REGIONAL WATER SUPPLY PLAN FOR SOUTHEASTERN WISCONSIN

NEWSLETTER 2 DECEMBER 2007

This newsletter is the second in a series of newsletters reporting progress in the regional water supply planning program. The first newsletter provided an overview of the scope and content of the planning program, the planning area, the water supply planning objectives formulated to guide the design and evaluation of alternative and recommended water supply plans, trends in regional water use, and existing sources of water supply.

This newsletter presents:

- regional economic and demographic forecasts and planned land use development to the year 2035. These forecasts and the planned land use development as envisioned in the adopted regional land use plan provide a basis for the preparation of water use forecasts;
- findings and conclusions of an evaluation of the potential effectiveness of water conservation measures;
- forecasts of future year 2035 water use, incorporating forecasts of potential water conservation;
- findings and conclusions of a study of water supply law; and
- conceptual initial water supply plan alternatives proposed for consideration and evaluation.

REGIONAL WATER SUPPLY PLANNING PROGRAM – AT A GLANCE

Geography:	Seven-county Southeastern Wisconsin Region, including a total of 147 cities, villages and towns.
Outcome:	An advisory plan providing recommendations necessary to attaining an adequate, sustainable water supply for the Region.
Application:	Constitutes a major element of the comprehensive plan for the Region for the design year 2035.
Guidance:	Planning effort is being directed by a technical Advisory Committee with representatives of local, State, and Federal governments, water utilities, private sector business, and environmental and academic interests.
Context:	Final element of a regional water supply planning program which also included basic groundwater resources inventories completed in 2002, development of a groundwater simulation model for the Region completed in 2005, and technical reports on water supply law and state-of-the-art practices completed in 2007.
Timeline:	A multi-year planning study, concluding in 2008.

BACKGROUND

The regional water supply planning program is to consider probable future water supply demands in southeastern Wisconsin to the year 2035 based upon Commission forecasts of population, households, employment, and land use demand. This forecast growth and change has been allocated within the Region based upon the Commission's adopted year 2035 regional land use plan. Regional water supply planning may identify a need to revise the land use plan due to water supply considerations. Should that prove to be the case, the regional water supply plan will include recommendations for land use plan amendment.

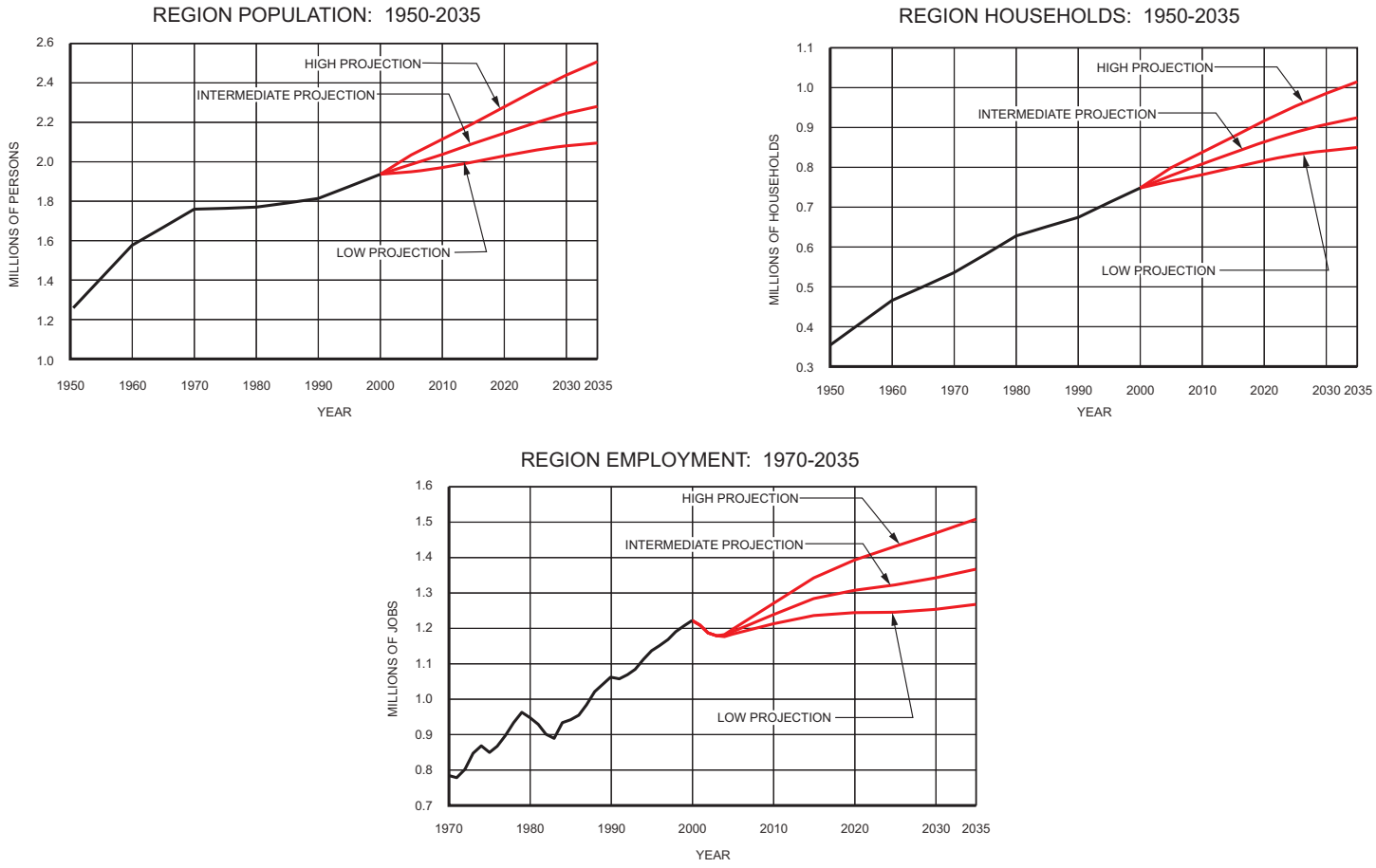
2035 Population, Household, and Employment Forecasts

The Commission population, household, and employment forecasts for the year 2035 are based upon consideration of three levels of future projections: high, intermediate, and low. This approach recognizes the uncertainty that surrounds any effort to forecast future socioeconomic conditions. The intermediate projections are considered the most likely to be achieved within the Region, and constitute the basis for the Commission's plan preparation efforts.

Figure 1 shows actual and projected population, households, and employment in the Southeastern Wisconsin Region through the year 2035. The number of jobs in the Region is forecast to increase by about 12 percent from 2000 to 2035. The strength of

Figure 1

ACTUAL AND PROJECTED POPULATION, HOUSEHOLDS, AND EMPLOYMENT IN THE SOUTHEASTERN WISCONSIN REGION: 1950-2035



Source: Wisconsin Department of Administration, U.S. Bureau of the Census, and SEWRPC.

the regional economy is not projected to significantly increase or decrease relative to the State or Nation. Recognized in the employment projections is the continuing shift in the Region from a manufacturing to a service-based economy. The population in the Region is forecast to increase by about 18 percent from 2000 to 2035. This forecast envisions a modest increase in fertility and survival rates in the Region, and anticipates minimal net in-migration through the year 2035. With baby-boomers aging, 20 percent of the Region's population is projected to be 65 years of age or older by the year 2035, as compared to 13 percent in the year 2000. The number of households in the Region is forecast to increase by about 24 percent from 2000 to 2035. The average household size in the Region is expected to continue to decrease, but more moderately than in the past – from 2.52 persons per household in the year 2000 to 2.39 persons per household in the year 2035.

2035 Regional Land Use Plan

The regional land use plan is intended to provide a guide for land use development within the Region to the year 2035. Implementation of the plan will depend upon the voluntary actions of municipal, county, State, and Federal agencies and units of government acting in cooperation with the private sector.

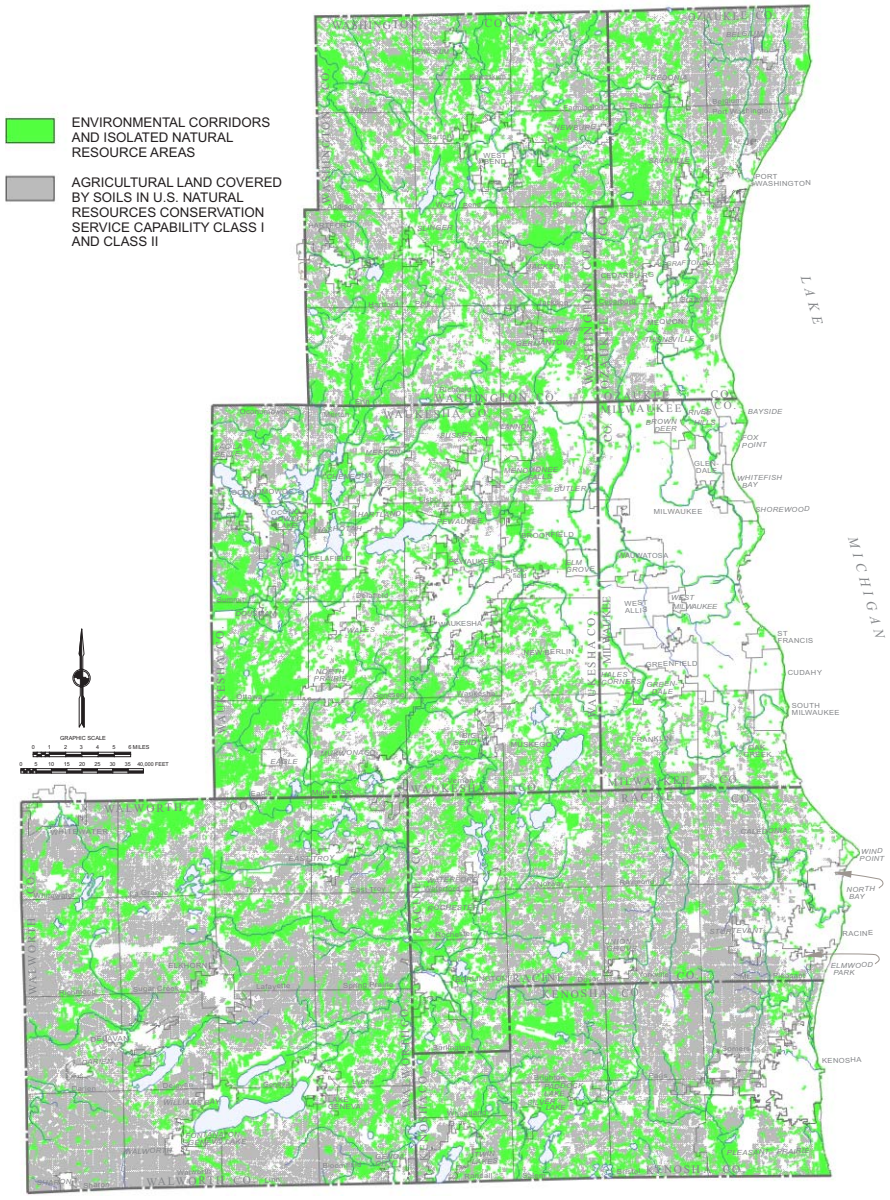
The year 2035 regional land use plan contains the following salient recommendations:

- The primary environmental corridors, secondary environmental corridors, and isolated natural resource areas of the Region should be preserved in essentially natural, open uses, continuing to account for about 23 percent of the area of the Region, as shown on Map 1. These areas encompass the best remaining features of the Region's natural resource base, the lakes, rivers, streams, and associated shorelands and floodlands, wetlands, woodlands, prairie remnants, wildlife habitat, rugged terrain and steep slopes, unique landforms and geological formations, existing and potential outdoor recreation sites, and scenic areas and vistas.

- The prime, or most productive, farmland in the Region should be preserved in agricultural use. The land with soils considered to be most suitable for agriculture is land covered by agricultural capability Class I and Class II soils as determined by the U.S. Natural Resources Conservation Service. As shown on Map 1, farmland with Class I and Class II soils accounted for about 36 percent of the land area in the Region and 75 percent of all farmland in southeastern Wisconsin in the year 2000. Some Class I and Class II farmland that is located adjacent to existing urban centers and within planned urban growth is necessarily proposed to be converted to urban use as a result of planned and orderly growth of those urban centers. It is recommended that the counties in the Region, in cooperation with the concerned municipal units of government, carry out work efforts to identify and preserve prime farmland, considering farmland covered by Class I and Class II soils, and such other factors as the size of individual farm units and overall size of the farming area, the availability of support services, and the degree of encroachment from urban uses.

Map 1

ENVIRONMENTAL LANDS AND PRIME FARMLANDS RECOMMENDED FOR PRESERVATION UNDER THE YEAR 2035 REGIONAL LAND USE PLAN



Source: SEWRPC.

- New urban development should be accommodated within and around existing urban centers through infill development, redevelopment, and the orderly expansion of planned urban service areas on lands proximate to these centers that can be readily and economically provided with centralized sanitary sewerage, water supply and mass transit services. Map 2 shows these urban centers and growth areas. Particular emphasis is placed on stabilizing and revitalizing the central cities of Milwaukee, Racine, and Kenosha. The regional land use plan envisions that the historic trend in land use decentralization will be moderated, with historic population decreases in Milwaukee County being replaced by population growth, and with growth in outlying counties being moderated. The plan further proposes that the forecast residential growth occur predominately at medium and high densities in planned residential neighborhoods and in more mixed use settings. The plan envisions residential neighborhoods designed as cohesive units, properly related to the larger community of which they are a part, and served by an interconnected internal street, bicycle- and pedestrian-way system; by neighborhood school, park, and shopping facilities; and by sanitary sewerage and water supply facilities. The regional plan also envisions residential development in mixed-use settings including dwellings above the ground floor of commercial uses; residential structures intermixed with, or located adjacent to, compatible commercial, institutional, or civic uses; and residential development integrated into, or located in proximity to, major employment and activity centers. Under the plan, lands in urban uses would increase by about 13 percent from the year 2000 to 2035 to accommodate the 18 percent increase in population, 24 percent increase in households, and 12 percent increase in employment.

- The regional plan envisions a range of commercial and industrial areas. The largest commercial and industrial areas, in terms of employment levels, are identified as major economic activity centers. These are defined as areas containing a concentration of commercial and/or industrial land having at least 3,500 total jobs or 2,000 retail jobs. Sixty such centers would

accommodate about 50 percent of all jobs in the Region in 2035. The plan envisions the continued development and redevelopment of the Region's existing major commercial and industrial centers, and those now under development or redevelopment, as shown on Map 2.

Municipal Water Supply Service Areas

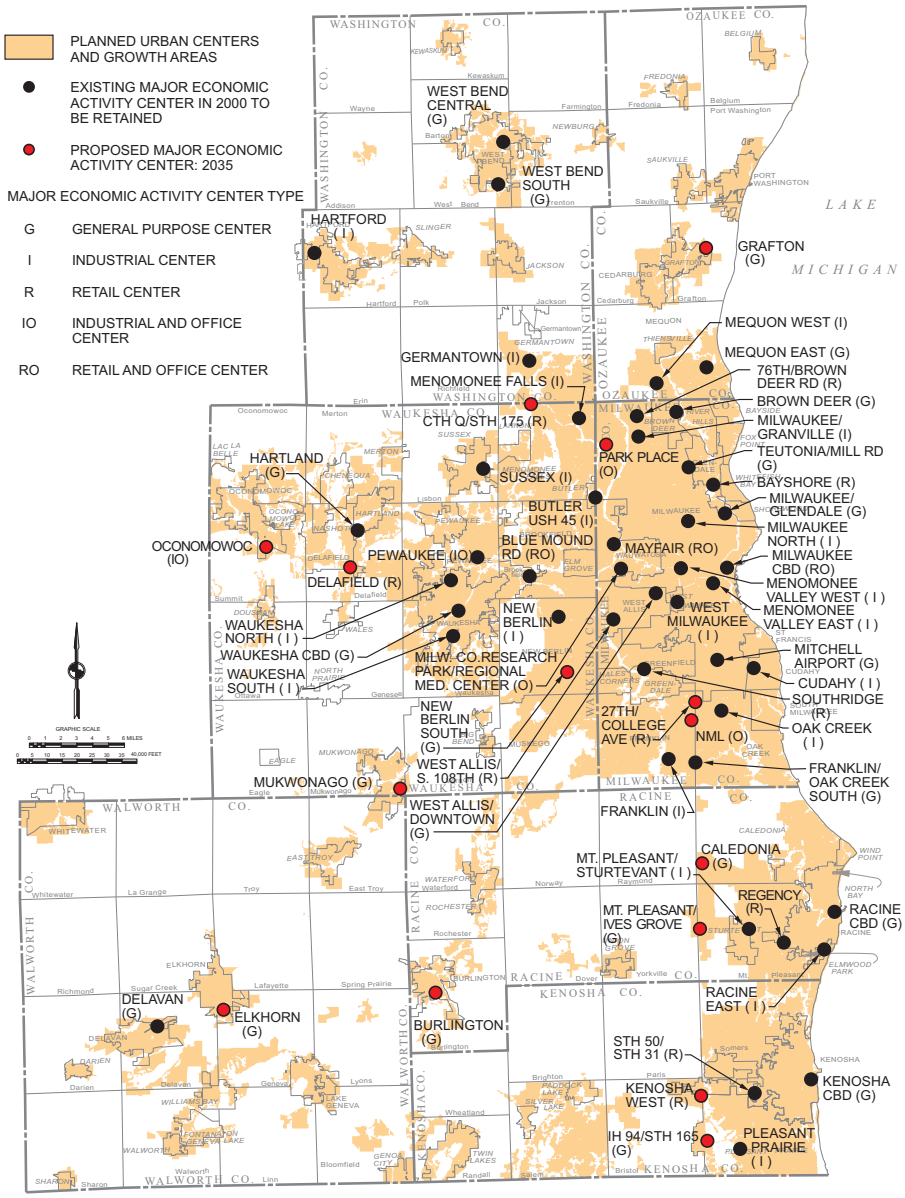
Under the regional water supply planning program, those areas which may be expected to be served by municipal water supply facilities by the year 2035 were identified. This effort considered existing and planned land use development type and density, relationship to existing water supply service areas, shallow groundwater aquifer characteristics, areas of known groundwater contamination, historical community positions toward water supply service, and local plans.

The potential municipal water service areas in the year 2035 are shown on Map 3. In 2007 these areas were served by 76 water utilities, and these areas are envisioned to continue to be served by these existing 76 utilities and by new municipal utilities.

The population expected to be served by municipal water supply systems in the Region would increase from about 1.56 million persons in the year 2000, to about 2.10 million persons in 2035, an increase of about 536,000 persons, or about 34 percent (see Table 1). The percentage increase in the population served by municipal water systems is greater than the anticipated growth of the total population, due to an expectation that the number of people presently relying on private water systems will decline, from approximately 370,000 people in the year 2000 to about 179,000 people in 2035, due to the anticipated expansion of municipal water service areas into areas currently served by private systems.

Map 2

PROPOSED URBAN CENTERS AND MAJOR ECONOMIC ACTIVITY CENTERS IN THE REGIONAL LAND USE PLAN: YEAR 2035



Source: SEWRPC.

WATER CONSERVATION

Reasons to pursue water conservation include:

- reductions in the operating costs and potential future capital costs of water treatment, transmission, and distribution;
- attendant reductions in energy consumption and air pollutant emissions; and
- contribution to maintaining a sustainable water supply.

The need for, and implications of, water conservation within the Region may be expected to differ between those areas utilizing Lake Michigan as a source of supply, and those areas utilizing groundwater. With limited exceptions, the areas utilizing Lake Michigan water are located east of the subcontinental divide which traverses the Region. Areas utilizing groundwater lie both east and west of the divide (see Map 4).

Table 1

ACTUAL AND PROJECTED POPULATION CHANGES IN MUNICIPAL AND PRIVATE WATER SUPPLY SERVICE AREAS WITHIN THE SOUTHEASTERN WISCONSIN REGION: 2000 AND 2035

County	Municipal Water Service Areas				Private Water Service Areas			
	2000 Population	2035 Projected Population	2000-2035 Municipal Water Service Areas Increment		2000 Population	2035 Projected Population	2000-2035 Private Water Service Areas Increment	
			Population	Percent Increase			Population	Percent Decrease
Kenosha	111,000	199,900	88,900	80	38,600	10,200	-28,400	-74
Milwaukee	917,300	1,004,200	86,900	9	22,900	2,900	-20,000	-87
Ozaukee	45,400	86,800	41,400	91	36,900	14,300	-22,600	-61
Racine	146,400	196,200	49,800	34	42,400	17,400	-25,000	-59
Walworth	56,200	112,100	55,900	99	35,800	27,900	-7,900	-22
Washington	66,800	113,000	46,200	69	50,700	44,300	-6,400	-13
Waukesha	218,400	385,000	166,600	76	142,400	61,800	-80,600	-56
Region	1,561,500	2,097,200	535,700	34	369,700	178,800	-190,900	-52

Source: U.S. Bureau of the Census and SEWRPC.

Those areas of the Region served by Lake Michigan supplied systems have access to a bountiful source of high-quality water provided that the Lake is properly protected and managed. Spent water is treated and returned to the Lake in an amount at least equal to the amount of water removed; consequently, there may be more limited reasons to conserve water for the purpose of maintaining a sustainable water supply. However, those areas of the Region served by groundwater-supplied systems need to be concerned with the continued ability of the groundwater aquifers to provide a sustainable water supply. Groundwater levels in the deep sandstone aquifer underlying southeastern Wisconsin have been steadily falling over the last century. This decline is due to pumping for use by urban development within Southeastern Wisconsin and adjacent developing areas, particularly Northeastern Illinois. Up until about 1960, more than one-half of the deep aquifer groundwater pumping in southeastern Wisconsin occurred east of the subcontinental divide. Figure 2 depicts the groundwater aquifers underlying southeastern Wisconsin.

Water Conservation Approaches

There are two approaches to water conservation:

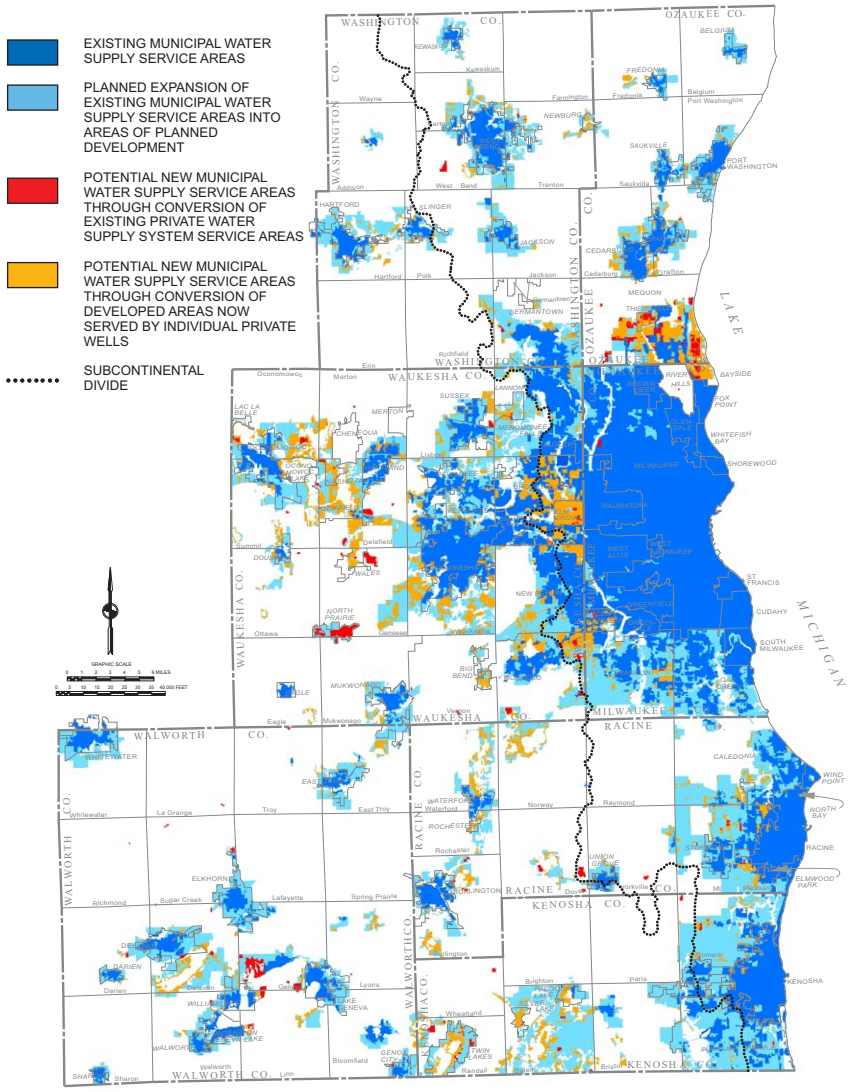
1. achieving greater efficiency in utility operations by minimizing the amount of water that must be produced and conveyed to meet water use demand, such as through leak detection and repair; and

2. reducing consumer demand for water, through measures such as modifications of water rates to discourage use, conversion to water-saving plumbing features, water recycling, and education.

In areas of the Region which utilize Lake Michigan as a source of supply, water conservation may be expected to be focused primarily on increasing the

Map 3

MUNICIPAL WATER SUPPLY SERVICE AREAS: 2035



Source: SEWRPC.

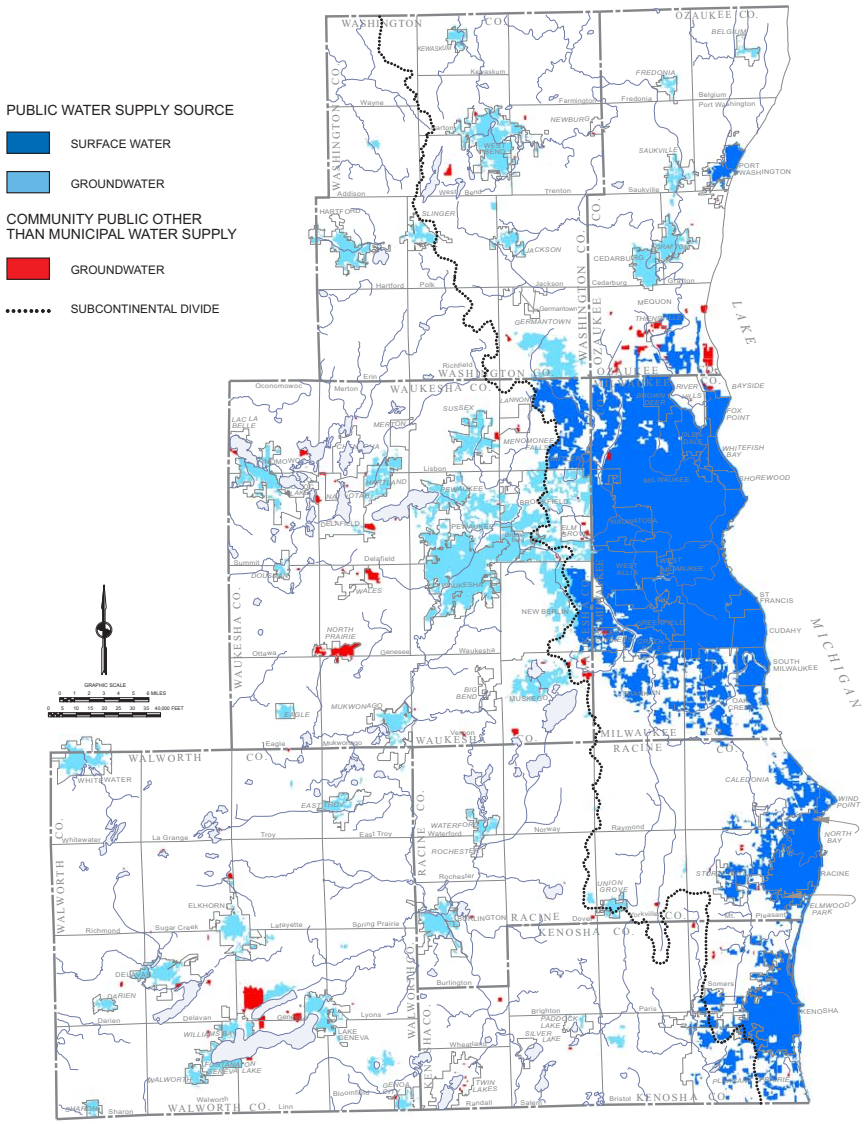
efficiency of water utilities along with the most cost effective demand conservation measures.

This approach can have the attendant benefits of reducing the cost of water production and providing more favorable rates for water use while meeting environmental objectives. For Lake Michigan utilities, as already noted, the water supply is abundant and the spent water is treated and returned to the source so there should be few concerns for supply sustainability provided the Lake is properly protected and managed. Moreover, some of the major Lake Michigan water supply systems are operating well below existing capacity. For example, the City of Milwaukee system is operating at less than 50 percent of capacity. Major reductions in consumer demand may be expected to result in corresponding increases in water rates. However, if Lake Michigan utilities were experiencing increasing demand such that existing infrastructure capacity was being approached, reducing consumer water use would be important.

In areas of the Region which utilize groundwater, the sustainability of supply, and in some cases, infrastructure needs, are the driving force for water conservation, and requires consideration of both utility efficiency and increased consumer demand conservation measures. Groundwater supply utilities using the deep aquifer rely upon water resources which are declining, and for all groundwater supply utilities, the spent water is treated and typically discharged to surface water streams rather than returned to the aquifer source.

Map 4

AREAS UTILIZING LAKE MICHIGAN AND GROUNDWATER SUPPLY IN SOUTHEASTERN WISCONSIN: 2005



Source: Wisconsin Department of Natural Resources and SEWRPC.

Potential Conservation Measures and Water Use Reduction

A summary of water conservation measures, including estimates of effectiveness and cost, is presented in Table 2. The level of municipal water conservation which may be expected to be implemented and achieved will be unique to each community and water utility and dependent upon the composition of its water users, the level of utility efficiency already being achieved, the adequacy of its water supply infrastructure, and the sustainability of its water supply.

Table 3 presents projected water conservation program effectiveness for water utilities based upon consideration of these factors. The expected water conservation levels above and beyond the estimated 4 percent currently being achieved by water utilities vary from an additional 4 to 10 percent on an average daily basis, and an additional 6 to 18 percent on a maximum daily basis. For more information on such effectiveness, the reader is referred to SEWRPC Technical Report No. 43, *State-of-the-Art of Water Supply Practices*, prepared under the planning program.

WATER DEMAND FORECASTS

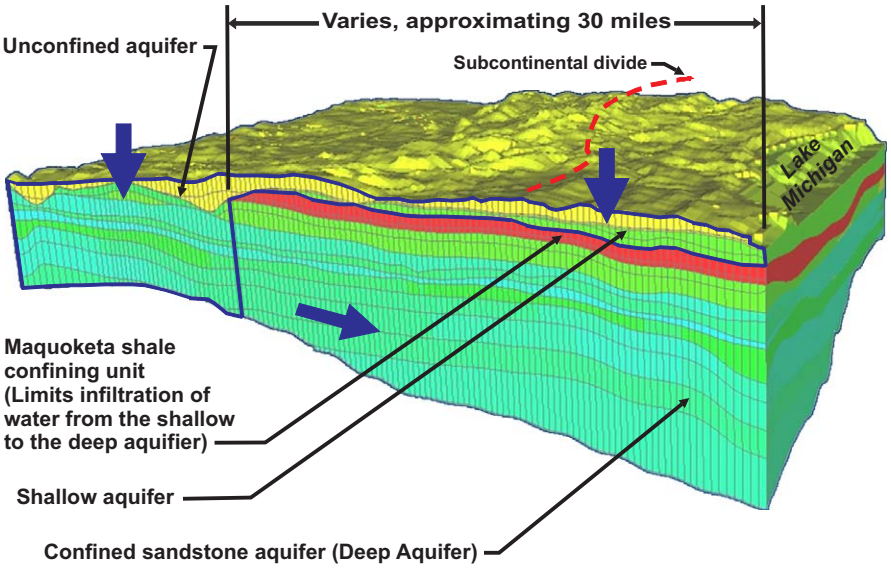
Forecasts of future water demand were prepared by first identifying the increment of forecast regional demographic, economic, and land use growth and change between the years 2000 and 2035. Unit water demand factors as documented in SEWRPC Technical Report No. 43, *State-of-the-Art of Water Supply Practices*, were then applied to this forecast increment of demographic, economic, and land use growth and change to project the increment of growth and change in water use:

- residential land use, average daily demand—70 gallons per capita per day;
- commercial and institutional land use, average daily demand—800 gallons per acre per day;
- industrial land use, average daily demand—1,500 gallons per acre per day; and
- miscellaneous municipal use, average daily demand—100 gallons per acre of urban service area per day.

Figure 3 illustrates the stability in average residential water use demand over the last several years. The minor variations from year to year may be attributed to the differences in outdoor water use in wet and dry years. Table 4 displays the trends in average water use demand by use category between the years 2000 and 2005. The unit water demand factors utilized to prepare the future water demand forecast assume stability in unit residential water demand, but continuing declines in unit industrial and commercial water demand.

Figure 2

GENERAL HYDROGEOLOGY OF SOUTHEAST WISCONSIN



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

Source: USGS.

The forecast of year 2035 average daily water use demand comprised of existing year 2000 demand and the forecast increment of demand between 2000 and 2035 were reduced by from 4 to 10 percent on an average daily demand basis, and from 6 to 18 percent on a maximum daily basis, to account for the proposed implementation of utility-specific water conservation measures, with the specific reduction proposed for each utility being based upon the utility source of supply, existing infrastructure, and existing conservation programs.

The forecasts of water use demand for each water utility, and by way of summary for each county and for the Region, were compared to a range of alternative projections based on low and high potential levels of demographic and economic growth, including and not including further water conservation as appropriate to each utility, and utilizing the year 2005 rather than the year 2000 as the base year. The use of the year 2005 rather than 2000 as the base year for the forecast, would result in a lower forecast for a few municipal utilities. Figure 4 presents the forecast and alternative projections considered for Milwaukee County. Significant reductions in industrial water use occurred in some municipalities over the period 2000 through 2005.

Municipal Water Supply System Forecasts

In 2005, there were 79 municipal water supply systems operating within the Region. Due to consolidations, there were three fewer utilities in existence in 2007. It is anticipated that by the year 2035, 24 additional municipal water supply systems will be developed to serve existing urban areas currently not served by municipal water supply.

As presented in Table 1, the year 2000 total resident population served by municipal water utilities in the Region was about 1.56 million persons, or about 81 percent of the 1.93 million total population. The total population expected to be served by municipal water utilities in the Region in 2035 approximates 2.1 million persons, or about 92 percent of the projected 2035 population of 2.3 million. This represents an increase of about 536,000 persons, or 34 percent, over the 2000 level. The area served by municipal water supply systems within the Region is expected to increase by about 62 percent, from about 390 square miles in 2000 to about 631 square miles in 2035, or to about 23 percent of the Region, as summarized in Table 5. About 418 square miles were served by municipal water supply systems in 2005. A significant portion of the increase in land served by municipal water supply systems is due to the expected expansion of existing municipal water service into already developed areas currently served by self-supplied water systems, and the establishment of new utilities to serve existing development currently on private water supply systems. The amount of new urban land envisioned to be developed and served by municipal water systems between 2000 and 2035 approximates 63 square miles, or about a 16 percent increase in existing urban lands served by municipal water utilities.

Table 2

POTENTIAL WATER CONSERVATION PROGRAM MEASURES

Program Component	Potential Reduction in Average Daily Water Use[a]	Estimated Annual Cost per Customer[b] Over a 10-Year Period	Comments
Water System Efficiency Actions	--[c]	--	Includes meter testing for accuracy, leak detection and repair, water main maintenance and replacement, water system survey and audits, and water production refinements. Some of these are in place in all communities in the Region
Moderate-Level Public Informational and Educational Program	1-3%	$1.50-$2.50	Includes redesign of water bill, distribution of educational materials, utility staff training, and presentations to schools and civic groups
Higher-Level Public Informational and Educational Program	2-4%[d]	$2.50-$3.50	Includes moderate-level program elements, plus development of school curriculum, and broader informational programming involving newspapers, website, and flyers
Outdoor Watering Restrictions	1-2%[e]	$0.50-$2.00	Cost varies, depending upon level of enforcement
Plumbing Retrofits At No Cost to Customer	1-2%[f]	$0.50-$1.00[f]	Includes low-volume shower heads and reduced toilet volume devices
Toilet Replacement Rebate Program	1-3%[g]	$2.00-$3.00[g]	Toilet flush volumes: pre-1950 = 7.0 gallons; 1950-1979 = 5.0 gallons; 1980-1993 = 3.6 gallons; 1994 to present = 1.6 gallons Not allowed under 2006 PSC policies. Effectiveness may be limited at $100 rebate due to estimated $100 cost of new toilet and $150 cost of installation
Water Softener Replacement Rebate Program	<1-1%[h]	$2.50-$3.50[h]	Not allowed under 2006 PSC policies. May be carried out for wastewater utility purposes. Effectiveness may be limited, due to modest rebate of $150, given cost of new softener and installation of about $550. Added advantage of reducing chloride in wastewater
Clothes Washing Machine Replacement Rebate Program	1-3%[i]	$3.00-$5.00[i]	Clothes washer water use per load: pre-1980 = 56 gallons; 1980-1990 = 51 gallons; 1990-present = 40 gallons for conventional; 27 gallons for high-efficiency Not allowed under 2006 PSC policies. Effectiveness may be limited, due to modest rebate of $200, given cost of new clothes washers of $700 or more
Water Conservation Rate Structure	2-4%	$0.10-$0.20[j]	--
Rainwater Harvesting	Variable	Variable	Primarily used for outdoor water use. Retro-fitting plumbing for indoor water uses can be expensive and raises concerns over accidental improper use, and dangerous cross connections, and extreme cold weather functioning.

[a] *Potential water savings estimates assume a largely residential water use base. Savings for systems with large commercial, institutional, and industrial components will be variable.*

[b] *Cost estimated on a household residential equivalent unit basis.*

[c] *Measures are utility-specific. Costs and effectiveness will vary with extent of current and past practices, condition and type of water supply system, and level of unaccounted-for water.*

[d] *Costs and effectiveness are total for program, including elements in the moderate public informational and educational program.*

[e] *Water savings would be substantially higher on a maximum day or week basis.*

[f] *Cost data and effectiveness assumes 25 percent participation spread over 10-years.*

[g] *Cost data and effectiveness assumes 25percent participation spread over 10-years. Rebate amount of $100.*

[h] *Cost data and effectiveness assumes 20 percent participation spread over 10-years. Rebate amount of $150.*

[i] *Cost data and effectiveness assumes 20 percent participation spread over 10-years. Rebate amount of $200.*

Source: SEWRPC.

Based upon the changes in population and land use within each of the municipal water service areas and proposed future water conservation measures, forecasts were made of the future water use demands and pumpage for each utility, as summarized by county in Table 6. The total water use demand on an average daily basis for the municipal water utilities in the Region is forecast to increase from about 201 million gallons per day (mgd) in 2000, to about 258 mgd in 2035, an increase of about 29 percent. The corresponding pumpage is forecast to increase from about 231 mgd to about 303 mgd, or by about 31 percent, on an average daily basis; and from about 347 mgd to about 491 mgd, or by about 41 percent, on a maximum daily basis. Pumpage forecasts include water use demand based upon sales, water used in the production of water and system maintenance, and unaccounted-for water. These forecasts of water use and pumpage serve as an important basis for the consideration and evaluation of future year 2035 alternative plans for municipal water supply systems. The forecasts were prepared by:

- Municipal utilities currently served by Lake Michigan water supply—total water use demand on an average daily basis is estimated to increase from about 162 mgd in 2000 to about 184 mgd in 2035, an increase of about 14 percent;

- Municipal utilities currently served by groundwater supplies—total water use demand on an average daily basis is estimated to increase from about 38 mgd in 2000 to about 67 mgd in 2035, an increase of about 76 percent; and

- Newly planned municipal utilities—an estimated 24 new utilities are estimated to have a year 2035 water use demand of about 8 mgd on an average daily basis. All of these systems are envisioned to use groundwater as the source of supply.

About 60 percent of the forecast increase in water use by municipal utilities between 2000 and 2035, or about 35 mgd on an average daily basis, is due to connecting areas served by private water supply systems and individual private on-site wells to public utilities. Accordingly, only about 40 percent of the forecast increase, or about 23 mgd on an average daily basis, represents new demand—of about 12 percent—on the resource base.

Table 3

FORECAST EFFECTIVENESS OF WATER CONSERVATION PROGRAM LEVELS INCLUDED AS A COMPONENT OF ALL WATER SUPPLY ALTERNATIVE PLANS FOR SOUTHEASTERN WISCONSIN

Water Utility Category	Future Water Conservation Assumption Over and Above the Current Level[a]	
	Average Day Reduction in Use	Maximum Day Reduction in Use
• Lake Michigan Supply with Return of Spent Water • Adequate Water Supply Infrastructure in Place for 10 or More Years	4%[b]	6%[b]
• Lake Michigan Supply with Return of Spent Water • Some Water Supply Infrastructure Needs Expected During the Next 10 Years	4%[c]	10%[c]
• Groundwater Supply • Adequate Water Supply Infrastructure for 10 or More Years • No Major Aquifer Quality or Quantity Issues	6%[d]	12%[d]
• Groundwater Supply • Major Infrastructure Needs Expected During the Next 10 Years • No Major Aquifer Quantity or Quality Problems	8%[d]	16%[d]
• Groundwater Supply • Major Infrastructure Needs Expected During the Next 10 Years • Aquifer Quantity or Quality Problems	10%[d]	18%[d]

[a] *The existing level of water conservation generally carried out by the Region's water utilities is estimated to be currently achieving reductions in average and maximum day water demand of about 4 percent through meter testing, leak detection and repair, and repair and replacement of water mains.*

[b] *Water conservation program cost may be offset by reductions in operating cost.*

[c] *Water conservation program cost may exceed reductions in operating costs.*

[d] *Water conservation program cost will likely exceed reductions in operating costs.*

Source: SEWRPC.

The following additional forecasts were made with respect to water supply:

- Residential Other Than Municipal Community Systems—24 privately owned, self-supplied, water systems which provide water supply services to primarily residential land uses, would remain. These systems serve residential developments, such as mobile home parks and condominium complexes, beyond the cost effective reach of municipal water supply facilities. These 24 systems are expected to continue utilizing groundwater as the source of supply;

- Industrial Water Supply Systems—63 privately owned, self-supplied, water systems which currently provide water for industrial land uses are expected to continue utilizing groundwater as the source of supply;

- Commercial Water Supply Systems—256 privately owned, self-supplied, water systems which currently provide water for commercial land uses are expected to continue utilizing groundwater as the source of supply;

- Institutional and Recreational Water Supply Systems—28 privately owned, self-supplied, water systems which currently provide water for institutional and recreational land uses are expected to continue utilizing groundwater as the source of supply;

Table 4

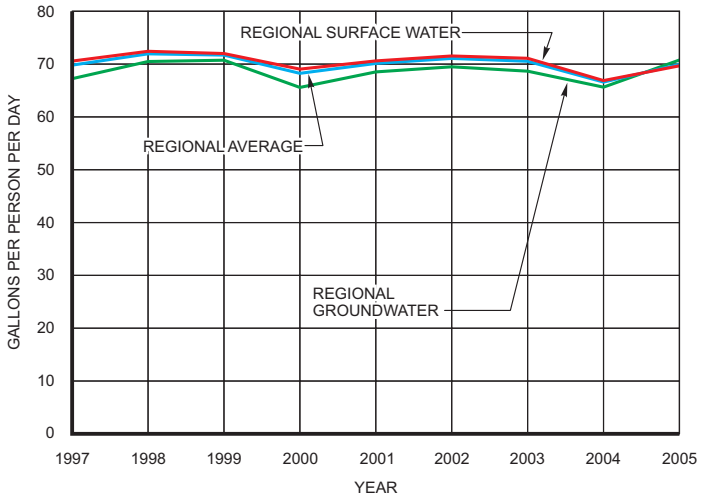
MUNICIPAL WATER USE BY USE CATEGORY IN THE SOUTHEASTERN WISCONSIN REGION: 2000 AND 2005

Year	Average Annual Water Use					Percent Unaccounted-for Water
	Residential Water Use		Industrial Water Use	Commercial, Institutional, and Multi-Family Residential	Total Water Use	
	Gallons Per Capita Per Day	Gallons Per Acre Per Day	Gallons Per Acre Per Day	Gallons Per Acre Per Day	Gallons Per Capita Per Day	
2000	68	910	4,010	1,054	128	10
2005	70	916	3,003	964	120	11

Source: SEWRPC.

Figure 3

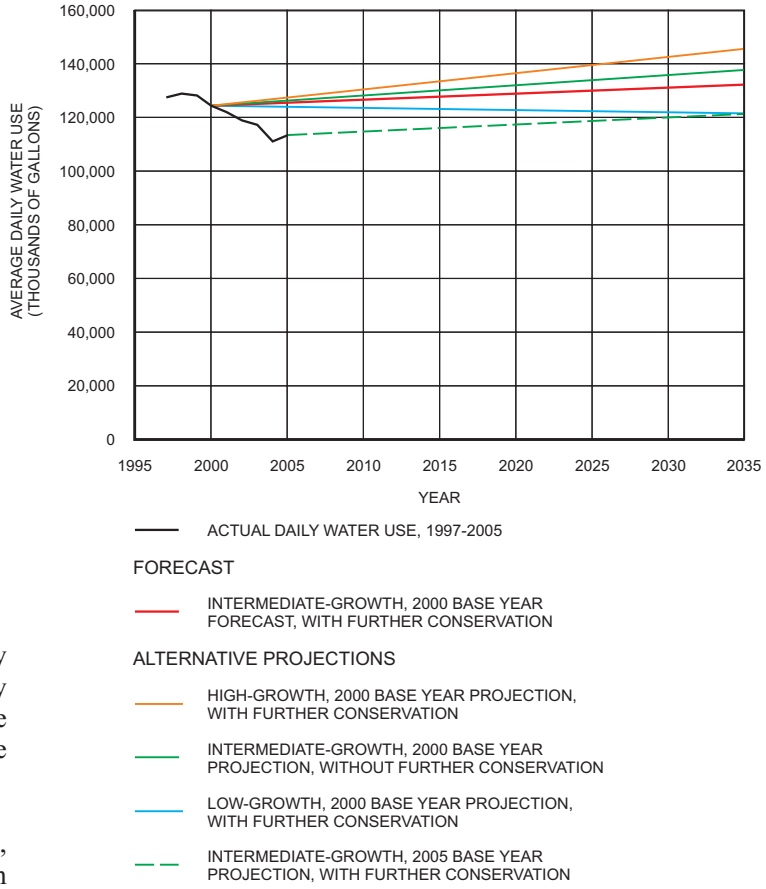
AVERAGE DAILY RESIDENTIAL MUNICIPAL WATER USE PER CAPITA: 1997-2005



Source: Public Service Commission of Wisconsin and SEWRPC.

Figure 4

ACTUAL, PROJECTED, AND FORECAST AVERAGE DAILY WATER USE: MILWAUKEE COUNTY



Source: Public Service Commission of Wisconsin and SEWRPC.

- Agricultural Water Supply Systems—52 privately owned, self-supplied, water systems which currently provide water for irrigation and other purposes are expected to continue utilizing groundwater as the source of supply;

- Irrigation Water Supply Systems—70 privately-owned, self-supplied, water systems which provide irrigation water for land uses other than agricultural uses, such as golf courses, are expected to continue utilizing groundwater as the source of supply;

- Power Generation Water Supply Systems—six existing privately owned, self-supplied, water systems provide water for cooling and other uses at thermoelectric-power-generation facilities. These facilities include: Pleasant Prairie Power Plant and Paris Generating Station facility in Kenosha County, Valley Power Plant and Oak Creek Power Plant in Milwaukee County, Port Washington Power Plant in Ozaukee County, and Germantown Power Plant in Washington County. Combined, these facilities are reported to use nearly 2 billion gallons of water per day. Most of that water is utilized by the Valley Power Plant, the Oak Creek Power Plant, and the Port Washington Power Plant, all of which use Lake Michigan water. These systems typically return over 99 percent of the cooling water used back to the Lake. Nevertheless, this represents a significant ongoing and important water use under current and future conditions.

Table 5

PROJECTED CHANGES IN MUNICIPAL WATER SUPPLY SERVICE AREAS IN THE SOUTHEASTERN WISCONSIN REGION: 2000 AND 2035

County	Total Area (square miles)	Municipal Water Service Area					
		Year 2000		Year 2035		Increment 2000-2035	
		Area Served (square miles)	Percent of County	Area Served (square miles)	Percent of County	Number	Percent
Kenosha	278.4	29.8	11	66.0	24	36.2	121
Milwaukee	242.7	180.9	75	202.3	83	21.4	12
Ozaukee	235.5	15.7	7	40.4	17	24.7	157
Racine	340.6	37.9	11	64.4	19	26.5	70
Walworth	576.5	22.0	4	46.7	8	24.7	112
Washington	435.6	21.4	5	40.5	9	19.2	89
Waukesha	580.5	82.3	14	170.6	29	88.3	107
Region	2,689.9	390.0	14	630.9	23	240.7	62

Source: U.S. Bureau of the Census and SEWRPC.

Table 6

MUNICIPAL WATER SUPPLY SERVICE AREA DEMAND AND PUMPAGE BY COUNTY IN THE SOUTHEASTERN WISCONSIN REGION: EXISTING YEAR 2000 AND FORECAST YEAR 2035

County	Existing Year 2000			Forecast Year 2035		
	Average Water Use Demand (gallons per day x 1,000)	Average Daily Pumpage (gallons per day x 1,000)	Maximum Daily Pumpage (gallons per day x 1,000)	Average Water Use Demand (gallons per day x 1,000)	Average Daily Pumpage (gallons per day x 1,000)	Maximum Daily Pumpage (gallons per day x 1,000)
Kenosha	11,011	14,847	22,171	21,102	27,786	42,591
Milwaukee	124,832	138,612	203,822	132,317	147,277	240,836
Ozaukee	5,573	6,542	10,362	10,629	13,212	20,356
Racine	23,252	28,584	45,994	28,958	36,808	59,669
Walworth	6,346	8,089	13,699	12,036	15,492	25,693
Washington	6,426	7,577	12,074	11,682	13,768	21,699
Waukesha	23,104	26,962	38,889	41,756	48,996	80,551
Region	200,544	231,213	347,011	258,480	303,339	491,395

Source: SEWRPC.

- Self-Supplied Residential Water Systems - About 179,000 persons, or about 8 percent of the year 2035 resident population of the Region, are expected to be served by private domestic wells. Assuming an average use of 65 gallons per capita per day, these private domestic wells would withdraw about 12.0 million gallons per day from the shallow groundwater aquifer, and be served by onsite sewage disposal systems. About 90 percent of the water withdrawn by these private wells may be expected to be returned to the groundwater via infiltration.

In comparison to Table 6 which presents data on forecast water demand over the next 30 years, Table 7 presents data on the utilization and reserve capacity of existing Lake Michigan water supply treatment plants. In particular, the City of Milwaukee treatment plants currently are operating at less than 50 percent of their capacity, and are projected in the year 2035 to be at about 56 percent of capacity. The projected reserve, or excess capacity, of the Milwaukee treatment plants exceeds the total regional forecast increase in maximum daily water pumpage in the Region over the next 30 years.

WATER SUPPLY LAW

An inventory of water supply law was conducted under the study and the findings of this study are documented in SEWRPC Technical Report No. 44, *Water Supply Law.* Although a number of the study findings have implications for the design of alternative plans, and the selection of a recommended plan, for Southeastern Wisconsin, the key findings of the study relate to the regulation of the use of Lake Michigan water to serve areas located west of the sub-continental divide traversing the Region. Both the existing regulatory framework and the currently proposed new regulatory framework were found to be particularly important in this respect.

Current Regulatory Framework

Under State law, a user seeking to divert water which would result in a water loss averaging more than two million gallons per day within a thirty day period from the Lake Michigan Basin must obtain a permit from the Wisconsin Department of Natural Resources (WDNR). A "water loss" means a loss of water from the Basin as a result of inter-basin diversion or consumptive use

Table 7

CAPACITY AND USE OF LAKE MICHIGAN WATER TREATMENT PLANTS WITHIN SOUTHEASTERN WISCONSIN: 2000 AND 2035

	Existing 2000 Pumpage (mgd)		Forecast 2035 Pumpage[b] (mgd)		Existing Rating Plant Capacity (mgd)[d]	Reserve Capacity (mgd)[d]
	Average	Maximum Day	Average	Maximum Day		
City of Cudahy Water Utility	4.8	6.6	4.8	6.0	6.0	None
City of Kenosha Water Utility	14.5	21.6	22.2	33.4	42.0	8.6
City of Milwaukee Water Utility	125.0	176.6	132.9	212.3	380.0	167.7
Linwood Avenue	- -	- -	- -	- -	275.0	- -
Howard Avenue	- -	- -	- -	- -	105.0	- -
City of Oak Creek Water and Sewer Utility	7.0	15.5	14.2	29.2	20.0[b]	None[b]
City of Port Washington	1.3	1.7	1.9	3.1	4.0	0.9
City of Racine Water and Wastewater Utility	25.0	39.0	29.2	44.2	60.0	15.8
City of South Milwaukee Water Utility	2.7	3.6	2.6	4.3	8.0	3.7
North Shore Water Commission	4.2	8.1	4.9	9.6	18.0	8.4

[a] *Based upon data from the Wisconsin Department of Natural Resources files. The capacity data given are based upon the capacity of the critical plant component. Other plant components may have higher capacities. Thus, some components may provide a higher reserve capacity than that based upon the capacity of the critical element used to construct the table.*

[b] *The City of Oak Creek water treatment plant is designed to be expanded in increments up to 48 mgd.*

Source: Public Service Commission of Wisconsin, Wisconsin Department of Natural Resources, water utilities, and SEWRPC.

or both. If the water is used outside the Basin but is returned to the Basin, it would not constitute a "water loss". If the water loss involved averages more than five million gallons per day, the WDNR must notify each of the governors of the eight Great Lakes states and the premieres of the Canadian providences involved. The WDNR must consider any comments submitted by the governors and premiers in making its decision on the proposal. The eight Great Lakes states are: Illinois, Indiana, Michigan, Minnesota, Ohio, Pennsylvania, New York, and Wisconsin; the two Canadian provinces concerned are Ontario and Quebec.

Federal law prohibits any diversion from the Lake Michigan Basin unless first approved by the governors of the eight Great Lakes states. This prohibition is set forth in the Water Resources Development Acts (WRDA). This prohibition does not apply to any diversions authorized on or prior to November 17, 1986. WRDA does not specifically define what constitutes a diversion. WDNR has taken the position that water taken and used outside the Great Lakes Basin, but then returned to the Basin, is not a diversion subject to the provisions of WRDA.

Potential Future Regulatory Framework

On December 13, 2005 the governors of the eight Great Lakes States entered into a Great Lakes - St. Lawrence River Basin Water Resources Compact. If this Compact is approved by the legislators of all of the eight Great Lakes States, and consented to by the Congress of the United States, it would modify the regulations applicable to the use of Great Lakes Basin water.

All diversions would be prohibited, with, however, three limited exceptions under the Compact. A diversion would be defined to occur whenever water is transferred from the Great Lakes Basin into another watershed by any means other than incorporation into a product. The three exceptions from the diversion prohibition are for straddling communities, communities within straddling counties, and intra-basin transfers.

The first exception would allow any incorporated municipality with corporate boundaries lying partially in, and partially out, the basin to seek approval for a diversion from the state concerned, provided that the water is to be used for public water supply purposes and that all water withdrawn is to be returned to the source less an allowance for consumptive use. The exception also requires that for diversions exceeding 100,000 gallons per day, the straddling communities must show that the need cannot reasonably be avoided; the withdrawal is limited to quantities that are reasonable for the intended purpose; and that the withdrawal is shown to have no significant adverse impacts on the natural resources of the Basin; and that water use conservation measures are to be implemented. If the diversion would result in a consumptive use of five million gallons per day or more the proposal must also undergo a multi-state review process, the findings of which must be considered by the state concerned in deciding whether or not to approve the proposed diversion.

The second exception permits communities located within a straddling county to similarly seek approval for a diversion. Approval of a diversion of any size would require approval by all of the governors of the eight Great Lake states. The diversion would have to be accompanied by provision for return flow. The third exception relating to intra-basin diversion would have no practical application within the planning area.

The Village of Pleasant Prairie in Kenosha County has a diversion approved by WDNR. The Pleasant Prairie diversion is to end by the year 2010 when all Lake Michigan water used west of the subcontinental divide is to be returned as treated wastewater to

Lake Michigan rather than to the Des Plaines River. The City of Kenosha has historically used Lake Michigan water west of the subcontinental divide with the return of the spent water to Lake Michigan via the City sanitary sewage system. The Kenosha use was never considered a diversion, provided the spent water was returned to its source.

Implications for Plan Design

All of the alternative plans to be considered under the study and the recommended plan are to be designed to fully meet the requirements of existing State law; of the Federal Water Resources Development Act; and of the proposed Great Lakes Compact.

CONSIDERATION OF ALTERNATIVE REGIONAL WATER SUPPLY PLANS

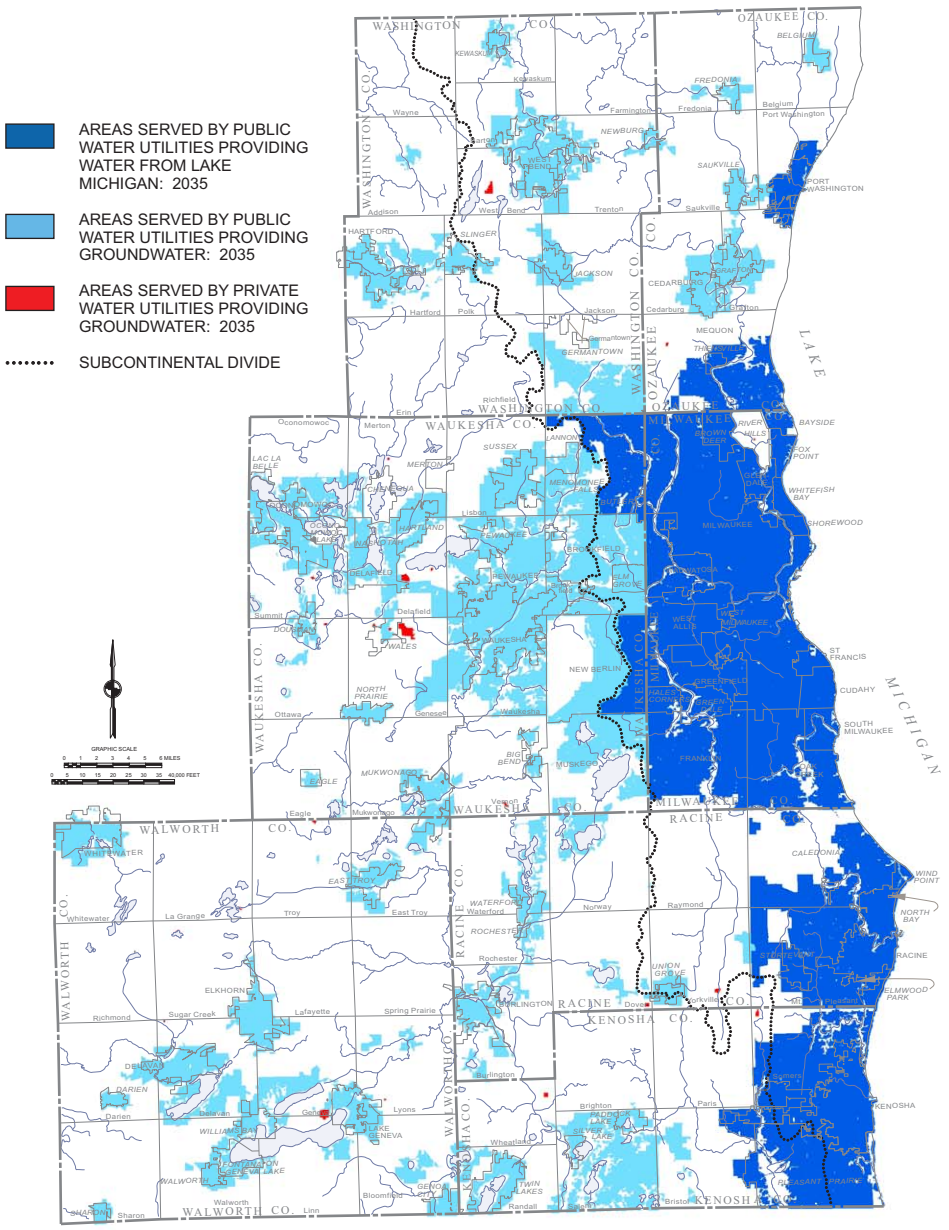
A number of initial alternative regional water supply plans are proposed to be considered and evaluated.

Alternative Plan 1—Continuation of Existing Sources of Water Supply

This alternative plan, as shown on Map 5, would maintain the existing sources of water supply for the Region's water utilities: groundwater for those now using groundwater and Lake Michigan water for those reliant on Lake Michigan water. For those groundwater-based water utilities with water quality or quantity problems, treatment of groundwater and/or alternative groundwater sources—shallow replacing deep groundwater as a source—will be considered. In the Kenosha area Lake Michigan water would continue to be provided west of the subcontinental divide by the City of Kenosha Water Utility to portions of the City of Kenosha, portions of the Village of Pleasant Prairie, the Town of Somers, and portions of the Town of Bristol, recognizing longstanding inter-municipal agreements, and investment in Lake Michigan water supply infrastructure, and provision for return flow already in place.

Map 5

ALTERNATIVE PLAN 1 - CONTINUED RELIANCE ON GROUNDWATER SUPPLY EAST AND WEST OF THE SUBCONTINENTAL DIVIDE



Source: SEWRPC.

Alternative Plan 2—Limited Expansion of Lake Michigan Supply (Limited to East of Subcontinental Divide and to Straddling Communities with Existing Return Flow)

This alternative plan, as shown on Map 6, would only differ from Alternative Plan 1 in that four selected communities located east of the subcontinental divide (the Villages of Germantown and Elm Grove; the eastern portion of the City of Brookfield; and a portion of the Town of Yorkville) would be converted from groundwater to Lake Michigan as the source of water supply, along with two communities straddling the subcontinental divide (the central portion of the City of New Berlin which is located west of the divide and the City of Muskego which is largely located west of the divide) but which already have return flow to Lake Michigan in place.[1]

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[1]*For purposes of the regional water supply planning effort, a Lake Michigan water supply return flow component is defined as the return of treated wastewater from the area under consideration, either directly via a sanitary sewerage system, or indirectly via treatment plant effluent conveyance through a pipeline, a watercourse, or some combination. The return flow must equal or exceed the amount taken from the source of supply, less an allowance for consumptive uses.*

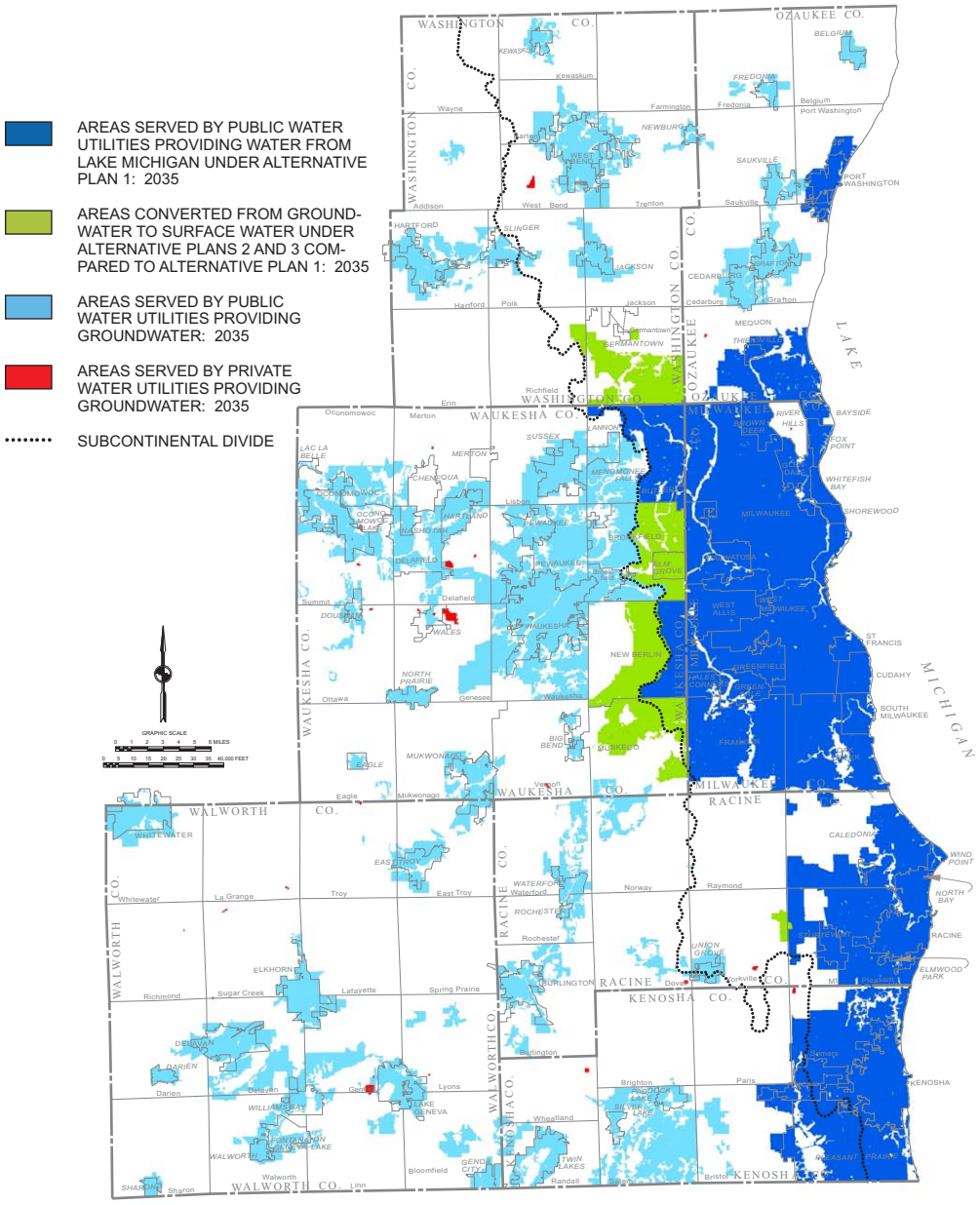
Alternative Plan 3—Limited Expansion of Lake Michigan Supply and Enhanced Groundwater Recharge

This alternative plan would be the same as Alternative Plan 2, but would also include shallow groundwater aquifer recharge measures using local rainfall and treated wastewater. The shallow groundwater aquifer recharge measures would include:

- Enhancement of current rainfall infiltration requirements of new development set forth in Chapter NR 151 of the Wisconsin Administrative Code, specifically, attempting to achieve 80 percent or more of pre-development rainfall infiltration after development.
- Enhancement of rainfall infiltration through bioengineering of about four square miles of open space at sites to be selected, specifically to minimize the impacts of groundwater water use on lakes, streams, and wetlands.
- Identification and protection of the remaining most significant groundwater recharge areas within the Region either through preservation or development in a manner which would preserve their natural hydrology and rainfall infiltration.
- The development of systems for further treatment and discharge of wastewater treatment plant effluent into the shallow aquifer at selected locations. Such recharge systems may violate current State regulations and policies regarding groundwater management, and could require changes to, or variances from, those regulations and policies.

Map 6

ALTERNATIVE PLAN 2 - LIMITED EXPANSION OF LAKE MICHIGAN[d] SUPPLY



[a]Alternative Plan 3 would maintain the same sources of water supply as alternative Plan 2, but would also include measures to increase groundwater recharge.

Source: SEWRPC.

This alternative will also examine—and provide a separate cost and impact evaluation—of groundwater injection wells intended for aquifer replenishment with treated Lake Michigan water from existing Lake Michigan water treatment facilities as a source, and the deep aquifer as the receptor. Injection wells would be located east of the subcontinental divide. Wells would be designed so that the deep sandstone groundwater at the point of injection would be flowing toward Lake Michigan, or toward wells where return flow would be to the Lake. Such injection wells would also require changes to, or variances from, State regulations and policies; and implementation would face issues of who pays for the injected water.

Alternative Plan 4—Substantial Expansion of Lake Michigan Supply

This alternative plan, as shown on Map 7, would further expand the use of Lake Michigan as a source of water supply—replacing groundwater as the source of supply—beyond that proposed in Alternative Plan 2, including expansion to communities located east of the subcontinental divide, communities straddling the subcontinental divide, and non-straddling communities in counties straddling the subcontinental divide.

- The additional communities using Lake Michigan water supply east of the subcontinental divide would include: the City of Cedarburg, and the Villages of Fredonia, Grafton, and Saukville, all in Ozaukee County.

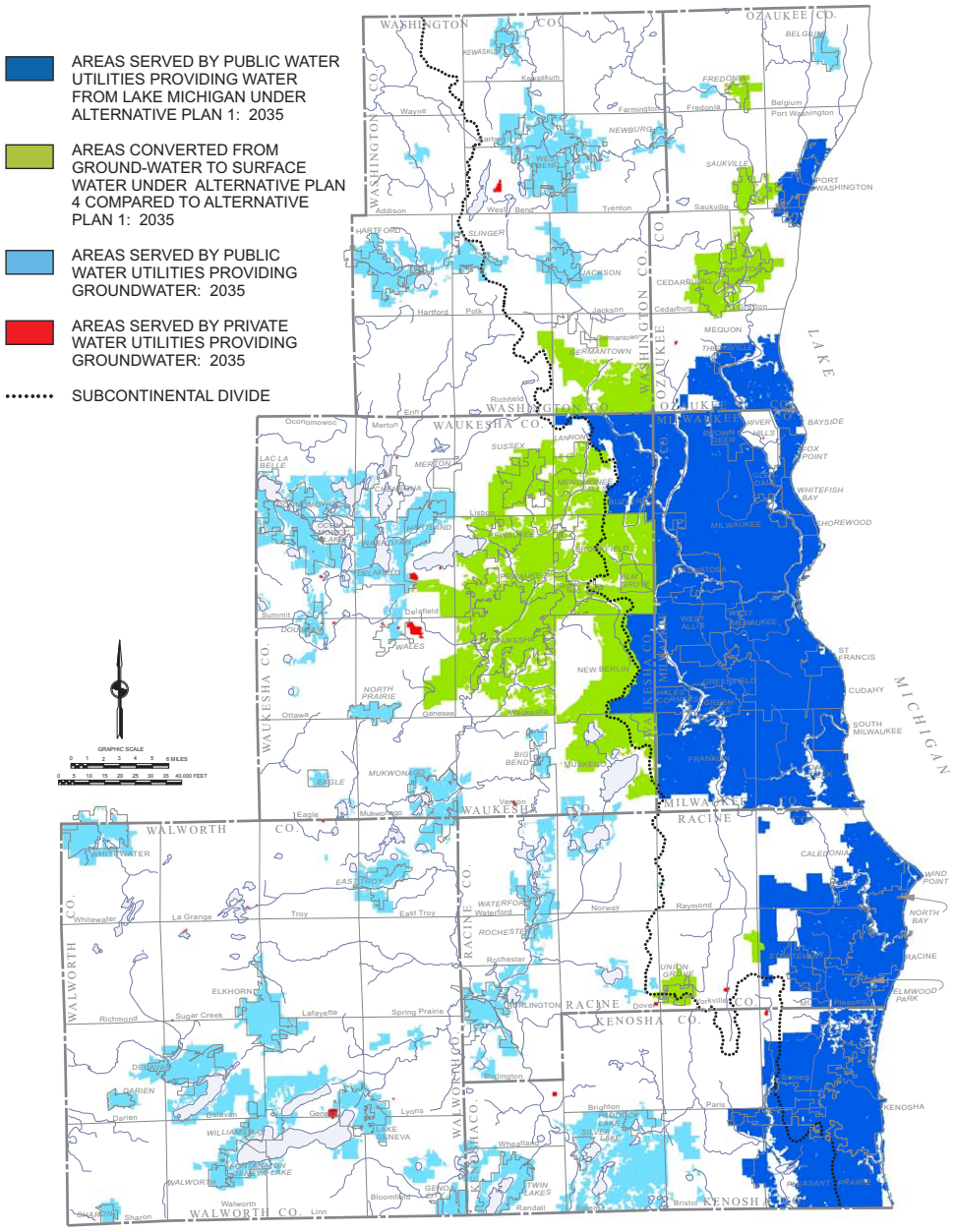
- The additional communities using Lake Michigan water supply straddling the subcontinental divide would include: the western portion of the City of Brookfield, the western portion of the Village of Menomonee Falls, the Town of Brookfield, all in Waukesha County, and the Village of Union Grove in Racine County.

- The non-straddling communities using Lake Michigan water supply in a county which straddles the subcontinental divide would include: the Cities of Pewaukee and Waukesha, and the Villages of Lannon, Pewaukee, and Sussex, all in Waukesha County.

For all communities converting from groundwater to Lake Michigan water, return flow of treated wastewater to Lake Michigan would be provided.

Map 7

ALTERNATIVE PLAN 4 - FURTHER EXPANSION OF LAKE MICHIGAN SUPPLY



Source: SEWRPC.

EVALUATION OF ALTERNATIVE PLANS AND NEXT STEPS

Each of the alternative plans will be evaluated with respect to cost; potential environmental impact including the impact on lakes, streams, and wetlands; potential impacts on the shallow and deep aquifers; water supply sustainability; and feasibility of implementation. The plans will also be evaluated with respect to environmental justice considerations, specifically, impacts on minority and low income populations. Based on the findings of the evaluation of the alternative plans, a recommended plan will be developed. Proposals may be considered to modify the regional land use plan and development, and in so doing alter water supply demand and needed supply and attendant costs and impacts. The next newsletter will summarize the findings of the evaluation of the four alternative plans, and potential conclusions regarding the next steps in the planning effort.

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.

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