800	--	--	--	1,800	--		
			5. Increase the dredged material storage volume of the Jones Island Confined Disposal Facility	3,500	12	--	--	3,500	12		
	Inland Lakes Water Quality Measures Plan Subelement	--	--	1. Lake management plans for 17 major lakes	850	--	--	--	850	--	
				2. Implement trophic state monitoring programs for 20 major lakes	--	120	--	--	--	120	
	Auxiliary Water Quality Management Plan Subelement	Public Beaches	Public Beaches	1. Continue current public health monitoring programs and expand to all public beaches in the study area	--	31	--	--	--	31	
				3. Continue and expand current beach grooming programs	--	710	--	--	--	710	
		Waterfowl Control	Waterfowl Control	1. Implement programs to discourage unacceptably high numbers of waterfowl from congregating near beaches and other water features	--	165	--	--	--	165	
		Water Pollution Control	Water Pollution Control	1. Continue collection programs for household hazardous wastes and expand such programs to communities that currently do not have them	--	374	--	--	--	374	
		Emerging Issues	Emerging Issues	2. Implement collection programs for expired and unused household pharmaceuticals	--	40	--	--	--	40	
		Water Quality Monitoring	Water Quality Monitoring	2. Continue and possibly expand USGS stream gauging program	2. Continue and possibly expand USGS stream gauging program	145	126	--	--	145	126
					3. Establish long-term water quality monitoring programs for areas outside of MMSD service area	--	156	--	--	--	156
					4. Establish long-term fisheries and macro-invertebrate monitoring stations	--	100	--	--	--	100
					5. Establish long-term aquatic habitat monitoring stations	--	59	--	--	--	59
		Maintenance of the Regional Water Quality Management/MMSD 2020 Facilities Plan Modeling System	Maintenance of the Regional Water Quality Management/MMSD 2020 Facilities Plan Modeling System	1. Continue maintenance of MMSD conveyance system modeling tools	1. Continue maintenance of MMSD conveyance system modeling tools	--	15	--	--	--	15
					2. Continue maintenance of watershedwide riverine water quality models (LSPC) and Milwaukee Harbor estuary/nearshore Lake Michigan hydrodynamic (ECOMSED) and water quality (RCA) models	--	15	--	--	--	15
		Groundwater Management Plan Element	Plan Recommendations Related to Groundwater	Groundwater Recharge Areas	1. Extend groundwater recharge area mapping to those portions of the study area located outside of the Southeastern Wisconsin Region	25	--	--	--	25	--
	Mapping Groundwater Contamination Potential				Mapping Groundwater Contamination Potential	1. Extend mapping of groundwater contamination potential for shallow aquifers to those portions of the study area located outside of the Southeastern Wisconsin Region	25	--	--	--	25
	--	--	--	Totals	\$1,348,562	\$14,897	\$340,712	\$45,746	\$1,689,274 ^b	\$60,643 ^c	

^aSome private-sector costs for rural nonpoint source pollution control measures may be offset by State or Federal grant funds.

^bIncludes \$196,976,000 for implementation of the NR 151 urban standards. Eliminating that amount yields the \$1.492 billion capital cost for new measures recommended under the regional water quality management plan update.

^cIncludes \$32,208,000 for implementation the NR 151 urban standards. Eliminating that amount yields the \$28.4 million annual operation and maintenance cost for new measures recommended under the regional water quality management plan update.

Source: SEWRPC.

county, city, village, and town units of government. Those plans contain elements related to land use; utilities and community facilities; and agricultural, natural, and cultural resources which are also components of the regional water quality management plan update. Thus, there is a relationship between the comprehensive plans and the regional water quality management plan update and the implementation of the plans may be complementary.

The plan report provides detailed information on grant and loan funding programs that may be possible sources of funding for the implementation of specific plan recommendations.

PUBLIC MEETINGS/HEARINGS ON THE RECOMMENDED PLAN

Introduction

Extensive public informational activities were conducted during the regional water quality management plan update process, including:

- Four “Clean Rivers, Clean Lakes” water quality conferences that were conducted in conjunction with MMSD in 2004, 2005, 2006, and 2007, each of which was attended by several hundred people,
- Inclusion of descriptive material and preliminary draft chapters from SEWRPC Planning Report No. 50, *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds*, and its companion report, SEWRPC Technical Report No. 39, *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds*, on the SEWRPC website (www.sewrpc.org), along with contact information to provide comments on the preliminary draft chapters to SEWRPC staff,
- Numerous presentations to the Citizens Advisory Council that was specifically established under the joint SEWRPC regional water quality management plan update and MMSD 2020 facilities planning process,
- Several presentations to local elected officials in the study area,
- Numerous presentations to the MMSD Technical Advisory Team, consisting of engineers and public works directors from the 28 MMSD member or contract communities,
- Detailed review of the plan by the SEWRPC Technical Advisory Committee for the Regional Water Quality Management Plan for the Greater Milwaukee Watersheds,
- Distribution of the notice of public informational meetings and hearings to all chief elected officials and clerks in the nine counties and 88 cities, villages, and towns in the study area; the Wisconsin Farm Bureau Federation office in each county in the study area; the members of the Milwaukee River Basin Partnership and the Root-Pike Watershed Initiative Network; the MMSD Technical Advisory Team; the MMSD/SEWRPC Citizens Advisory Council; and the SEWRPC Technical Advisory Committee and Modeling Subcommittee, and
- Publication of a notice of public informational meetings and hearings in *El Conquistador* (Milwaukee area), *The Reporter* (Fond du Lac), *The Insider News* (Racine area), *the Milwaukee Courier*, *the Milwaukee Journal Sentinel*, *the News Graphic* (Ozaukee County), *The Journal Times* (Racine), *The Sheboygan Press*, *The Freeman* (Waukesha), and *the Daily News* (West Bend).

The following public information meetings/public hearings were conducted within the study area:

- October 15, 2007, at the Gateway Technical College in the City of Racine in Racine County,
- October 16, 2007, at the Milwaukee Downtown Transit Center in the City of Milwaukee in Milwaukee County,
- October 23, 2007, at the Riveredge Nature Center, near the Village of Newburg at the boundary between Ozaukee and Washington Counties.

The purpose of these informational meetings was to: 1) provide a briefing on the preliminary water quality management plan update recommendations; 2) answer any questions that interested citizens and local public officials may have had on the plan; and 3) solicit constructive comments and criticism on the preliminary plan. Each meeting consisted of an open house at which the public had the opportunity to meet with the SEWRPC staff to receive information, ask questions, and provide comment. Each open house was followed by a SEWRPC staff presentation summarizing the planning process and the recommended plan. A copy of this presentation can be viewed on the SEWRPC website at www.sewrpc.org, under “Water Quality Management Plan,” “Plan Chapters,” and “Appendix U.” Each presentation was followed by a public hearing during which public comments were made. Mr. Daniel Schmidt, a SEWRPC Commissioner and Chair of the Technical Advisory Committee on the Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds, presided at each public hearing.

**ADVISORY COMMITTEE ON REGIONAL WATER QUALITY
MANAGEMENT PLAN UPDATE FOR THE GREATER MILWAUKEE WATERSHEDS**

Daniel S. Schmidt, Chairman	SEWRPC Commissioner
Michael G. Hahn, Secretary	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission
Julie A. Anderson	Director, Racine County Division of Planning and Development
Michael J. Ballweg	Crops and Soils Agent, University of Wisconsin-Extension, Sheboygan County
John R. Behrens	Commissioner-Secretary, Silver Lake Protection and Rehabilitation District
John M. Bennett	City Engineer, City of Franklin
Thomas J. Bunker	Representative, City of Racine Water and Wastewater Utility
Lisa Conley	Representative, Town and Country Resource Conservation and Development, Inc.
Joyce A. Fiacco	Director, Dodge County Land Resources and Parks Department
Shawn Graff	Executive Director, The Ozaukee Washington Land Trust, Inc.
Andrew A. Holschbach	Director, Ozaukee County Planning, Resources, and Land Management Department
William J. Hoppe	City Engineer, City of Mequon
William A. Kappel	Director of Public Works, City of Wauwatosa
Steve Keith	Acting Director of Environmental Services, Milwaukee County
Kristine M. Krause	Vice-President, Environmental Department, We Energies
James F. Lubner	Sea Grant Advisory Services Specialist, University of Wisconsin Sea Grant Institute
Jeffrey J. Mantes	Commissioner of Public Works, City of Milwaukee
Lynn Mathias	County Land Conservationist, Fond du Lac County
James L. McNelly	Regional Water Leader, Wisconsin Department of Natural Resources
Charles S. Melching	Associate Professor, Civil & Environmental Engineering, Marquette University
Matthew Moroney	Executive Director, Metropolitan Builders Association of Greater Milwaukee
Paul E. Mueller	Administrator, Washington County Planning and Parks Department
Patrick A. Murphy	State Resource Conservationist, Natural Resources Conservation Service
Cheryl Nenn	Riverkeeper/Project Director, Friends of Milwaukee's Rivers
Jeffrey S. Nettesheim	Director of Utilities, Village of Menomonee Falls
Judith A. Neu	City Engineer, City of West Bend
Charles A. Peters	Director, Wisconsin Water Science Center, U.S. Geological Survey
Kevin L. Shafer	Executive Director, Milwaukee Metropolitan Sewerage District
Dale R. Shaver	Director, Waukesha County Parks and Land Use Department
Peter G. Swenson	Branch Chief, NPDES Programs Branch, U.S. Environmental Protection Agency
Sam Tobias	Director of Planning and Parks, Fond du Lac County
Shawn L. Wesener	Assistant Planning Director, Planning and Resources Department, Sheboygan County
Thomas A. Wiza	Director of Engineering and Public Works, City of Cedarburg

CONTACT INFORMATION

Further information on the regional water quality management plan update for the greater Milwaukee watersheds, including Advisory Committee meeting minutes and plan chapters are available on the Commission's website.

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