

REGIONAL WATER SUPPLY PLAN FOR SOUTHEASTERN WISCONSIN



NEWSLETTER 4

JANUARY 2011

On December 1, 2010, the Southeastern Wisconsin Regional Planning Commission adopted a regional water supply plan for the Southeastern Wisconsin Region. This plan has a design year of 2035 and represents a new major element of the evolving comprehensive plan for the Southeastern Wisconsin Region.

The preparation of the regional water supply plan represents the third, and final, element of a Commission water supply planning program. The first element consisted of basic groundwater resource inventories, and the second consisted of the development of a groundwater simulation model for the Region.

The report documenting the new plan element is being provided to all water utilities; county, city, village, and town, and special-purpose units of government; and State and Federal agencies that are identified in the plan as management agencies with plan implementation responsibilities. Those entities are also asked to adopt or endorse the plan.

This newsletter is the fourth in a series of newsletters reporting progress in the regional water supply planning program. The first newsletter provided an overview of the scope and objectives of the planning program, the planning area, and of the water supply development and management objectives and their attendant standards formulated to guide the design and evaluation of alternative and recommended water supply plans. That newsletter also presented data on trends in regional water use and sources of water supply. The second newsletter provided regional economic, demographic, and water use forecasts; described existing and planned land use development to the year 2035; presented the findings and conclusions of an evaluation of potential effectiveness of conservation measures and a study of water supply law; and described the conceptual water supply plan alternatives initially proposed for consideration and evaluation. The third newsletter presented a description of the initial water supply plan alternatives developed for consideration and evaluation, the findings and conclusions of a comparative evaluation of these alternatives with respect to the water supply development and management objectives, a description of a preliminary recommended plan incorporating the best components of the initial water supply plan alternatives, and information regarding opportunities to provide comments on the preliminary recommended plan.

This newsletter presents:

- A brief description of the organizational structure of the water supply planning effort,
- A summary of the factors considered in the development of the adopted regional water supply plan, and
- A description of the adopted regional water supply plan,

ORGANIZATION STRUCTURE FOR THE PLANNING EFFORT

The work leading to the preparation of the regional water supply plan was carried out under the guidance of the SEWRPC Water Supply Planning Advisory Committee. Membership on the Advisory Committee included representatives of the constituent counties and municipalities; of concerned State and Federal agencies; of the academic, agricultural, and environmental communities; and of concerned businesses and industries. A list of the membership of the Advisory Committee is provided on page 2. The Advisory Committee guided the planning process, and carefully reviewed and approved the recommended plan, the planning report documenting the plan, and the related technical reports.

Technical staffing for the regional water supply plan preparation was carried out under a cooperative arrangement involving the Commission staff; a consulting engineering firm; a consulting law firm; and the hydrogeology staffs of the Wisconsin Geological and Natural History Survey, the U.S. Geological Survey, and the University of Wisconsin-Milwaukee. The Commission served as the lead agency in the planning effort.

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Daniel S. Winkler	Director of Public Works and Utilities, City of Lake Geneva
Steve Yttri	General Manager, Water and Sewer Utility, City of Oak Creek

During the course of the study, the Commission staff worked with a number of interests through individual and group meetings, providing information about, and obtaining input on, the plan and the planning process. This effort included over 150 presentations to elected officials and interested business, civic, and environmental groups and organizations from within the Region. Also during the course of the study, newsletters were provided on a work progress basis to a wide audience including elected officials, technical and appointed planning and engineering officials, interested citizen groups, business and industry groups, print and broadcast media, and citizens who had in the past, or during the conduct of the planning effort, indicated an interest in the issues concerned. A series of nine public informational meetings were held to present the preliminary recommended water supply plan for public review and comment. In addition to these nine public informational meetings, two sessions of the “Water-Wise Conference” held in the City of Waukesha on March 7, 2009 were devoted to obtaining public reaction to the proposed plan.

At the request of the Commission's Environmental Justice Task Force, the Center for Economic Development of the University of Wisconsin-Milwaukee conducted a study of the potential socio-economic impacts of the recommended plan.

The Commission also maintained a website which included materials prepared under the water supply planning effort, including drafts of the planning documents and newsletters, and which provided opportunity to offer comments on the planning effort.

FACTORS CONSIDERED IN THE DEVELOPMENT OF THE RECOMMENDED REGIONAL WATER SUPPLY PLAN

A number of potential plan components were considered and evaluated under the water supply study. These potential components included:

- Several levels of water conservation,
- Groundwater recharge area protection,
- Enhanced recharge of the shallow aquifer through stormwater management,
- Enhanced recharge of the shallow aquifer by infiltration of highly treated wastewater treatment plant effluent,
- Enhanced recharge of the shallow aquifer through construction of rainfall infiltration systems,
- Recharge of the deep aquifer by injection of treated Lake Michigan surface water,
- Extension of Lake Michigan water supply to selected communities east of the subcontinental divide,
- Extension of Lake Michigan water supply to selected communities straddling the subcontinental divide that currently have return flow to Lake Michigan in place,
- Extension of Lake Michigan water supply to selected communities west of the subcontinental divide with provision of return flow to Lake Michigan,
- Provision of Lake Michigan water supply via various sources, including surface water treatment plants located in Kenosha, Milwaukee, Oak Creek, Port Washington, Racine, and a new surface water treatment plant, to serve the Cedarburg-Grafton area of Ozaukee County,
- Continued reliance on the deep aquifer with treatment,
- Continued and expanded reliance on the shallow aquifer, and
- Reliance on a combination of treated deep aquifer water and shallow aquifer water.

The alternatives developed as part of the water supply planning effort included various combinations of these potential components. A comparative evaluation of these alternatives led to the design of a preliminary recommended plan as described in Water Supply Newsletter 3.

RECOMMENDED REGIONAL WATER SUPPLY PLAN

The recommended regional water supply plan incorporates the best of the alternative means identified in meeting the water supply development and management objectives developed by the Advisory Committee, including consideration of costs and environmental impacts. These objectives are listed on page 15. The recommended plan also reflects the substantial comments received during the extensive public hearings conducted as a part of the planning program.

The regional water supply plan includes recommendations concerning: 1) sources of water supply, 2) water conservation, 3) groundwater recharge area protection, 4) stormwater management practices, 5) high capacity well siting practices, and 6) enhanced rainfall infiltration. In addition, the plan includes a series of auxiliary recommendations. These recommendations, taken together, are intended to serve as the basis for the provision of a long-term, sustainable water supply for the Southeastern Wisconsin Region.

Land Use Basis for the Regional Water Supply Plan

The adopted design year 2035 regional land use plan served as the basis for the preparation of the regional water supply plan. The regional land use plan seeks to encourage infill development and redevelopment in existing urban centers, and the location of new urban development adjacent to and outward from existing urban centers in areas which can be readily served by sanitary sewerage, public water supply systems, and mass transit facilities. The plan seeks to preserve the environmental corridors and isolated natural areas within the Region in essentially natural open uses, and to preserve the best remaining agricultural areas of the Region in agricultural uses.

It should be noted that, in response to State legislation, six of the seven counties comprising the Region have recently adopted comprehensive, “smart growth,” plans which must contain a water supply element. The land use elements of the adopted smart growth plans are generally in conformance with the adopted regional land use plan, the exceptions largely being associated with some rural communities not preserving prime agricultural land as recommended in the regional plan, and proposing some areas of very low-density urban development; and with some urban communities which envision more substantial growth by the plan year 2035 than does the regional plan. By State law, adoption of the smart growth plans must be by ordinance, and the exercise of certain plan implementation powers, such as zoning and land subdivision control, must be in conformance with the adopted plans.

Plan Recommendations Related to Sources of Water Supply

The regional water supply plan identifies 81 areas that by the plan design year are recommended to be served by public water utilities. These areas are shown on Map 1. The new facilities required to serve these areas are shown on Map 2.

As listed in Table 1, these areas include 60 utilities, or portions of utilities, that have been determined to have adequate existing sources of water supply. These utilities are recommended to continue to use their existing sources of supply, with expansion of infrastructure, as needed, to serve the forecast demand in their existing and proposed plan design year 2035 service areas. Among these 60 utilities are 27 that rely on Lake Michigan as a source of supply, and 33 that rely on groundwater as a source of supply.

The plan recommends that four utilities—the City of Delavan Water and Sewage Utility, the City of Elkhorn Water Utility, the Village of Union Grove Water Utility, and the Village of Bristol Utility District No. 1—over time increase their reliance on the shallow aquifer and decrease their reliance on the deep aquifer as sources of supply. In addition, the plan recognizes that the City of Hartford completed a new shallow aquifer well and abandoned its one existing deep aquifer well in 2010, resulting in complete reliance upon the shallow aquifer.

There are four utilities—the western portion of the City of Brookfield Water Utility, the City of Pewaukee Water Utility, the Village of Pewaukee Water Utility, and the Village of Sussex Water Utility—for which the plan recommends increased reliance on the shallow aquifer as a source of supply and treatment of the existing deep aquifer source of supply.

The plan recommends that eight utilities which currently utilize groundwater as the source of supply, and have return flow to Lake Michigan in place, convert to Lake Michigan as a source of supply. Six of the service areas concerned—the eastern portion of the City of Brookfield Water Utility, the City of Cedarburg Light & Water Commission, the Village of Germantown Water Utility, the Village of Grafton Water and Wastewater Commission, the Village of Saukville Municipal Water Utility, and the Town of Yorkville Utility District No. 1—are located east of the subcontinental divide which traverses the Region. While the other two service areas—the central portion of the City of New Berlin Water Utility service area and the City of Muskego Public Water Utility—serve communities that straddle the subcontinental divide, they are located within the Milwaukee Metropolitan Sewerage District service area and have provisions for return flow in place. With regard to the City of Muskego Public Water Utility, the regional water supply plan recognizes that more-detailed engineering, legal, and environmental information will be required to support any application for Lake Michigan water supply and to meet the requirements of the Great Lakes-St. Lawrence River Basin Water Resources Compact and 2007 Wisconsin Act 227.

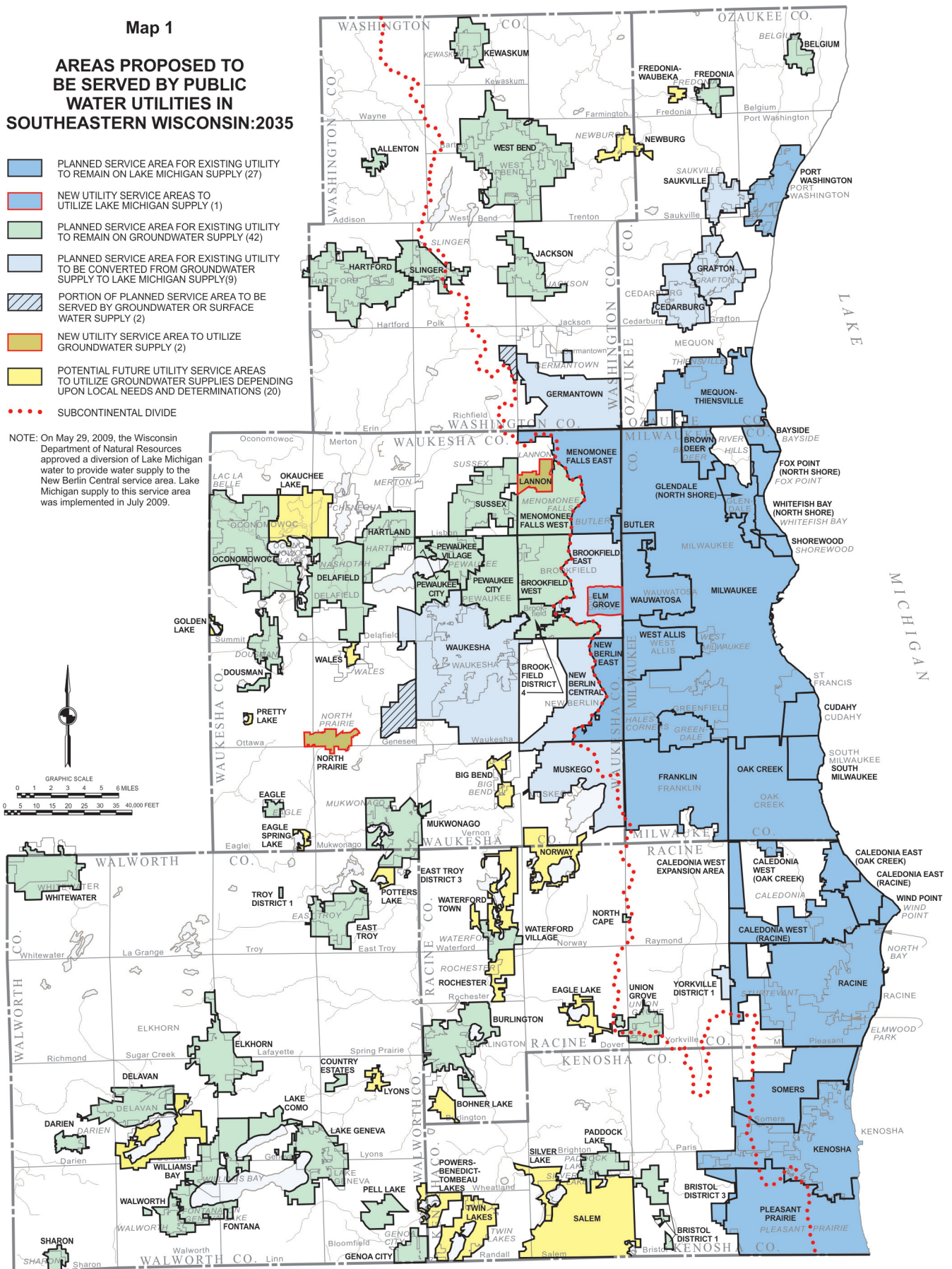
For the City of Waukesha Water Utility, the plan recommends the conversion to Lake Michigan as the source of water supply with the provision of return flow to Lake Michigan. Return flow could be provided by returning treated wastewater either directly by pipeline to Lake Michigan, or to streams tributary to Lake Michigan. Potential return flow options are shown on Map 3. The City of Waukesha would continue to operate its existing wastewater treatment plant which discharges to the Fox River. The plant would provide treated wastewater for the required return flow. Moreover, the continued operation of the plant would permit the quantities of return flow to be managed, so that the addition of return flow to the streams concerned under flood flow conditions could be avoided by temporary discharge of the treated return flow to the Fox River. With regard to this recommendation, the regional water supply plan recognizes that more-detailed engineering, legal, and environmental information will be required to support any application for Lake Michigan water supply and to meet the requirements of the Great Lakes-St. Lawrence River Basin Water Resources Compact and 2007 Wisconsin Act 227. Such information should be assembled under the necessary facilities planning and preliminary engineering required for plan implementation. The more-detailed environmental analyses related to the return flow option should include assessment of potential impacts on floodlands, water quality, stream channel erosion, and stream habitat. The environmental analysis process as set forth in Chapter NR 150 of the *Wisconsin Administrative Code* will have to be followed as deemed appropriate by the Wisconsin Department of Natural Resources (WDNR). This process is designed to ensure proper environmental analysis of specific projects and may include preparation of a full environmental impact statement. Because of the need for further assessment, no

Map 1

AREAS PROPOSED TO BE SERVED BY PUBLIC WATER UTILITIES IN SOUTHEASTERN WISCONSIN:2035

- PLANNED SERVICE AREA FOR EXISTING UTILITY TO REMAIN ON LAKE MICHIGAN SUPPLY (27)
- NEW UTILITY SERVICE AREAS TO UTILIZE LAKE MICHIGAN SUPPLY (1)
- PLANNED SERVICE AREA FOR EXISTING UTILITY TO REMAIN ON GROUNDWATER SUPPLY (42)
- PLANNED SERVICE AREA FOR EXISTING UTILITY TO BE CONVERTED FROM GROUNDWATER SUPPLY TO LAKE MICHIGAN SUPPLY(9)
- PORTION OF PLANNED SERVICE AREA TO BE SERVED BY GROUNDWATER OR SURFACE WATER SUPPLY (2)
- NEW UTILITY SERVICE AREA TO UTILIZE GROUNDWATER SUPPLY (2)
- POTENTIAL FUTURE UTILITY SERVICE AREAS TO UTILIZE GROUNDWATER SUPPLIES DEPENDING UPON LOCAL NEEDS AND DETERMINATIONS (20)
- SUBCONTINENTAL DIVIDE

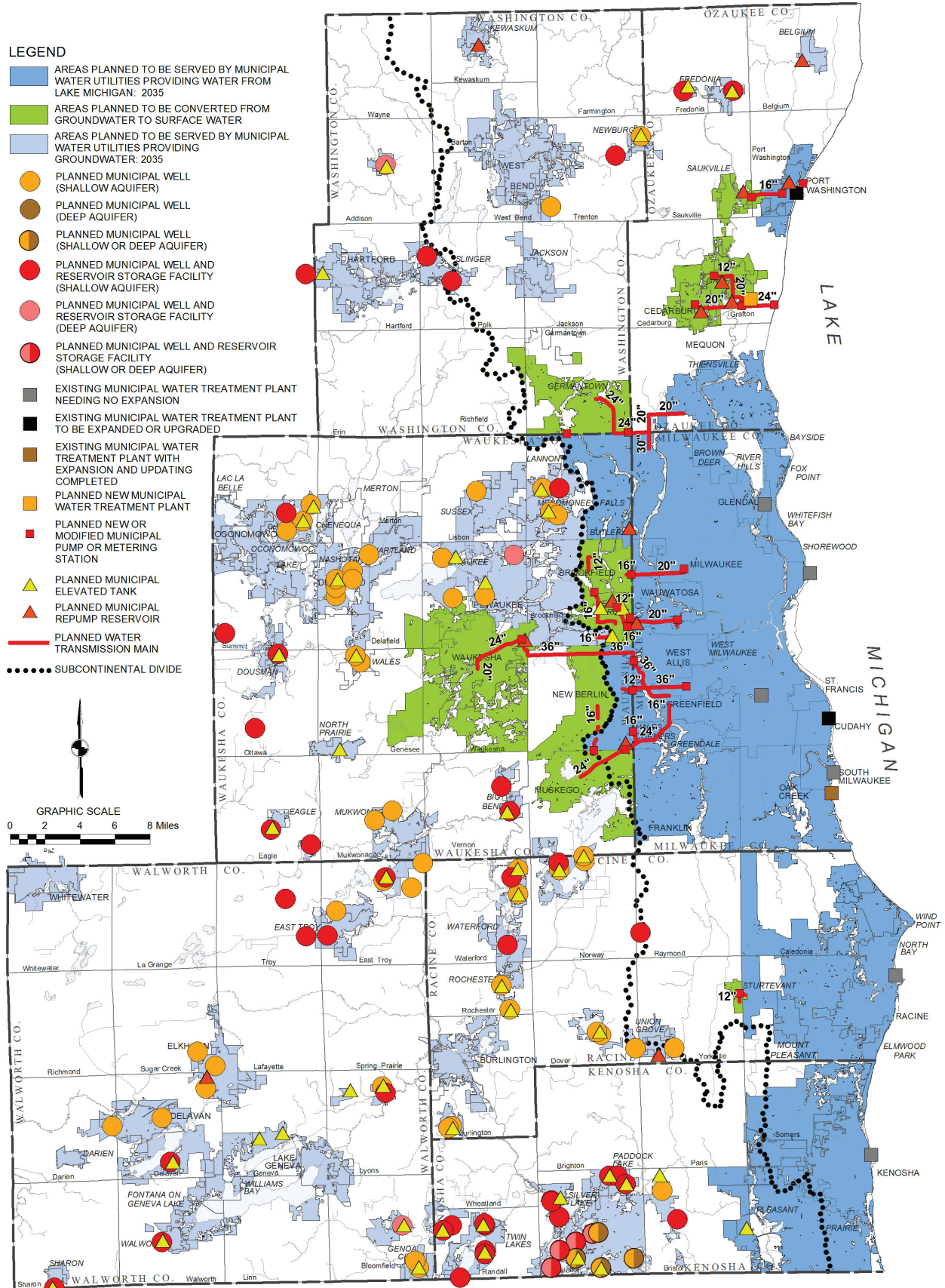
NOTE: On May 29, 2009, the Wisconsin Department of Natural Resources approved a diversion of Lake Michigan water to provide water supply to the New Berlin Central service area. Lake Michigan supply to this service area was implemented in July 2009.



Source: SEWRPC.

Map 2

RECOMMENDED REGIONAL WATER SUPPLY PLAN FACILITIES: 2035



NOTES: The City of Oak Creek Sewer and Water Utility completed expansion and upgrading of its water treatment plant in 2010.
The City of Hartford completed the recommended new well and storage tank in 2010.
This map does not indicate the return flow options of the recommended plan. See Map 132 for these return flow options.

Source: Ruekert & Mielke, Inc. and SEWRPC.

Table 1

**UTILITIES CONSIDERED TO HAVE ADEQUATE SOURCES OF WATER SUPPLY
UNDER THE RECOMMENDED REGIONAL WATER SUPPLY PLAN**

County and Utility	Source of Supply	County and Utility	Source of Supply
Kenosha County		Walworth County	
City of Kenosha Water Utility	Lake Michigan self-supplied	City of Lake Geneva Municipal Water Utility	Groundwater shallow
Village of Paddock Lake Municipal Water Utility	Groundwater shallow aquifer	City of Whitewater Municipal Water Utility	Groundwater deep aquifer
Village of Pleasant Prairie Water Utility	Lake Michigan purchased supply	Village of Darien Water Works and Sewer System	Groundwater deep and shallow aquifers
Town of Bristol Utility District No. 3	Lake Michigan purchased supply	Village of East Troy Municipal Water Utility	Groundwater deep and shallow aquifers
Town of Somers Water Utility	Lake Michigan purchased supply	Village of Fontana Municipal Water Utility	Groundwater deep and shallow aquifers
Milwaukee County		Village of Genoa City Municipal Water Utility	Groundwater deep and shallow aquifers
City of Cudahy Water Utility	Lake Michigan self-supplied	Village of Sharon Waterworks and Sewer System	Groundwater deep and shallow aquifers
City of Franklin Water Utility	Lake Michigan purchased supply	Village of Walworth Municipal Water and Sewer Utility	Groundwater shallow aquifer
City of Glendale Water Utility	Lake Michigan purchased supply	Village of Williams Bay Municipal Water Utility	Groundwater deep and shallow aquifers
City of Milwaukee Water Utility	Lake Michigan self-supplied	Country Estates Sanitary District	Groundwater deep aquifer
City of Oak Creek Water and Sewer Utility	Lake Michigan self-supplied	Town of Bloomfield Pell Lake Sanitary District No. 1	Groundwater deep aquifer
City of South Milwaukee Water Utility	Lake Michigan self-supplied	Town of East Troy Sanitary District No. 3	Groundwater deep and shallow aquifers
City of Wauwatosa Water Utility	Lake Michigan purchased supply	Town of Geneva Lake Como Sanitary District No. 1	Groundwater deep aquifer
City of West Allis Water Utility	Lake Michigan purchased supply	Town of Troy Sanitary District No. 1	Groundwater shallow aquifer
Village of Brown Deer Public Water Utility	Lake Michigan purchased supply	Washington County	
Village of Fox Point Water Utility	Lake Michigan purchased supply	City of West Bend Water Utility	Groundwater shallow aquifer
Village of Greendale Water Utility	Lake Michigan purchased supply	Village of Jackson Water Utility	Groundwater shallow aquifer
Village of Shorewood Municipal Water Utility	Lake Michigan purchased supply	Village of Kewaskum Municipal Water Utility	Groundwater shallow aquifer
Village of Whitefish Bay Water Utility	Lake Michigan purchased supply	Village of Slinger Utilities	Groundwater shallow aquifer
We Energies-Water Services	Lake Michigan purchased supply	Allenton Sanitary District No. 1	Groundwater deep aquifer
Ozaukee County		Waukesha County	
City of Port Washington	Lake Michigan self-supplied	City of Delafield Municipal Water Utility	Groundwater deep and shallow aquifers
Village of Belgium Municipal Water Utility	Groundwater shallow aquifer	City of New Berlin Water Utility (east)	Lake Michigan purchased supply
Village of Fredonia Municipal Water Utility	Groundwater shallow aquifer	City of Oconomowoc Utilities	Groundwater deep and shallow aquifers
We Energies-Water Services	Lake Michigan purchased supply	Village of Butler Public Water Utility	Lake Michigan purchased supply
Racine County		Village of Dousman Water Utility	Groundwater deep and shallow aquifers
City of Burlington Municipal Waterworks	Groundwater deep aquifer	Village Eagle Municipal Water Utility	Groundwater shallow aquifer
City of Racine Water and Wastewater Utility ^a	Lake Michigan self-supplied	Village of Hartland Municipal Water Utility	Groundwater shallow aquifer
Village of Caledonia West Utility District ^b Oak Creek	Lake Michigan purchased supply	Village of Menomonee Falls Water Utility (east)	Lake Michigan purchased supply
Village of Caledonia West Utility District ^b Racine	Lake Michigan purchased supply	Village of Menomonee Falls Water Utility (west)	Groundwater shallow aquifer
Village of Caledonia East Utility District ^c Oak Creek	Lake Michigan purchased supply	Village of Mukwonago Municipal Water Utility	Groundwater deep and shallow aquifers
Village of Caledonia East Utility District ^c Racine	Lake Michigan purchased supply	Town of Brookfield Sanitary District No. 4	Groundwater shallow aquifer
Village of Waterford Water and Sewer Utility	Groundwater deep and shallow aquifers		
Village of Wind Point Municipal Water Utility	Lake Michigan purchased supply		
North Cape Sanitary District	Groundwater shallow aquifer		

^aIncludes the Village of Sturtevant Water Utility which was purchased by the City of Racine Water and Wastewater Utility in 2007 and is now served by the City Utility on a retail basis.

^bIncludes the former Caddy Vista Sanitary District and the former Caledonia Sanitary District No. 1 which were consolidated in 2007 to form the Caledonia West Utility District.

^cIncludes the former Crestview Sanitary District and the former North Park Sanitary Districts which were consolidated in 2007 to form the Caledonia East Utility District.

Source: SEWRPC.

final recommendations relating to specific return flow component is included in the recommended plan. Rather, the selection of the best return flow option is left open until completion of the required more-detailed assessments. For the purposes of developing the cost of the regional water supply plan, a range of costs was used to represent the potential costs of the return flow options.

The potential impacts of a City of Waukesha Water Utility return flow component upon Underwood Creek, the Menomonee River, and the Root River, should the return flow be discharged to those streams for conveyance to Lake Michigan, was an issue raised and commented upon in the public review of the preliminary recommended water supply plan. The WDNR has concluded that an environmental impact statement would have to be prepared to evaluate the return flow options, should the City decide to proceed. The preparation of an environmental impact statement is intended to ensure that the environmental impacts of the return flow options are identified and considered during the project development and review phases. With regard to the return flow component associated with the City of Waukesha Water Utility conversion to a Lake Michigan supply, the plan recommends that an oversight committee be formed by the WDNR to provide guidance in the planning, operation, and monitoring of the return flow. The committee would be comprised of representatives of the agencies and units of government most directly affected, including the WDNR, Milwaukee County, Racine County, Waukesha County, the Milwaukee Metropolitan Sewerage District, the City of Waukesha Water Utility, SEWRPC, and the local units of government, including the City of Milwaukee, within which the affected streams are located, with the final composition of the committee depending upon the return flow option involved.

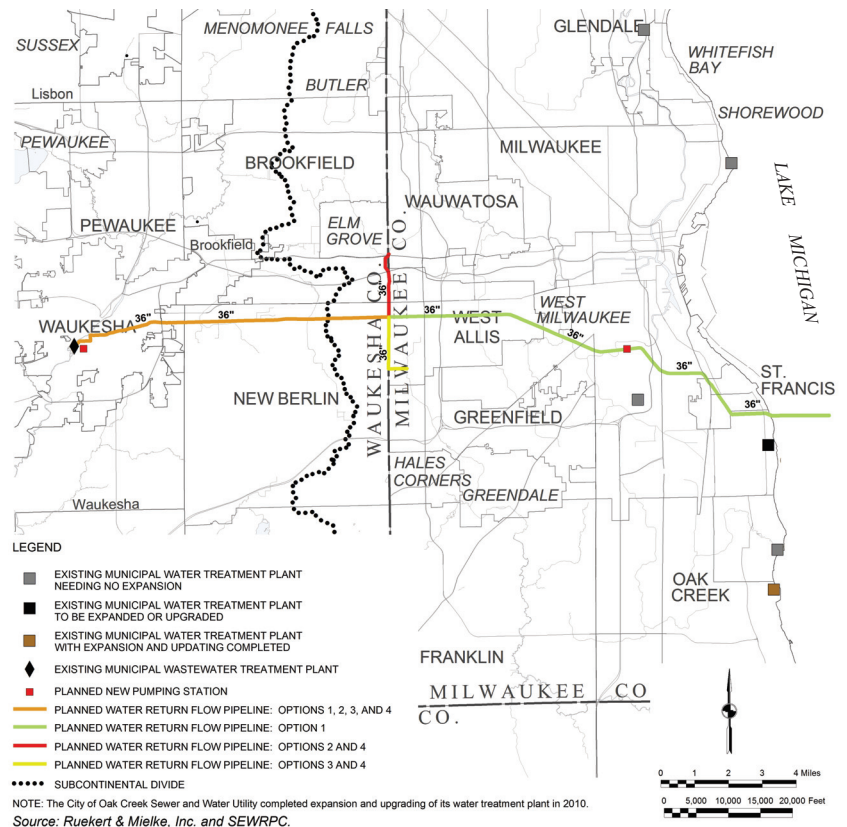
In addition to the required preparation of an environmental impact statement, other steps in the plan implementation process would assist in ensuring the environmental soundness of the return flow option selected. These steps include: the WDNR permitting process and related review of any return flow proposal for conformance with the regional water quality management plan by SEWRPC as well as by the WDNR itself; required County and municipal permitting for construction of facilities in public rights-of-way; and the negotiations involved in the attainment of an intergovernmental agreement between a Lake Michigan water supplier and the purchaser of that water.

With regard to the WDNR permitting process, it is particularly important to note that the permitting of a new discharge for the return flow will require a finding of conformance with the regional water quality management plan. Such a finding would require the preparation by the SEWRPC and the approval of the WDNR of an amendment to the regional water quality management plan. Such preparation and approval would include the collegial involvement of the affected county and municipal units of government, the conduct of public informational meetings and hearings, and detailed consideration of the potential technical, financial and environmental impacts associated with the proposed action. Such collegial involvement in the review process would assure careful consideration of county and municipal interests and concerns. The plan recommends that the concurrence of the counties and municipal units of government directly affected be obtained for any proposed return flow system. Accordingly, it may be concluded that adequate means are available to ensure a thorough review of any return flow proposals and to ensure that a sound decision is reached regarding such proposals.

The plan recommends the development of a new water utility to serve the Village of Elm Grove. It is recommended that this utility utilize a Lake Michigan water supply.

For several of the utilities recommended for conversion to a Lake Michigan water supply, the regional water supply plan identifies and recognizes multiple viable options available for providing the service areas concerned with a Lake Michigan water supply. These options generally involve the availability of more than one potential supplier or means of connection to a potential supplier.

Map 3
RETURN FLOW OPTIONS FOR THE RECOMMENDED WATER SUPPLY PLAN: RETURN FLOW PIPELINES TO LAKE MICHIGAN, THE ROOT RIVER, AND UNDERWOOD CREEK



The plan recommends that the existing Prairie Village Water Trust serving the Village of North Prairie be converted to a municipal water utility and serve the North Prairie water supply service area using groundwater supplies.

The Village of Lannon proposed water utility is recommended to be served by groundwater supplies.

There are 20 areas of existing urban-density development that are currently served by private, onsite wells, which are considered as potential areas for service by municipal groundwater supplies, either through the creation of new utilities which would be served by extension of service from existing utilities or, in some cases, by the creation of new utilities, with separate sources of supply. These areas are shown on Map 1. The development of municipal water supply systems in the areas concerned is envisioned only if a local demonstrated need were to arise based upon groundwater quality or quantity issues, and if a local initiative was then undertaken to implement a municipal system. In the absence of such a need and initiative, the residents and businesses in these areas would be expected to continue to rely on private wells. If conversion to a public supply takes place in accordance with local actions, it is recommended that, to the extent practicable, the areas be served by the extension of service by existing utilities. The Public Service Commission of Wisconsin has found that such extensions offer economies of scale and are often more favorable to rate payers.

The plan recommends that the existing, self-supplied water systems serving residential communities and most of the self-supplied systems serving commercial, institutional, and recreational land uses located within planned municipal water supply service areas connect to municipal systems by the plan design year of 2035. The plan recommends continued use of private domestic wells in areas beyond the planned water supply service areas.

Plan Recommendations Related to Water Conservation Programs

The plan recommends implementation of comprehensive water conservation programs, including both supply side efficiency measures and demand side conservation measures. The scope and content of these conservation programs are to be determined on a utility-specific basis to reflect the type and sustainability of the source of supply and the probable future water supply infrastructure requirements.

The levels of water conservation recommended to be applied were established using the following guidelines:

Base-Level Program. This basic program is proposed to be applied to the following utility categories:

- Utilities currently utilizing Lake Michigan as a source of supply and needing no major infrastructure development to meet current and future needs; and
- Utilities currently utilizing Lake Michigan as a source of supply and needing no major infrastructure development to meet current and near-term future needs, but which may be expected to require major infrastructure development to meet long-term future needs associated with new urban development in the service areas covered.

Intermediate-Level Program. This program is proposed to be applied to the following utility categories:

- Utilities to be converted to a Lake Michigan supply with an existing return flow and requiring significant additional infrastructure development for the new supply connection; and
- Utilities continuing to utilize groundwater as a source of supply with no or modest infrastructure needs and no outstanding significant groundwater quality issues requiring resolution.

Advanced-Level Program. This level program was proposed to be applied to the following utility categories:

- Utilities to be converted to a Lake Michigan supply with a need for the development of a return flow system, as well as major supply infrastructure development, thus, entailing significant additional infrastructure development cost; and
- Utilities utilizing groundwater as a source of supply with major infrastructure needs and/or outstanding significant water quality issues requiring resolution or with associated special environmentally sensitive surface water protection considerations.

The base-level program was proposed to provide a reduction of about 4 percent in average daily demand and a reduction of about 6 to 10 percent in maximum daily demand; the intermediate-level program a reduction of about 6 to 8 percent in average daily demand and a reduction of about 12 to 16 percent in maximum daily demand; and the advanced-level program which would provide a reduction of about 10 percent in average daily demand and a reduction of about 18 percent in maximum daily

demand. In addition, an optional higher level water conservation program could be considered by local utilities or individual water users. Such a program would provide a reduction of about 25 to 35 percent in average daily demand and a reduction of about 30 to 50 percent in maximum daily demand.

Recommended levels of water conservation for individual utilities are summarized on Map 4. The recommended water conservation measures are primarily intended to apply to municipal water utilities; however, the plan envisions that the base-level water conservation measures would also apply to private individual, self-supplied systems. Areas of existing development served by private individual wells are recommended to utilize a base level of water conservation. An advanced level of water conservation is envisioned to be used in those areas if and when they are converted to municipal service based upon local needs and initiatives. This recommendation is made in recognition of the potential value of conservation measures in reducing infrastructure costs associated with the development of new water supply systems. The recommended water conservation measures together are expected to reduce the plan design year 2035 water demand in the Region by about 6.0 million gallons per day on an average daily demand basis, and by about 15 million gallons per day on a maximum daily basis. It should also be noted that as of January 1, 2011, WDNR has promulgated rules and guidelines related to water conservation pursuant to the requirements of the State's groundwater protection legislation and Great Lakes-St. Lawrence River Basin Water Resources Compact.

Plan Recommendations Related to Groundwater Recharge Area Protection

The plan recommends the protection and preservation of groundwater recharge areas classified as having a high or very high recharge potential, as shown on Map 5. Such protection may be largely achieved through the implementation of the adopted design year 2035 regional land use plan and supporting county comprehensive plans, since these plans recommend preservation of the environmental corridors, natural areas, prime and other agricultural areas of the Region that facilitate recharge. Depending on the zoning and development practices utilized, additional highly rated and very highly rated recharge areas may also be substantially protected in suburban-density and low-density residential areas. In these areas, it is recommended that careful site design and the use of stormwater management practices designed to maintain the natural hydrology and maintain recharge be applied. This would increase the level of protection for the important recharge areas. It is also recommended that the recharge areas be considered for protection and preservation by agencies and organizations involved in land conservancy activities.

Plan Recommendations Related to Stormwater Management, High-Capacity Well Siting Practices, and Rainfall Infiltration

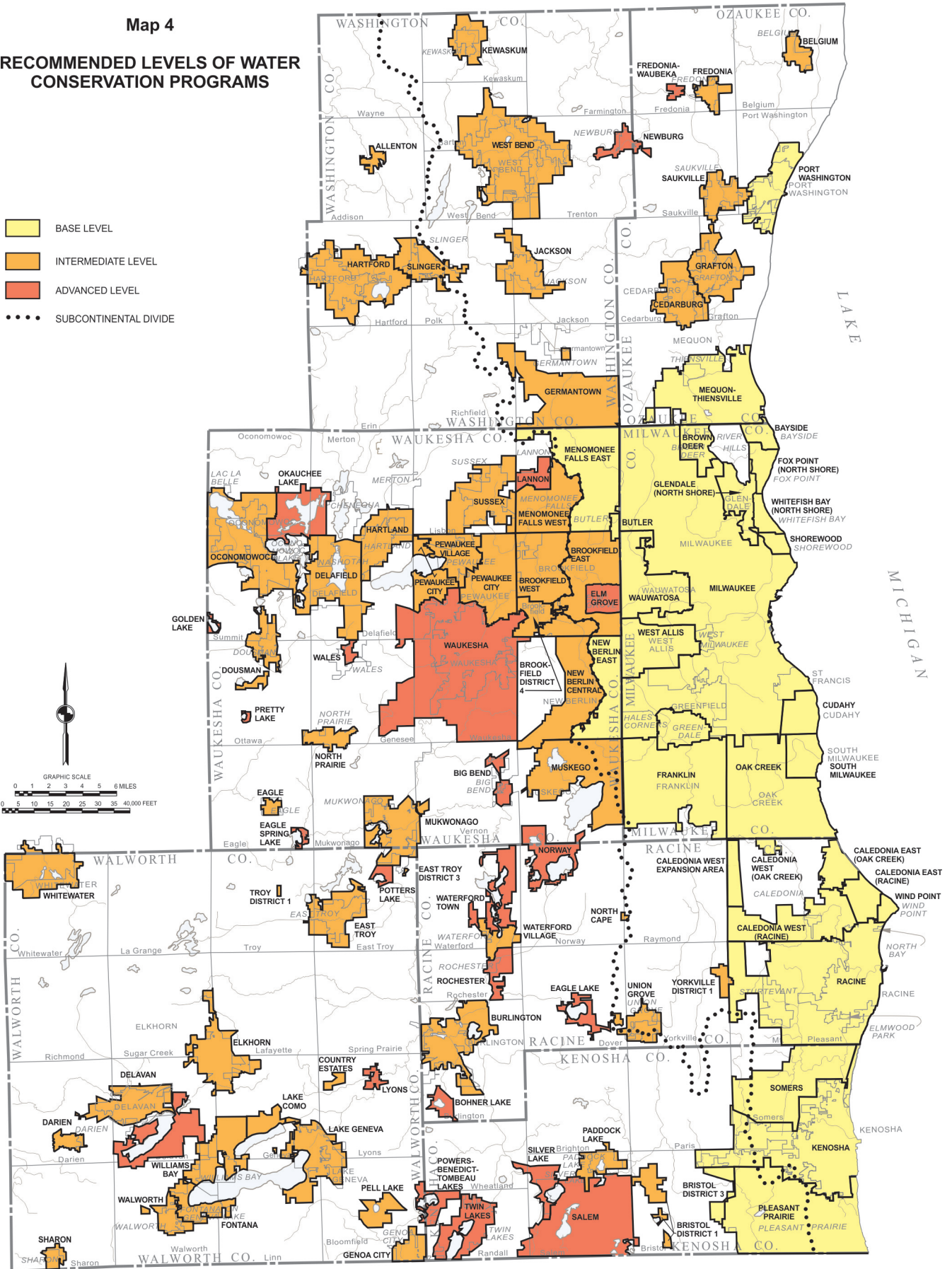
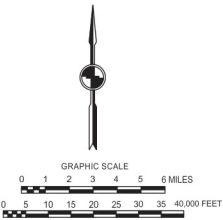
The plan recommends implementation of state-of-the-art stormwater management practices, including application of treatment and infiltration systems, which, to the extent practicable, would maintain the natural recharge of areas committed to urban land use development. This component is intended to apply to residential and nonresidential developments served by both municipal and private water supply systems in order to contribute to a sustainable groundwater supply, as well as for related stormwater management purposes. Such practices are considered important, even in areas served by individual wells and onsite sewage disposal systems where the majority of the water used is returned to the aquifer. Such areas do experience some losses in water used and stormwater infiltration practices can contribute to broader aquifer recharge objectives. This recommendation may be expected to be largely implemented through the provisions of Chapter NR 151 of the *Wisconsin Administrative Code*, and through county and municipal stormwater management ordinances adopted in accordance with Chapter 216 of the *Wisconsin Administrative Code*. In particular, the application of practices in accordance with the WDNR stormwater management technical standards is recommended. Consideration of the application of conservation subdivision design to enhance infiltration is also recommended, particularly in areas where groundwater analyses associated with well siting identifies potential negative impacts on surface waters as a result of potential well siting.

The plan recommends that studies related to the siting of all new high-capacity wells include analyses of potential impacts, and subsequent monitoring of the actual impacts, of such wells on the shallow aquifer, existing wells, and surface waters. The siting studies should be designed to develop the necessary understanding of the hydrogeological system associated with each candidate site and to assess the likelihood of impacts of proposed wells upon nearby existing wells and surface waterbodies. The studies should include identification of significant potential negative impacts, needed mitigative actions, or site location revisions. Water levels in the vicinity of new high-capacity wells in the shallow aquifer should be monitored before and after wells are constructed and placed into operation to establish a baseline, including levels expected to be maintained in private wells and to develop performance and impact data during the test well phase of well development and during the subsequent operation of the well over time.

Map 4

RECOMMENDED LEVELS OF WATER CONSERVATION PROGRAMS

- BASE LEVEL
- INTERMEDIATE LEVEL
- ADVANCED LEVEL
- SUBCONTINENTAL DIVIDE



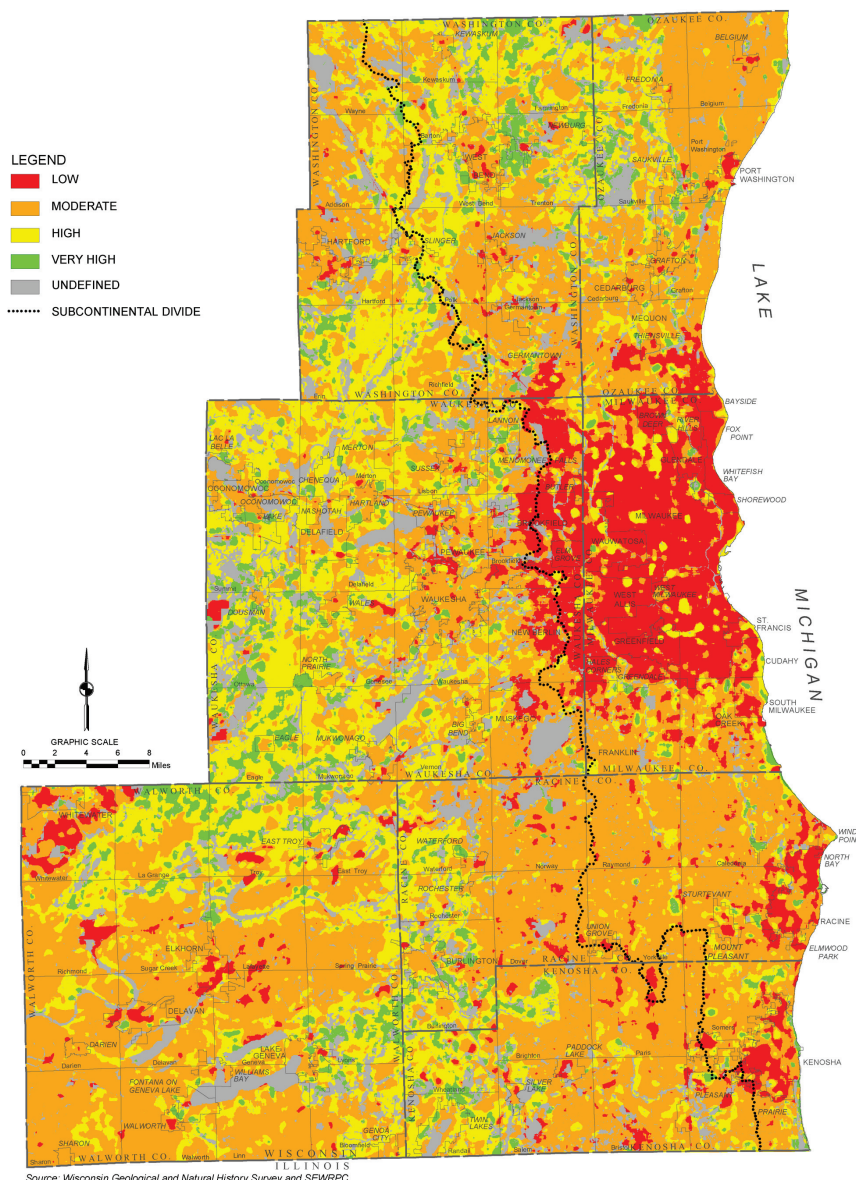
Source: SEWRPC.

The plan recommends enhanced rainfall infiltration in areas where evaluations conducted in conjunction with the siting of high-capacity wells in the shallow aquifer indicate probable reductions in baseflow on nearby streams and in water levels in lakes and wetlands due to installation and operations of these wells. Two means of providing for the enhanced recharge are recommended. One means of providing this infiltration is through the installation of constructed rainfall infiltration systems. Installation of these systems is deemed to be especially important where adverse impacts are anticipated in surface water features considered to be highly dependent on groundwater contributions. Locating these systems will require site-specific analyses to ensure that the systems are located in the recharge areas of the waterbodies expected to be impacted, and in areas well suited for shallow groundwater recharge. The specific measures comprising the systems must be selected and designed on a case-by-case, site-specific basis. The systems include measures such as rain gardens, larger bioretention basins, infiltration ponds, infiltration ditches, and subsurface storage and infiltration galleries. It is envisioned that there would be a total of 32 of these rainfall infiltration systems installed under the recommended plan. The general locations of the rainfall infiltrations systems that are envisioned are shown on Map 6.

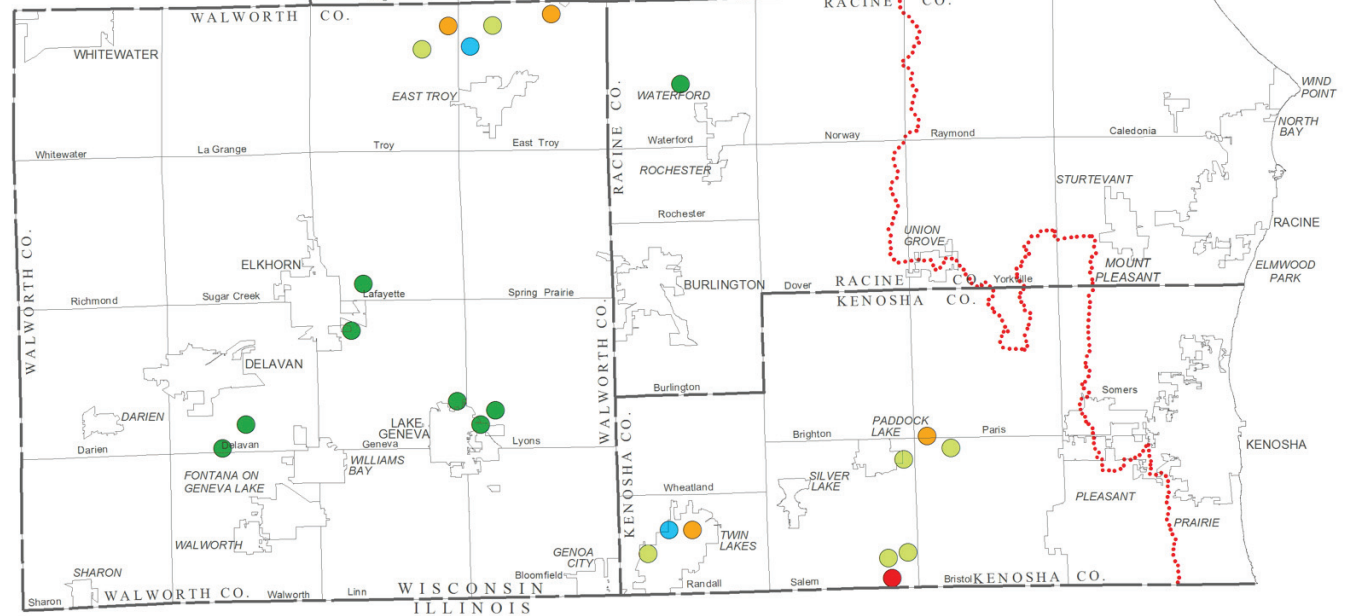
The second means of providing for additional groundwater recharge is through applications of farming practices that reduce or eliminate tillage of fields. This means has the potential to be applied on an areawide basis, as well as in areas potentially affected by high capacity wells. These practices also have other benefits such as reduced erosion which are often the primary purpose for the application of the practice. When applying low- or no-till practices, it will be important to consider additional factors including the potential impact of nutrient management and agricultural chemical management practices on groundwater quality.

The recommended stormwater management, high-capacity well siting, and rainfall infiltration practices are intended to form the basis for the abatement of the potential negative impacts on surface water systems associated with high-capacity well development. The practices would provide for initial analyses of potential alternative well sites in order to select sites which minimize adverse impacts on the groundwater and surface water systems. These initial siting analyses would guide the selection of well sites and would be followed by more-detailed analyses of the potential impacts associated with each of the selected sites. Initial monitoring of water levels in private wells to establish a baseline condition is recommended. Where significant potential negative impacts to surface water systems, or to existing wells, are identified, a mitigation plan should be developed incorporating enhanced recharge based upon stormwater management and infiltration measures. In addition, other mitigation measures, such as pumping protocols and impacted well compensation measures, could be considered. Measures to mitigate impacts on surface waterbodies would include provision of artificial recharge designed to offset the losses in baseflow to the extent practical.

Map 5
CLASSIFICATION OF AREAS BASED UPON
ESTIMATES OF ANNUAL GROUNDWATER RECHARGE



RAINFALL INFILTRATION FACILITIES RECOMMENDED IN THE REGIONAL WATER SUPPLY PLAN



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For areas where an increased reliance on shallow aquifer wells is expected, it is recommended that special consideration be given to implementation of: 1) the recommended water conservation measures; 2) the recommended groundwater recharge protection and enhancement measures; and 3) the recommended high-capacity well development siting, monitoring, and impact mitigation measures. Mitigative measures may include limiting municipal service area expansion to areas with specific needs, careful well siting, well operating protocols, groundwater recharge protection and enhancements, artificial groundwater recharge, infiltration-based stormwater management practices, and groundwater monitoring.

Auxiliary Plan Recommendations

The regional water supply plan includes several auxiliary recommendations that are intended to address specific water supply problems or issues facing, and to address several opportunities available to, the water utilities operating within the Southeastern Wisconsin Region. Among these auxiliary recommendations are recommendations related to reducing the use of chlorides for street and highway ice and snow control; stormwater management measures affecting groundwater quality; major disposal of pharmaceutical and personal care products; water supply quality monitoring and enforcement; monitoring of water development and use in areas located adjacent to the Southeastern Wisconsin Region; and cooperative development and systems integration of existing water utilities. In addition, the plan identifies options for providing water supply to potential new municipal utilities and other unincorporated areas adjacent to incorporated areas served by water utilities.

PLAN COSTS

The principal features of the recommended plan, including the new sources of supply and attendant storage and transmission facilities for each water utility in the Region, have an estimated capital cost ranging from about \$394 million to about \$420 million, depending upon which return flow alternative is selected for the recommended City of Waukesha supply. The annual operation and maintenance costs associated with the proposed water supply facilities are estimated to range from about \$12.1 million to about \$12.7 million, also depending upon the return flow alternative selected for the recommended City of Waukesha supply. The annual savings in costs associated with the elimination of individual point-of-entry treatment devices (water softeners) is estimated to be \$18.5 million. The annual operation and maintenance costs for existing water supply facilities envisioned to be maintained are estimated to be about \$117.8 million. Thus, the total annual operation and maintenance cost of the regional water supply plan water supply existing and new facilities are estimated to range from about \$111.4 million to about \$112.0 million depending upon the return flow alternative selected for the recommended City of Waukesha supply.

The costs cited are those estimated to be needed to develop or expand the water supply facilities for the municipal water utilities within the Region. Those facilities include: new or upgraded wells; water treatment facilities for both surface and groundwater supplies; selected storage facilities; transmission and pumping facilities associated with connection between utilities for source water purposes; and return flow facilities where needed. The costs do not include provisions for upgrading, replacing, or developing and expanding water transmission and distribution systems, which are largely independent of the plan recommendations.

ABILITY OF THE RECOMMENDED PLAN TO MEET WATER SUPPLY AND MANAGEMENT OBJECTIVES

A set of water supply development and management objectives and supporting principles and standards were formulated early in the regional water supply planning effort, and constitute the overall goals of the regional water supply plan. These objectives and standards provided the basis for the preparation and comparative evaluation of alternative plans. These objectives are summarized in Table 2. Accordingly, an evaluation of the recommended plan was made on the basis of its ability to achieve the water supply development and management objectives and supporting standards.

The results of this evaluation indicate that most standards would be met, or largely met, by the recommended regional water supply plan. The remaining standards could be met under the recommended plan, but their achievement would require that additional actions be taken by State agencies, local communities, or the private sector. The recommended regional water supply plan represents a means of providing a sustainable water supply for the Southeastern Wisconsin Region through the plan design year of 2035. The plan is specifically designed to be consistent with the Great Lakes-St. Lawrence River Basin Water Resources Compact, the groundwater protection provisions of Chapter 281.34 of the *Wisconsin Statutes*, and the recommendations of the Groundwater Advisory Committee created by 2003 Wisconsin Act 310. It is recognized that additional planning, engineering, legal, and environmental analyses will be needed to meet the requirements of the Compact

Table 2

WATER SUPPLY AND MANAGEMENT OBJECTIVES

Objective No. 1—Support of Existing Land Use Patterns and Support and Direction of Planned Land Use Patterns

A regional water supply system which, through its capacity and efficiency, will effectively serve the existing regional land use pattern, promote the implementation of the regional land use plan, and identify any constraints to development in subareas of the Region which may require refinement of the regional land use plan.

Objective No. 2—Conservation and Wise Use of the Surface Water and Groundwater Supplies

A regional water supply plan which conserves and wisely utilizes the surface water and groundwater supplies of the Region so as to sustain those supplies for future, as well as existing needs.

Objective No. 3—Protection of Public Health, Safety, and Welfare

A regional water supply system which protects the public health, safety, and welfare.

Objective No. 4—Economical and Efficient Systems

The development of water supply facilities, operational improvements, and policies, that are both economical and efficient, best meeting all other objectives at the lowest practical cost, considering both long-term capital and operation and maintenance costs.

Objective No. 5—Responsive and Adaptive Plans

The development of water supply systems, operations, and policies which are flexible and adaptive in response to changing conditions.

Source: SEWRPC.

when a diversion of Lake Michigan water is involved in a plan implementation action. Such analyses should be conducted as an integral part of the required second-level planning and preliminary engineering and the associated WDNR environmental analysis procedures.

A socio-economic impact analysis (SEI) of the recommended regional water supply plan was conducted by the University of Wisconsin-Milwaukee Center for Economic Development (UWM-CED) under the guidance of the Commission's Environmental Justice Task Force. This analysis considered the potential impacts of the plan on the minority and low-income populations of the Region. The findings of the analysis are documented in the report entitled *Socio-Economic Impact Analysis of the Regional Water Supply Plan for Southeastern Wisconsin*, dated July 31, 2010, prepared by the University Center.

The analysis concluded that nearly all of the recommendations contained in the regional water supply plan—including the recommendations on water conservation, stormwater management practices, well siting, enhanced rainfall infiltration systems, and utilities to remain on existing sources of supply—would either have no significant impact on communities of low-income, minority, ethnic, or disabled persons; or that no clear linkage existed between plan implementation and such impacts. It also concluded that it was unlikely that these plan elements would have a significant adverse impact on the environment or cause disproportionate environmental impacts on communities of low- and moderate-income persons.

An important focus of the SEI was the potential impacts of the plan recommendation that 11 utilities convert from a groundwater supply to a Lake Michigan supply. The analysis noted that a significant increase in the number and percentage of low-income persons or families living at or below the poverty level has occurred over the past 40 years in the cities of Kenosha, Milwaukee, and Racine—communities which would be providing Lake Michigan water—while such number and percentage has declined in many of the suburban communities which would be converted to, and receiving Lake Michigan water. The analysis concluded that these trends are likely to continue regardless of source of supply. This conclusion was based on study findings that the groundwater resources of the area, if properly managed, could support existing and planned development in the communities served by the 11 utilities concerned, as well as support further urban development elsewhere throughout Southeastern Wisconsin through the year 2035.

The UWM-CED study concluded that implementation of this plan recommendation necessarily presumes the development of a cooperative intergovernmental water service sale and purchase agreement in which two or more communities would have to

reach agreement over the costs of any proposed service extension to be paid by the purchasing community, and specifically, the amount of water to be provided and the delineation of the water service area. The UWM-CED study concluded that the agreement could also address additional payments to be made by the purchasing community, agreements on business recruitment, and any other factors—such as the provision of affordable housing or public transit service—to address existing socio-economic imbalances between Lake Michigan water receiving and providing communities.

Moreover, UWM-CED interviews with area planners, developers, and utility managers did not provide evidence that the source of water—groundwater or Lake Michigan—would affect decisions concerning the location of urban development and redevelopment within the Region. The analyses of the existing and proposed water utility service areas of the communities proposed to receive Lake Michigan water further indicated that these service areas largely consisted of substantial areas which are currently developed, would be subject to infill development, or lands which were undevelopable.

The UWM-CED further noted that the recommendation to convert to Lake Michigan water should help to improve Milwaukee Water Works system efficiency, keep system costs low, and potentially, encourage lower rates, based on the excess capacity of Milwaukee Water Works which currently utilizes only about half of its existing water production capacity. As fixed costs make up the greatest portion of water rates (70 percent or more), potential benefits could extend to those areas with a higher percentage of minority lower income populations.

PLAN IMPLEMENTATION

While the recommended regional water supply plan is designed to attain, to the extent practicable, the agreed upon water supply development and management objectives, the plan would not be 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 plan report identifies the actions which must be taken by the various levels and agencies of government in concert with private sector organizations if the recommended water supply plan is to be fully carried out by the design year. Those units and agencies of government which have plan adoption and plan implementation powers applicable to the plan are identified, necessary or desirable formal plan adoption actions are specified, and specific implementation actions are recommended for each of the units and agencies of government with respect to the elements of the plan. Also, both the coordinated roles of the public and private sectors and financial and technical assistance programs available to implement the water supply plan are described.

The major implementation responsibilities for the sources of water supply elements of the recommended water supply plan rest with the existing and potential future water utilities in the Region. The major sources of water supply recommendations relate to recommended sources of supply for each existing and potential utility. The major responsibilities for the design and implementation of comprehensive water conservation programs also rest with the existing and potential future water utilities in the Region. The plan recommends that the scope and content of these conservation programs be determined on a utility-specific basis, reflecting the type and sustainability of the source of supply and the existing and probable future water supply infrastructure requirements.

For those portions of the Region served by private wells, it is recommended that the county, city, village, and town governments, in cooperation with the WDNR and the Wisconsin Department of Health Services, monitor the need for municipal water utilities in areas of urban-density development that are not served by municipal water systems.

The protection of groundwater recharge areas classified as having a high or very high recharge potential is expected to be largely achieved through the implementation of the adopted design year 2035 regional land use plan and county comprehensive plans consistent with the regional plan, since these plans recommend preservation of the environmental corridors, isolated natural areas, prime and other agricultural areas of the Region that facilitate recharge. The plan recommends that the Commission itself, in the preparation of the next generation regional land use plan, consider expansion of the delineated environmental corridors to encompass areas having high or very high potential groundwater recharge characteristics as identified in the adopted water supply plan. There may also be additional opportunities for utilities, local units of government, and nongovernmental conservation groups to achieve additional protection of important groundwater recharge areas through coordination of recharge area protection with other environmental management efforts.

Implementation of state-of-the-art stormwater management practices elements of the recommended water supply plan may be expected to be largely implemented through the provisions of Chapter NR 151 of the *Wisconsin Administrative Code* and through county and municipal stormwater management ordinances adopted in accordance with Chapter 216 of the *Wisconsin Administrative Code*, including related State and local programs and regulations. In particular, the application of practices in accordance with the WDNR Stormwater Management Technical Standards is recommended.

SUSTAINABILITY OF THE REGIONAL WATER SUPPLY PLAN

Sustainability with respect to water supply resources may be defined as the condition of beneficially using water supply resources in such a way that while current and probable future needs are met, the resource is not unacceptably damaged or diminished, but essentially conserved for future use. For the purposes of the regional water supply planning program, the phrase “unacceptably damaged or diminished” was defined as a change in an important physical property of the groundwater or surface water system—such as water level, water quality, water temperature, recharge rate, or discharge rate—that approaches a significant percentage of the normal range of variability of that property. Changes that are 10 percent or less of the annual, or historic period, of record range for any property were considered acceptable, unless it could be shown that the cumulative effect of the changes would cause a permanent change in an aquatic ecosystem by virtue of increasing the extremes of that property to levels known to be harmful.

Importantly, water levels in the deep sandstone aquifer under most of the Region are expected to rise under the use and recharge conditions envisioned under the recommended plan. This increase in water levels should ensure the sustainability of this aquifer.

Because unconfined shallow aquifers are hydraulically connected to surface waterbodies, water levels in the shallow aquifer are buffered by the surface water system. As a consequence, groundwater-derived baseflow to surface waterbodies is a better indicator of impacts on the shallow groundwater system than water levels in the shallow aquifer itself. Under the recommended plan, some surface waters in the Region are expected to experience reductions in groundwater-derived baseflow. In many streams that are expected to experience such reductions, however, baseflow is supplemented by discharges of effluent from wastewater treatment plants. For these streams, the impact of groundwater-derived baseflow reductions upon total streamflow is expected to be small or negligible, since the groundwater withdrawals for the utility systems concerned are returned to the streams through the wastewater treatment plants. The regional water supply plan recommends mitigative measures for those waterbodies expected to experience reductions in groundwater-derived baseflow that do not receive contributions of treated effluent; however, some reduction in groundwater-derived baseflow, representing about 2 percent of the total regional baseflow, is expected. Given that groundwater-derived baseflow typically comprises between 20 and 50 percent of total streamflow, this is considered to be a small impact and within the range considered acceptable.

It is recommended that the primary responsibility for conducting the analyses and monitoring related to the implementation of the recommended high capacity well siting procedure rest with the utilities or other entities proposing installation of the high capacity wells concerned.

The implementation of the enhanced rainfall infiltration systems element of the recommended regional water supply plan can be best achieved in conjunction with the results of the analyses performed as part of implementation of the high capacity well siting element described in the previous section. It is recommended that these infiltration systems be installed as a mitigative measure to provide artificial recharge when such analyses indicate that installation of the high capacity well or wells would result in impacts to surface waterbodies and existing private wells. The primary responsibility for the development and installation of these infiltration systems belongs to the utility or other entity installing the high capacity well that would generate the impact.

The plan implementation recommendations call for the conduct of a continuing regional water supply planning program. This program would provide for surveillance of the economic, demographic, land use development, and water use forecasts on which the water supply plan is based; plan reappraisal and expansion as may be found to be necessary; provision of water supply plan data and forecasts to regulatory and complementary agencies; ongoing evaluation of and, where necessary, improvement upon the techniques and procedures used for water supply planning; delineation of water supply service areas; review and comment on local water supply facility plans and water supply service area proposals; and attendant documentation.

COMMON QUESTIONS ON THE REGIONAL WATER SUPPLY PLAN

Why is it recommended that some communities convert to using Lake Michigan as the source of their water supply?

A layer of largely impenetrable shale located from about 100 to 300 feet below the surface of much of Southeastern Wisconsin separates the groundwater resource underlying the Region into that of a shallow and deep aquifer, and limits recharge of the deep aquifer (See Figure 1 and Map 7). Many communities and industries including communities and industries within Milwaukee County have historically used the deep aquifer as their source of water supply. A number of communities and industries within the Region continue to rely on the deep aquifer. However, the levels of water in that aquifer have declined alarmingly as a result of its historic and continued use and its limited recharge potential. The current levels of use of the deep aquifer cannot be sustained. Shifting several communities that currently use this aquifer to another source of water, either the shallow aquifer or Lake Michigan water, would allow the water level in the deep aquifer to stabilize or recover. Studies conducted under the regional water supply planning effort concluded that either Lake Michigan or the shallow aquifer, the latter if properly managed, could provide a water supply of adequate quantity and quality for existing and planned development within the Region through the year 2035, and would permit the proposed shift in source from the deep aquifer.

Providing some of these communities with Lake Michigan water, rather than converting them from the deep to the shallow aquifer as a source of supply, was recommended for three principal reasons. First, Lake Michigan water would result in fewer impacts upon baseflows of streams, the levels of inland lakes, and the water supply to wetlands. Second, providing these communities with Lake Michigan water rather than water from the shallow aquifer would result in a reduction in the hardness of the water provided and would eliminate the need for water softening by the households served. This would result in reductions in the concentration of chlorides in the sewage conveyed to the wastewater treatment plants and in the amounts of chlorides discharged to the receiving surface waters. Third, providing these communities with a Lake Michigan water supply, rather than a shallow aquifer water supply, would take advantage of the currently unused capacities of the existing Lake Michigan water treatment plants.

How does the regional water supply plan relate to the regional land use plan?

The design year 2035 regional land use plan served as the basis for the design of the regional water supply plan, thus coordinating the water supply plan with not only the land use plan, but with all of the other elements of the regional plan, such as transportation, sanitary sewerage, stormwater management, and park and open space development, which are also based upon the regional land use plan.

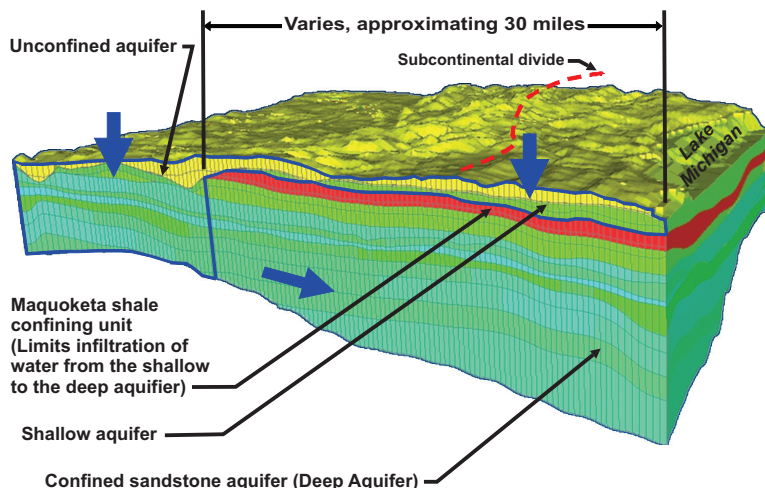
The Regional Planning Commission has always recognized the relationship that exists between land use planning and water supply planning, and indicated at the beginning for the regional water supply planning effort that, should the planning effort identify any water resource constraints on the development pattern envisioned in the adopted regional land use plan, the Commission would initiate a process to amend the land use plan in an appropriate manner. The regional water supply planning effort found that water supply was not a limiting factor within this Region with respect to the location of urban development either east or west of the subcontinental divide traversing the Region. Indeed, the Commission studies have shown that the patterns and intensities of development envisioned in the regional land use plan—which represent a departure from development trends over the past 30 years and a return to more centralized development patterns—could be supported by the available groundwater systems in the areas concerned, albeit at a cost in sustainability and environmental impacts on surface waters and wetlands.

Does the plan recommend creating new water utilities?

The regional water supply plan identifies several urban-density areas that are currently served by private wells that could potentially be served by municipal water utilities. The plan recommends providing municipal water service to these areas only if a need is demonstrated based on water quantity or water quality and a local initiative occurs to provide such service. In the absence of a demonstrated need and local initiative, the plan recommends that these areas remain on private wells.

Figure 1

GENERAL HYDROGEOLOGY OF SOUTHEAST WISCONSIN



Groundwater occurs in three major aquifers that underlie the Southeastern Wisconsin Region. From the land's surface downward, they are: the sand and gravel deposits of the glacial drift; the shallow dolomite layer of the underlying bedrock; and the deeper sandstone, dolomite, siltstone, and shale layers. These aquifers are shown in the figure to the left. Because of their proximity to the land surface and hydraulic interconnection, the first two aquifers are commonly referred to as the "shallow aquifer," while the latter is referred to as the "deep aquifer." Within most of the Southeastern Wisconsin Region, the shallow and deep aquifers are separated by a layer of the Maquoketa shale, which forms a relatively impermeable barrier between the two aquifers.

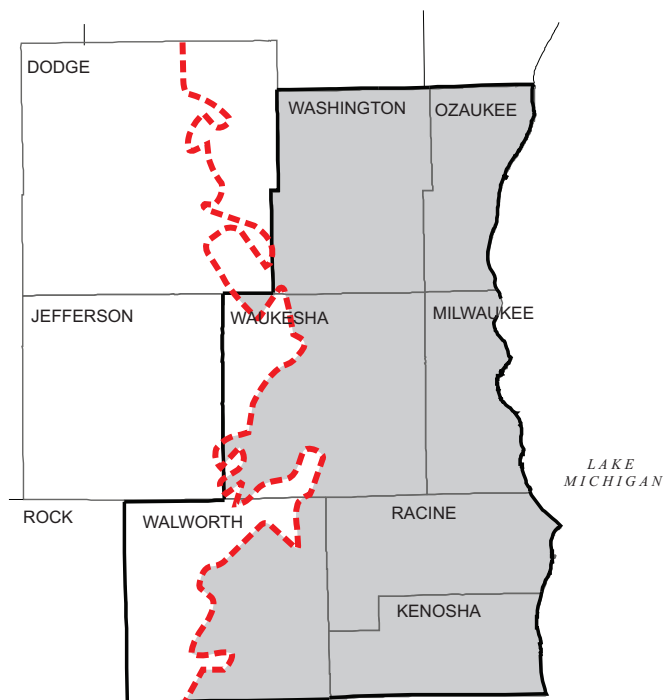
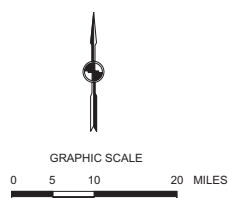
Private residential wells are generally located in the shallow aquifer and are 100 to 300 feet deep. Some municipal wells are located in the shallow aquifer, while others are located in the deep aquifer. Most municipal wells are 200 to 800 feet deep, with some up to 2,200 feet deep.

Source: U.S. Geological Survey.

Map 7

LOCATION OF MAQUOKETA SHALE WHICH SEPARATES THE DEEP AND SHALLOW AQUIFERS UNDERLYING SOUTHEASTERN WISCONSIN

----- Western extent of Maquoketa shale as approximated in model



Source: U.S. Geological Survey and Wisconsin Geological and Natural History Survey.

FOR MORE INFORMATION

The findings and recommendations of the regional water supply planning program are documented in a series of Commission reports including:

- SEWRPC Planning Report No. 52, *A Regional Water Supply Plan for the Southeastern Wisconsin*, December 2010.
 - o This report documents the regional water supply plan for Southeastern Wisconsin, as well as the process used to arrive at that plan.
- SEWRPC Technical Report No. 37, *Groundwater Resources of Southeastern Wisconsin*, June 2002.
 - o This report describes the hydrogeology of the Southeastern Wisconsin Region. It presents information related to soils and their ability to attenuate contaminants before they reach the groundwater system, the glacial and bedrock geology of the Region, groundwater aquifers of the Region, groundwater quality, and potential sources of groundwater contamination.
- SEWRPC Technical Report No. 41, *A Regional Aquifer Simulation Model for Southeastern Wisconsin*, June 2005.
 - o This report documents the development, calibration, and testing of a three-dimensional groundwater aquifer simulation model which can be used to forecast groundwater levels and groundwater flow under various water demand scenarios.
- SEWRPC Technical Report No. 43, *State-of-the-Art of Water Supply Practices*, July 2007.
 - o This report presents the results of a review of the current and probable future state-of-the-art practices in water supply source development, water treatment, water transmission, water storage, and water conservation and reuse.
- SEWRPC Technical Report No. 44, *Water Supply Law*, April 2007.
 - o This report identifies and analyzes water supply law applicable to the Southeastern Wisconsin Region, including law applicable to the capture of water and law applicable to the ownership, operation, and financing of water supply systems.
- SEWRPC Technical Report No. 46, *Groundwater Budget Indices and Their Use in Assessing Water Supply Plans for Southeastern Wisconsin*, February 2010.
 - o This report documents the development of three indices for assessing the impacts of water supply alternative plans upon the groundwater system and applies those indices to the analysis of impacts associated with the alternative plans considered as part of the regional water supply planning program.
- SEWRPC Technical Report No. 47, *Groundwater Recharge in Southeastern Wisconsin Estimated by a GIS-Based Water-Balance Model*, July 2008.
 - o This report documents the development of a soil water balance model used to estimate groundwater recharge in Southeastern Wisconsin. It presents estimates of present day recharge and delineates areas of high recharge.
- SEWRPC Technical Report No. 48, *Shallow Groundwater Quantity Sustainability Analysis Demonstration for the Southeastern Wisconsin Region*, November 2009.
 - o This report analyzes the impacts of varying densities of residential development on groundwater sustainability.

Electronic copies of these reports are available on the Commission's website (<http://www.sewrpc.org/SEWRPC/Environment/RegionalWaterSupplyPlan.htm>). Paper copies of these reports can also be ordered from the Commission's offices.

CONTACT INFORMATION

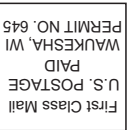
Further information on the regional water supply study, including all study materials—Advisory Committee meeting minutes, plan chapters, presentations, and study reports—are all available on the Commission's website.

Website: <http://www.sewrpc.org/SEWRPC/Environment/RegionalWaterSupplyPlan.htm>
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This newsletter was mailed directly to a list of individuals and organizations that have expressed interest in receiving such information. If you did not receive this newsletter directly, and would like to receive future issues, please contact the Commission using the contact information above.

THIS NEWSLETTER CONTAINS:

Organization Structure for the Planning Effortp. 1
Factors Considered in the Development of the Recommended Regional Water Supply Planp.3
Recommended Regional Water Supply Planp.3
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Plan Implementationp.16



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