VOLUME 2 OF 5

City of Waukesha
Water Supply Service Area Plan

OCTOBER 2013

Volume 2 of 5

City of Waukesha Water Supply Service Area Plan

October 2013

CH2MHILL®

Contents

Exhibits

Appendixes

Acronyms and Abbreviations

ADD	average day demand
AWWA	American Water Works Association
City	City of Waukesha
Compact	Great Lakes – St. Lawrence River Basin Water Resources Compact
County	Waukesha County
County Plan	A Comprehensive Development Plan for Waukesha County, Wisconsin
CPES	Parametric Cost Estimating System
ERP	Environmental Repair Program
ft	feet
gal/day	gallons per day
gpcd	gallons per capita day
HMO	hydrous manganese oxide
MDD	maximum day demand
MCL	maximum contaminant level
MG	million gallons
mgd	million gallons per day
mg/L	milligram per liter
NR 852	Wisconsin Administrative Code chapter NR 852 Water Conservation and Water Use Efficiency
NR 854	Wisconsin Administrative Code chapter NR 854 Water Supply Service Area Plans
piC/L	picocurie per liter
PSC	Public Service Commission of Wisconsin
psi	pounds per square inch
PWS	public water supply
Regional Water Supply Plan	A Regional Water Supply Plan For Southeastern Wisconsin
RO	reverse osmosis
SCADA	Supervisory Control And Data Acquisition
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SOC	synthetic organic compound
TDS	total dissolved solids
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WDNR	Wisconsin Department of Natural Resources
WSSA	Water Supply Service Area
WWU	Waukesha Water Utility

1. Introduction

This Water Supply Service Area Plan (WSSA Plan) describes the City of Waukesha's water system and the its long-range water supply planning process. The WSSA Plan is based on extensive studies conducted by public- and private-sector engineers, planners, hydrogeologists, and scientists. The purpose of the WSSA Plan is to define the water supply needs of the City's WSSA, to systematically evaluate alternative means of supplying and treating water to Safe Drinking Water Act standards, and to identify a cost-effective water supply alternative.

The City of Waukesha is located in Waukesha County, about 17 miles west of Lake Michigan and 1.5 miles west of the Great Lakes watershed surface water divide. Waukesha County is a straddling county because it lies partly within the Great Lakes basin. Because the City is eligible to apply for a new Great Lakes diversion with return flow in accordance with the Great Lakes–St. Lawrence River Basin Water Resources Compact (Compact) and Wisconsin's legislation for implementing the Compact, this option is one of the water supply alternatives evaluated in the WSSA Plan.

In May 2010, the City submitted to the Wisconsin Department of Natural Resources (WDNR) its WSSA Plan and Application for Lake Michigan Supply. Since then, the draft Water Supply Service Area Plans administrative rule (Wisconsin Administrative Code chapter NR 854) was published; subsequent technical evaluations were conducted; and new data became available. The revised WSSA Plan contains the technical information originally provided in May 2010 and discussion of changes made to incorporate 2010 U.S. Census Bureau data, new water conservation goals, updated water demand forecasts, additional evaluation of the environmental impacts of water supply alternatives, and updated cost estimates.

Draft Wisconsin Administrative Code chapter NR 854 requires a water supply planning period of 20 years and development of a WSSA Plan for any proposed new diversion of water from the Great Lakes basin. Consequently, this plan includes discussion of water supply service area needs for both a 20-year planning horizon (2010–2030) and the ultimate buildout, or full development condition, of the City's WSSA. Some planning information (population projections, water demand forecasts, water savings from conservation) is presented for 2030 and for the buildout condition. Other information (such as the evaluation of alternatives to meet the long-term need for a water supply that is adequate in volume, sustainable, cost-effective, and protective of public health) was developed for the service area buildout condition.

The WSSA Plan is consistent with applicable local comprehensive plans and includes analyses of the public water system infrastructure, water supply issues, water supply alternatives, and improvements needed to meet projected water demands. In conformance with ch. NR 854, Wis. Admin, Code., the WSSA Plan comprises the following sections:

1. Introduction
2. Delineated Water Supply Service Area
3. Existing Water Supply System
4. Existing Water Supply Sources
5. Water Use by Customers
6. Water Demand Forecasts
7. Plan to Meet Projected Water Demand
8. Consistency with Other Plans
9. Water Conservation Alternatives
10. Cost-Effectiveness Analysis of Water Supply Alternatives
11. Assessment of Environmental Impacts of Water Supply Alternatives
12. Intergovernmental Agreements and Approvals
13. Public Participation
14. Procedures for Implementing and Enforcing the Plan

The WSSA Plan is Volume 2 of the City's revised Application for a Lake Michigan Diversion with Return Flow (Application).

2. Delineated Water Supply Service Area

Under Wisconsin Statutes chapter 281 and Wisconsin Administrative Code chapter NR 121, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) is authorized to delineate the City's water supply service area. SEWRPC delineated the City's WSSA considering several factors and requirements. Factors considered in water service area delineation include urban development densities, distance to the nearest existing water supply service area, aquifer characteristics, and potential for groundwater contamination. In addition, the City's WSSA was delineated to meet the requirements of the Compact and the state statutes implemented to administer the Compact in Wisconsin.

Prior to Wisconsin's Compact implementation law (2007 Act 227, now at Wisconsin Statutes chapter 281), water supply service areas were not delineated in the state. Sewer service areas, however, have been delineated by local regional planning commissions for several decades in an effort to meet regional water quality management goals, coordinate planning efforts across municipal boundaries, and minimize investment in duplicate wastewater collection and treatment infrastructure (SEWRPC, 03/1995), (SEWRPC, 03/1999). As directed by Wisconsin's Compact implementing legislation, SEWRPC applied the same guiding principles to the delineation of the City's WSSA. The WSSA is required by state law to be consistent with the sewer service area of the City of Waukesha and environs, thus conforming to the Compact requirement to maximize the return of Great Lakes water and to minimize the return of water from outside the Great Lakes basin. The planned WSSA and sewer service area are considered to be consistent (SEWRPC, 12/2008).

The planned water supply service area for the 20-year planning horizon and ultimate buildout condition are identical (Exhibit 2-1). Comprehensive long-term regional water supply planning conducted for southeastern Wisconsin included analysis and recommendations based on the City's planned WSSA (SEWRPC, 12/2010).

The City's public water system serves the City of Waukesha and limited areas in the Town of Waukesha and the City of Pewaukee. State law prohibits the WSSA boundaries from being limited to the City's boundaries (except to prevent water from being transferred outside of a straddling county). Wis. Stat. § 281.348(3)(e), Wis. Admin. Code ch. NR 121. The planned service area includes parts of neighboring communities (Exhibit 2-2):

- 4 percent of the City of Pewaukee
- 9 percent of the Town of Delafield
- 15 percent of the Town of Genesee
- 84 percent of the Town of Waukesha

The communities outside the City's municipal borders are largely developed and served by private wells and septic systems, some of which have been contaminated by pathogens, pollution, and naturally occurring elements in the groundwater. In accordance with regional water supply plan and Wisconsin Statutes, the City's WSSA Plan includes provisions to allow the City to serve those areas for public health reasons. For planning purposes, it is assumed that the City will be prepared to serve the entire WSSA by 2030

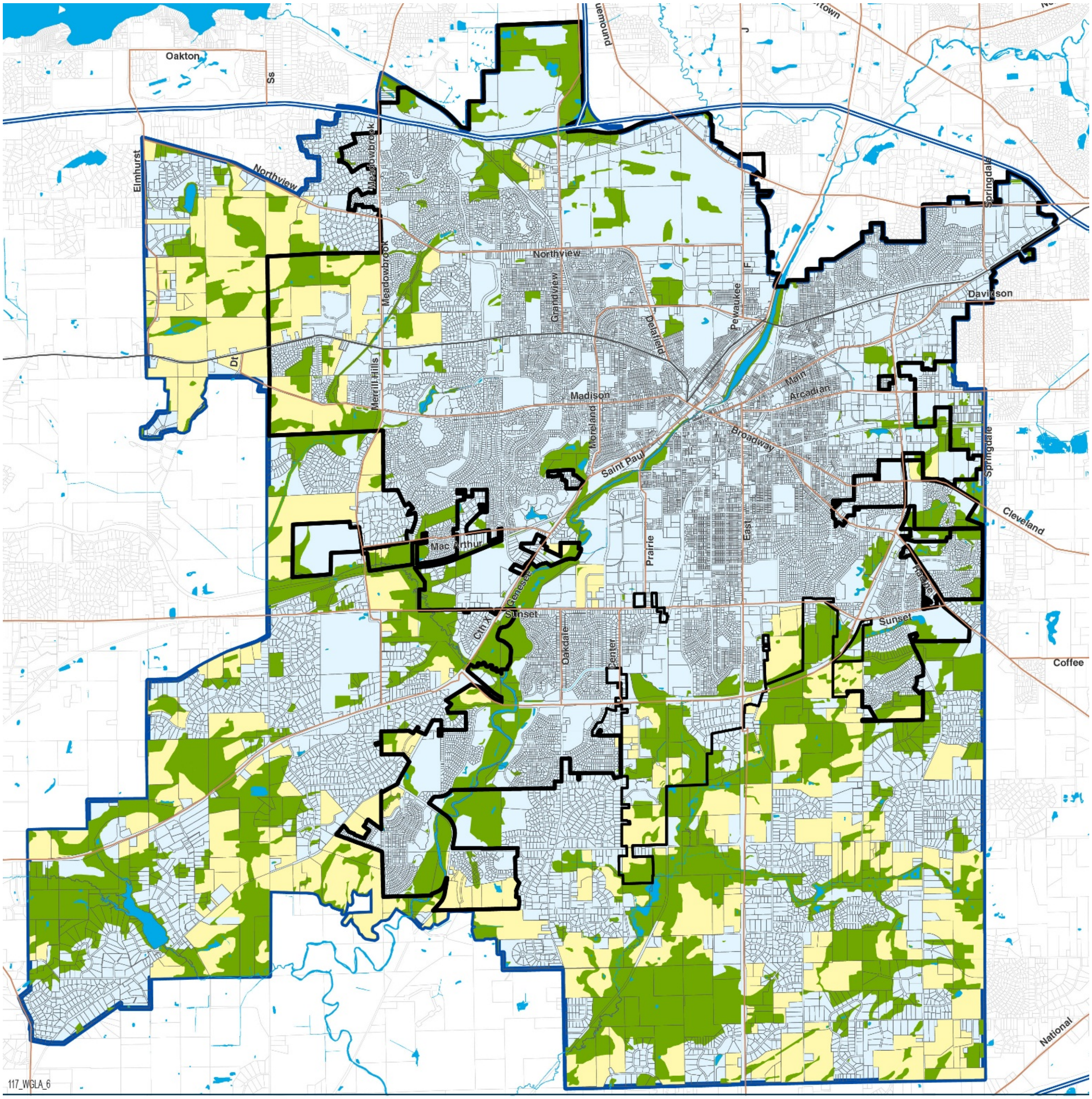
At this time, the WSSA does not include City water service to consecutive public water systems, but WSSA areas beyond City municipal boundaries may create their own public water systems in the future, subject to state statute.

2.1 Land Use in the Water Supply Service Area

Between 2000 and 2035, little change is projected in WSSA land designated for recreational, commercial, institutional, transportation, and environmental use. The greatest anticipated changes in land use are the 19 percent increase in residential land use, 3 percent increase in industrial land use, and 26 percent decrease in agricultural and open lands. To estimate the change in residential and industrial land use between the 2000 inventory and 2010, the City used 2010 digital aerial photography, polygon land use boundaries, and parcel information from Waukesha County. The City determined that roughly 50 percent of the residential and 20 percent of the industrial projected land use changes projected to take place by 2035 have already occurred (Exhibit 2-3).

EXHIBIT 2-1

Current and Planned WSSA



LEGEND

CITY OF WAUKESHA PLANNED WATER SERVICE AREA

CITY OF WAUKESHA CURRENT WATER SERVICE AREA

WETLANDS AND ENVIRONMENTAL CORRIDORS

LAND WITH DEVELOPMENT POTENTIAL

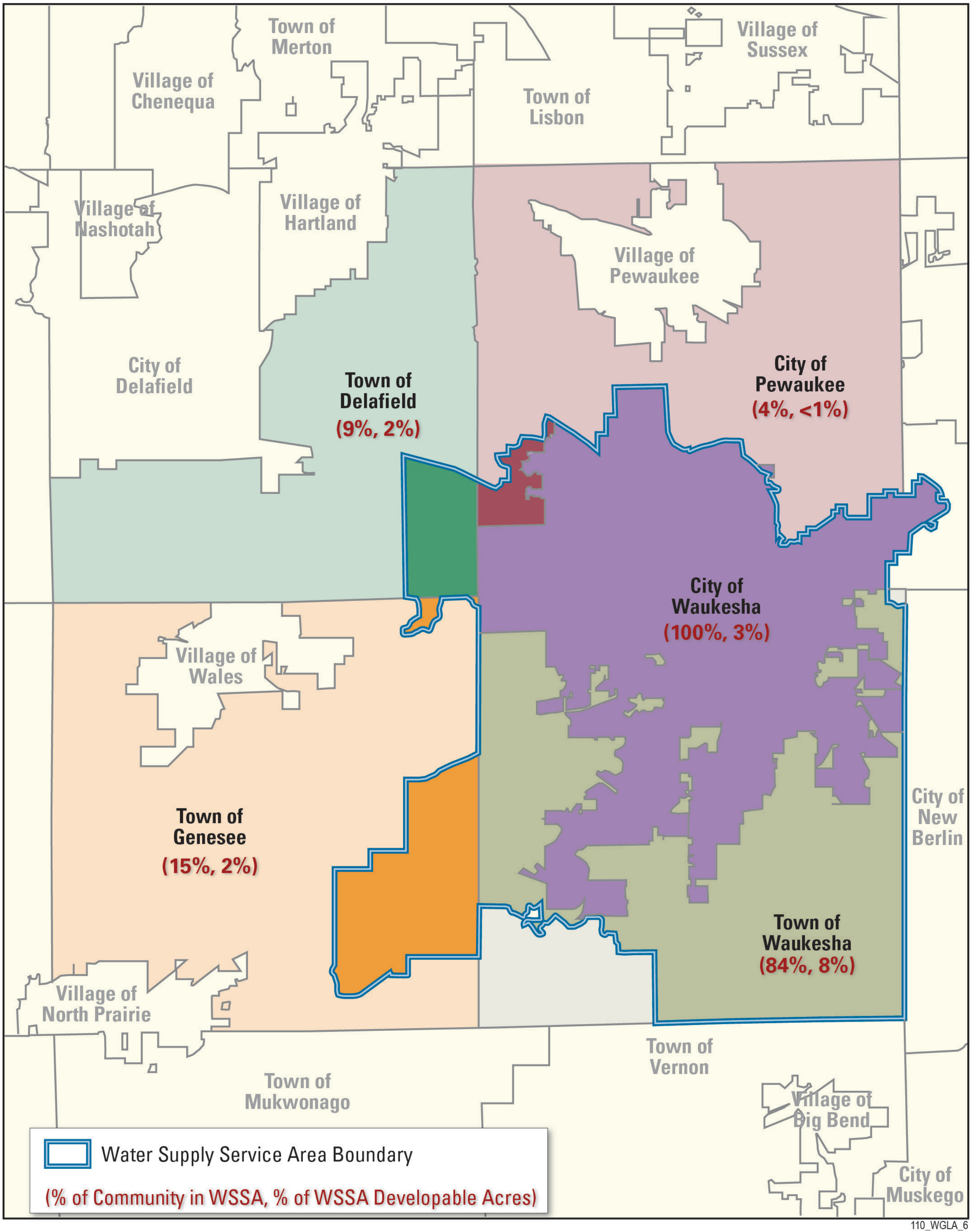
FREEWAY

HIGHWAY

MAJOR ROAD

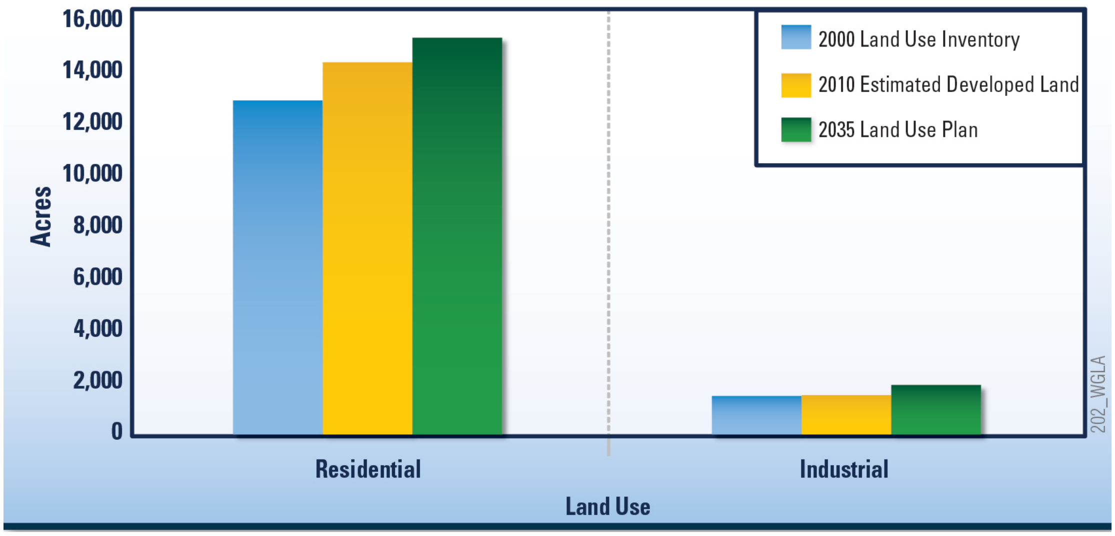
EXHIBIT 2-2

Civil Divisions within City of Waukesha Water Supply Service Area



110_WGLA_6

EXHIBIT 2-3
WSSA Residential and Industrial Land Use



The planned WSSA covers 32,209 acres. The 2000 land use inventory (Exhibit 2-4) represents actual land use in 2000. This is the best available information pending publication of the 2010 land use inventory. The 2035 recommended land use plan (Exhibit 2-5) represents the future land use that meets comprehensive planning goals (water quality management, economic, government, transportation, and public utility) through 2035. Exhibit 2-5 compares land use within the delineated WSSA by civil division. The data summarized in Exhibit 2-6 demonstrate there is limited growth potential in the WSSA, because roughly 15 percent of the land is available for new development, 70 percent of the land is already developed, and 15 percent of the land is designated as environmentally protected. In keeping with recommended land use plans, about 0.5 percent of the land outside city limits is undeveloped industrial land, and about 0.2 percent is undeveloped commercial land.

EXHIBIT 2-4

2000 Regional Land Use Inventory in WSSA

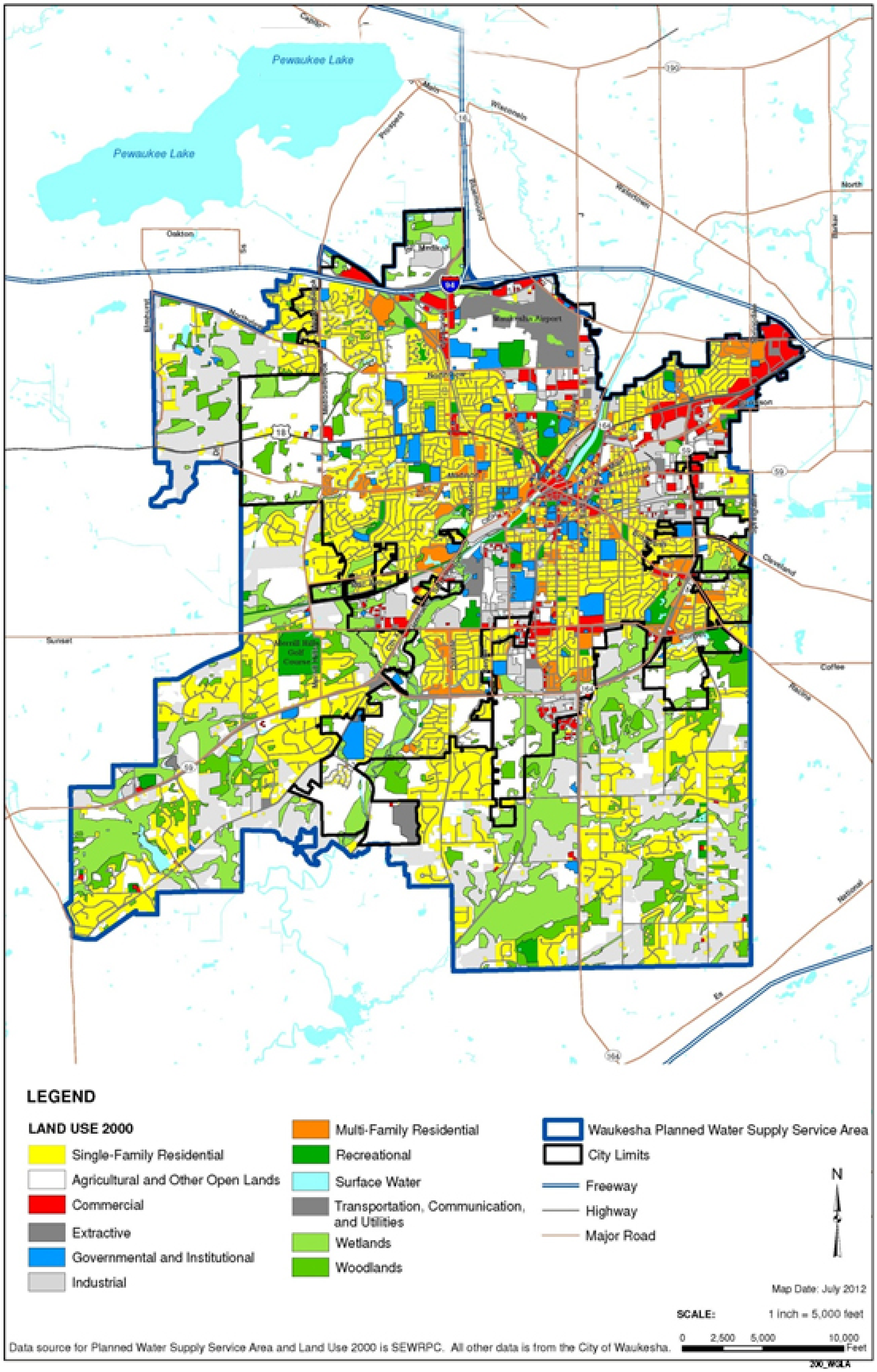


EXHIBIT 2-5

2035 Recommended Land Use in WSSA

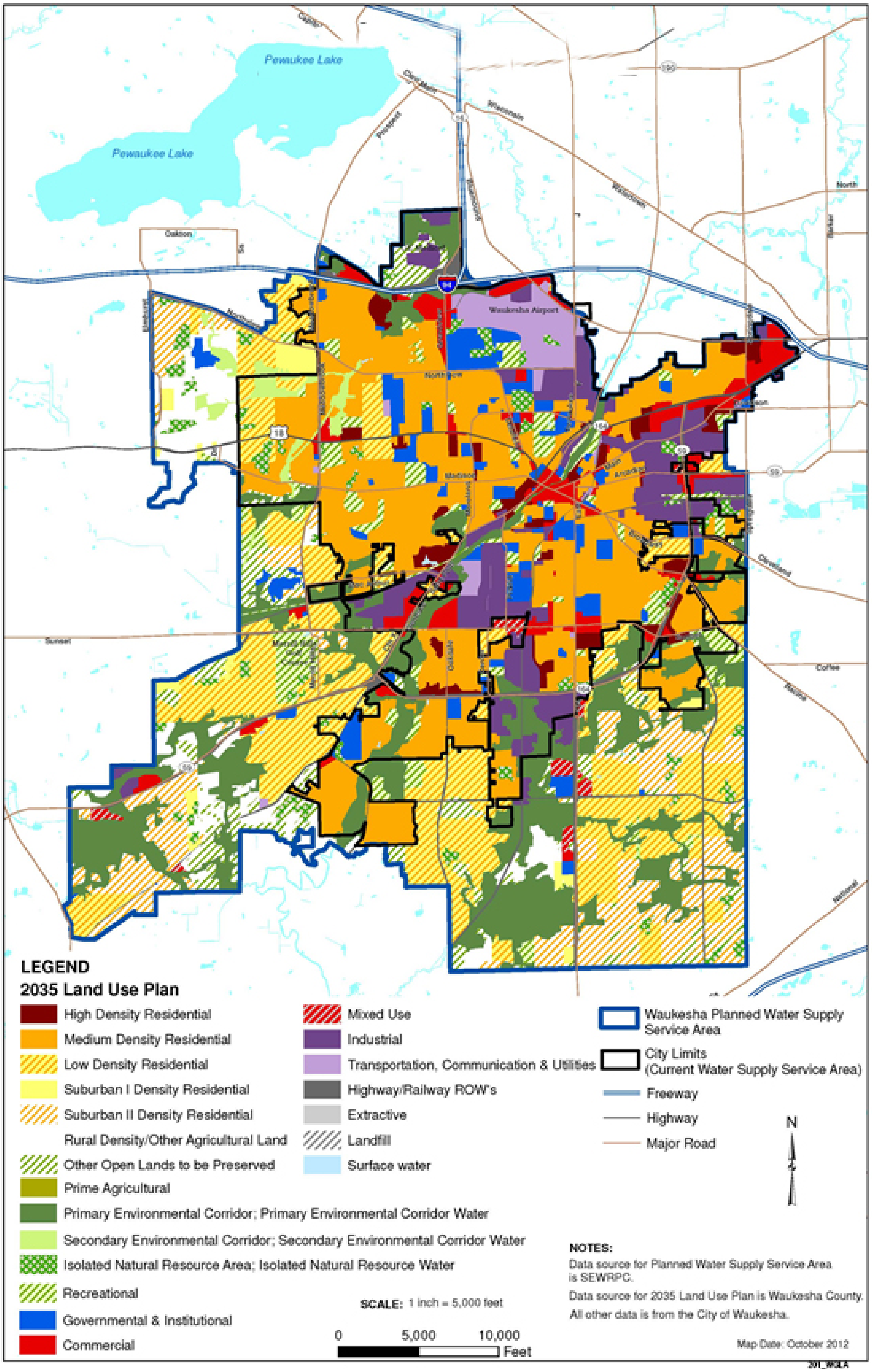
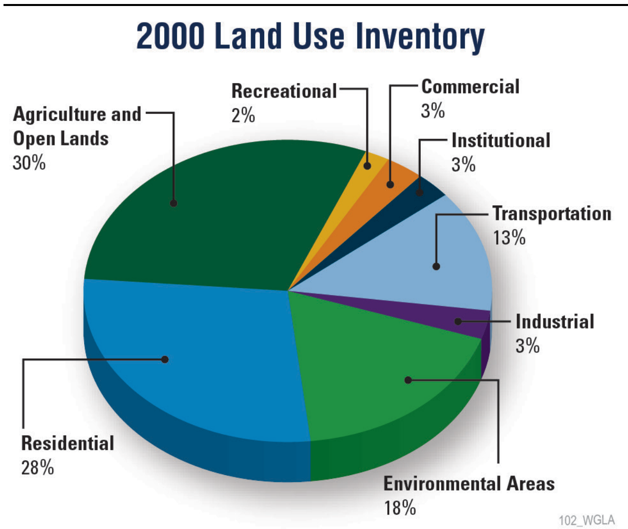


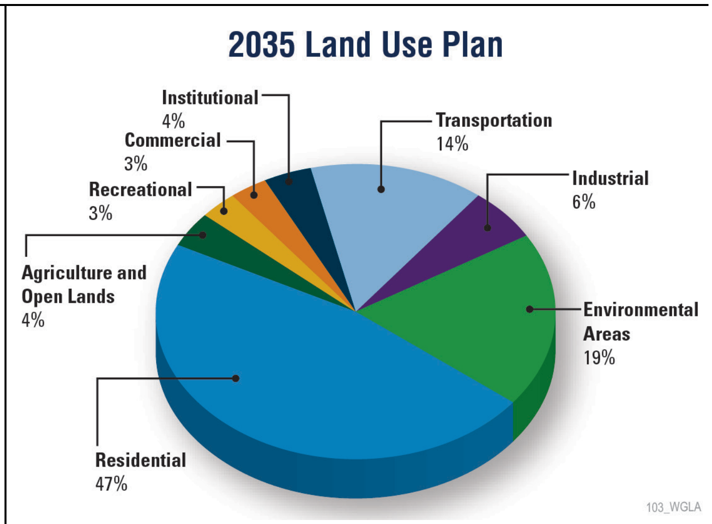
EXHIBIT 2-6

WSSA Land Use Comparison by Civil Division—2000 Inventory versus 2035 Plan

Land Use Categories	City of Pewaukee	City of Waukesha	Town of Delafield	Town of Genesee	Town of Waukesha	Grand Total
2000 LAND USE INVENTORY (acres)						
Agricultural and Other Open Lands	175	3,460	836	1,086	4,202	9,760
Commercial	0	816		9	64	889
Environmental Areas and Wetlands	53	1,670	195	932	2,711	5,562
Extractive	0	75		10	0	85
Governmental and Institutional		802	8	2	54	866
Industrial	0	987		23	38	1,048
Multi-family Residential		919		1	1	921
Recreational	13	500		26	260	800
Single-Family Residential	208	3,756	103	643	3,267	7,978
Surface Water	1	126	14	51	33	226
Transportation, Communication, and Utilities	60	2,904	43	165	904	4,075
Total	**511**	**16,014**	**1,200**	**2,949**	**11,534**	**32,209**
2035 LAND USE PLAN (acres)						
Agricultural and Other Open Lands	3	182		292	808	1,285
Commercial	0	879		26	118	1,023
Environmental Areas and Wetlands	54	1,800	214	976	2,868	5,913
Extractive						
Governmental and Institutional	15	964	43	2	162	1,186
Industrial	0	1,639		37	151	1,827
Multi-family Residential		583			0	583
Recreational	17	641	12	0	491	1,161
Single-Family Residential	366	5,999	879	1,389	5,956	14,589
Surface Water	1	114		52	33	200
Transportation, Communication, and Utilities	55	3,214	52	174	946	4,441
Total	**511**	**16,014**	**1,200**	**2,949**	**11,534**	**32,209**

Sources: SEWRPC. 2000. *Regional Land Use Inventory*. Waukesha County. 2009. *2035 Recommended Land Use Plan.*





"Residential" is the combination of single- and multi-family residential land use acres.

"Environmental Areas" is the combination of environmental areas, wetlands, and surface waters.

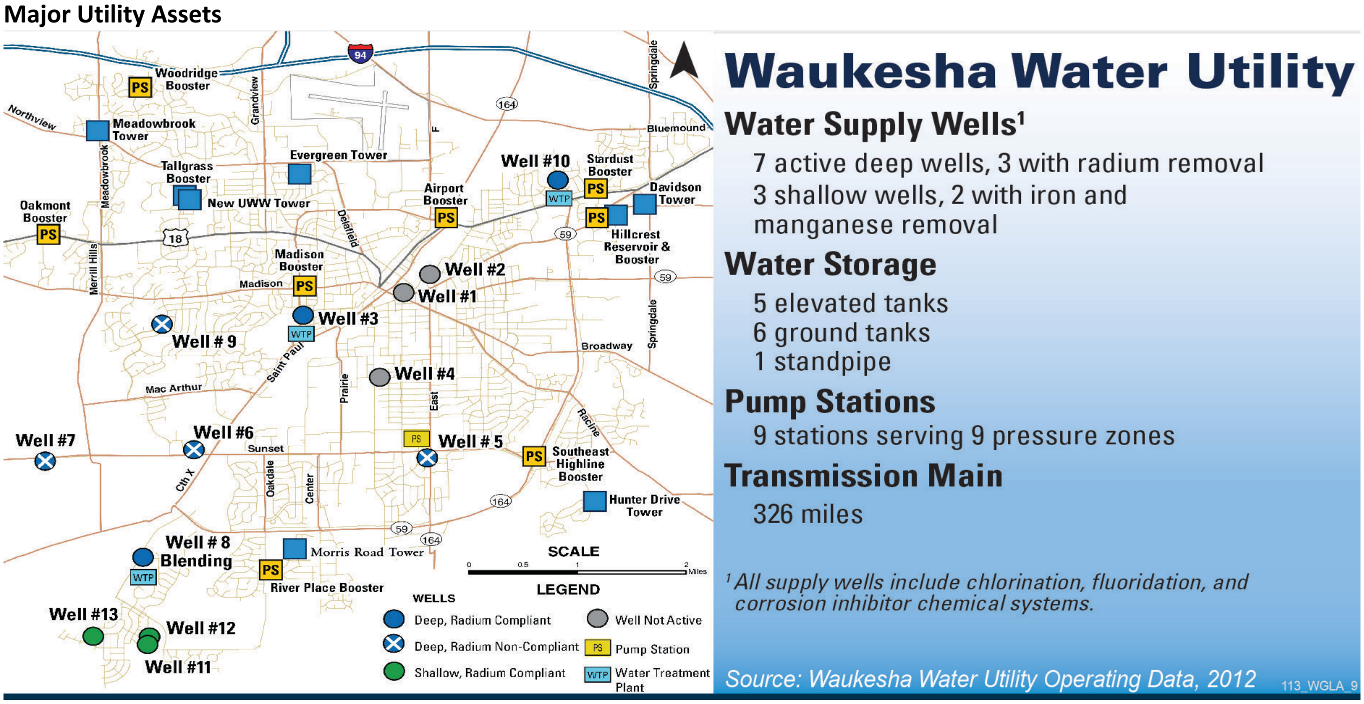
3. Existing Water Supply System

The City of Waukesha water system comprises groundwater supply, treatment, storage and conveyance assets. It is a "public water supply"—a means of distributing water to the public through a physically connected system of supply, treatment, storage, and distribution facilities that serve a group of largely residential customers, and that also serve industrial, commercial, and public customers (Wis. Stats. 281). The water system consists of the following major facilities (Exhibit 3-1):

- Ten active wells (seven deep, three shallow)
- Three water treatment plants for radium and iron/manganese removal
- Five elevated storage tanks
- Seven ground storage tanks
- Nine booster pump stations supplying nine separate pressure zones
- Approximately 326 miles of transmission and distribution water mains.

The City also maintains a water utility administration building with offices for customer service, billing, supervisory control and data acquisition (SCADA), meter testing, fleet storage, and equipment storage.

EXHIBIT 3-1
Major Utility Assets



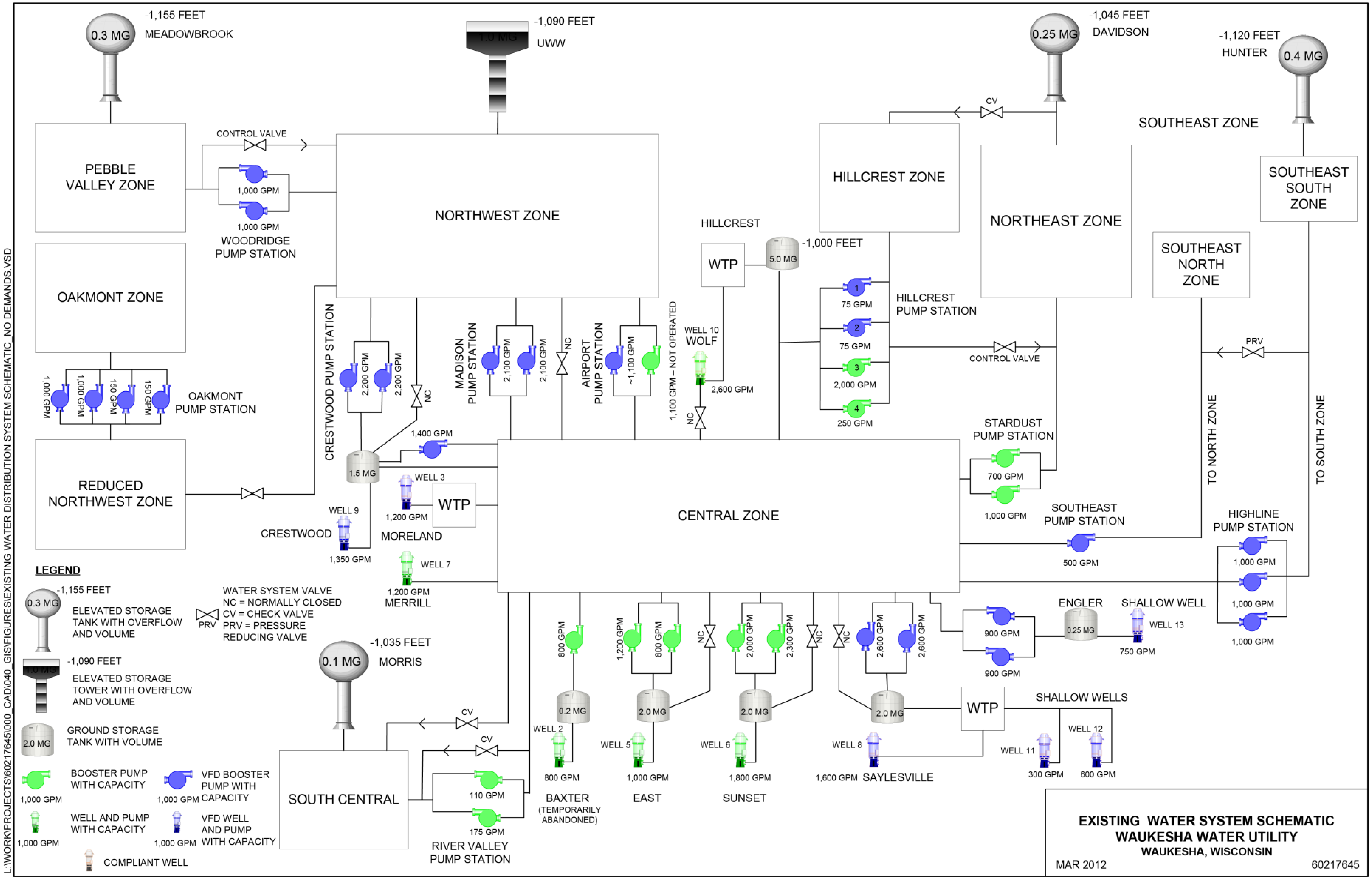
The water treatment plants at wells 3 and 10 consist of chlorine (sodium hypochlorite) contact, hydrous manganese oxide (HMO) addition (made from potassium permanganate, manganese sulfate and sodium hydroxide), and pressure vessel filtration. Fluoride (hydrofluosilicic acid) is added to the water for dental health, and sodium silicate is added to control lead corrosion. HMO particles adsorb radium and are removed in the filters. The filters are cleaned, and the wastewater is discharged to a sanitary sewer and treated at the wastewater treatment plant. Most of the radium-containing particles are transferred to the wastewater sludge and land applied.

The water treatment plant near well 8 can treat water from wells 11 and 12 for iron/manganese removal through chlorine oxidation and pressure filtration. HMO can also be added to well 8 and filtered through the same filter, but this cannot be done while wells 11 or 12 are being treated. Water from wells 8, 11, and 12 can be blended in the storage tank near well 8. The filter backwash wastewater is discharged to the sanitary sewer and treated at the wastewater treatment plant. The solids are mostly removed in the wastewater sludge and land applied.

The radium treatment plants reduce the amount of radium in the drinking water, but the water system is not compliant with regulations that require less than 5 picocuries per liter (pCi/L) radium 226 and radium 228 at each entry point to the distribution system. There is an agreed deadline of June 30, 2018, to fully comply with the radium regulations (*State of Wisconsin v. City of Waukesha,* Waukesha County Case Number 2009CX000004).

Exhibit 3-2 is a schematic of the water system Additional details on the water distribution system can be found in the 2006 Water System Master Plan and 2012 update (AECOM, 03/2012).

EXHIBIT 3-2
Water Distribution System Schematic



Source: AECOM, 03/2012.

4. Existing Water Supply Sources

The City 's current source of water supply is groundwater. The City has 10 functional wells: 7 in the deep St. Peter Sandstone aquifer and 3 in the shallow Troy Bedrock Valley aquifer (Exhibit 4-1). Roughly 80 percent of the City's supply is from the deep St. Peter Sandstone aquifer, which has severe groundwater level drawdown and significant water quality issues. The remaining 20 percent is from the shallow Troy Bedrock Valley aquifer, which feeds sensitive surface water resources and also has water quality issues.

Exhibit 4-2 shows the average daily withdrawal from each well over the past 10 years. Each well has a flowmeter to indicate instantaneous flow rate and record total volume. The flowmeter is integrated with a SCADA system for data collection and reporting. Water use is metered for each customer and recorded in the City's water utility billing system.

EXHIBIT 4-1
Waukesha Water Utility Supply Wells

Well No.	Well Depth (ft)	Maximum Capacity (mgd)
1	Abandoned because of contamination	N/A
2	Pumping equipment worn out and not replaced	N/A
3	1,995	1.3
4	Not used because of potential contamination	N/A
5	2,120	1.5
6	2,075	2.7
7	1,658	1.0
8	2,024	2.3
9	1,730 (backup service only)	1.7
10	2,145	3.9
11	127	0.4
12	149	1.0
13	105	1.0

4.1 St. Peter Sandstone Aquifer

The City's deep aquifer wells are constructed to depths of greater than 2,100 feet and withdraw water from 600 to 800 feet below ground. Since the 1840s, the aquifer has served as a source of water supply for many communities in Wisconsin and Illinois. Deep aquifer water supply pumping in southeastern Wisconsin results in groundwater levels of 500 to 600 feet below ground (SEWRPC, 10/2010).

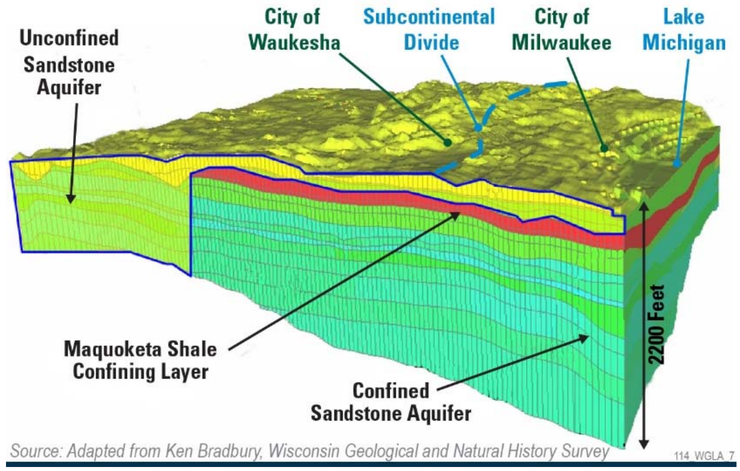
EXHIBIT 4-2
Average Daily Withdrawal (gallons per day) from Each Well

	Deep								Shallow		
Year	Well 2	Well 3[a]	Well 5	Well 6	Well 7	Well 8[b]	Well 9	Well 10[c]	Well 11	Well 12	Well 13
2011	22,603	865,307	205,638	858,419	448,444	1,053,882	8,447	2,273,063	208,677	491,984	621,962
2010	56,214	1,160,540	69,742	44,277	251,101	720,734	7,660	2,755,523	243,123	571,792	866,616
2009	299,918	1,268,134	408,181	354,164	605,238	789,773	0	1,414,411	272,548	716,718	703,797
2008	117,855	1,295,432	27,617	43,964	144,719	1,168,019	34,809	2,913,604	376,719	763,262	0
2007	514,345	745,216	484,592	617,260	955,671	1,318,490	187,008	972,970	431,888	879,200	0
2006	327,441	512,879	494,389	1,171,063	942,068	804,860	1,269,682	1,404,849	44,769	116,238	0
2005	170,110	573,523	544,290	1,434,058	848,107	879,455	1,450,849	1,671,685	0	0	0
2004	309,634	743,538	594,885	1,183,721	1,164,273	949,803	1,090,721	1,337,675	0	0	0
2003	446,107	793,071	518,764	1,067,364	1,040,474	1,057,096	1,141,740	1,538,008	0	0	0
2002	463,841	334,104	825,430	1,381,825	1,352,395	1,282,879	1,225,712	1,224,786	0	0	0

[a]HMO treatment for radium since 2006.
[b]Blending with Wells 11 and 12 since 2006.
[c]HMO treatment for radium since 2008.

The drawdown of the deep aquifer is in part attributed to the Maquoketa shale confining layer, a geological feature that limits aquifer recharge (Exhibit 4-3). For these and other reasons, the WDNR placed Waukesha County in a Groundwater Management Area (Wis. Admin. Code. ch.NR 820). A groundwater management area is an area of concern with excessive groundwater drawdown—150 feet or more—or other adverse impacts.

EXHIBIT 4-3
Hydrogeology of Southeastern Wisconsin



The City's deep wells vary in age from 30 to 75 years. The 2002 *Future Water Supply Study for the Waukesha Water Utility* documented that many of the wells were not constructed to current codes and could experience physical failures, such as casing leaks or borehole collapse, which require extensive rehabilitation or replacement (CH2M HILL and Ruekert-Mielke, 03/2002). The following physical issues have occurred in the City's deep wells in recent years:

- In 2011, well No. 3 sandstone borehole collapsed and sand was pumped into the radium removal filter. The filter media and underdrains needed to be replaced.
- In 2011, well No. 10 column assembly failed, resulting in the well pump plummeting to the bottom of the 2,000-foot deep well. A new pump was installed and parts of the column pipe were replaced.
- In 2012, well No. 2 pumping equipment wore out. The well is not used, and the equipment is planned to be removed.

4.2 Deep Aquifer Groundwater Quality

Groundwater from the deep aquifer is generally hard (300 to 400 milligrams per liter [mg/L] as calcium carbonate [$CaCO_3$]). As water is pumped from greater depths, naturally occurring contaminants, primarily radium and total dissolved solids (TDS), are present in progressively higher concentrations. These contaminants require removal to meet drinking water standards. The City's groundwater supply has radium levels up to three times the United States Environmental Protection Agency's (USEPA's) drinking water maximum contaminant level (MCL) of 5 piC/L. The naturally occurring radioactive isotopes radium-226 and radium-228 are present in the aquifer because of parent elements in the sandstone. The radioactive isotopes are known to be carcinogenic. The radium levels in the City's supply are among the highest concentrations in the country for a potable water supply.

To provide drinking water that meets the radium standard on a weighted average basis, the City treats some deep aquifer water to remove radium and blends some untreated deep aquifer water with radium-compliant water from the shallow aquifer. The City has until June 30, 2018 to complete the capital improvements needed to meet the radium standard at all times at each entry point to the water system. Treatment for radium removal, in conjunction with deep aquifer pumping, is costly. Also, the radium removal process creates a highly concentrated radium waste stream. WDNR requires the waste stream radium concentration to be minimized prior to disposal to the wastewater treatment plant. Radium levels are also regulated in the wastewater treatment plant residual sludge.

USEPA regulates TDS as a secondary drinking water standard of 500 mg/L. For the City, continued use of the deep aquifer eventually may require treatment to remove TDS. TDS concentrations in the City's wells have ranged from 300 to 1,000 mg/L. To mitigate the high TDS concentrations in well No. 9 (nearly 1,000 mg/L), the well was partially blocked in 2000. Partially blocking the well reduced its capacity by 35 percent, making it expensive to operate. As a result, the well use is limited to backup service (Waukesha Water Utility, 2002–2012).

TDS can be removed by reverse osmosis treatment. Reverse osmosis is an expensive and energy-intensive process that may be necessary for the long-term continued use of the deep wells. Reverse osmosis produces a waste stream with a high concentration of salts. The salts ultimately pass through the City's wastewater treatment plant (WWTP) and are released to the environment. With existing high chloride concentrations in its wastewater, compliance with the City's WWTP chloride discharge limit is already a challenge. If more salt waste streams are generated, additional wastewater treatment will be required. In addition, because the reverse osmosis process creates a salt waste stream that accounts for 10 to 20 percent of the water treated, greater groundwater withdrawals are required to offset the volume lost as waste.

In addition to naturally occurring contaminants like radium, deep aquifer wells could be subjected to other pollution sources as indicated below:

- In 2000, well No. 1 was removed from service because of coal tar contamination from a former natural gas manufacturing plant.
- In 2001, well No. 4 was removed from service because of concern there may be leakage from an old landfill.

Removing contaminants such as radium, salts, and other pollutants from the deep aquifer water to protect public health is technically feasible, but increases adverse environmental impacts (e.g., more greenhouse gases, more water removed from the aquifer) and increases costs. Public health is put at higher potential risk when contaminants are present.

4.3 Troy Bedrock Valley Aquifer

The Troy Bedrock Valley formation (the shallow aquifer) overlays the Maquoketa shale layer and contains up to 500 feet of glacial deposits in its deepest parts (SEWRPC, 01/2010). It is a source of water supply for the Village of Mukwonago, the Village of East Troy, the City of Waukesha, and the City of Muskego. It is also hydraulically connected to sensitive environmental resources including the Vernon Marsh Wildlife Area, Pebble Brook (a Class II trout stream), and Pebble Creek.

The shallow aquifer partially within Waukesha County, a state-designated groundwater management area (Wis. Admin. Code. ch. NR 820). From a water balance perspective, any water withdrawn from the shallow aquifer deprives other natural lakes, streams, and springs of that water and could cause adverse environmental impacts. These impacts are described in Section 11.

During the past 6 years, the City has withdrawn 19 to 25 percent of its water supply from the shallow aquifer. The City manages several operational challenges with the shallow wells including high chloride concentrations, production limitations due to dramatic drawdown, and susceptibility of aquifer yield to seasonal rainfall variation.

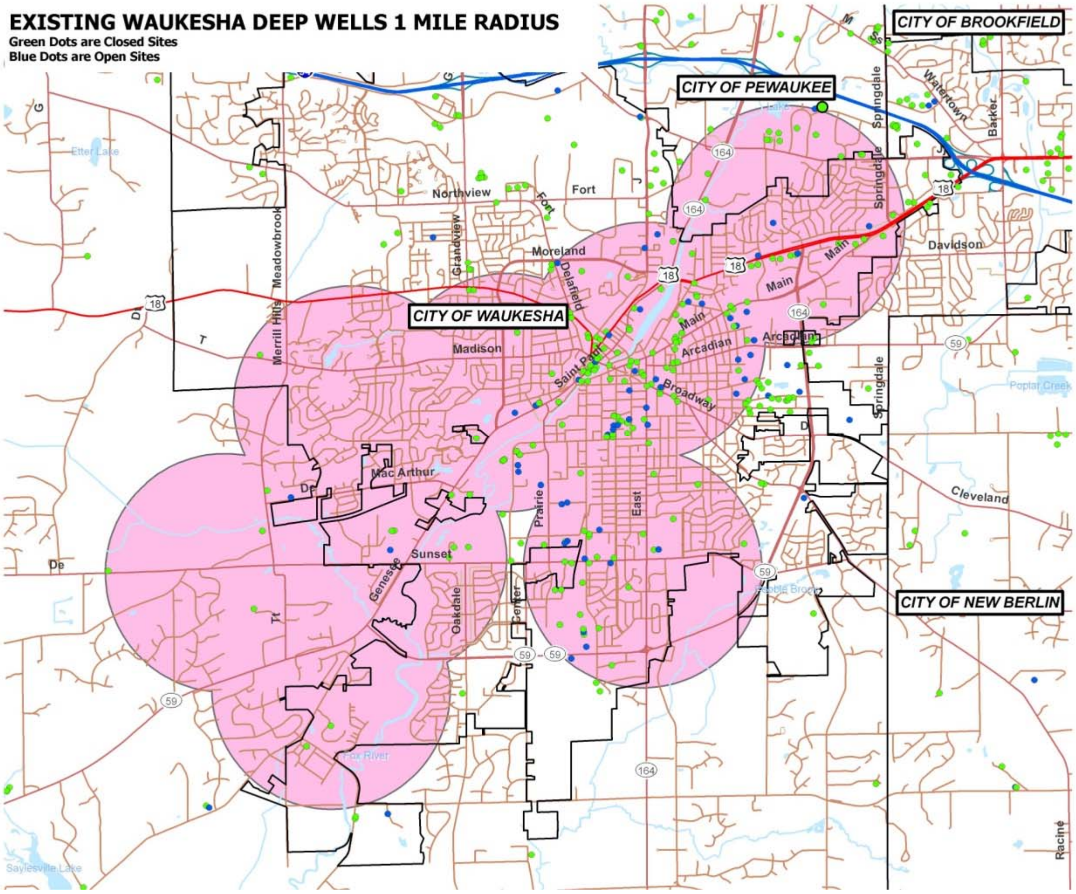
4.4 Shallow Aquifer Groundwater Quality

Groundwater from the shallow aquifer generally is hard (400 to 500 mg/L as $CaCO_3$) and requires treatment to meet secondary drinking water standards of 0.3 mg/L for iron, 0.05 mg/L for manganese. The TDS concentration of 600 to 700 mg/L is above secondary standards of 500 mg/L. Well tests conducted in 2007 in a potential future shallow aquifer well field south of Waukesha indicated that the primary drinking water standard of less than 10 parts per billion (ppb) for arsenic was exceeded and treatment for arsenic removal could be required.

Contamination poses a greater risk to shallow aquifers than to the deep aquifer because contaminants can pass relatively quickly through the sand and gravel and enter the water. The shallow aquifer is susceptible to contamination from agricultural runoff, septic systems, and urban runoff. Also, there are more than 200 registered contamination sites (leaking underground storage tanks, landfills, waste disposal sites) within a 1-mile radius or 1 foot drawdown contour of the deep and shallow aquifer wells (WDNR Bureau for Remediation and Redevelopment, 07/2012). Potential sources of volatile organic compounds (VOCs) and synthetic organic compounds (SOCs) are present in both the deep and shallow aquifer areas. The proximity of these contamination sources poses a health risk to public groundwater supplies (Exhibit 4-4).

EXHIBIT 4-4

Contamination Sites Near Existing Waukesha Wells



5. Water Use by Customers

The estimated population served in the WSSA in 2010 is over 70,718. Characteristic WSSA population density is shown in the 2000 and 2035 land use maps (see Exhibits 2-4 and 2-5). Exhibit 5-1 depicts water use by customer class in 2010. Exhibit 5-2 summarizes historical water consumption for the period 1999 to 2010.

Residential customers represent the City's largest customer class. The City's residential population increased about 12 percent between 1999 and 2010. Since 1999, water use by single-family residential customers has decreased by about 8 percent, and total water pumping decreased 19 percent. Water use reduction over this period may be attributed to the presence of more water-efficient plumbing fixtures in the marketplace, weak economic conditions, and the City's water conservation program.

EXHIBIT 5-1
Water Use Summary: 2010

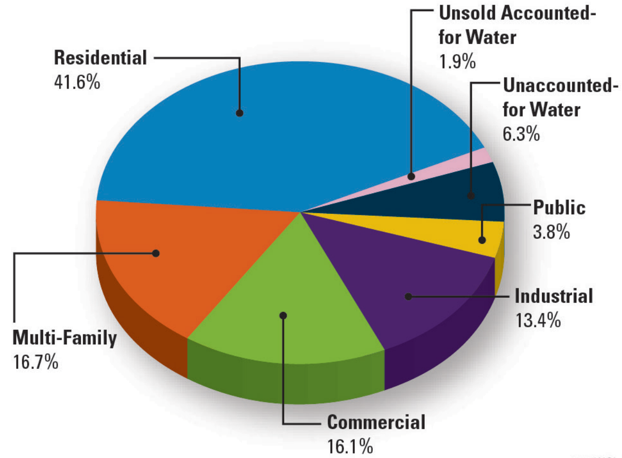


EXHIBIT 5-2
City of Waukesha Historical Annual Water Consumption

Year	Residential	Commercial	Industrial	Public	Total Water Sales	Total Pumpage	Water Used but not Sold	Unaccounted for Water	Unaccounted for Water, %
2010	1,016,670	801,974	326,289	93,491	2,238,164	2,437,964	47,113	152,687	7
2009	1,054,288	806,736	325,667	99,619	2,286,310	2,479,895	27,930	165,655	7
2008	1,056,650	827,543	382,413	99,646	2,366,252	2,530,964	37,879	126,833	4
2007	1,086,542	846,566	404,079	110,532	2,447,719	2,618,682	3,791	167,172	6
2006	1,077,127	858,062	424,603	109,846	2,469,638	2,620,450	14,676	136,136	5
2005	1,193,851	874,418	428,518	120,126	2,616,913	2,831,510	5,054	209,543	7
2004	1,117,325	854,624	435,004	121,601	2,528,554	2,698,980	6,169	164,257	6
2003	1,176,115	895,850	461,885	120,071	2,653,921	2,795,859	3,228	138,710	5
2002	1,185,745	914,138	612,856	119,173	2,831,912	2,953,216	21,540	99,764	3
2001	1,128,475	874,030	586,552	114,492	2,703,549	2,821,969	37,909	80,511	3
2000	1,067,184	848,664	660,364	108,873	2,685,085	2,836,141	19,057	131,630	5

Note: Consumption volume values are given in 1,000s of gallons. Examples of "water used but not sold" include water used for main flushing, water treatment processes, and firefighting. Examples of "unaccounted for water" include water improperly measured because of meter inaccuracies and service connection leakage.

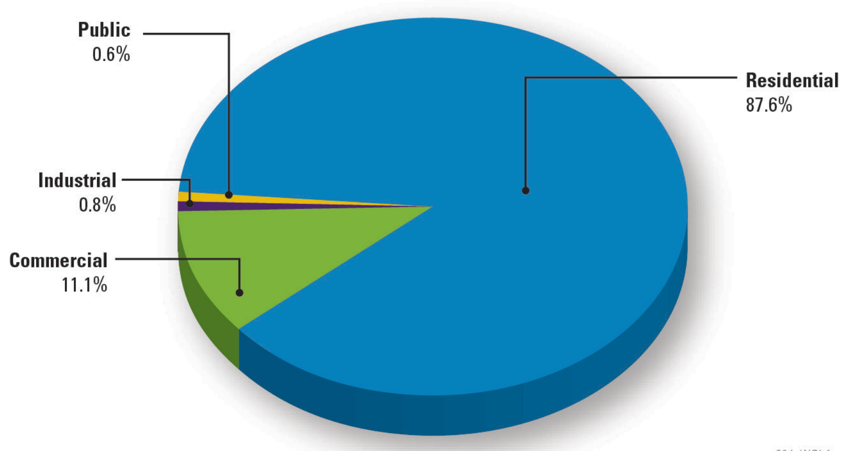
5.1 Nonrevenue Water

The difference between total pumpage and total water sales is termed nonrevenue water and is usually expressed as a percentage. The portion of nonrevenue water attributed to leakage, meter inaccuracies, and other unknown losses is often termed *unaccounted-for water* (or real losses) and can be an indicator of the condition of the water system. Between 2000 and 2010, the unaccounted-for water ranged from 3 to 7 percent; between 2008 and 2012, unaccounted-for water averaged 8 percent.

5.2 Metered Water Customers

To account accurately for water use and to comply with state regulations, all City customers are metered. Exhibit 5-3 summarizes the percentage and number of the system's meters by customer class.

EXHIBIT 5-3
Metered Accounts: 2010



	Number of Meters				
Year	Residential	Commercial	Industrial	Public Authority	Total
2010	17,124	2,170	147	118	19,559
2009	16,955	2,264	147	117	19,483
2008	16,827	2,276	144	116	19,363
2007	16,677	2,264	141	116	19,198
2006	16,501	2,235	144	123	19,003
2005	16,295	2,189	144	121	18,749
2004	15,983	2,141	144	119	18,387
2003	15,686	2,112	144	119	18,061
2002	15,508	2,101	143	119	17,871
2001	15,209	2,038	142	120	17.509
2000	14,754	1,952	138	119	16,963
1999	14,593	1,925	137	119	16,774

Source: City of Waukesha Water Annual Reports to the Wisconsin Public Service Commission, 1999–2010.

5.3 Ten Largest Customers

Appendix B lists the City's 10 largest customers during the last 10 years. Industrial customers typically comprise 80 to 90 percent of the top water users.

5.4 City Consumptive Use

"Consumptive use" means a use of water that result in the loss of or failure to return some of or all the water to the basin from which the water is withdrawn because of evaporation, incorporation into products, or other processes (Wis. Admin. Code. ch. NR 281). Public water suppliers can calculate their consumptive use coefficients following the USGS Winter Base-Rate Method (Shaffer, 2009). Based on water utility data over the past 10 years, the City of Waukesha annual average consumptive use is 8 percent (Exhibit 5-4).

EXHIBIT 5-4
Seasonal and Annual Consumptive-Use Coefficients Computed Using the Winter-Base-Rate Method

Year	Spring	Summer	Fall	Annual
1999	8	18	6	9
2000	6	12	2	5
2001	6	22	5	9
2002	6	24	8	10
2003	3	20	7	8
2004	5	16	10	8
2005	5	26	11	12
2006	5	16	3	6
2007	8	19	6	9
2008	5	14	3	6
2009	4	14	3	5
2010	9	15	9	9
25th percentile	5	15	3	6
Median	6	17	6	9
75th percentile	7	21	8	9
Average (1999–2010)	6	18	6	8

Note: The consumptive-use coefficient is a percentage, rounded to the whole number.

6. Water Demand Forecasts

Under Wisconsin Statute section 281 and draft Wisconsin Administrative Code chapter NR 854, the City's long-range water supply plan must accommodate the forecasted water demands within its service area boundaries for the 20-year planning period. Because the WSSA Plan supports the City's Application, population projections and water demand forecasts were prepared for both the 20-year planning period and WSSA buildout condition. The buildout condition exists when all the land available for development in the WSSA has been developed in a manner consistent with the southeastern Wisconsin regional water quality, water supply, and land use plans. Buildout may be more than 40 years in the future, but it is a key consideration now because extensive infrastructure needs to be constructed to provide a sustainable long-term water supply.

Given the need for a sustainable water supply, the City's water supply planning that included evaluation of a wide range of water sources and combinations of water sources to reliably meet its long-term water needs and to conserve environmental resources. In order to analyze the environmental impacts, costs, and implementation constraints associated with alternative water supplies, conceptual designs of the infrastructure needed to support each alternative were developed. Conceptual design concepts (e.g., number and capacity of wells, size and type of treatment plants, size of pipelines) were based largely on the forecasted water demands needed to serve the fully developed WSSA.

The population projections and water demand forecasts summarized in this section are based on projections that have been prepared and routinely updated as part of regional, county, and City planning efforts for several decades. Appendix C contains a comprehensive discussion of water demand planning, additional data, and detailed background information.

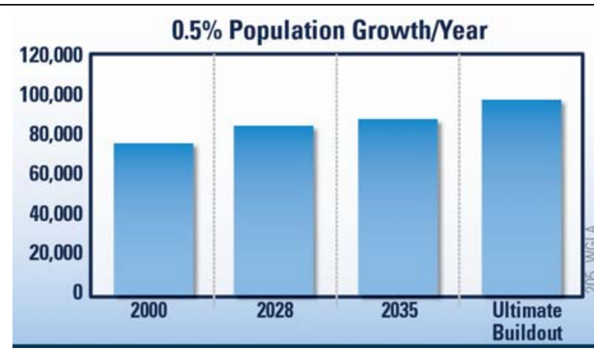
6.1 Population Projections

Population growth in the WSSA is expected occur at a rate of 0.5 percent per year over the planning period. SEWRPC prepared population projections for 2035 for the City's WSSA (Exhibit 6-1). SEWRPC prepared the projections using 2000 census information and population projections from the State of Wisconsin Department of Administration, in conformance with Wisconsin Statutes chapter 16. The method used to derive the population projections for the civil divisions within the planning region is as follows:

> The SEWRPC projections for the year 2035 were developed in two phases. The first phase involved the projection of the year 2035 population for the Southeastern Wisconsin Region and its constituent counties, including Waukesha County, using a cohort-component population projection model. The second phase involved the allocation of the county-level population projections derived from the cohort-component model to county subareas based upon a consideration historic trends, land availability, and local development plans. The projections are documented in SEWRPC *Technical Report No. 11 (4th Edition)*, *The Population of Southeastern Wisconsin* and in SEWRPC *Planning Report No. 48 A Regional Land Use Plan for Southeastern Wisconsin: 2035*.

EXHIBIT 6-1
SEWRPC Population Projections

Year	Population	Citation Source
2000	75,500	SEWRPC email to City, January 25, 2012
2028	85,800	SEWRPC letter to City, December 23, 2008
2035	88,500	SEWRPC *A Regional Water Supply Plan For Southeastern Wisconsin*, December, 2010
Buildout	97,400	SEWRPC letter to City, March 17, 2009



In addition to the overall WSSA population projections, SEWRPC estimated the buildout population within each civil division (Exhibit 6-2).

EXHIBIT 6-2
SEWRPC Population Projections by Civil Division in WSSA (SEWRPC, 02/2012)

Civil Division within WSSA	Year 2000 Population	Year 2030 Population[a]	Buildout Population
City of Waukesha (includes portions of the Town of Waukesha already served by the City)	65,700	71,105	76,330
City of Pewaukee	900	1,042–1,139	1,180–1,370
Town of Genesee	1,250	1,514–1,555	1,770–1,850
Town of Waukesha	7,410	9,485–10,552	11,490–13,590
Town of Delafield	240	535–2,284	820–4,260
Total	**75,500**	**83,681–86,636**	**91,590–97,400**

[a] Interpolated from available SEWRPC estimates. See Appendix C.

6.2 Water Demand Forecasts

The purpose of preparing long-term water demand forecasts is to develop forward-looking information that is useful to providing public water service efficiently. Reliable water demand forecasting involves analysis of wide-ranging historical data and consideration of variable factors that affect water use like climate change and economic conditions. The City's water demand forecasts are based on analysis of existing water use data, land use plans, water conservation practices, and local service area factors. The City's water demand forecasts are conservative. They include a margin of safety to avoid under-predicting future needs because of the uncertainties inherent to long-term projections. The forecasts are based on reasonable assumptions that reflect conditions within the service area and are consistent with regional water use projections.

The water demand forecasts were prepared following two commonly used approaches:

- Water use coefficients for customers by categories (residential, commercial, industrial, and public) based on historic City water use and water system performance
- Regional planning water use coefficients calibrated to land use and refined to service area conditions

Since the early 1990s, the City has prepared water demand forecasts every 5 years as part of its master planning process. Water demand forecasts prepared for the 2006 water system master plan were updated in 2009 to reflect WSSA population projections and implementation the City's water conservation plan. The 2009 projections were updated in 2013 to reflect updates to the water conservation plan and to provide supplemental projections calibrated to land use plans. The key assumptions and criteria which form the basis of the current water demand forecasts are summarized below. Appendix C contains the detailed development of the water demand forecasts.

6.2.1 Key Assumptions and Criteria

- Historically, per capita water use factors have been useful tools in projecting near- and long-term City water use, which is important for assessing financial and facility needs. The City will continue to monitor per capita water use in monitoring its water conservation program and in its annual budget-setting process.
- Land within the WSSA is about 70 percent developed; 15 percent designated "environmental area"; 15 percent undeveloped. There are no significant changes in planned land use between current conditions and the 2035 recommended land use plan.
- The City will be prepared to serve the entire WSSA by 2030. The conversion of areas currently served by private wells to public water service represents the largest increase in forecasted water demand.

- With the availability of more water-efficient fixtures, appliances, and equipment, water use has declined. Given the age of the City's housing stock, some opportunities remain for retrofit of existing fixtures with water-efficient devices.
- Weak economic conditions, evidenced after the terrorist attacks on September 11, 2001, and the start of the recession in 2008/2009, resulted in loss of local industry and reduced industrial water use.
- The City's water conservation program applies to all customers in the service area. The program will continue to be implemented, monitored, and adapted as needed to cost-effectively meet the City's 10 percent water savings goals of 0.5 mgd by 2030 and 1 mgd at ultimate buildout.
- Water use over the last 10 years reflects the influences of water efficiency in the marketplace, the City's water conservation program, and a long period of recession. The average water use factors over this time period are used in the water demand forecasts. These include 44 gallons per capita day (gpcd) for residential customers; 33 gpcd, commercial; and 4 gpcd, public.
- To develop water demand projections for industrial customers, two water use intensity factors were used:
  - 642 gallons/acre/day, which is equivalent to the current water use and which is the lowest historic level.
  - 1,297 gallons/acre/day, which is equivalent to industrial water use intensity in 2000. Note, this value is modest representation of industrial water use prior to September 11, 2001, and is a value less than SEWRPC's planning factor of 1,500 gallons/acre/day (SEWRPC, 12/2010).
- The maximum day demand (MDD) is 1.66 times greater than average day demand (ADD).
- Unaccounted-for water was projected at 8 percent of total water pumpage.
- There are risks associated with using historic water use, water system performance, and population projections to forecast future water requirements. Uncertainties in planning factors are greatest in far future years. Some contingency is required in long-term water supply planning to account for drought, changes in customer class (particularly the number and type of commercial and industrial users), and prevailing economic conditions.
- Because of future uncertainties associated with the economy and the success of conservation initiatives, the City developed four potential future scenarios to create an envelope, or range, of possible future demand conditions. The selected planning scenario includes continuation of the water conservation program and long-term rebound of industrial enterprise and water demand to year 2000 levels.

Given the assumptions highlighted above, Exhibit 6-3 depicts the ranges of forecast ADD and MDD. Exhibit 6-4 presents the projected ADD and MDD by customer class for the planning period in 5-year increments. Exhibit 6-5 lists the estimated ADD requirement for the 20-year planning period and ultimate buildout by civil division.

EXHIBIT 6-3
Water Demand Forecasts

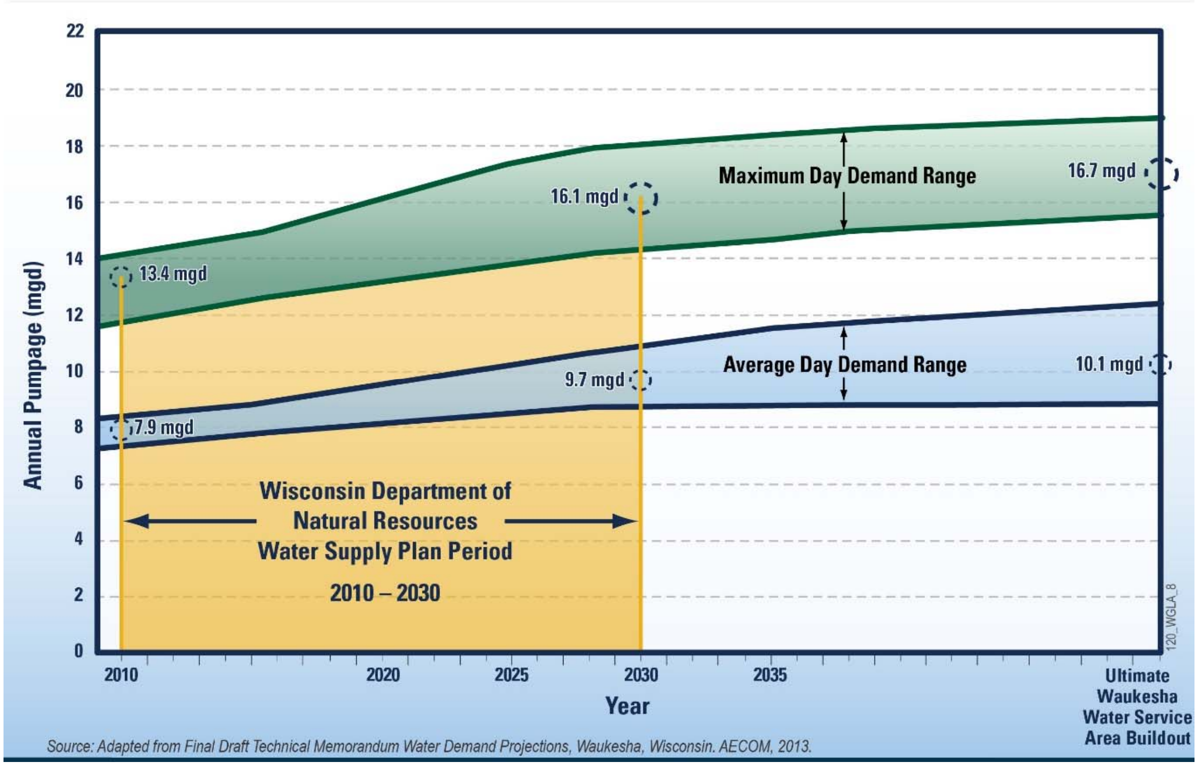


EXHIBIT 6-4
Five-Year Period Water Demand Projections for WSSA

Description	Actual 2012 (mgd)	Projected Water Demands (mgd)							
		2015	2020	2025	2030	2035	2040	2045	Buildout
Population	71,697	74,187	78,337	82,486	86,636	89,327	92,018	94,7099	97,400
Residential sales (44 gpcd)	2.9	3.1	3.2	3.3	3.4	3.4	3.4	3.5	3.5
Public sales (4 gpcd)	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Commercial sales (33 gpcd)	2.3	2.4	2.5	2.7	2.8	2.8	2.9	3.0	3.1
Industrial sales (1,297 gal./acre/day)	0.9	2.0	2.1	2.2	2.4	2.4	2.4	2.4	2.4
Commercial sales	6.4	7.8	8.2	8.5	8.9	9.0	9.1	9.2	9.3
Industrial sales	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8
Average day	**7.0**	**8.5**	**8.9**	**9.3**	**9.7**	**9.8**	**9.9**	**10.0**	**10.1**
Maximum day	**10.8**	**14.1**	**14.8**	**15.4**	**16.1**	**16.2**	**16.4**	**16.6**	**16.7**

EXHIBIT 6-5

Year 2030 and Ultimate Buildout ADD Forecasts by Customer Class and Civil Division

Civil Division	Population	Residential (mgd)	Commercial (mgd)	Public (mgd)	Industrial (mgd)	UFW (mgd)	Total (mgd)
Year 2030							
City of Waukesha	71,105	2.80	2.28	0.28	2.12	0.65	8.1
City of Pewaukee	1,139	0.04	0.04	0.00	0.00	0.01	0.1
Town of Genesee	1,555	0.06	0.05	0.01	0.05	0.01	0.2
Town of Waukesha	10,522	0.41	0.34	0.04	0.20	0.09	1.1
Town of Delafield	2,284	0.09	0.07	0.01	0.00	0.01	0.2
Total	**86,636**	**3.41**	**2.78**	**0.34**	**2.37**	**0.77**	**9.7**
Ultimate Buildout							
City of Waukesha	76,330	2.72	2.39	0.30	2.12	0.65	8.2
City of Pewaukee	1,370	0.05	0.04	0.01	0.00	0.01	0.1
Town of Genesee	1,850	0.07	0.06	0.01	0.05	0.02	0.2
Town of Waukesha	13,590	0.48	0.43	0.05	0.20	0.10	1.3
Town of Delafield	4,260	0.15	0.13	0.02	0.00	0.03	0.3
Total	**97,400**	**3.47**	**3.06**	**0.38**	**2.37**	**0.81**	**10.1**

7. Plan to Meet Projected Water Demand with New Water Supply Facilities

7.1 Water Quantity

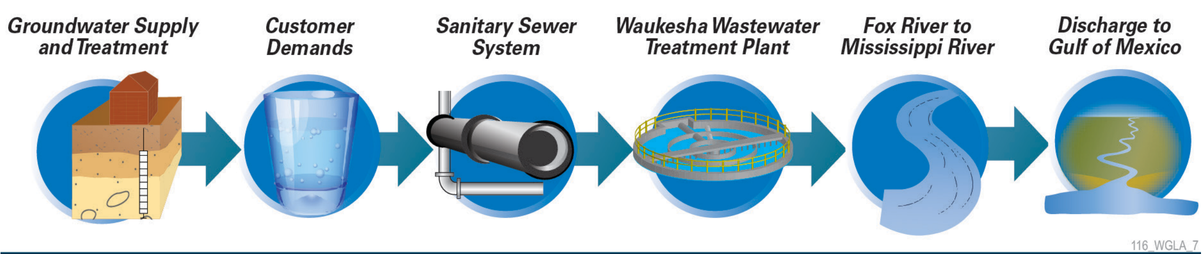
As summarized in Section 6 and detailed in Appendix C, the water demand forecasts for the future full development condition of the WSSA are 10.1 mgd (ADD) and 16.7 mgd (MDD) The City's current firm water supply capacity is 12.9 mgd. Even with continued and expanded implementation of its water conservation program, the City will need additional water supply to meet future water demands.

7.2 Deep Sandstone Aquifer

The City's deep aquifer wells are constructed to depths of greater than 2,100 feet and withdraw water from 800 to 1,000 feet below ground. Since the 1840s, the aquifer has served as a source of water supply for many communities in Wisconsin and Illinois. Water level in the confined aquifer has dropped an estimated 500 feet since the 19th century (SEWRPC, 12/2010).

The significant drawdown of the aquifer is in part attributed to the Maquoketa shale confining layer, a geological feature that limits the recharge of the aquifer by rain and snow. Water is extracted from the deep aquifer but is not returned to its source. After use, the water is discharged to the Fox River and eventually to the ocean (Exhibit 7-1). The deep confined aquifer is an unsustainable water supply. Because of the extensive drawdown of the deep confined aquifer, the WDNR has designated Waukesha County a groundwater management area, Wis. Admin. Code. ch. NR 820.

EXHIBIT 7-1
Groundwater Supply Water Cycle



The deep aquifer water has radium levels two to three times higher than allowed by federal regulations. Radium is a naturally occurring radioactive element that poses increased risk of cancer. Water from some wells is treated to remove radium; water from others is blended with shallow aquifer water to reduce radium levels. Even with these efforts, the City does not continually meet the radium standards. Under a stipulated court order, the City must continuously provide radium-compliant water throughout its public water system by June 30, 2018 (*State of Wisconsin v. City of Waukesha,* Waukesha County Case Number 2009CX000004).

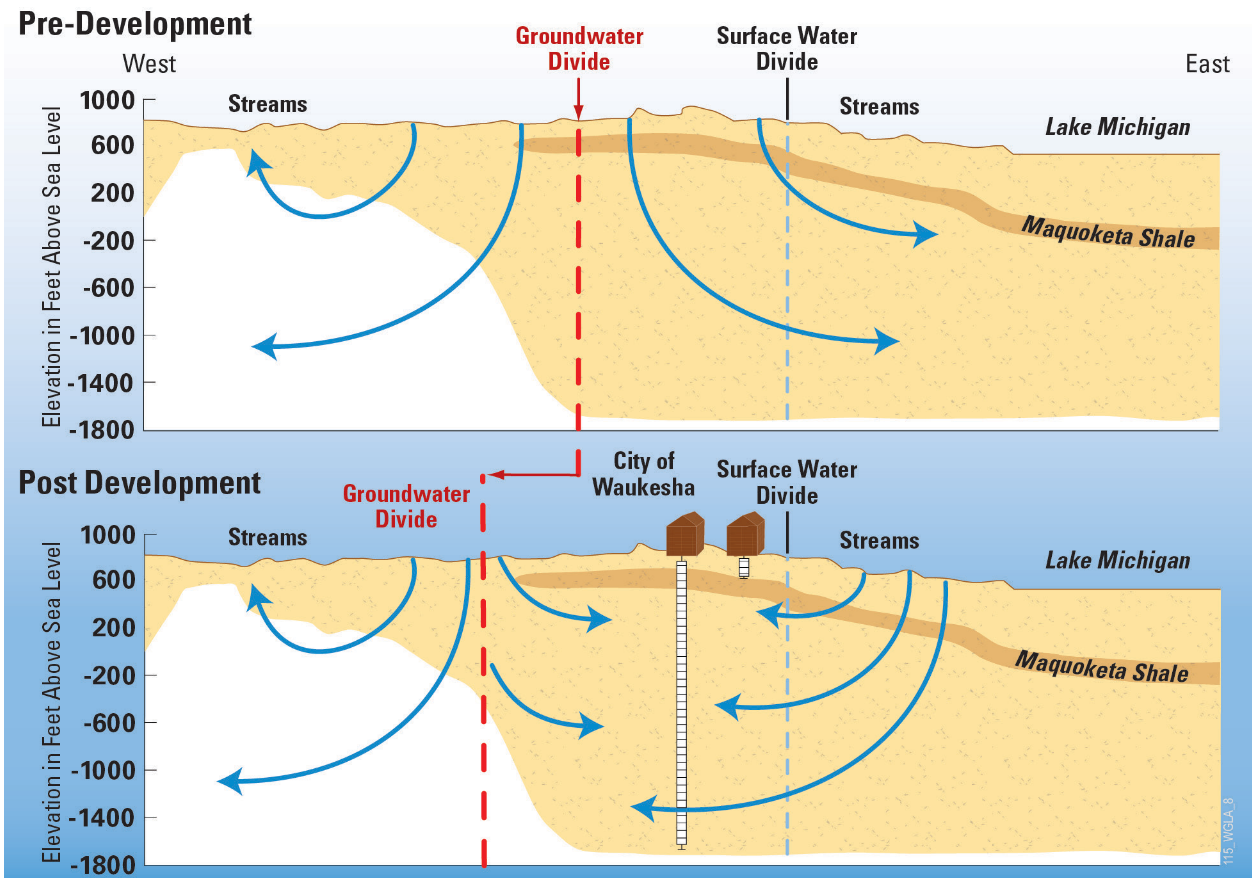
In addition, the TDS or salt content of the water has increased in some wells as water levels have dropped (Jansen and Taylor, 10/2000). Waukesha Well No. 9 had the highest TDS, at twice the EPA secondary drinking water standard of 500 mg/L. The well has been partially blocked to reduce TDS and radium, and it is now used infrequently as a backup due to reduced capacity. Water obtained from the deep sandstone aquifer may need to be treated by reverse osmosis in the future to remove TDS. Reverse osmosis is very expensive, energy intensive and creates a high-volume liquid salt waste stream. The waste stream is difficult to dispose of and requires increased aquifer withdrawal to offset the waste stream volume.

7.2.1 Deep Sandstone Aquifer Linkage to Great Lakes Basin

The U.S. Geological Survey (USGS) and the Wisconsin Geological and Natural History Survey (WGNHS), and other leading researchers in Wisconsin and Illinois have conducted extensive modeling and studies of the deep sandstone aquifer and determined the City's groundwater supply is hydrologically interconnected to the waters of the Great Lakes basin (WGNHS and USGS, 10/2006; USGS, 03/2007). Drawdown of the deep sandstone aquifer and continued pumping are having a measurable impact on the Great Lakes basin.

Water in the deep sandstone aquifer near Waukesha historically flowed east to Lake Michigan. Now groundwater flows from the Great Lakes basin west to the City of Waukesha (Exhibit 7-2). Some of the water is extracted from the Great Lakes basin and discharged to the Mississippi River Basin, thereby diverting water out of the Great Lakes basin. Even though the City's wells are outside the Great Lakes surface water divide, they withdraw water from both the Mississippi River basin and the Great Lakes basin. The USGS estimates that 30 percent of the 33 mgd of water pumped by the deep aquifer wells in southeastern Wisconsin originates within the Lake Michigan Basin (WGNHS and USGS, 10/2006). In 2006, City of Waukesha pumping accounted for 22 percent of the 33 mgd annual withdrawal from the deep aquifer beneath southeastern Wisconsin.

EXHIBIT 7-2
Flow of Groundwater in the Waukesha Area



Adapted from: Effect of Pumping On Ground-water Divides In The Deep Sandstone In Southeastern Wisconsin, U.S. Geological Survey, J.T. Krohelski and D.T. Feinstein

Groundwater pumping has also moved the groundwater divide—the boundary that defines the flow of groundwater toward Lake Michigan or to the Mississippi River—farther to the west (Exhibit 7-2). The natural hydrogeology has been altered so that the deep aquifer, which historically fed the Lake Michigan basin with groundwater, now draws water from the Lake Michigan basin.

Additional research indicates that limitations in water availability may arise in the western Lake Michigan basin (Reeves, 2010). Pumping the deep aquifer near the City of Waukesha was specifically cited as contributing to significant groundwater drawdown and capturing water that would have otherwise naturally discharged to Lake Michigan. This has diverted flow away from the Great Lakes Basin, without return flow.

Reducing or eliminating pumping of the deep sandstone aquifer would have a significant positive effect on groundwater levels. The Great Lakes Basin can be better preserved and more effectively managed, if more communities that pump from the deep aquifer reduce or eliminate future pumping. Measurements taken after other communities have replaced deep aquifer groundwater supplies with a Lake Michigan supply indicate recovery of the aquifer. In areas of northeastern Illinois, where groundwater withdrawal was reduced because communities have converted from the deep St. Peter Sandstone aquifer to a Lake Michigan supply, groundwater levels at former pumping centers recovered more than 100 feet (Burch, 2002). However, subsequent use of the aquifer by other communities decreased water levels in the aquifer again (Chicago Metropolitan Agency for Planning, 03/2010).

For southeastern Wisconsin, the USGS estimated that if all pumping of the deep aquifer ceased in 2000, the aquifer would similarly recover over this century. Specifically, USGS estimated the following (USGS, 03/2007):

- To replace 50 percent of the water drawn out of storage, it would take 13 years for the shallow part and 9 years for the deep part of the aquifer to recover.
- To replace 90 percent of the water drawn out of storage, it would take 100 years for the shallow part and 70 years for the deep part of the aquifer to recover.

Based upon the available scientific evidence, it has been shown that the City’s groundwater supply is derived in part from groundwater interconnected hydrologically to the Lake Michigan basin. Ceasing groundwater pumping of the deep aquifer will reduce the amount of groundwater withdrawn from the Lake Michigan basin.

USGS determined that most of water withdrawn from southeastern Wisconsin over the last approximately 140 years was not derived from groundwater storage but rather from captured baseflow. Baseflow is groundwater that under natural conditions would discharge to streams and lakes, including Lake Michigan. Because of pumping, groundwater has been diverted to wells instead of supplying water to surface water resources. About 70 percent of the water to replenish deep well pumping is diverted from streams in the Mississippi River basin and 30 percent from the Great Lakes basin (WGNHS and USGS, 10/2006).

7.2.2 Deep Aquifer Supply Environmental Impacts

The City’s pumping of the deep aquifer contributes to the following adverse environmental impacts (WGNHS and USGS, 10/2006) (USGS, 03/2007):

- Groundwater levels significantly below predevelopment levels.
- Reversal of the natural groundwater flow causing water that once flowed east toward Lake Michigan through the deep aquifer in southeastern Wisconsin to now flow west to deep aquifer pumping centers near Waukesha.
- Diversion of as much as 30 percent of the water replenishing the deep aquifer from the Great Lakes basin.
- Diversion of as much as 70 percent of the water replenishing the deep aquifer from the Mississippi River basin that would have fed stream and lakes. Baseflow reduction of 12 percent to surface water resources, as water is drawn toward deep wells.
- An overall diversion of water from the Great Lakes Basin to the Mississippi River basin, which adversely affects the environment by reducing the amount of water available to the waters and water dependent resources of the Great Lakes basin.
- Addition of radium in wastewater treatment plant sludge into the environment through land application.
- Increased release into the environment of the salts used to soften hard groundwater.

The deep aquifer is not an environmentally sustainable source of supply for the City. Additional information on environmental impacts of pumping the deep aquifer is discussed in Section 11.

7.3 Shallow Aquifer Supply Environmental Impacts

Realizing that the deep aquifer is not a sustainable water supply source, the City investigated and developed a small amount (about 1 mgd firm capacity) of shallow aquifer water supply. The water is also used to blend with deep sandstone aquifer water to reduce radium concentrations.

To estimate the impacts of the City significantly increasing its withdrawal from the shallow aquifer, hydrogeologic modeling was conducted with the Troy Bedrock Valley Aquifer Model (RJN Environmental Services 04/2010; 08/2013). The model predicted significant groundwater level drawdown and baseflow reduction if additional shallow wells are put into service. The additional wells would be located outside the City limits. Baseflow is groundwater that discharges to, or feeds, surface water bodies. The groundwater discharge is the inflow that keeps surface waters flowing during dry periods, and cools the water to better support certain aquatic species, such as trout. Estimating baseflow reduction from groundwater pumping is critical to understanding whether the shallow aquifer is a sustainable water supply.

Although the shallow aquifer wells needed to meet the City's future demands were spread over an extensive area in the model and located at least 1,300 feet from sensitive water resources, additional shallow aquifer withdrawal resulted in significant drawdown at the wells of up to 50 to 100 feet. Additional shallow wells would also reduce baseflow to surface waters ranging from 5 to 100 percent (RJN Environmental Services 04/2010; 08/2013). Such reduction is not environmentally sustainable.

Additional shallow aquifer pumping by the City would contribute to the following adverse environmental impacts:

- Significant decline of groundwater levels would adversely affect thousands of acres of wetlands along with several lakes and springs.
- High baseflow reduction would have a significant adverse environmental impact on surface waters, including the Vernon Marsh Wildlife Area and the Pebble Brook, a Class II trout stream.
- More than 1,000 existing private wells could be affected by additional shallow aquifer withdrawal. Increased pumping could potentially draw contaminants from private septic systems into the water supply.
- There would be increased release of salts used to soften hard groundwater into the environment.

The shallow aquifer supply cannot be expanded to meet future demands sustainably, because additional withdrawal causes severe adverse environmental impacts to local surface water resources. Section 11 contains additional information on environmental impacts of existing and new water supply sources.

Arsenic was found at concentrations above drinking water standards in the shallow aquifer at a potential future well field location near the City of Waukesha. This would increase risk to public health and require additional treatment to meet drinking water regulations.

7.4 Waukesha Is Without Adequate Supplies of Potable Water

A community within a straddling county applying for a diversion must be without adequate supplies of potable water. Reference: Compact Article 4, Section 4.9.3.a.; Sec. 281.346(4)(e)1.a. Wis. Stats.

> *"Without adequate supplies of potable water" is defined as "lacking a water supply that is economically and environmentally sustainable in the long term to meet reasonable demands for a water supply in the quantity and quality that complies with applicable drinking water standards, is protective of public health, is available at a reasonable cost, and does not have adverse environmental impacts greater than those likely to result from the proposed new or increased diversion" Reference: Sec. 281.346(1)zm, Wis. Stats.*

With the passage of the Great Lakes–St. Lawrence River Basin Water Resources Compact, Lake Michigan became a potential source of water supply for the City of Waukesha. Because the City lies wholly within a county that is partially in the Basin, the City may apply to withdraw Lake Michigan water for public water service and return treated water to the Great Lakes basin.

Section 11 of this plan sets forth a comprehensive analysis of the water supply alternatives including a comparison of the environmental impacts of each option. Scientific evidence and studies reveal that the adverse environmental impacts of the City's deep and shallow aquifer pumping are much greater than the impacts likely to result from the proposed Great Lakes diversion.

The comparative analysis shows that eliminating the pumping of the deep and shallow aquifer would discontinue a number of adverse environmental impacts and improve groundwater resources of the Great Lakes Basin. It would assist the recovery of both surface and groundwater resources; assist in the restoration of the natural flow system wherein the deep aquifer feeds the Waters of the Great Lakes; benefit habitat restoration and fisheries of Great Lakes tributaries through the return flow; and eliminate the diversion of water from the Lake Michigan basin to the Mississippi River basin. Switching from groundwater to a Lake Michigan supply will result in a positive net benefit to the environment versus continued adverse impacts resulting from the City's continued use of its existing groundwater supplies.

The scientific evidence, technical studies, and evaluation of environmental impacts support the diversion exception criterion: that the City of Waukesha lacks an adequate supply of potable water. The groundwater supply in the deep aquifer is severely depleted and is not a reliable source to meet future needs. The quantity of water that can be withdrawn from the shallow aquifer for potable water supply is limited, because increased pumping would severely reduce the quantity of water available for local streams, brooks, and wetlands and thus harm the environment. The City lacks a water supply that is sustainable in the long term to meet reasonable demands for a water supply in the quantity and quality that complies with applicable drinking water standards, is protective of public health, and does not have adverse environmental impacts greater than those likely to result from the proposed Great Lakes diversion.

7.5 Facilities for Meeting Projected Water Demand

After extensive analysis of water supply alternatives (Section 11), a Lake Michigan water supply was determined to be the only reasonable water supply for the City. In general, potable water would be conveyed through a pump station and about 17 miles of transmission pipe from a Lake Michigan water supplier to the City's distribution system. While the City's distribution and storage system would be used, improvements would be made to accommodate the new water source (AECOM, 03/2012). The existing deep and shallow wells would be used for backup purposes.

Water would be returned to the Great Lakes basin from a pump station located at the City's WWTP and about 19 miles of transmission pipe. Return flow would be discharged to a tributary to Lake Michigan. Exhibit 7-3 shows the facilities for Lake Michigan water supply and return flow.

7.6 Public Health Protection

The Lake Michigan water supplier treats water with conventional surface water treatment technologies, including rapid mixing, flocculation, settling, filtration, and chlorine disinfection. The treated water is of high quality and meets Safe Drinking Water Act standards. Millions of people are provided with drinking water from Lake Michigan. Contamination is possible, as with all supplies, but the large size, intake locations, and high quality of the lake water makes that a rare occurrence. Lake Michigan water suppliers have some of the most stringent water quality monitoring programs and advanced treatment processes to assure high quality water. Many water supply intake pipes are located more than a mile from shore, minimizing impacts from contaminant sources. Hydrodynamic studies of nearshore Lake Michigan flow patterns and water quality have been conducted to minimize the potential for contaminants from entering drinking water intakes (Lee, 1995; 1996).

7.7 Water Withdrawal and Return

Water use rates and estimated system losses are discussed in Section 5. No less than 100 percent of the water volume withdrawn from Lake Michigan would be returned to the source watershed. Alternative return flow management strategies are identified and evaluated in Volume 4, City of Waukesha Return Flow Plan. Water withdrawal and return flows will be continuously measured by flowmeters included in the water supply and return flow facilities. Flow monitoring information will be recorded and stored for operating, maintenance, and reporting purposes. The City's water supply and return flow systems will continue to be regulated by WDNR and the PSC as required by state statutes.

EXHIBIT 7-3

Facilities for Lake Michigan Water Supply

8. Consistency with Other Plans

Comprehensive planning is a widely practiced in the State of Wisconsin, because the process allows governments and agencies to think strategically about local and regional needs. Comprehensive planning is implemented collaboratively by the City of Waukesha, Waukesha County, and SEWRPC through the development of common land use policies, goals, objectives, and supporting information, which in turn provide a foundation for local decision-making, intergovernmental cooperation, and efficient use of resources. As it pertains to long-term water supply planning, the collaborative planning process involves coordinated development of water quality management, economic, population, land use, public utility, and transportation plans.

The City's WSSA plan is consistent with the approved areawide water quality management plan and applicable comprehensive plans. This finding is based on analysis of available planning documents, including those listed in Exhibit 8-1.

8.1 Consistency with Key Planning Elements

The following sections highlight consistency between the City's WSSA plan and other plans and rules.

8.1.1 A Regional Water Quality Management Plan for Southeastern Wisconsin

To achieve regional water quality goals, sewer service areas are delineated to plan for wastewater infrastructure needs and to protect local water resources from pollution. The City's WSSA plan is required by state statutes to be consistent with the City's adopted sewer service area (Wis. Stats. 281). Appendix A contains the letter stating that the delineated planned water supply area is consistent with the regional water quality management plan and subsequent updates (SEWRPC, 12/2008).

In its evaluation of long-term water supply alternatives, the City investigated return flow approaches in a manner consistent with the goals and objectives outlined in *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds* (SEWRPC, 12/2007).

8.1.2 A Regional Water Supply Plan for Southeastern Wisconsin

Alternative plans for addressing water supply needs through 2035 were developed and evaluated in *A Regional Water Supply Plan for Southeastern Wisconsin* (SEWRPC, 12/2010). The City's WSSA plan is fully consistent with findings and recommendations of the regional water supply plan. Examples of consistency in findings include population projections, water demand forecasts, and water savings goals through water use efficiency and conservation measures. Most significantly, the City's WSSA Plan is consistent with the regional water supply plan recommendation of a Lake Michigan water supply with return flow.

In its evaluation of long-term groundwater supply alternatives, the City incorporated the findings and objectives of the regional water supply plan. Examples of integrating regional considerations include the use of regional groundwater hydraulic models and assumptions to estimate availability of supplies and environmental impacts of groundwater withdrawals.

8.1.3 Groundwater Management Area Designation

The WDNR has designated Waukesha County as a groundwater management area because the groundwater potentiometric surface is more than 150 feet lower than it was before pumping began. In a manner consistent with this designation and as described in Wisconsin Statute section. 281.34(9), environmental impacts of sustained groundwater withdrawals are identified and summarized in Section 11.

8.1.4 Comprehensive Plans—Waukesha County and Communities within It

The comprehensive plans for Waukesha County, the City of Waukesha, the City of Pewaukee, and the Town of Waukesha are written to comply with the State of Wisconsin Comprehensive Planning Law (Wis. Stat. *§* 66.1001).

EXHIBIT 8-1
Applicable Plans Reviewed for Consistency

Area or Community	Plan	Prepared By	Date
Southeastern Wisconsin	*A Regional Water Supply Plan For Southeastern Wisconsin*	SEWRPC	December 7, 2010
Waukesha County	*A Comprehensive Development Plan for Waukesha County, Wisconsin*	Waukesha County Department of Parks and Land Use, Waukesha University of Wisconsin–Extension, Waukesha County Municipalities	February 24, 2009
Southeastern Wisconsin	*A Regional Land Use Plan for Southeastern Wisconsin: 2035*	SEWRPC	June 2006
Greater Milwaukee Watersheds	*A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds*	SEWRPC, Milwaukee Metropolitan Sewerage District	December 2007
Southeastern Wisconsin	*Groundwater Resources in Southeastern Wisconsin*	SEWRPC, Wisconsin Geologic and Natural History Survey	June 2002
Southeastern Wisconsin	*A Regional Water Quality Management Plan Southeastern Wisconsin: An Update and Status Report*	SEWRPC	March 1995
Southeastern Wisconsin	*The Population of Southeastern Wisconsin*	SEWRPC	July 2005
City of Waukesha	*Comprehensive Plan*	City of Waukesha	September 2009
City of Pewaukee	*City of Pewaukee Comprehensive Plan for the Year 2035*	City of Pewaukee	March 19, 2009
Town of Delafield	*Town of Delafield Smart Growth Plan, Waukesha County, Wisconsin*	Town of Delafield, Waukesha County Department of Parks and Land Use, Waukesha University of Wisconsin–Extension	August 11, 2009
Town of Genesee	*Alternate and Recommended Land Use Plans for the Town of Genesee—2010*	SEWRPC	varies
Town of Waukesha	*Smart Growth Plan, Comprehensive Development Plan*	Town of Waukesha, Waukesha County Department of Parks and Land Use, Waukesha University of Wisconsin–Extension	October 8, 2009
City of Waukesha	*Water Conservation Plan*	CH2M HILL, Amy Vickers & Associates, Beth Foy & Associates	May 2012
City of Waukesha	*Water Model Update and Capital Improvement Planning, Waukesha, Wisconsin*	AECOM	March 2012
City of Waukesha	*Water System Master Plan*	AECOM	May 2006
City of Waukesha	*Future Water Supply Plan*	CH2M HILL, Ruekert-Mielke	March 2002
City of Waukesha	*Final Report, Phase I Sanitary sewer Master Plan, City of Waukesha, Wisconsin*	Donohue & Associates	September 2011
City of Waukesha	*Final Report, Phase II Sanitary sewer Master Plan, City of Waukesha, Wisconsin*	Donohue & Associates	September 2011
City of Waukesha	*Wastewater Treatment Plant Facilities Plan*	Strand Associates, Inc.	May 2011
City of Waukesha	*Wellhead Protection Plan: Waukesha Water Utility Wells No. 11 and 12*	Ruekert-Mielke	July 2009
City of Waukesha	*Wellhead Protection Plan: Waukesha Water Utility Well No. 13*	Ruekert-Mielke	May 2009
City of Waukesha	*Stormwater Master Plan*	Hey and Associates	2003

By law, comprehensive plans must include the following elements:

- Trends, issues, opportunities, and planning standards
- Agricultural, natural, and cultural resources
- Community, facility, and utility elements
- Housing element
- Economic development element
- Land use element
- Transportation element
- Implementation and intergovernmental cooperation

The comprehensive planning process includes opportunities for public involvement prior to plan adoption. Ultimately a local government is guided by its adopted plan when engaging in pertinent actions.

For continuity, municipalities within Waukesha County and SEWRPC participated in the comprehensive planning process. Following completion of *A Comprehensive Development Plan for Waukesha County, Wisconsin*(County Plan) the municipalities within the City's WSSA completed their individual community comprehensive plans. Because the municipalities in the City's WSSA were involved in the County planning process, extensive provisions of the County Plan were directly incorporated in municipal plans. As a result, allowing for community-specific data (such as population, household income, land use), the policies, goals, and overarching recommendations regarding key planning elements—and in particular, implementation and intergovernmental cooperation—are nearly identical for community plans.

8.1.5 Key Planning Elements

Some key planning elements used in developing the WSSA Plan include population projections, land use plans, and community utilities.

- **Population projections—**For consistency in County Plan and municipal comprehensive plans, the same population projections were used. The projections, developed by SEWRPC and used for long-term water supply planning, are described in detail in Section 5.

- **Land use plans—**The best available land use planning information is represented in the *Waukesha County Recommended Land Use Plan—2035*. This information was used, with minor exceptions, in the comprehensive plans of the municipalities within the WSSA. The land use information was also used in the City's WSSA Plan to prepare water demand forecasts, as described in Section 5 and Appendix C.

- **Community utilities—**With respect to drinking water systems, County Plan and community plans identified water quality concerns related to pharmaceutical product contamination of groundwater from private onsite sewage systems and public wastewater treatment systems. Another public water quality issue raised in the comprehensive plans was the presence of naturally occurring radium in the drinking water supplies of Cities of Brookfield, New Berlin, Pewaukee, and Waukesha and the Villages of Eagle, Mukwonago, Pewaukee, and Sussex.

Because the County Plan and *A Regional Water Supply Plan for Southeastern Wisconsin* (Regional Water Supply Plan) were developed concurrently, the findings and recommendations of the Regional Water Supply Plan are not reflected in the County Plan. However, the County Plan is consistent with the Regional Water Supply Plan in recognizing groundwater is susceptible to depletion in quantity and deterioration in quality as a result of urban and rural development. The County Plan acknowledges the legal challenges in diverting water with return flow to the Great Lakes and claims that the Regional Water Supply Plan addresses all sources of water available to sustain planned development.

Limited quantities of groundwater water resources and concerns about the impacts on existing wells of increased pumping were cited in municipal comprehensive plans.

8.1.6 Wellhead Protection Plans

Wellhead projection plan requirements, like setback distances from municipal wells and other features, were considered in the conceptual design of groundwater supply alternatives. The presence of sources of groundwater contamination was also considered (Ruekert-Mielke, 05/2009; 06/2009).

8.1.7 Stormwater Management Plans

The City had developed and is implementing its stormwater management plan to improve water quality and quantity consistent with the goals of SEWRPC's *A Regional Water Quality Management Plan* and its various amendments and the County's comprehensive plan. The WSSA Plan is consistent with the City's stormwater management plan and broader area stormwater management objectives.

8.1.8 Wastewater Facilities Plans

The City's wastewater facilities plans are consistent with the WSSA Plan because service areas, water demand forecasts, and the need for a possible future return flow facilities were coordinated in the respective planning processes.

8.1.9 Sanitary Sewer Plans

The City has undertaken extensive recent sanitary sewer collection system master planning and capacity management, operations, and maintenance planning. The sewer system plans are consistent with the WSSA Plan because they identify and prioritize collection system improvements to enhance the reliability and efficiency of the sewer system. The improvements will also reduce infiltration and inflow to the sewers, thereby reducing the amount of water from outside the Great Lakes basin that is collected, treated, and returned.

8.1.10 Other Plans

Other plans that provide critical, consistent information to the WSSA Plan include water utility master plans, water utility capital improvement plans, and the City's water conservation plan. The City is not designated a Green Tier participant under Wisconsin Statute section 299.

8.2 Planning Documents Inconsistency

Several documents critical to the WSSA Plan—including the Regional Water Supply Plan, the County Plan, and the comprehensive plans of the cities and towns—were developed collaboratively, but there are some inconsistencies in the documents, such as the following:

- The *City of Waukesha Comprehensive Plan* cites a projected population of 78,762 in 2035 (City of Waukesha 2009); SEWRPC projected a City buildout population of 76,330 (SEWRPC 12/2008).
- The *City of Waukesha Comprehensive Plan* includes roughly 200 additional industrial acres (about 0.6 percent of the WSSA) by 2035 than the County land use plan (City of Waukesha 09/2009).

Among planning professionals, the variations are considered negligible and within the anticipated accuracy of estimates of development conditions 25 years in the future. Investigation revealed several reasons for variation in specific documented planning values. Chief among the reasons is that as time passes, more information is available for planning. Documents like the County comprehensive plan and the regional water supply plan were prepared concurrently. As a result, the best available—but only preliminary—information was incorporated in each plan. Following adoption of the final County comprehensive plan and the regional water supply plan, new information was available for the development of municipal comprehensive plans.

Another reason planning documents vary is that plans are developed to meet goals and objectives of different planning authorities. SEWRPC's planning included cooperation across hundreds of civil divisions within a seven-county region. SEWRPC assists counties and municipalities in developing a framework for establishing and administering sound land use regulations to provide social, economic, and environmental benefits in the region.

This level of planning does not necessarily include all the local individual community attributes and goals considered in municipal planning.

Other reasons for minor differences in reported planning values pertain to data management practices. For example, slight variations in the approach to delineation of land use can result in valid data sets that best serve each planning authority, but do not report precisely the same values.

9. Water Conservation Alternatives

Water conservation is an essential component of the City's long-range water supply strategy. To rely on water conservation savings as a source of supply, the City adopted its 2006 *Water Conservation and Protection Plan*, which set forth water savings goals and recommendations for conservation program management and source water protection. Since 2006, the City has implemented a variety of conservation measures, including the following:

- Inclining block water rate structure to encourage conservation
- City ordinance to restrict outdoor irrigation
- High-efficiency toilet rebates
- School and general public information and education campaigns

In 2012, the City updated its water conservation plan to meet the requirements under Wisconsin Administrative Code ch. NR 852. In accordance with the code, a wide range of water conservation and efficiency measures were evaluated, prioritized, and scheduled for implementation. The City's present and future actions target an overall 10 percent reduction in water use, or an increase in water efficiency. A 10 percent reduction in water use is equivalent to roughly 1 mgd for ultimate buildout of the City's WSSA. Exhibit 9-1 lists near- and long-term target water savings from conservation (CH2M HILL, Vickers, and Foy, 05/2012).

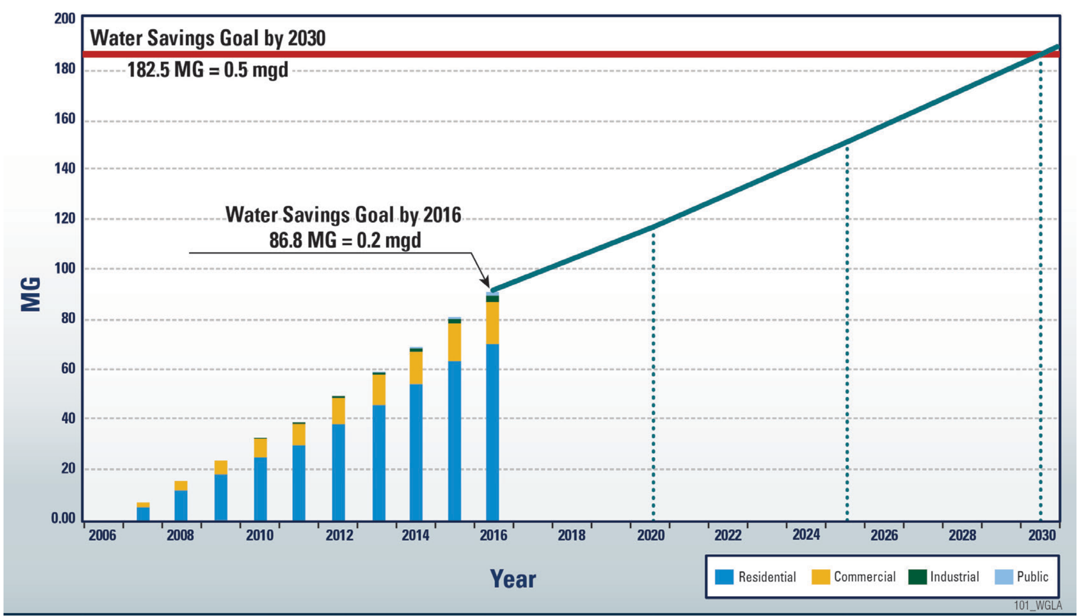
EXHIBIT 9-1
Target Water Savings from Conservation and Water Use Efficiency

Year	Average Day Demand Flow Rate (mgd)	Cumulative Volume (MG)
2016	0.2	86.8
2030	0.5	182.5
2050 (Buildout)	1.0	365

Note: Estimated cumulative savings through 2011 is 36.4 MG.

Comprehensive documentation of the City's water conservation planning process, analysis of water use by its customers, evaluation of candidate conservation measures, and development of implementation schedules and budgets are presented in Appendix D.

EXHIBIT 9-2
Water Savings Goal and Projected Water Savings



10. Cost-Effectiveness Analysis of Water Supply Alternatives

The City's public water supply is not able to sustainably meet the forecasted water demand within the planned service area. Therefore, the City evaluated water supply alternatives, including cost-effectiveness analysis of water supply sources, return flow discharge locations, and water conservation measures. This section presents a summary of the conceptual-level cost estimates for the construction, operation, and maintenance of water supply alternatives including wells, treatment plants, pump stations and pipelines.

Refer to Section 11 for an assessment of economic and environmental impacts and for discussion of legal, policy, and regulatory compliance aspects of each alternative. The cost-effectiveness evaluation of return flow alternatives is presented in Volume 4, City of Waukesha Return Flow Plan. The cost-effectiveness evaluation of water conservation alternatives and the estimated water savings of the water conservation and efficiency measures implemented by the City are presented in Volume 3, City of Waukesha Water Conservation Plan.

10.1 Cost Estimate Basis

The type of cost estimates prepared are Class 5 Estimates, which are prepared on the basis of limited project information for the purpose of screening conceptual alternatives. Per the Association for the Advancement of Cost Estimating, Class 5 Estimates are prepared using capacity factors, parametric models, judgment, or analogy. The expected accuracy range is -20 to -50 percent on the low end to +30 to +100 percent on the high end.

The cost estimates are based on conceptual information (proposed asset type, location, and capacity) and no design has been completed. They support strategic planning efforts that assess the feasibility of different alternatives and screen project options. The final cost estimate of any project will depend on market conditions, site conditions, final project scope, schedule, and other variable factors. As a result, final project costs may vary from the estimates presented here.

The conceptual cost estimates include the following:

- Preliminary pipeline alignments and facility siting plans were developed to meet WDNR environmental reporting and cost-effectiveness reporting requirements. The cost estimates factor in road, highway, and water crossings for each mile of pipeline. Specific unit costs were developed for pipeline construction in open country, low urban, medium urban, and high urban areas. The unit costs account for other utilities in the same pipeline corridor (gas, electric, telephone, cable, sewer) and the occasional routing adjustment of the pipeline to avoid obstacles. For example, the cost of a 30-inch pipe is estimated at $360 per foot in low urban areas and $495 per foot in high urban areas. The higher unit cost is used in congested areas with many other utilities.
- Treatment strategies for the groundwater supply alternatives considered water quality data on both the deep and shallow aquifers. For example, iron, manganese, and arsenic removal treatment was used for shallow aquifer groundwater because of the presence of these elements in shallow aquifer wells south of Waukesha. Conventional surface water treatment with lime softening was used for shallow aquifer water when groundwater modeling indicated a significant surface water influence could be present. Increasing total dissolved solids in some deep aquifer wells resulted in desalination treatment being added to some wells in about 10 years. The quarry water was treated as surface water, but no additional treatment for potential contaminants was added. Additional information on water treatment is in Section 11.

CH2M HILL's proprietary Parametric Cost Estimating System (CPES) was used to generate pipeline, pump station, and water treatment plant construction, operation, and maintenance cost estimates by inputting fundamental pipeline and water treatment process design criteria. The tool generates facility footprints to support site layout development and facility planning for quick assessment of cost and space impacts of alternatives. CPES uses updated industry databases and actual costs from projects.

- Development costs for new shallow aquifer wells reflect recent shallow well costs and Lathers property wellfield planning.
- Electrical power costs reflect 2010 Water Utility rates.
- Backup power generation systems are included in the estimates for pump stations, wells, and treatment plants.
- Wastewater disposal costs are included for the water treatment plant residuals.
- Greenhouse gas estimates are prepared for all the alternatives to quantify this environmental impact.

Construction cost estimates include the following:

- Contractor bonds and insurance: 3 percent
- Contractor mobilization and demobilization: 5 percent
- Contractor overhead: 8 percent
- Contractor profit: 4 percent
- Project contingency: 25 percent

Further, the estimated total construction costs include:

- Engineering, planning, and design: 8 percent
- Permitting, legal, and administration: 12 percent
- Engineering services during construction: 8 percent

Note: Cost estimates prepared in 2009 were adjusted for inflation through 2013 using *Engineering News-Record* construction cost indices. There is no escalation to the midpoint of construction. This is appropriate for relative cost comparison of alternatives. When the project and construction schedule are better defined, escalation costs can be added.

10.2 Capital and Life-Cycle Costs

Exhibit 10-1 summarizes the capital, operation/maintenance and present worth costs of the water supply alternatives evaluated in Section 11. Appendix E contains the cost estimates backup documentation.

Alternative Lake Michigan water suppliers considered include the cities of Oak Creek, Milwaukee and Racine, Wisconsin. Alternative return flow locations include the Root River, Underwood creek and a pipe directly to Lake Michigan. Exhibit 10-2 lists the costs for some of these alternatives.

EXHIBIT 10-1
Water Supply Alternative Cost Estimates

Water Supply Alternative	Capital Cost[a] ($ million)	Annual O&M Cost ($ million)	20 year Present Worth Cost ($ million, 6%)	50 year Present Worth Cost ($ million, 6%)
Deep and shallow aquifers	211	7.2	294	325
Lake Michigan[b] with return flow to Root River	207	8.0	299	334
Shallow aquifer and Fox River alluvium	217	8.9	320	358
Lake Michigan[b] and shallow aquifer	329	8.2	424	459
Unconfined deep aquifer	234	6.4	308	335
Multiple source (deep aquifers, shallow aquifers, quarries)	323	7.3	407	439

[a]Includes direct construction cost, contractor administrative costs (insurance, bonds, supervision etc.), 25% contingency, and costs for permitting, legal, engineering, and administrative.

[b] Assumes Oak Creek water supply and Root River return flow discharge.

EXHIBIT 10-2
Alternative Lake Michigan Water Supply and Return Flow Cost Estimates

Water Supply and Return Flow Alternative	Capital Cost[a] ($ million)	Annual O&M Cost ($ million)	20-year Present Worth Cost ($ million, 6%)	50-year Present Worth Cost ($ million, 6%)
Milwaukee Supply and Underwood Return	160	6.7	237	265
Milwaukee Supply and Root River Return	219	7.0	299	330
Milwaukee Supply and Direct Lake Michigan Return	212	6.8	290	319
Oak Creek Supply and Underwood Creek Return	176	7.7	264	297
Oak Creek Supply and Root River Return	207	8.0	299	334
Oak Creek Supply and Direct Lake Michigan Return	228	7.8	317	351
Racine Supply and Underwood Creek Return	276	7.7	365	398
Racine Supply and Root River Return	327	8.0	419	454
Racine Supply and Direct Lake Michigan Return near Racine	377	8.4	473	509

[a]Includes direct construction cost, contractor administrative costs (insurance, bonds, supervision etc.), 25% contingency, and permitting, legal, engineering, and administrative costs.

11. Assessment of Environmental Impacts of Water Supply Alternatives

A community within a straddling county applying for a diversion must have no reasonable water supply alternative within the basin in which the community is located, including conservation of existing water supplies. Reference: Compact Article 4, Section 4.9.3.d.; Wis. Stat. §§ 281.346(4)(e)1.d. and 281.346(4)(e)1.g.

"Reasonable water supply alternative" is defined as "a water supply alternative that is similar in cost to, and as environmentally sustainable and protective of public health as, the proposed new or increased diversion and that does not have greater adverse environmental impacts than the proposed new or increased diversion." Reference: Wis. Stat. § 281.346(1)(ps).

11.1 Introduction

The City and others have studied extensively the water resources in the Waukesha area (SEWRPC, 12/2010; Cherkauer, 02/2010; Reeves, 2010; USGS, 03/2007; Feinstein, 10/2006; CH2M HILL and Ruekert-Mielke, 03/2002). The evaluations and recommendations from the various studies are summarized here.

Evaluation criteria for water supply alternatives were developed applying the standards and conditions of the Compact, including "protection of the integrity of the Great Lakes–St. Lawrence River Basin Ecosystem shall be the overarching principle for reviewing Proposals subject to Regional Review, recognizing uncertainties with respect to demands that may be placed on Basin Water, including groundwater, levels and flows of the Great Lakes and the St. Lawrence River, future changes in environmental conditions, the reliability of existing data and the extent to which Diversions may harm the integrity of the Basin Ecosystem." Compact section 4.5.1.d. The City also prepared an environmental report detailing the environmental impacts of water supply alternatives (Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives).

In addition, proven principles of sound water supply planning were considered such as protection of public health, long-term sustainability and reliability. Finally, practical aspects of implementing a public water supply system were considered such as impacts on land owners and other water users.

The following water supply alternative evaluation criteria were developed with input from WDNR:

- Environmental impact
- Long-term sustainability
- Protection of public health
- Implementability

11.2 Previous Studies of Water Supply Alternatives

Extensive studies have investigated various water supply alternatives for the City of Waukesha. The results and conclusions from a few of those studies are summarized in this Section. These studies helped identify the alternatives analyzed in this application.

11.2.1 Future Water Supply Study

In March 2002, the City of Waukesha water utility completed a future water supply study (CH2M HILL and Ruekert-Mielke, 03/2002). Stakeholders in this study included representatives from the Waukesha water utility, City of Waukesha, WDNR, SEWRPC, USGS, the WGNHS, and the University of Wisconsin–Madison. The study looked at 14 water supply sources and combinations of them:

- Deep aquifer near Waukesha (confined)
- Deep aquifer west of Waukesha (unconfined)
- Shallow groundwater south or west of Waukesha
- Dam on the Fox or Rock River
- Waukesha quarry
- Waukesha springs

- Dolomite aquifer
- Fox River
- Rock River
- Lake Michigan
- Pewaukee Lake
- Milwaukee River
- Wastewater reuse

The study eliminated 10 water supply sources as the sole supply for the reasons listed in Exhibit 11-1.

EXHIBIT 11-1
Water Supply Sources Eliminated

Potential Water Supply Source	Primary Reason for Not Being a Sole Water Supply Source
Dolomite Aquifer	Insufficient water in the aquifer to meet the needs of the City of Waukesha.
Fox River	Inability to provide a reliable supply during dry periods, when public water supply is most needed.
Rock River	Inability to provide a reliable supply during dry periods, when public water supply is most needed.
Dam on the Fox or Rock River	Environmental impacts, regulatory issues, and public/property concerns.
Waukesha Quarry	Inadequate supply, water quality contamination potential, used for other purposes.
Waukesha Springs	Insufficient water in the aquifer to meet the needs of the City of Waukesha.
Pewaukee Lake	Insufficient water to meet the needs of the City of Waukesha, adverse environmental impacts, property owner concerns.
Milwaukee River	Poor quality, environmental impacts.
Wastewater Reuse	Public health and perception, water quality concerns, treatment requirements, limited supply, seasonal demand, regulatory issues.

The water supply sources, and combinations of sources, that were evaluated further included:

- Deep confined aquifer
- Deep unconfined aquifer
- Shallow groundwater near Waukesha
- Shallow groundwater and deep confined aquifer
- Lake Michigan

These water supply alternatives were evaluated by a broad group of stakeholders using the following criteria:

- Sustainability and reliability as a long-term, high-quality water supply
- Regulations, environmental impacts, and land and legal requirements
- Political issues and public acceptance
- Operational and maintenance requirements
- Schedule for implementation
- Infrastructure requirements

A brief summary of the results follows. Refer to the Future Water Supply report for details.

Continued use of the deep confined aquifer (current water supply for Waukesha) was ranked lowest for the following reasons:

- Unsustainability over the long term because of significant groundwater drawdown
- Adverse environmental impacts to the deep aquifer, shallow aquifers, surface water, and hydrologically connected waters of the Great Lakes basin
- Potential negative public health impacts from radium and high dissolved solids in the water
- Highest cost for water supply and treatment facilities and long term operations and maintenance

The deep unconfined aquifer alternative, far west of Waukesha, also was ranked low because:

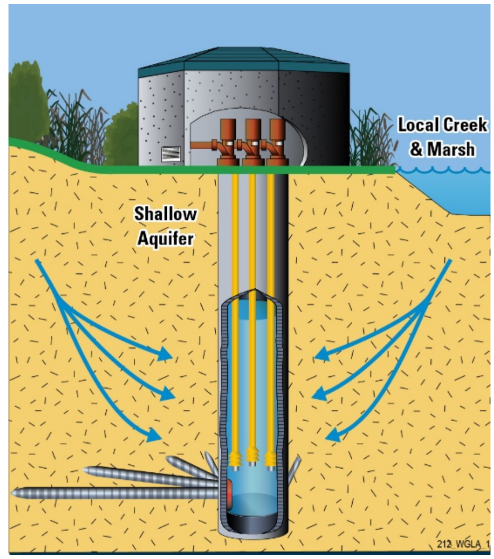
- Adverse impacts to the surrounding groundwater and surface water environment due to groundwater table drawdown and water budget depletion
- Adverse impacts to other water users currently using this source
- Poor public acceptance and potential lawsuits
- High costs for water supply, treatment and conveyance facilities and long term operations and maintenance

With the deep aquifer alternatives ranking lowest, the Future Water Supply Study report recommended further evaluation of the highest ranked alternatives:

- Lake Michigan
- Shallow aquifer sources

Recommendations relating to the Lake Michigan potable water supply included evaluating diversion permit requirements and identifying a Lake Michigan water provider. The alternatives analysis noted that the Lake Michigan alternative provided the most reliable and highest quality source of water for the City.

EXHIBIT 11-2
A Shallow Aquifer Water Supply Affects Surface Waters and Groundwaters



For the shallow aquifer alternatives, the report recommended evaluating sustainable capacities from the aquifers, environmental impacts of extracting additional shallow groundwater, land issues, and impacts on other shallow aquifer users (Exhibit 11-2). Evaluation of these items was not in the scope of the Future Water Supply Study. However, subsequent reports addressed these issues (SEWRPC, 12/2010).

11.2.2 Evaluation of Water Supply Alternatives by SEWRPC

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) is the official regional planning agency for the seven-county Southeastern Wisconsin Region, including Waukesha County. SEWRPC is charged by law with making and adopting a comprehensive plan for the physical development of the region. In 2010, SEWRPC released *A Regional Water Supply Plan for Southeastern Wisconsin* (SEWRPC, 12/2010), which included an extensive evaluation of water supply alternatives for the seven-county area, including the City of Waukesha, to 2035.

Water supply alternatives were evaluated on the basis of five overall objectives:

1. Support of existing land use patterns
2. Conservation and wise use of the surface water and groundwater supplies
3. Protection of public health, safety, and welfare
4. Economical and efficient systems
5. Responsive and adaptable plans

Each objective had several sub-objectives or standards. Two key standards under Objective 2 were as follows:

- Manage the use of the deep and shallow aquifers so as to minimize ecological impacts on the surface water system of the region.
- Use groundwater and surface water for water supply purposes in a manner that minimizes adverse impacts to the water resources, including lakes, streams, springs, and wetlands.

Similar to the Future Water Supply Study, the SEWRPC study screened alternative water supplies and identified similar water supply alternatives. The water supply alternatives evaluated for the region included the following:

- Lake Michigan
- Shallow aquifers
- Deep aquifer
- Shallow aquifers and artificial recharge using rainwater
- Deep aquifer and artificial recharge using treated Lake Michigan water
- Combinations of these alternatives

Extensive groundwater and surface water modeling was conducted in the evaluation of alternatives. Major findings include the following:

- Continued increased pumping of the deep aquifer would continue to draw down groundwater levels, create poorer water quality (higher concentrations of radium and TDS), increase adverse impacts on surface waters and hydrologically connected waters of the Great Lakes basin, and increase the water budget deficits.
- Increased pumping of the shallow aquifer would reduce baseflows to surface waters, produce water budget deficits, and have adverse environmental impacts on sensitive surface water ecosystems, such as Vernon Marsh, Pebble Brook, and Pebble Creek (a high quality trout stream) near Waukesha (WDNR, 2002),
- Shallow aquifer recharge with rainwater infiltration facilities could increase baseflows to surface water a small amount compared to no infiltration facilities. However, rainwater infiltration facilities create public health concerns because of potential contamination, implementation concerns due to suitable land availability and long-term effectiveness concerns due to plugging and maintenance.
- A Lake Michigan supply to some straddling communities and counties west of the subcontinental divide (with return flow) would reduce the ecological stress on the deep aquifer, shallow aquifer, and associated waters and water dependent natural resources of the Great Lakes basin compared to the other alternatives.
- The amount of chlorides and sodium discharged into the environment by water-softening devices would increase greatly under any groundwater alternative. The SEWRPC report estimated that eliminating groundwater softening by providing Lake Michigan water to some communities east and west of the divide (including Waukesha) would eliminate 5.2 million pounds of chlorides per year discharged to the Cedar Creek, Milwaukee River, and Lake Michigan environments (SEWRPC, 12/2010).
- Shallow groundwater supplies are more susceptible to contamination than a Lake Michigan supply. This could result in an increased risk to public health and the need for advanced water treatment facilities that would increase costs, energy use, and greenhouse gas emissions.

Comparing alternatives under which the City of Waukesha obtains a Lake Michigan water supply with return flow to alternatives where the City of Waukesha uses current or new groundwater supplies (deep and shallow aquifers), **SEWRPC concluded that the Lake Michigan alternative "offers advantages related to the long-term sustainability of the deep aquifer, reductions in chloride discharges to the surface waters, and improvement in groundwater-derived baseflow inputs to the surface water system."**

Additional advantages were noted if the City of Waukesha discontinued use of groundwater and obtained a Lake Michigan water supply (SEWRPC, 12/2010):

- Meets SEWRPC's water supply development and management objectives more fully
- Provides greater draw ups in the deep aquifer, improving sustainability and water quality
- Offers an opportunity to utilize existing excess Lake Michigan water production capacity, and provides potential cost advantages to both the supplier and supplied utilities.
- Preserving the groundwater aquifer for other land uses, such as agriculture.
- More cost-effective

On that basis, SEWRPC issued a recommendation for the City of Waukesha to change from a groundwater supply to a Lake Michigan water supply. This recommendation was reviewed, and 32 experts with a variety of interests and perspectives in the region concurred (SEWRPC, 12/2010). Some of the experts included representatives from WDNR, WGNHS, USGS and the University of Wisconsin-Milwaukee.

A 2009 study provided further groundwater/surface water modeling of the SEWRPC alternatives, with projections to 2035 (Cherkauer, 02/2010). The study evaluated alternatives for the City of Waukesha similar to those in the SEWRPC Regional Water Supply Plan. The analysis showed that a Lake Michigan water supply for the City of Waukesha would improve the deep aquifer water levels and reduce its adverse impacts on the shallow aquifer and surface water baseflow reductions in the whole region. **A Lake Michigan supply to Waukesha would also increase deep aquifer flows to the Lake Michigan basin, since they are hydrologically connected** (USGS, 03/2007; Feinstein, 10/2006; CH2M HILL and Ruekert-Mielke, 2003). The study issued cautions against Waukesha's or similarly situated communities' reliance on a future groundwater supply west of the divide, noting that groundwater levels and environmental impacts would worsen (Cherkauer, 02/2010).

These studies evaluated alternatives up to 2035, only 22 years from the date of the Waukesha Application (2013) (SEWRPC, 12/2012; Cherkauer, 02/2010). This is a relatively limited planning period, given that water supply planning typically looks out 50 years and more. A community water supply must be sustainable in the long term, or the capital, operations, and environmental costs of development are too high to make it reasonable. Developing a short-term water supply puts communities at risk of paying twice for the large capital costs involved.

11.3 Artificial Recharge to Replenish Water Resources

This section summarizes previous studies on artificial recharge to replenish water resources, and provides analysis of the Waukesha water supply issue. Artificial recharge of groundwater aquifers or surface water has been attempted with engineered facilities designed to introduce and store water. The source of recharge water can be naturally occurring from rainfall, surface water, groundwater, stormwater, or wastewater treatment effluent. Artificial recharge can be accomplished in several ways including:

- Infiltrating water into the ground above the aquifer through surface or subsurface facilities (impoundments, trenches, changes to the land surface)
- Direct injection into the groundwater aquifer through wells

Artificial recharge is not a water supply alternative but a water resources management strategy to potentially reduce the adverse environmental impacts of surface water baseflow reduction and groundwater drawdown that results from groundwater pumping.

11.3.1 Rainwater Infiltration

Enhancing rainwater infiltration is one method of artificial recharge. In its extensive study of artificial recharge, SEWRPC concluded that rainwater infiltration provides the most potential benefits, compared to other methods of artificial recharge (SEWRPC, 07/2007). SEWRPC also evaluated the development of eight rainwater infiltration systems in Waukesha County to enhance recharge of the shallow aquifer, if the deep and shallow aquifers remained the City of Waukesha's source of water supply. The eight rainwater infiltration systems required an estimated 265 acres, would be located in areas of natural aquifer recharge, and were estimated to increase groundwater recharge by about 0.3 million gallons per day (110 million gallons per year).

There are several issues to address when planning and implementing rainwater infiltration systems:

- Large land areas are required for artificial recharge, with significant costs and public concerns. Land with the right characteristics for recharge is required and may not be available for recharge. Land ownership and use control are critical issues for implementation feasibility, water quality and public health protection.
- Water that is artificially recharged is more vulnerable to contamination, which might increase the cost of treatment and risk to public health.
- The long-term feasibility of artificial recharge is unknown. Soil permeability for effective recharge might be compromised over the long term. Plugging of the soils would reduce effectiveness over time. Restoration or decommissioning of facilities would add to costs.
- Rainwater recharge will be limited during periods of dry, warm weather and drought. Conversely, during those same times, water supply demands will increase, along with the adverse environmental impacts associated with groundwater pumping.

The relatively small amount of potential aquifer recharge determined from the SEWRPC study (0.3 mgd or less than 3 percent of the water needed to meet Waukesha projected water demand) would not eliminate the significant adverse environmental impacts of continued use of the shallow aquifer for water supply. Groundwater modeling of the shallow aquifer near Waukesha indicated that reducing groundwater extraction by 8.2 mgd (from 10.9 mgd to 2.7 mgd) still caused significant adverse environmental impacts on wetlands (RJN Environmental Services, 02/2011). Therefore, extracting 10.9 mgd for potable use and artificially recharging 8.2 mgd would still have significant adverse environmental impacts, assuming recharging 8.2 mgd was possible.

Rainwater infiltration systems can replace some of the water lost from pumping water in the shallow aquifer. Enhancing rainwater infiltration where practical and feasible is a good goal and should be considered in land use planning. However, rainwater infiltration will not mitigate the adverse environmental impacts of pumping groundwater in the Waukesha groundwater supply alternatives.

11.3.2 Wastewater Effluent Infiltration

Because some in situ natural treatment may occur, infiltrating wastewater effluent through the ground above the aquifer is allowed by Wisconsin Administrative Code Chapter NR 206 (Land Disposal of Municipal and Domestic Wastewater). However, the water must meet groundwater quality requirements of NR 140 (Groundwater Quality) and wastewater effluent standards of NR 206. NR 140 has a chloride limit of 250 milligrams per liter (mg/L) and other water quality limits. Waukesha wastewater effluent is well above the chloride limit (two to three times higher) and would require expensive and energy intensive treatment such as reverse osmosis (RO) to meet the regulations. In addition, a liquid concentrate waste stream from RO treatment would consist of 10 to 20 percent of the treated water flow, and contain chlorides in the 3,000 to 7,000 mg/L range. It is not possible to discharge liquid salt waste from the RO process to the wastewater treatment plant because discharge limits on chloride would be exceeded. Therefore, mechanical evaporation would be one method to accumulate the concentrate waste. This process evaporates the water and leaves a solid salt waste product that would require disposal.

Finding adequate amounts of suitable land for infiltration is another issue. NR 110.25 (General Conditions Required for All Land Disposal Systems) has specific requirements for siting infiltration areas. These sites must be at least 1,000 feet from municipal wells, infiltration pond bottom must be greater than 5 feet from groundwater and 10 feet from bedrock. The soil conditions must be adequate for infiltration, and connected to the water source aquifer. A potential infiltration rate of 50,000 gallons/acre/day used in some infiltration ponds would require 160 acres to infiltrate about 75 percent of Waukesha's future average day water use. The amount of land could be much greater depending on soil type.

Assuming 75 percent of the groundwater extracted for Waukesha's potable use could be infiltrated into the ground (about 8 mgd), there would still be significant adverse environmental impacts to hundreds of acres of wetlands, as discussed above (RJN Environmental Services, 02/2011). Even if this large amount of water was able to be recharged into the aquifer and the land was available, there is no guarantee that the recharge area would continue to operate due to plugging of the soils over time (SEWRPC, 07/2007). A smaller amount of water could be infiltrated, but the adverse environmental impacts would increase and would not be mitigated.

The capital cost of treating and conveying 8 mgd of wastewater effluent and handling the waste streams is estimated at $150 to 200 million capital costs and over $13 million per year in operation/maintenance costs based on recent project costs (Schimmoller, 09/2011; WateReuse Symposium, 09/2008). The present worth cost (20 years, 6 percent) is $300 million to $400 million. These costs do not include the cost of land acquisition to recharge the water, or the cost of salt waste disposal. Because desalting, mechanical evaporation and conveyance are energy-intensive operations, over 64,000 tons/year of greenhouse gases would be discharged into the environment with this water resources management strategy based on electrical usage alone. This is two to four times more greenhouse gas emissions than any of the water supply alternatives.

Based on this analysis, infiltrating treated wastewater effluent through the ground above an aquifer is not feasible for eliminating adverse environmental impacts of groundwater pumping and does not merit further consideration.

11.3.3 Wastewater Effluent to Supplement Streams

Supplementing trout streams with treated wastewater effluent to offset baseflow reductions from groundwater pumping would require chloride removal, and possibly removal of other contaminants such as heavy metals and ammonia. Chronic toxicity criteria for chloride in cold and warm water streams are 395 mg/L (NR 105.06), much lower than present in Waukesha wastewater effluent. Chloride removal would require expensive and energy intensive treatment, such as RO. Treated wastewater effluent is also warmer than trout streams during many months of the year and the water would have to be cooled to avoid triggering thermal pollution and impairing cold water stream habitat. Cooling water is possible with natural treatment systems or mechanical chilling. Mechanically chilling the treated wastewater effluent significantly increases costs, energy consumption and greenhouse gas emissions above that of RO treatment.

Based on this analysis, recharging streams with treated wastewater effluent is not economical or practical. Given the high costs, constraints to implementation, and unproven effectiveness, artificial recharge of streams with wastewater effluent will not be considered further.

11.3.4 Well Injection

Injecting water into an aquifer through a well could replenish some of the water lost to pumping groundwater for potable use. To prevent groundwater contamination, Wisconsin regulations prohibit recharge of stormwater (NR 815) and wastewater effluent (NR 206) directly into groundwater through a well. If water was to be injected into the ground, it would have to meet drinking water quality standards (NR 811.87). Therefore, the expensive, energy intensive treatment system described previously would have to be used before injection. Injecting drinking water into aquifers is regulated by the aquifer storage and recovery requirements of NR 811.87. One requirement is that the displacement zone around the recharged water well shall not exceed 1,200 feet. This limits the practicality of this recharge method since the water may not be allowed to reach wetlands and streams that are adversely affected by groundwater pumping.

Based on the regulatory, cost and practicality limitations, well injection will not be considered further.

11.3.5 Other Methods to Mitigate Environmental Impacts

Other methods to mitigate adverse environmental impacts of groundwater pumping were evaluated (City of Waukesha, 04/2011), including:

- Groundwater extraction from one area, pumped to augment a wetland
- Control of surface water through in-stream dams or weirs to augment wetlands
- Wellfield pumping management to rotate where water is being extracted
- Wetland mitigation bank credit purchase

The results of these analyses indicated that none of the methods are practical or feasible to eliminate adverse environmental impacts for the conditions in Waukesha, Wisconsin.

11.4 Water Supply Alternatives Evaluation

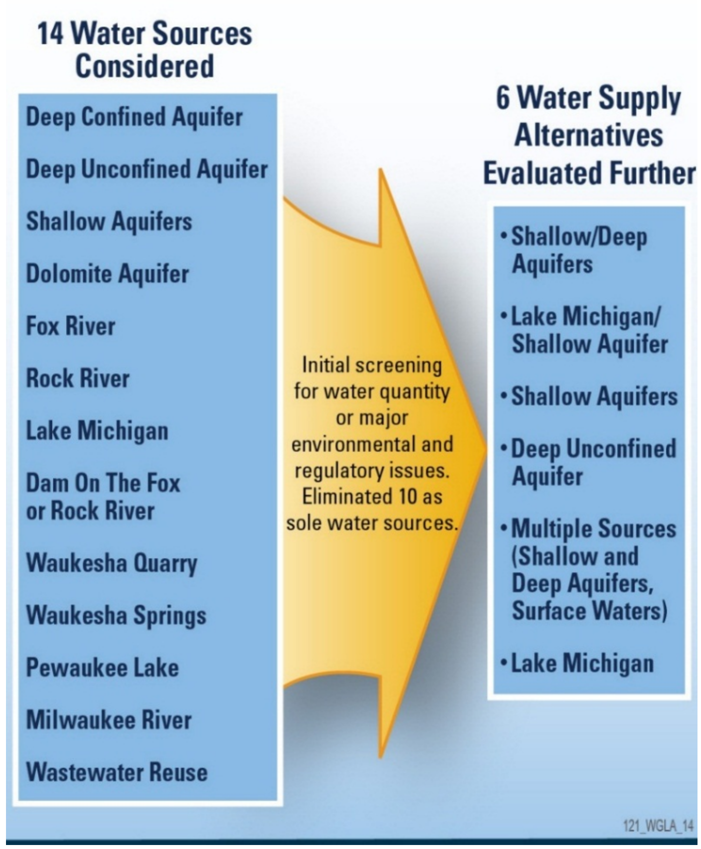
Extensive evaluations of water supply alternatives for the City of Waukesha and the region have previously been conducted. To be eligible for Lake Michigan water, the City must show that there is no reasonable water supply alternative within the basin the City is located in. Fourteen water supply sources were considered. The City compared a Lake Michigan water supply source to the other water supply sources, and combinations of sources. Six water supply alternatives were chosen for further analysis based on the evaluations done in previous studies, stakeholder comments and discussions with WDNR (SEWRPC, 12/2010; CH2M HILL and Ruekert-Mielke, 03/2002). Exhibit 11-3 summarizes the water supply alternatives selection process.

The following six water supply alternatives were selected for further evaluation:

1. Deep confined aquifer and shallow aquifer
2. Lake Michigan
3. Shallow aquifer and Fox River alluvium
4. Lake Michigan and shallow aquifer
5. Deep unconfined aquifer
6. Multiple source waters (deep aquifers, shallow aquifers, surface waters)

A general description for each water supply alternative is provided below. Exhibit 11-4 summarizes the water sources, quantity of water from each source, and facilities for each of the six water supply alternatives. The benefits of an aggressive water conservation program are included in capacities for all water supply alternatives (CH2M HILL, 05/2012).

EXHIBIT 11-3
Water Supply Alternative Screening



Evaluation criteria for water supply alternatives were developed applying the standards and conditions of the Compact, including “protection of the integrity of the Great Lakes–St. Lawrence River Basin Ecosystem shall be the overarching principle for reviewing Proposals subject to Regional Review, recognizing uncertainties with respect to demands that may be placed on Basin Water, including groundwater, levels and flows of the Great Lakes and the St. Lawrence River, future changes in environmental conditions, the reliability of existing data and the extent to which Diversions may harm the integrity of the Basin Ecosystem.” Compact section 4.5.1.d. The City also prepared an environmental report detailing the environmental impacts of water supply alternatives (Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives).

In addition, proven principles of sound water supply planning were considered such as protection of public health, long-term sustainability and reliability. Finally, practical aspects of implementing a public water supply system were considered such as impacts on land owners and other water users.

The following water supply alternative evaluation criteria were developed with input from WDNR. Each water supply alternative was compared to these four evaluation criteria.

- **Environmental Impacts**
  - Impact on groundwater resources
  - Impact on wetlands and surface water ecosystem aquatic habitats
  - Greenhouse gas emissions
- **Long-Term Sustainability**
  - Amount of water returned to the original source
  - Reliability during droughts to provide adequate water
- **Public Health**
  - Potential for contamination
  - Quality of the water and treatment required to protect public health
  - Number of different water qualities to be blended to create a consistent water quality to customers
- **Implementability**
  - Operation and maintenance requirements
  - Infrastructure and land requirements
  - Coordination with other government entities (County, City, Town, State)
  - Impact on other wells

Each of the four evaluation criteria are further defined in Exhibit 11-5. The environmental impact descriptions are similar to those used in Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives.

EXHIBIT 11-4
Facilities for Water Supply Alternatives

Alternative	Water Sources	Avg. day demand, mgd	Max. day demand, mgd	Supply Facilities	Treatment Facilities[a]	Transmission Facilities
1. Deep Confined and Shallow Aquifers	Deep confined aquifer	4.5	7.6	8 existing wells	3 new reverse osmosis[a] treatment plants at wells 6, 8, and 10. Existing hydrous manganese oxide[b] treatment at well 3.	About 5 miles of pipeline to Hillcrest Reservoir for blending, then pumped throughout distribution system.
	Shallow aquifer (new wells)	4.9	7.9	12 new wells and about 6 miles of connecting pipeline to the treatment plant.	1 new groundwater treatment plant.[c]	1 new pump station at new water plant and about 10 miles of transmission pipe to Hillcrest Reservoir for blending, then pumped to distribution system with about 4 miles of piping improvements.
	Shallow aquifer (existing wells)	0.7	1.2	3 existing wells	Existing groundwater treatment plant[d] for wells 11 and 12.	About 1 mile of transmission pipe to Hillcrest Reservoir for blending, then pumped to distribution system.
2. Lake Michigan	Lake Michigan	10.1	16.7	1 pump station and about 17 miles of transmission pipe (Oak Creek supply) to the southeast side of the Waukesha distribution system.	Surface water treatment[f] by water supplier	About 2 miles of distribution system piping improvements. A return flow pump station and about 20 miles of return flow transmission pipe to the Root River.
3. Shallow Aquifers	Shallow aquifer (existing wells)	0.7	1.2	3 existing wells	Existing groundwater treatment plant[d] for wells 11 and 12.	About 1 mile of transmission pipe in distribution system.
	Fox River Alluvium (Riverbank Inducement)	2.7	4.5	4 new wells and about 1 mile of connecting pipeline to water treatment plant.	1 new groundwater/ surface water treatment plant.[e]	1 new pump station at new water plant and about 6 miles of transmission pipe in distribution system.
	Shallow aquifer (new wells)	6.7	11.0	12 new wells and about 6 miles of connecting pipeline to the treatment plant.	Treated in same ground-water/surface water treatment plant as Fox River alluvium wells.	Pumped through same pump station and pipeline as above.
4. Lake Michigan and Shallow aquifer	Lake Michigan	4.5	7.6	1 pump station and about 19 miles of transmission pipe (Oak Creek supply) to Hillcrest Reservoir for blending.	Surface water treatment[f] by water supplier	Pumped to distribution system with about 4 miles of piping improvements. A return flow pump station and about 20 miles of return flow transmission pipe to the Root River.

EXHIBIT 11-4
Facilities for Water Supply Alternatives

Alternative	Water Sources	Avg. day demand, mgd	Max. day demand, mgd	Supply Facilities	Treatment Facilities[a]	Transmission Facilities
	Shallow aquifer (new wells)	4.9	7.9	12 new wells and about 6 miles of connecting pipeline to the treatment plant.	1 new groundwater treatment plant.[c]	1 new pump station at new water plant and about 10 miles of transmission pipe to Hillcrest Reservoir for blending.
	Shallow aquifer (existing wells)	0.7	1.2	3 existing wells	Existing groundwater treatment plant[d] for wells 11 and 12.	About 1 mile of transmission pipe in distribution system.
5. Unconfined Deep Aquifer		10.1	16.7	12 new wells and about 9 miles of interconnecting pipeline. 12 miles of raw water transmission pipeline to the water plant.	1 new groundwater treatment plant.[d]	Pump station at treatment plant and about 7 miles of transmission pipe to Hillcrest Reservoir. Water is pumped to distribution system with about 4 miles of transmission pipelines.
6. Multiple Sources	Deep confined aquifer	2.1	3.5	4 existing wells (3, 6, 8, and 10)	3 new reverse osmosis[a] treatment plants at wells 6, 8, and 10. Existing hydrous manganese oxide[b] treatment at well 3.	About 3 miles of transmission pipeline to Hillcrest Reservoir for blending, then pumped to distribution system.
	Fox River Alluvium (Riverbank Inducement)	1.5	2.5	3 new wells and about 1 mile of connecting pipeline to water treatment plant.	1 new groundwater/ surface water treatment plant.[e]	1 new pump station at new water plant and about 10 miles of transmission pipe to Hillcrest Reservoir for blending, then pumped to distribution system.
	Shallow aquifer (existing wells)	0.9	1.5	3 existing wells	Existing groundwater treatment plant[d] for wells 11 and 12.	About 1 mile of transmission pipe to Hillcrest Reservoir pipeline for blending, then pumped to distribution system.
	Unconfined Deep Aquifer	2.0	3.2	3 new wells and 2 miles of inter-connecting pipeline. 12 miles of raw water transmission pipeline to the water plant.	1 new groundwater treatment plant.[d]	About 5 miles of transmission pipe to Hillcrest Reservoir, then pumped to distribution system.
	Pewaukee Quarry	0.9	1.5	2 quarries with 2 intakes, 1 pump station and 2 miles of pipe to a new water plant.	1 new surface water treatment plant[g] near the Hillcrest Reservoir.	1 new pump station at new water plant and about 1 mile of transmission pipe to Hillcrest Reservoir for blending, then pumped to distribution system.
	Lisbon Quarry	1.5	2.5	2 quarries with 2 intakes, 1 pump station and 7 miles of pipe to new water plant.	Treated in the same new water treatment plant as the Pewaukee Quarry.	Pumped with the same new pump station above.

EXHIBIT 11-4
Facilities for Water Supply Alternatives

Alternative	Water Sources	Avg. day demand, mgd	Max. day demand, mgd	Supply Facilities	Treatment Facilities[a]	Transmission Facilities
	Silurian Dolomite Aquifer	1.2	2	5 new wells, 8 miles of interconnecting pipeline to a new water plant.	1 new groundwater treatment plant.[d]	1 new pump station at new water plant and about 2 miles of transmission pipe to Hillcrest Reservoir pipeline for blending, then pumped to distribution system.

Notes for Exhibit 11-4.

	Treatment	Processes	Primary Treatment Objectives
Note: All treatment facilities have chlorine or chloramine disinfection for the distribution system, consistent with current practice.			Microbial disinfection
a	Reverse osmosis (RO)	Fine screen filtration, reverse osmosis, degasification, chemicals for membrane antiscaling, membrane cleaning, pH adjustment with sodium hydroxide. Treated water clearwell and pump station. Assumes concentrate brine can be discharged to sewer.	Total dissolved solids removal, radium removal.
b	Hydrous manganese oxide (HMO)	Chlorine contact, HMO chemicals, pressure vessel filtration. Backwash residuals are discharged to sewer.	Radium removal.
c	Groundwater treatment	Chlorine contact, pressure vessel filtration, granular ferric hydroxide (GFH) contact in pressure vessel. Pressure filter backwash residuals discharged to sewer. GFH replaced when arsenic capacity is reached.	Iron, manganese, arsenic removal.
d	Groundwater treatment	Chlorine contact, pressure vessel sand/anthracite filtration. Backwash residuals pumped to sewer or wastewater treatment plant.	Iron, manganese removal.
e	Groundwater/surface water treatment	Lime softening, filtration, UV and chlorine disinfection. Lime softening residuals dewatered and land applied. Other residuals pumped to wastewater treatment plant.	Removal of iron, manganese, arsenic, turbidity, hardness, microbials (*Giardia* and virus), total organic carbon, minimization of disinfection byproducts (trihalomethanes and haloacetic acids).
f	Lake Michigan water treatment	Rapid mix, flocculation, clarification, filtration. Potential water suppliers use different coagulants (alum, polyaluminum chlorine, or ferric chloride). One water supplier has ozone for disinfection and oxidation. One supplier has membrane filters for additional removal of particles and microbials. All suppliers have chlorine or chloramines for distribution system disinfection.	Removal of turbidity, microbials (*Giardia* and virus), total organic carbon, minimization of disinfection byproducts (trihalomethanes and haloacetic acids).
g	Surface water treatment	Rapid mix, flocculation, clarification, filtration, UV and chlorine disinfection. Residuals pumped to wastewater treatment plant.	Removal of turbidity, microbials (*Giardia* and virus), total organic carbon, minimization of disinfection byproducts (trihalomethanes and haloacetic acids).

EXHIBIT 11-5
Water Supply Evaluation Criteria

	No Adverse Impact or Risk	Minor Adverse Impact or Risk	Moderate Adverse Impact or Risk	Significant Adverse Impact or Risk
Environmental[a]				
Impact on groundwater resources	Causes rebound of the deep confined aquifer in City of Waukesha to pre-development levels.	Causes rebound of the deep confined aquifer in City of Waukesha to levels less than 50 ft below predevelopment.	Causes rebound of the deep confined aquifer in City of Waukesha between 50 and 149 ft below predevelopment.	Causes rebound of the deep confined aquifer in City of Waukesha to 150 ft or more below predevelopment.
	No drawdown of the shallow or deep unconfined aquifer.	Shallow or unconfined deep aquifer draw down of 5 feet or less.	Shallow or unconfined deep aquifer draw down of 5 feet to 49 feet.	Shallow or unconfined aquifer draw down of 50 feet or more.
Impact on Aquatic habitat	No wetlands, lakes or springs in the 1 foot groundwater drawdown contour.	Affects fewer than 5 acres of wetlands in the 1 foot drawdown contour.	Affects greater than 5 but less than 10 acres of wetlands in the 1 foot drawdown contour.	Affects greater than 10 acres of wetlands in the 1-foot drawdown contour.
	Does not reduce stream flow at any time.	Reduced baseflow in a segment of warm water streams of up to 10%, causing habitat loss. Reduced baseflow in a segment of cold water streams, but less than 5%.	Reduced baseflow in a segment of warm water streams of greater than 10% but less than 20%, causing habitat loss. Reduced baseflow in a segment of cold water streams, but less than 15%.	Reduced baseflow in a segment of warm water streams of 20% or more, causing habitat loss. Reduced baseflow in a segment of cold water streams of 10% or more, causing habitat loss.
	No lakes or springs in the 1 foot groundwater drawdown contour.	No lakes and up to 4 springs in the 1 foot groundwater drawdown contour.	One to 5 lakes or 5 to10 springs in the 1 foot groundwater drawdown contour.	Greater than 5 lakes or more than 10 springs in the 1 foot groundwater drawdown contour.
Long-Term Sustainability[b]				
Percent of water returned to the original water source from where it was extracted	100%	75 to 99%	50 to 74%	<50%
Water supply impact by drought	Very large surface water or confined deep aquifer	Large surface water or unconfined deep aquifer	Medium surface water or confined shallow aquifer	Small surface water or unconfined shallow aquifer
Public Health[c]				
Potential contaminant sources and types[d] contained within the 1-ft groundwater drawdown contour line or within 1 mile from the water supply source	No sources of contaminants	1 to 5 sources and 1 type of contaminant	6 to 10 sources and 2 types of contaminants	>10 sources or 3 or more types of contaminants
Treatment[c] required to meet primary drinking water standards or wastewater regulations	No treatment	Conventional surface water or groundwater treatment	Conventional surface water or groundwater treatment plus treatment to remove one additional contaminant	Conventional surface water or groundwater treatment plus treatment to remove two or more additional contaminants, or potential for increased wastewater treatment or sludge disposal requirements.

EXHIBIT 11-5
Water Supply Evaluation Criteria

	No Adverse Impact or Risk	Minor Adverse Impact or Risk	Moderate Adverse Impact or Risk	Significant Adverse Impact or Risk
Blending different water sources for a consistent water quality	1 water source	2 water sources	3 water sources	> 3 water sources
Implementability[e]				
Facilities to operate and maintain (wells, treatment plants, pump stations)	1 to 3	4 to 10	11 to 20	> 20
Number of land sites required and miles of pipeline	No land sites or pipelines	1 to 3 land sites or 1 to 10 miles of pipeline	4 to 10 land sites or 11 to 30 miles of pipeline	> 10 land sites or > 30 miles of pipeline
Potential number of government entities to coordinate with	0	1 to 5	6 to 9	> 9
Number of wells potentially adversely affected by the water supply	0	< 100 private wells within the 1-foot groundwater drawdown contour and no public drinking water or high capacity wells within the 10-foot groundwater drawdown contour	100 to 500 private wells within the 1 foot groundwater drawdown contour line or <5 public drinking water or high capacity well within the 10 foot groundwater drawdown contour	> 500 private wells within the 1 foot groundwater drawdown contour line or > 5 public drinking water or high capacity well within the 10-foot groundwater drawdown contour

[a]See Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives, for details and definitions. Adverse impacts in the Environmental category are consistent with the Environmental Report with adjustments made to account for the additional water sources.

[b]Adverse impacts or risks for the Long-Term Sustainability category are associated with the long-term dependability of the source water as a reliable potable drinking water supply considering recycling water to the source and impacts during droughts.

[c] The Public Health category reflects relative potential drinking water supply risks and reliability of the source water quality. It is assumed that all water supply alternatives have treatment in place to meet primary drinking water standards for known contaminants. See Exhibit 11-4 for water treatment descriptions.

[d]The four types of contaminants considered are inorganics, volatile organic compounds, synthetic organic compounds, and radionuclides.

[e]Adverse impacts or risks for the Implementability category reflect the relative number of facilities to construct, operate and maintain while obtaining the source water, plus the number of other wells affected by obtaining the water source.

Each water supply alternative was rated by the following categories, based on the evaluation criteria in Exhibit 11-5:

- ○ No adverse impact or risk
- ⊙ Minor adverse impact or risk
- ◉ Moderate adverse impact or risk
- ● Significant adverse impact or risk

The term “adverse impact” applies more to the environmental criteria and the term “risk” applies more to the other three criteria.

The following section describes each water supply alternative and compares it to the evaluation criteria.

11.4.1 Water Supply Alternative 1: Deep Confined and Shallow Aquifers

11.4.1.1 General Description

Alternative 1 consists of using the deep confined aquifer (St. Peter through Mt. Simon sandstone) and shallow aquifer south of Waukesha (Troy Bedrock Valley). The future average annual day demand (ADD) would be 10.1 mgd and the maximum day demand (MDD) would be 16.7 mgd based on water demand projections (Section 5). These water demands are the same for all the water supply alternatives.

To meet a future maximum day demand of 16.7 mgd, infrastructure would be in place for 7.6 mgd firm capacity from the existing deep wells and 9.1 mgd from shallow wells. After treatment, water from these wells would be blended in a pipeline to the Hillcrest reservoir, then distributed throughout the City. Exhibit 11-6 shows the facilities for Alternative 1. These facilities are summarized in Exhibit 11-4.

Currently the groundwater elevation is 400 to 600 feet below predevelopment levels. This depressed water level causes water quality problems (increased TDS, radium, and gross alpha levels) (Jansen and Taylor, 10/2000). As a result, treatment with reverse osmosis would be installed at the three largest deep wells (No. 6, 8, 10) to reduce TDS and radium. Since the deep wells are on small lots, adjacent residential property would need to be purchased and homes demolished to make room for the additional treatment facilities. Treatment to remove TDS would produce a concentrated salt waste stream equal to about 7.5 percent of the water pumped (assuming 25 percent bypass). The lost deep well capacity would be made up with shallow wells. This is consistent with the Future Water Supply Study (CH2M HILL and Ruekert-Mielke, 03/2002). It is further assumed that the concentrated salt waste stream can be discharged to the wastewater treatment plant for disposal, and there are no regulatory or treatment requirements. Current chloride limits on wastewater discharge to the Fox River may prohibit discharge of the salt waste without further expensive treatment, or not allow it altogether. The cost of salt waste treatment was not included in this alternative. If treatment to remove chlorides were required, the costs would be significant (see section 11.3).

The maximum capacity from shallow aquifer wells would be achieved by relying upon the current 1.2 mgd firm capacity (capacity with the largest well out of operation) from existing wells 11, 12 and 13, plus developing an additional 7.9 mgd firm capacity by installing 12 new shallow aquifer wells south of Waukesha near Vernon Marsh in the Troy Bedrock Valley aquifer.

Water from the shallow aquifer wells could need to undergo treatment for iron and manganese removal, followed by disinfection. The recent discovery of arsenic above regulatory limits in shallow aquifer at future well test sites means arsenic treatment could be required as well. The shallow aquifer water would be pumped from the wells to a new treatment plant. A new pump station at the treatment plant would convey treated water to the City of Waukesha's Hillcrest reservoir, the largest reservoir in Waukesha used as a point to blend with deep aquifer water and deliver to the City.

Water supply alternatives with multiple sources assume blending water at the Hillcrest Reservoir. Distribution system improvements to convey water throughout the distribution system are included in the cost estimate. Distribution system improvements and costs for supplying water from various supply sources were evaluated in a separate report (AECOM, 2012).

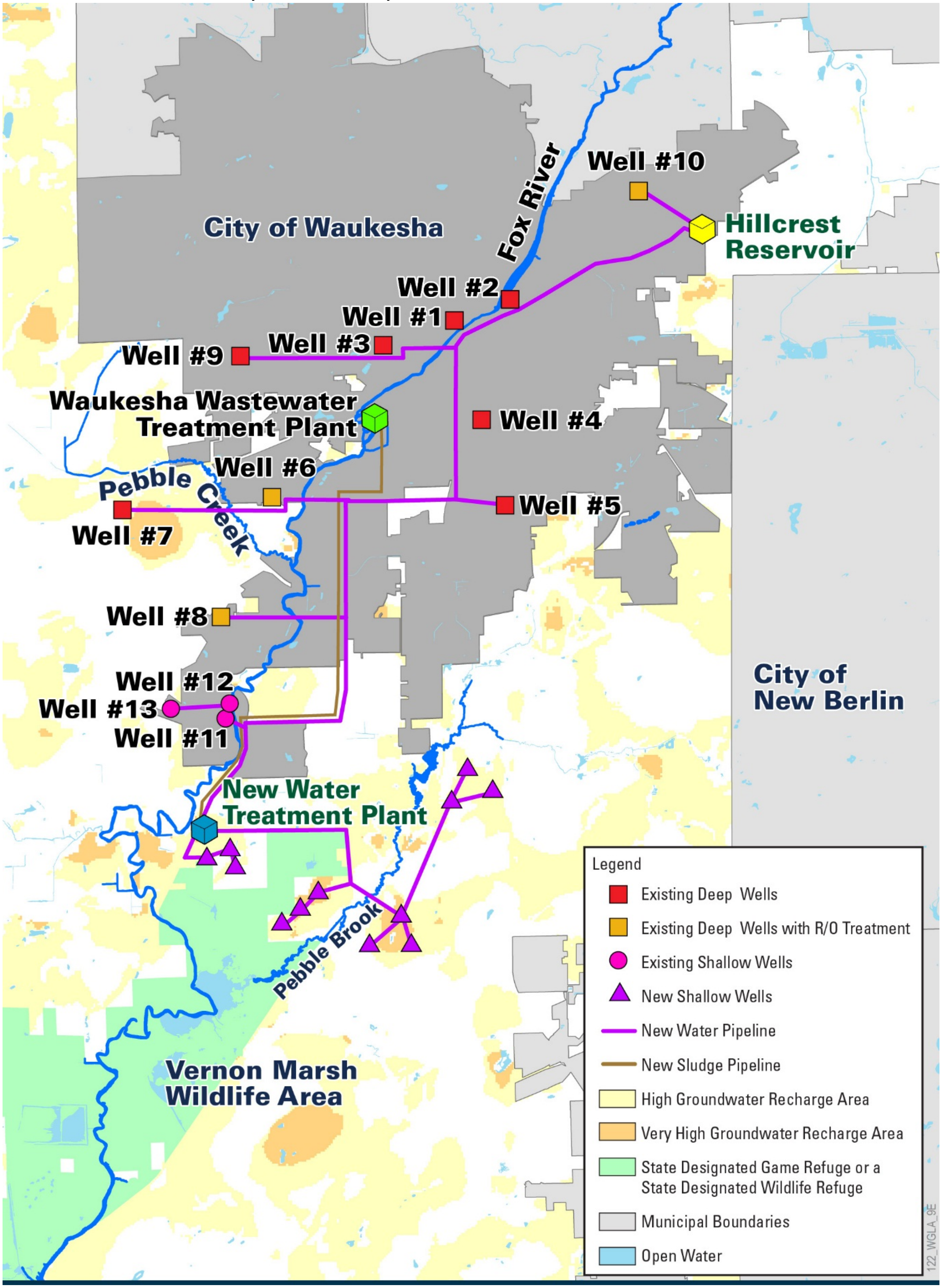
11.4.1.2 Environmental Impacts

Groundwater Resources.

Deep Confined Aquifer. In this alternative, the deep confined aquifer would continue to be pumped, but at a lower rate than current pumping. Drawdown of the deep confined aquifer would still be significant (SEWRPC, 12/2010). This is in part attributed to the Maquoketa shale confining layer, a geological feature that limits the recharge of the aquifer by rain and snow. More water is pumped from the aquifer than can be recharged. Waukesha has been placed in a groundwater management area by WDNR because of this extensive drawdown of the deep confined aquifer. WDNR determined that an aquifer drawdown of 150 feet or more was significant and that aquifer could be placed in a groundwater management area. The deep aquifer near Waukesha has about three times this drawdown.

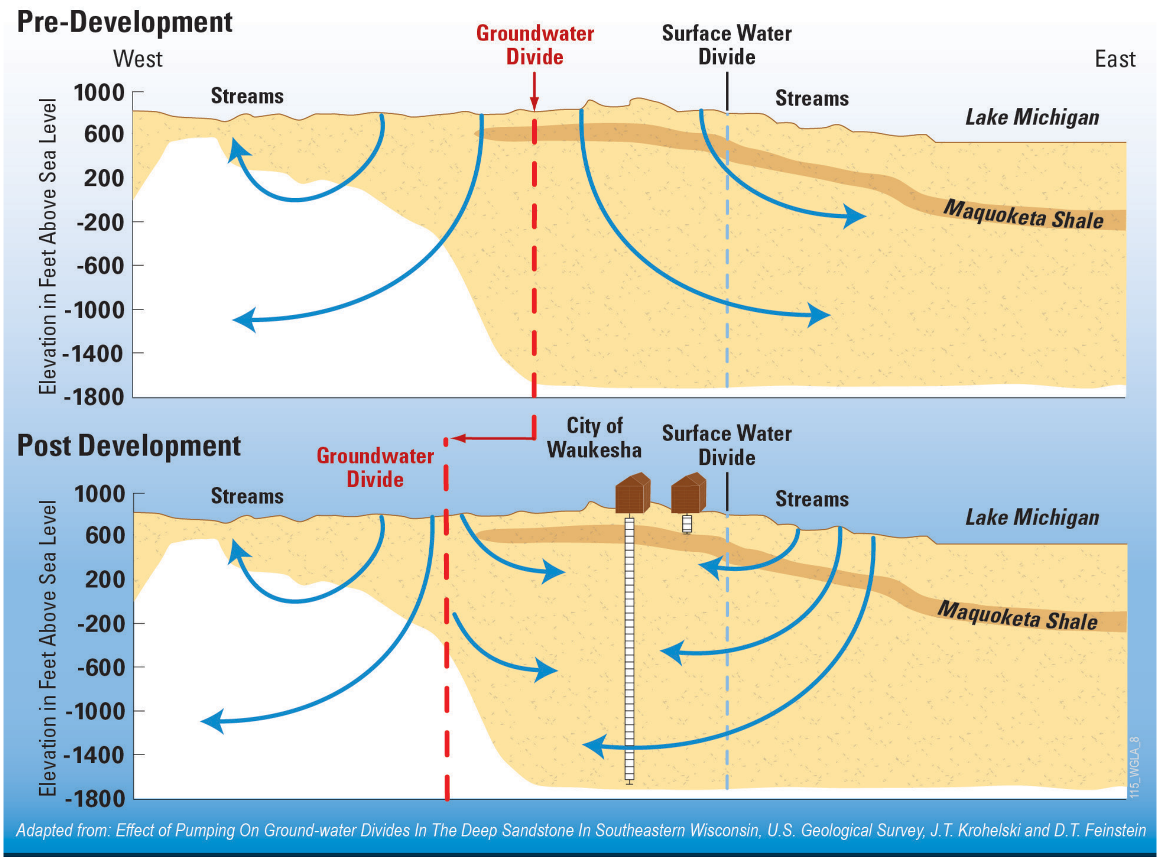
EXHIBIT 11-6

Facilities for Alternative 1: Deep and Shallow Aquifers



A recent USGS report indicated that water availability limitations may arise in the western Lake Michigan basin (Reeves, 2010). Pumping the deep aquifer near Waukesha was specifically mentioned, resulting in large groundwater level drawdowns, and capturing water that would have otherwise naturally discharged to the Lake Michigan basin (Exhibit 11-7). This has caused a diversion of flow away from the Great Lakes basin (USGS, 03/2007).

EXHIBIT 11-7
Impact of Deep Aquifer Pumping on Groundwater Movement



Overpumping of the deep confined aquifer for decades has created a large cone of depression. Radium and other water quality and quantity issues in the deep aquifer have forced many water utilities in Wisconsin and Illinois to seek new water supplies. This has reduced pumping in the deep aquifer and caused a decrease in the rate of water level drop over the last few years. The recovery is encouraging but not necessarily permanent. The experience in northern Illinois over the past 30 years shows how a short-term reduction in pumping can cause water level recovery in the deep aquifer. However, as continued growth in the region caused pumping from the deep aquifer to increase again, water levels started to decline. Northern Illinois is looking at significant declines in the deep aquifer over the next 40 years. Parts of the aquifer may become dewatered unless alternative sources of water can be implemented (Chicago Metropolitan Agency for Planning, 03/2010).

Adverse environmental impacts can occur because of the depletion of the deep aquifer. Excessive groundwater drawdown below the confining unit can expose sulfide minerals to oxygen and increase levels of toxic metals, such as arsenic. This could create a regional contamination issue and either limit the availability of this groundwater resource or require additional treatment before use.

Exposure to oxygen can also provide conditions for growth of pathogenic microorganisms in wells, which has occurred in a number of deep wells (CH2M HILL and Ruekert-Mielke, 03/2002). Changing the physical and biological nature of the aquifer creates adverse environmental impacts and is not environmentally sustainable.

Shallow Aquifer. For the shallow aquifer, the Troy Bedrock Valley groundwater model was used to simulate shallow aquifer groundwater drawdown (Ruekert-Mielke for SEWRPC, 01/2010). Although a maximum day pumpage of 9.1 mgd may need to be extracted from the shallow aquifer, a well pumpage of 6.4 mgd was the withdrawal amount modeled. Exhibit 11-8 (see next page) shows the results on groundwater drawdown (RJN Environmental Services, 04/2010). The results show shallow aquifer drawdown of 50 feet near the wells. Groundwater modeling also assumed normal rainfall and aquifer recharge. During droughts and higher well pumpage, the drawdown would be greater. During the 2012 drought, Waukesha's shallow wells were reduced in capacity by about 20 percent because of declining groundwater levels.

Aquatic Habitat.

Deep Confined Aquifer. The deep aquifer is hydrologically connected to the waters of the Lake Michigan basin (USGS, 03/2007; Feinstein, 10/2006; CH2M HILL and Ruekert-Mielke, 2003). Before development, the deep groundwater below southeast Wisconsin flowed toward Lake Michigan. Pumping water from the deep aquifer reduces the amount of water that would flow to the waters of the Great Lakes basin, and actually reverses the flow so that it is away from Lake Michigan (Feinstein, 10/2006). The USGS estimates that 30 percent of the 33 mgd of water pumped by the deep aquifer wells in Southeast Wisconsin originates from inside the Lake Michigan basin (Feinstein, 10/2006). The largest pumping center with the highest drawdown is in Waukesha County (Feinstein, 10/2006).

Reducing the amount of water that would have flowed into the Lake Michigan basin by deep aquifer pumping has adverse environmental impacts on the waters of the Lake Michigan basin. By stopping deep aquifer pumping in Waukesha alone, an improvement in the hydrology and hydrogeology of the waters of the Lake Michigan basin can be realized (SEWRPC, 12/2010; CH2M HILL and Ruekert-Mielke, 2003; RJN Environmental Services, 02/2011). In addition, water pumped from the deep aquifer removes water that would otherwise be available to local surface water resources. The USGS and WGNHS indicate that 70 percent of water pumped from the deep aquifer would have gone to inland surface waters. The remaining 30 percent originates from inside the Lake Michigan basin and 4 percent of that is contributed by Lake Michigan (Feinstein, 10/2006).

Reducing natural flows to surface waters by pumping the deep aquifer has adverse environmental impacts both inside and outside the Lake Michigan basin. A recent USGS report (Reeves, 2010) indicated that water availability limitations may arise in the western Lake Michigan basin. Pumping the deep aquifer near Waukesha was specifically mentioned, resulting in large groundwater drawdowns, and capturing water that would have otherwise have naturally discharged to Lake Michigan. This has created a diversion of groundwater flow away from the Great Lakes basin instead of the natural movement towards it.

Shallow Aquifer. For the shallow aquifer, the Troy Bedrock Valley groundwater model (Ruekert-Mielke for SEWRPC, 01/2010) was used to simulate baseflow reduction from streams and rivers. Pumping the shallow aquifer can cause adverse environmental impacts on ground and surface water resources. From a water balance perspective, every gallon pumped from shallow wells will come at the expense of surface water, either from reduced base flow discharge or from induced recharge from surface water.

Water extracted from the ground reduces the water that would naturally flow to wetlands, lakes and streams (base flow). The Troy Bedrock Valley model estimated that base flow would be reduced as shown in Exhibit 11-9 with this alternative (RJN Environmental Services, 08/2013). This baseflow reduction can have significant adverse environmental impacts to the water ecosystems.

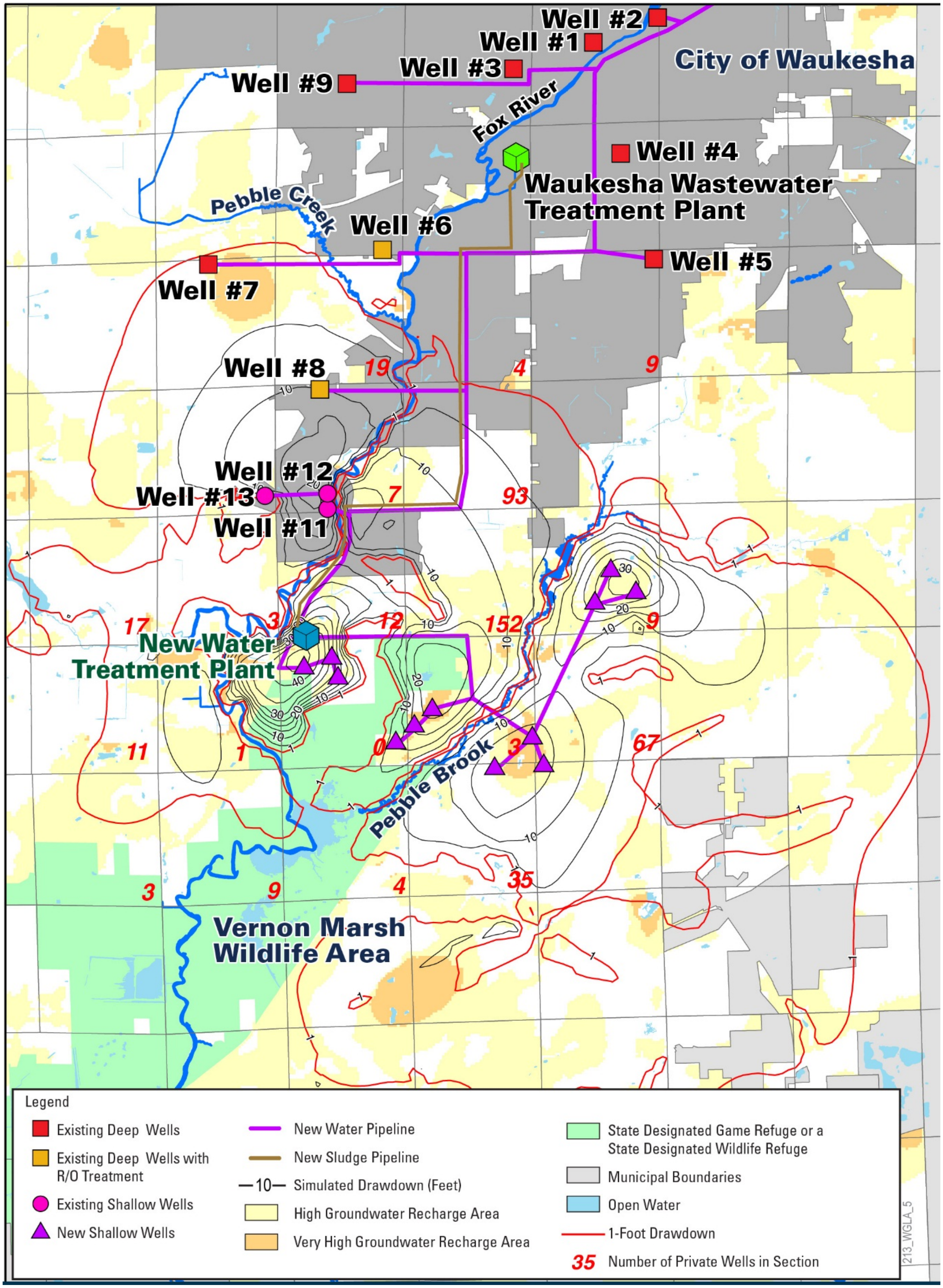
Under this scenario, not only would groundwater be intercepted and not reach surface waters, water also would be drawn from the Fox River. The Environmental Report contains information on the environmental impacts (see Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives).

EXHIBIT 11-9
Baseflow Reduction in Streams with Shallow Aquifer Wells Pumping 6.4 mgd

Resource	Baseflow Reduction (%)
Fox River	5
Pebble Brook	34
Mill Creek	33
Mill Brook	85
Pebble Creek	0

EXHIBIT 11-8

Groundwater Drawdown: Alternative 1 with Shallow Wells Pumping 6.4 mgd



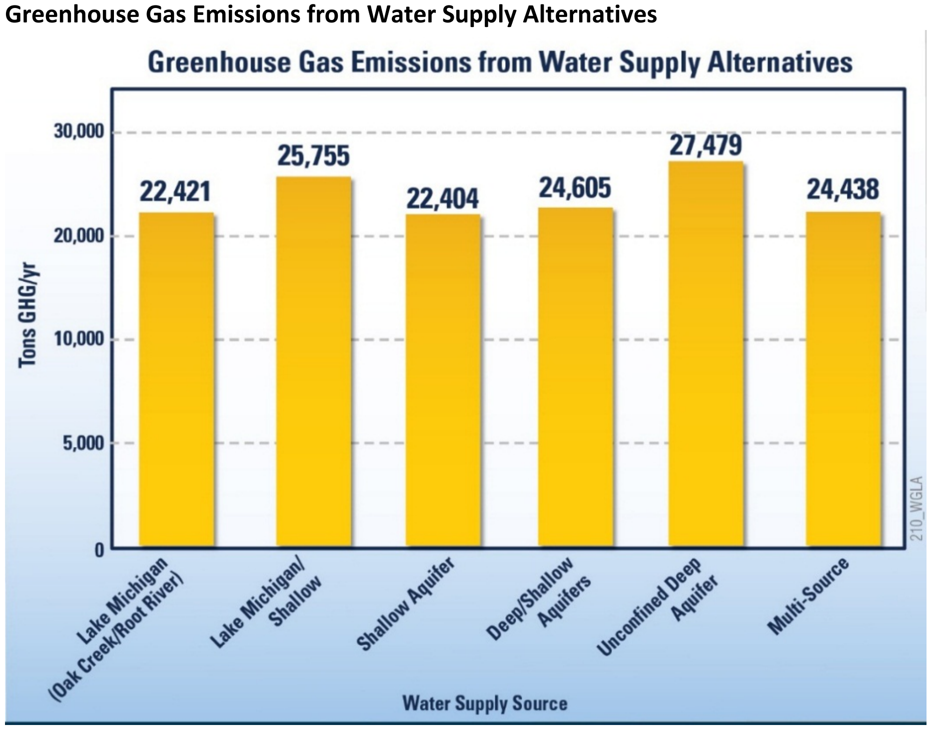
SEWRPC estimates that about 85 percent of water extracted from the shallow aquifer is diverted or extracted from surface waters (SEWRPC, 12/2010). This would adversely affect sensitive and valuable environmental areas near Waukesha, such as Pebble Brook, Mill Brook and Vernon Marsh. SEWRPC estimated parts of the Vernon Marsh and Pebble Creek could see the baseflow decrease more than 25 percent if the City of Waukesha continues using a combination of deep and shallow groundwater, with artificial recharge (SEWRPC, 12/2010). A subsequent study estimated significant baseflow reductions would occur near Waukesha, even if only 3.9 mgd of shallow groundwater were pumped and enhanced rainwater recharge were used (Cherkauer, 02/2012). Under Alternative 1, Waukesha would need a maximum of 9.1 mgd of shallow aquifer water, so the adverse impacts to baseflow reduction and groundwater/surface water ecosystems would be much greater.

Water levels would also be lower in a large part of the Vernon Marsh and near Pebble Brook. A groundwater drawdown of 1 foot is significant in a wetland as it may affect root structures of aquatic plants. The Environmental Report calculates that more than 3,000 wetland acres are affected by groundwater drawdown of 1 foot and greater (see Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives).

In addition, there are more than 3,000 private wells in the 1 foot and greater drawdown area that could be affected, along with 2 lakes and 7 springs in the 5 to 50 gpm range. Because both the deep and shallow groundwaters are hard, there is extensive use of home water softeners. Continued and expanded use of water softeners increases salt discharge into the environment. It is estimated that Waukesha discharges 7.4 million pounds of salt into the Fox River each year from home water softeners. Chlorides are already high in the Waukesha wastewater treatment plant effluent, reaching over 600 mg/L and above discharge water quality limits. Treatment to remove chlorides would be extremely expensive. Water consumption per household also increases with the use of home water softeners. It is estimated that each household water softener produces 40 gallons of salty wastewater per regeneration. TDS removal treatment concentrates salts that also are discharged into the environment and increases wastewater volumes. Continued use of hard groundwater would increase water and energy use while degrading water quality and conservation efforts.

Finally, it is estimated that Alternative 1 would discharge more than 24,000 tons of greenhouse gases per year (carbon dioxide equivalent) through pumping from aquifers, water treatment, and pumping from the wellfield to Waukesha. That is equivalent to powering about 2,000 homes for a year (U.S. Energy Information Administration, 12/2011). Exhibit 11-10 compares greenhouse gas emissions of the other water supply alternatives.

EXHIBIT 11-10
Greenhouse Gas Emissions from Water Supply Alternatives

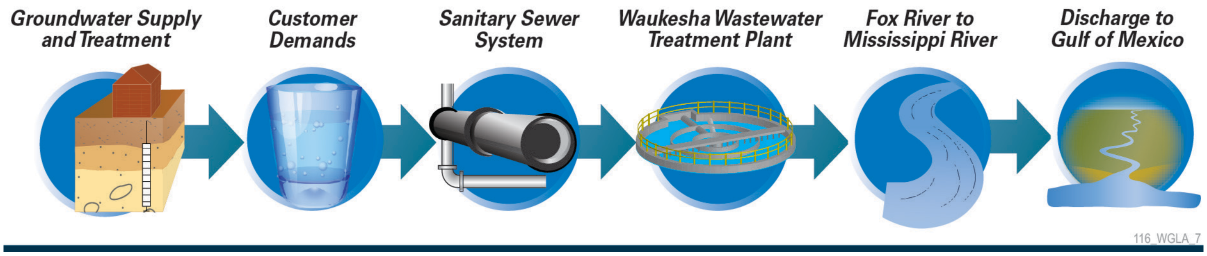


Considering the environmental impacts of Alternative 1, a rating of “significant adverse impact or risk” was applied based on the criteria in Exhibit 11-5. The deep aquifer levels would continue to be depressed, shallow aquifer drawdown would be 50 feet or more, much greater than 10 acres of wetlands are adversely affected (more than 3,000 acres), baseflow is reduced more than 80 percent in segments of some streams, 2 lakes, 7 springs and over 3,000 wells are affected.

11.4.1.3 Long-Term Sustainability

Water Returned to Original Source. No water is returned to its original source when deep aquifer groundwater is pumped and discharged to surface water. Some of the water is transferred out of the Great Lakes to the Mississippi River ecosystem and eventually to the ocean (Exhibit 11-11). Since the water is not returned, the result is less water in the source watersheds (Great Lakes basin and Mississippi River basin) and associated adverse environmental impacts.

EXHIBIT 11-11
Groundwater Supply Water Cycle



Drought Impact. The deep aquifer is not as affected by drought as an unconfined aquifer, since the shale confining layer above the aquifer limits recharge near Waukesha. As the unconfined shallow aquifer depends on rainwater for recharge, it is less reliable during drought conditions, when water supply is needed most. The shallow aquifer would be stressed during maximum day demands during a drought, and adverse impacts to the environment would be more severe. Waukesha's existing shallow well capacity was reduced about 20 percent during the 2012 drought. Having both the deep and shallow aquifers as water supply sources is more reliable than having only the shallow aquifer.

Considering the long-term sustainability criteria of Alternative 1 in Exhibit 11-5, a rating of "significant adverse impact or risk" was applied. Almost none of the water is returned to the source. The unconfined shallow aquifer is significantly susceptible to lower capacity during drought conditions.

11.4.1.4 Public Health

Contaminants. The deep aquifer exceeds the radium and gross alpha regulations. While drinking water regulations can be met with proper treatment, if there is a malfunction in the treatment process or if new contaminants appear, the public may be exposed to greater health risk from these or other contaminants. One of Waukesha's deep wells (Well #1) has already been contaminated from outside sources in recent years and abandoned. Another deep well (Well #4) has been shut down due to potential for contamination from a nearby landfill. Similar contamination may occur in the future requiring abandoning the wells or installing expensive treatment.

Potential sources of VOCs and SOCs are present in both the deep and shallow aquifers. There are 254 potential sources of contamination in the deep and shallow aquifer wells within a 1-mile radius or 1-foot drawdown contour (WDNR, 07/2012). Contaminated sites include sites where cleanup of environmental contamination is ongoing or completed. These sites include leaking underground storage tanks (LUST) with contaminated soil and/or groundwater with petroleum, which includes toxic and cancer causing substances. These contaminated sites also include environmental repair sites. Environmental repair sites are sites other than LUSTs that have contaminated soil and/or groundwater. Examples include industrial spills (or dumping) that need long term investigation, buried containers of hazardous substances, and closed landfills that have caused contamination. Of the 254 potential contamination sites, 8 sites were found to contain SOCs.

The deep aquifer contains radium above the MCL and some shallow aquifer test wells showed arsenic above the MCL (Davy Laboratories, 04/05/2007). Agricultural chemicals and road salt are also potential contaminant sources for the shallow aquifer. These chemicals can be difficult and expensive to remove from drinking water. In addition, the deep and shallow aquifers are high in TDS, mainly from calcium, magnesium, carbonates, chlorides and sulfate. TDS levels are in the 400 to 600 mg/L range. The USEPA secondary standard for TDS is 500 mg/L. Home ion exchange softening takes out calcium and magnesium but adds sodium.

Shallow unconfined aquifers are more susceptible to contamination than deep confined aquifers and very large surface water bodies. Without a confining layer, the porous sand and gravel of shallow aquifers can quickly pass contaminants into the drinking water. Preventing a potential source of contamination (i.e., industry, gas station) from locating near the wellfield is difficult, particularly when the wellfield is located outside of a municipality's borders. The proposed shallow wellfield here will be located outside of the City limits, and, as a result, the City would have limited zoning control to enforce a wellhead protection ordinance to protect the well. A wellhead protection program is required by WDNR to protect municipal wells from contamination. Buying large tracts of land or trying to influence land use zoning around the wellfield is possible but costly, and the effectiveness is uncertain.

In addition, there are more than 1,300 private wells in the 5-foot shallow aquifer groundwater drawdown contour (WDNR, 04/2009). Private wells are often associated with septic systems. These septic systems could be another source of contamination such as pathogenic microorganisms or nitrate, in situations where groundwater pumping pulls the contaminants towards the well. Home water softening can also add salt to the environment.

Treatment. Conventional groundwater treatment would initially be required for the deep confined and shallow aquifer sources, plus radium removal from the deep aquifer and arsenic removal from the shallow aquifer. In addition, the deep confined and shallow aquifers could require advanced treatment such as RO to reduce TDS in the future. If TDS is removed with RO treatment, it would consist of pretreatment to condition the water, RO treatment with membranes, aeration to remove dissolved gases, and chemical addition for corrosion control and disinfection. RO treatment produces a concentrated liquid salt waste that can be between 10 and 20 percent of the water treated. Disposal of the waste stream is difficult in areas far from an ocean. Disposing of salt waste into the sewer may create wastewater treatment plant discharge limits to be exceeded and create water quality problems. Other liquid salt waste disposal options (mechanical evaporation, deep well injection) are very expensive and may not be permittable. RO also produces a chemical cleaning waste solution that requires disposal but that may be able to be neutralized and discharged to the sewer.

Water from some deep aquifer supply wells would be softened by RO, but the shallow aquifer supply would still be hard. The different waters would need to be blended before distribution to mitigate water quality issues (red water from iron pipe corrosion, lead leaching from home plumbing) that could lead to customer complaints and regulatory issues. After treatment, both water sources would be blended and stabilized for consistent water quality before distribution to customers.

Considering the public health impacts of Alternative 1 based on criteria in Exhibit 11-5, a rating of "significant adverse impact or risk" was applied. There are greater than 10 sources of contamination in the wellfield area, and three or more types of contaminants. In addition to conventional groundwater treatment, treatment for two contaminants above the MCL (radium and arsenic) is required.

11.4.1.5 Implementability

Facilities. Alternative 1 requires 23 wells, 5 water treatment plants, 1 pump station, and about 22 miles of transmission pipeline (Exhibit 11-4). Each well and treatment plant would require a land site. All these facilities require operation and maintenance. The shallow aquifer facilities are outside the City limits.

Wells Affected. There are 3,420 private wells in the 1-foot groundwater drawdown contour, and 1,320 wells within the 5-foot contour (WDNR, 04/2009). Private wells may run dry or encounter water quality problems due to additional shallow aquifer pumping. If this should occur, new wells or deeper wells would be needed. There are 11 non-private, non-municipal wells within the 5-foot groundwater drawdown contour (WDNR, 04/2009). The capacity of the wells could also be affected by this water supply alternative.

Government Entity Coordination. There are at least four government entities to coordinate with:

- City of Waukesha
- Town of Waukesha
- Waukesha County
- State of Wisconsin

Although the number of government entities is few, the City's ability to implement Alternative 1, which requires the installation of 12 new shallow wells, would be difficult for several reasons.

First, Waukesha is part of a groundwater management area, and as a result, more requirements and restrictions could be placed on groundwater development. Future groundwater protection legislation may require environmental review of proposed high capacity wells located in a groundwater management area before WDNR approves or develops a groundwater management plan for the area.

Second, the shallow aquifer wellfield would be installed outside the City's boundaries. Significant land purchase/lease and controls outside the city limits would be required. Residents near the shallow aquifer wellfield have already opposed high-capacity wells because of concerns about adequate water supply and impacts to wetlands, private wells, and other environmental resources.

In addition to the technical basis for determining that the shallow aquifer supply may not be implementable due to its unreliability as a supply source, relying on the shallow aquifer is uncertain from a legal perspective. For example, the following may cause confusion or conflict regarding protection of shallow groundwater resources: high capacity well statutes and regulations (see, for example, Wisconsin Statutes section 281.34 and Wisconsin Administrative Code chapter NR 820); competing interests due to natural resource impacts and other water resource uses (see, for example, Wis. Stat. § 281.34(5m) ("No person may challenge an approval, or an application for approval, of a high capacity well based on the lack of consideration of the cumulative environmental impacts of that high capacity well together with existing wells") and *Family Farm Defenders, Inc. v. DNR,* 1012AP001882, Court of Appeals District 4(pending case)); and, the Wisconsin Supreme Court decision on waters held in public trust (*Lake Beulah Management District v. State of Wisconsin Department of Natural Resources,* 2011 WI 54 (July 6, 2011) (any party can challenge a new well permit if there is a credible case that groundwater withdrawal will adversely affect surface water held in public trust)).

If new wells need to be installed in the future because of declining water levels in existing wells or the need to locate wells farther from surface water resources, wells may need to be located a greater distance from Waukesha. Locating wells farther from Waukesha would increase costs, energy usage, and legal/public concerns. The environmental and legal impacts described above would become more severe.

Water transmission mains would need to be constructed from the shallow aquifer wellfield to the treatment plant, and from the treatment plant to Waukesha. This would require easements, and construction through rural and urban conditions.

Residential housing would need to be bought and demolished to make room for the treatment facilities at the three deep well sites requiring RO treatment. This may require legal condemnation procedures.

Considering the implementability of Alternative 1, based on the criteria in Exhibit 11-5, a rating of "significant adverse impact or risk" was applied. Over 20 facilities need to be operated and maintained, more than 10 land sites are required, and over 3,000 wells are adversely affected. However, only four government entities have been identified to coordinate with.

EXHIBIT 11-12

Summary of Evaluation Criteria for Deep and Shallow Aquifer Alternative

Major Criteria	Subcriteria	Rating	Overall
Environmental	Impact on groundwater resources	●	●
	Impact on aquatic habitat	●	
Long-Term Sustainability	Water returned to original source	●	●
	Supply affected by drought	◎	
Public Health	Nearby contaminated sources	●	●
	Treatment requirements	●	
	Ability to produce consistent water quality	⊙	
Implementability	Operation and maintenance complexity	●	●
	Land sites	●	
	Government entity coordination	⊙	
	Wells affected	●	

○ No adverse impact or risk
⊙ Minor adverse impact or risk
◎ Moderate adverse impact or risk
● Significant adverse impact or risk

Exhibit 11-12 summarizes the evaluation criteria for Alternative 1.

11.4.2 Water Supply Alternative 2: Lake Michigan

11.4.2.1 General

Under Alternative 2, treated potable drinking water from a Lake Michigan water utility would be obtained and conveyed to Waukesha through a transmission pipeline and booster pump station to the Waukesha distribution system. The amount of water is 10.1 mgd on a future average day and 16.7 mgd on a future maximum day, the same as the other alternatives. Water used by Waukesha would be treated at the Waukesha wastewater treatment plant and returned to the Lake Michigan basin by a pump station and a pipeline to a tributary to Lake Michigan. The facilities are shown in Exhibit 11-13.

EXHIBIT 11-13
Facilities for Alternative 2: Lake Michigan Water Supply

In this alternative, Lake Michigan water sent to Waukesha would be returned to Lake Michigan (Exhibit 11-14). This is an example of sustainable water reuse and recycling that is protective of public health and the environment.

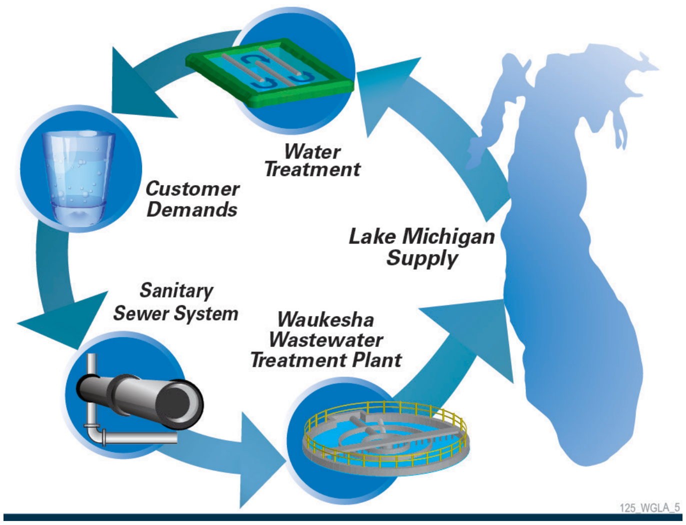
Recycling Lake Michigan water preserves the waters and water dependent natural resources of the Lake Michigan basin and protects the integrity of the Great Lakes ecosystem. High quality water is available for potable use to protect public health. In contrast, the groundwater supply alternatives divert water away from the region and do not return it (Exhibit 11-11). This has an adverse environmental impact.

The City discussed the purchase of potable water from Lake Michigan with the City of Milwaukee, the City of Oak Creek, and the City of Racine, all of which are located within the Great Lakes basin and operate public water utilities that withdraw water from Lake Michigan. Following discussions with the potential suppliers, a letter of intent for water supply was signed with the City of Oak Creek.

To estimate infrastructure requirements and costs, Alternative 2 assumes connection to the City of Oak Creek water system at 27th Street and Puetz Road. A pump station would be placed there, and a transmission pipe would extend to Waukesha.

Several options for a return flow pipeline were evaluated, all starting at the Waukesha wastewater treatment plant with a pump station. Discharge location options include tributaries to Lake Michigan, via Underwood Creek and Root River, discharge to the MMSD collection system and direct discharge to Lake Michigan through an outfall. The Root River location was selected based on benefits to the Great Lakes basin and implementability. See Volume 4, City of Waukesha Return Flow Plan for additional information on return flow.

EXHIBIT 11-14
Lake Michigan Water Cycle



11.4.2.2 Environmental Impacts

Groundwater Resources. Historically, water from the deep aquifer flowed towards Lake Michigan. After groundwater pumping of the deep aquifer began, water from the deep aquifer was drawn down and was not available to feed the Great Lakes basin. As pumping increased, the flow of groundwater was actually reversed and water that would have otherwise fed the Great Lakes basin was drawn to groundwater wells west of the Great Lakes basin. Now with current pumping practices, waters of the Great Lakes basin are flowing into the deep aquifer rather than recharging the Basin. The USGS estimates that 30 percent of the 33 mgd of water pumped by the deep aquifer wells in southeastern Wisconsin originates from inside the Great Lakes basin (USGS, 03/2007). Switching from the deep groundwater supply to a Lake Michigan surface water supply would contribute to aquifer recovery and reduce the diversion of water from the Great Lakes basin to the Mississippi River watershed (Burch, 2002).

If Lake Michigan water is obtained, the City would cease pumping the deep and shallow aquifers and groundwater levels could begin to recover. Using the Southeastern Wisconsin Regional Groundwater Model and assuming Waukesha stops pumping from the deep aquifer, the deep aquifer cone of depression may recover 100 feet over time (CH2M HILL and Ruekert-Mielke, 2003). SEWRPC estimates deep aquifer water levels could rise as much as 270 feet if deep aquifer pumping ceased in several communities, including Waukesha (SEWRPC, 12/2010) Ceasing deep aquifer pumping in northeastern Illinois allowed water levels to rise 300 feet between 1980 and 2000 at Villa Park and Elmhurst, Illinois (Burch, 2002). Similar aquifer recovery is becoming evident near Green Bay, Wisconsin, where Brown County water utilities stopped pumping the deep aquifer and started using Lake Michigan water in 2007.

Recovering deep aquifer water levels would result in an environmental benefit because more water would be provided to the waters and water-dependent natural resources of the Great Lakes basin (WGNHS and USGS, 10/2006). A 2003 study concluded that ceasing groundwater pumping from Waukesha’s deep wells would have a beneficial effect on streams and wetlands and help restore the natural flow regimes toward, rather than away from Lake Michigan (CH2M HILL and Ruekert-Mielke, 2003). Other studies showed similar results (SEWRPC, 12/2010; Reeves, 2010; USGS, 03/2007). This has a benefit to the waters and water dependent natural resources of the Great Lakes.

Shallow aquifer pumping for Waukesha would cease with a Lake Michigan water supply. The significant drawdown of the shallow aquifer and adverse impacts on surface water systems described in Alternative 1 would be eliminated.

Aquatic Habitat. Current and future adverse environmental impacts of pumping deep and shallow groundwater and reducing baseflows would be eliminated, thus protecting sensitive and valuable environmental areas such as Pebble Brook, Mill Brook, and the Vernon Marsh. Pumping the deep aquifer pulls down water from the overlaying shallow aquifer to the deep aquifer. It is estimated that 12 percent of shallow aquifer baseflows are diverted toward deep wells and away from surface water resources (USGS, 03/2007). If pumping of the deep aquifer is stopped, water will no longer be pulled from the shallow aquifer to the deep aquifer, and as a result critical baseflows to surface water resources including wetlands, streams, and lakes, will be restored.

In preparation for the passage of the Great Lakes Compact, the City participated in a case study that arrived at several critical conclusions about a potential Lake Michigan diversion for the City (CH2M HILL and Ruekert-Mielke, 2003). Chief among these was that changing sources from the current groundwater supply to a withdrawal from Lake Michigan was found to provide an improvement to the groundwater resources of the Great Lakes basin through ceasing groundwater pumping from the deep aquifer. Further, a Lake Michigan withdrawal has no measureable effect on the Great Lakes basin ecosystem (CH2M HILL and Ruekert-Mielke, 2003). A SEWRPC study several years later came to the same conclusion on improvement to the groundwater resources of the Great Lakes basin (SEWRPC, 12/2010).

Switching to a Lake Michigan water supply and discontinuing the withdrawal of groundwater from the deep aquifer would benefit the waters of the basin. It would assist in the recovery of both surface water and groundwater resources; assist in the restoration of the natural flow system wherein the deep aquifer feeds the water of the Great Lakes; result in no impact on Lake Michigan water level for the proposed diversion of 10.1 mgd with return flow.

It is estimated that Alternative 2 would discharge over 22,000 tons of greenhouse gases per year (carbon dioxide equivalent) through pumping from Oak Creek and returning the water to the Great Lakes basin (Exhibit 11-10).

Another benefit of using Lake Michigan water is that the water quality is much softer than groundwater and many customers may choose to eliminate or substantially reduce the use of home water softeners. This would substantially reduce and come close to eliminating the additional 7.4 million pounds of salt that is added to the environment as a result of use of the hard groundwater. The adverse environmental impacts associated with home water softening (salt discharge to surface waters, additional water and energy use) present in all the other alternatives could be eliminated under Alternative 2. Further, it would prevent radium in wastewater treatment plant sludge from being discharged into the environment.

Water transmission mains from a Lake Michigan supplier to Waukesha, the booster pump stations, and return flow pipelines from the Waukesha wastewater plant to the Root River would have temporary environmental impacts during construction. The Environmental Report has information on the relative impacts of these activities (see Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives, Section 5.1.3).

Return Flow

The City’s use of Lake Michigan water will also not result in a significant adverse individual or cumulative impact to the water dependent industries of the Great Lakes such as shipping or hydropower generation. The City proposes providing no less than 100 percent return flow to the basin, and the return flow would be continuous (see Volume 4, City of Waukesha Return Flow Plan, Section 2). By providing return flow, there will be no volume change to the Great Lakes basin and no significant adverse impact to the water dependent ecosystems or industries of the Great Lakes.

Return flow to the Root River will enhance the water and water-dependent resources of this Great Lakes tributary. Most notably, return flow will enhance operations at the Root River Steelhead Facility by improving base flow and egg harvesting operations, which will benefit the Great Lakes basin. Returning the water to a tributary creates a positive precedent for using treated wastewater as a beneficial environmental resource. For details, see Volume 4, City of Waukesha Return Flow Plan.

Return flow management and the City’s efforts to reduce sewer system infiltration and inflow will minimize introduction of out-of-basin water to the Great Lakes. Return flow will meet all applicable water quality discharge standards and will in fact meet requirements that are more stringent than those for other dischargers to Lake Michigan or Lake Michigan tributaries. With a wastewater treatment process that includes filtration and ultraviolet light disinfection, there are no opportunities for invasive species from the Mississippi River basin to be introduced to the Great Lakes basin. There will be no significant adverse impacts to the quality or quantity of water in the Great Lakes (see Volume 5 City of Waukesha Environmental Report for Water Supply Alternatives, Section 6.4.2.3).

Discontinuing groundwater pumping would cease supplementing the Fox River with deep and shallow groundwater from the City's wastewater treatment plant effluent. During low flow periods, the Fox River annual low flow would be reduced by roughly 25 percent. The water depth is expected to change by about 2 inches or less. Consequently, significant habitat change is not expected and this can be designated as a minor adverse impact (see Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives, Section 5.1.2.2).

In summary, switching from a groundwater to a Lake Michigan supply would have the following environmental impacts:

- Assist in the recovery of both surface water, wetlands, aquatic habitat and groundwater resources by eliminating current groundwater pumping.
- Assist in the restoration of the natural flow system wherein the deep aquifer feeds the Waters of the Great Lakes.
- Eliminate the diversion of water from the Great Lakes basin to the Mississippi River basin.
- Result in no impact on Lake Michigan water level for the proposed diversion of 10.1 mgd with return flow.
- Provide an environmental benefit by enhancing aquatic habitat and fisheries in a Great Lakes tributary during dry periods.
- Prevent radium from being discharged into the environment through wastewater treatment plant sludge
- Reduce the release of salts, used to soften hard groundwater, into the environment.

Overall, the City believes a Lake Michigan water supply results in a net environmental benefit compared to using a groundwater supply. This is consistent with SEWRPC's conclusion that the Lake Michigan alternative "offers advantages related to a greater improvement in the deep aquifer long-term sustainability, reductions in chloride discharges to the surface waters, and improvement in groundwater-derived baseflow inputs to the surface water system" (SEWRPC, 12/2010). The net environmental benefit would therefore provide no significant individual or cumulative adverse impact to the quantity or quality of the waters and water dependent natural resources of the Great Lakes basin.

Considering the environmental impacts of Alternative 2, a rating of "minor adverse impact" was applied. There is actually a net environmental benefit to the waters and water dependent natural resources of the Lake Michigan basin because groundwater pumping would be eliminated, and as a result groundwater levels and baseflow to surface waters and wetlands would increase.

11.4.2.3 Long-Term Sustainability

Water Returned to Original Source. No less than 100 percent of the withdrawn water volume would be returned to its original source (Lake Michigan) in this alternative.

Impact of Drought. Lake Michigan contains a huge volume of water (1,300 trillion gallons) and is therefore very resistant to drought conditions.

Lake Michigan would reliably provide Waukesha with an adequate quantity of high-quality water. The water source would provide long-term sustainability indefinitely because the water used would be recycled to its source.

Waukesha could maintain its shallow and/or deep wells as a partial emergency backup to the Lake Michigan supply. This will increase reliability.

Considering the long-term sustainability of Alternative 2, a rating of "no adverse impact or risk" was applied. The water is returned to its source and the very large volume of Lake Michigan makes it much less affected by drought than the other water supplies.

11.4.2.4 Public Health

Contaminants. Treated Lake Michigan water is high quality and safe. Millions of people are provided with drinking water from Lake Michigan. Contamination is possible, as with all supplies, but the large size, intake locations and high quality of Lake Michigan water makes this a rare occurrence. Lake Michigan water suppliers have some of the most stringent water quality programs and advanced treatment processes to assure high quality water. Many Lake Michigan water supply intake pipes are located over a mile from shore, minimizing impacts from contaminant sources. Hydrodynamic studies of near shore Lake Michigan flow patterns and water quality have been conducted to minimize the potential for contaminants from entering drinking water intakes (Lee, 1995; 1996).

With a Lake Michigan water supply, the deep aquifer would no longer be used and the potential public exposure to radionuclides would be eliminated. Arsenic in the shallow aquifer supply would also not be exposed to the public or environment.

Treatment. Conventional surface water treatment meets all water quality regulations in the Lake Michigan water suppliers' treatment plants. Since there would only be one water source, no blending would be required and a consistent water quality could be produced.

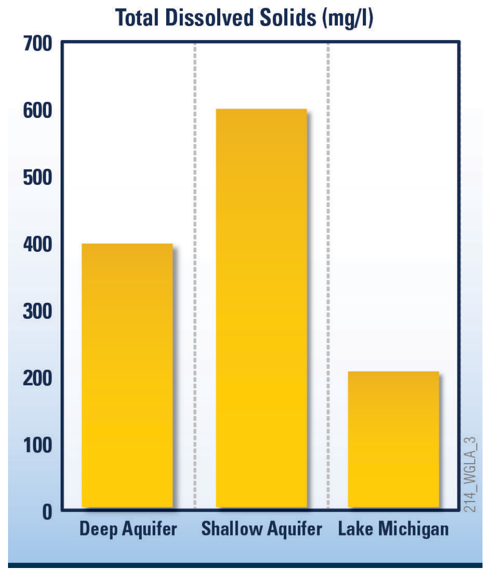
A Lake Michigan water supply also provides higher quality potable water to consumers. The much lower total dissolved solids content in the Lake Michigan water supply (Exhibit 11-15) not only reduces the need for home softening; it also is healthier for consumers and the environment, and better for many industrial and commercial uses.

Home softening would no longer be needed, and the water would contain much less sodium and TDS than a groundwater supply, making it healthier to consume. The deep and shallow aquifers would no longer be used, and potential public exposure to radionuclides, arsenic and other contaminants is eliminated.

A Lake Michigan potable water supply for Waukesha would be more protective of public health than the groundwater alternatives.

Considering the public health impacts of Alternative 2, a rating of "minor adverse impact" was applied. The potential for contamination at the intakes is low, and conventional treatment meets all drinking water regulations.

EXHIBIT 11-15
Water Quality Comparison between Water Supply Alternatives



11.4.2.5 Implementability

Facilities. This alternative requires two pump stations and about 40 miles of transmission pipeline (Exhibit 11-4).

A new pump station and transmission pipe would be required to convey the treated drinking water from the Lake Michigan water supplier to the distribution system in Waukesha. A new pump station and transmission pipe would be required to convey treated wastewater from the Waukesha wastewater treatment plant to the Root River. The drinking water pump station would be located outside the City limits and require land purchase or lease. The return flow pump station could be located on City property at the wastewater treatment plant.

There are no treatment plants or wellfields for Waukesha to operate with Alternative 2, making operation and maintenance of the water utility much simpler than that of a groundwater alternative. Existing treatment and pumping infrastructure from a Lake Michigan water supplier would be used, maximizing use of existing infrastructure. In addition, long term operation and maintenance of pipelines and pump stations are simpler and less expensive than those of wellfields and water treatment plants.

Wells Affected. No wells would be affected under this alternative, because no groundwater is pumped.

Government Entity Coordination. There are at least 16 government entities to coordinate with assuming an Oak Creek supply and Root River return:

- City of Waukesha
- Waukesha County
- Milwaukee County
- City of Oak Creek
- City of Franklin
- City of New Berlin
- City of Muskego
- Eight Great Lakes States and the Province of Ontario

Water transmission mains to and from Waukesha would require routing studies, easements, and construction through rural and urban conditions.

Land purchase requirements would be less than a groundwater alternative, because no treatment plant or wellfield are required. Land use issues for wellhead protection, well and treatment plant siting are eliminated. Public concerns over impacts to groundwater levels and long-term wetland and surface water impacts are also eliminated.

Considering the implementability of Alternative 2, a rating of "moderate adverse impact or risk" was applied. This alternative has the highest amount of government coordination, but the least long term operation and maintenance, land acquisition, and well impacts.

EXHIBIT 11-16
Summary of Evaluation Criteria for Lake Michigan Alternative

Major Criteria	Subcriteria	Rating	Overall
Environmental[a]	Impact on groundwater resources	○	⊙
	Aquatic habitat loss	○	
Long-Term Sustainability	Water returned to original source	○	○
	Supply affected by drought	○	
Public Health	Nearby contaminated sources	⊙	⊙
	Treatment requirements	⊙	
	Ability to produce consistent water quality	○	
Implementability	Operation and maintenance complexity	○	◉
	Land sites	○	
	Government entity coordination	●	
	Wells affected	○	

○ No adverse impact or risk ◉ Moderate adverse impact or risk
⊙ Minor adverse impact or risk ● Significant adverse impact or risk
[a] Minor adverse environmental impact from construction. See Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives.

Exhibit 11-16 summarizes the criteria for this Lake Michigan water supply alternative.

11.4.3 Water Supply Alternative 3: Shallow Aquifer and Fox River Alluvium

11.4.3.1 General Description

Alternative 3 uses the shallow aquifer south of Waukesha for Waukesha's entire water supply. The future average annual water usage would be 10.1 mgd based on water demand projections (Section 5). To meet a future maximum day demand of 16.7 mgd, infrastructure would be built for 4.5 mgd of firm capacity through 4 new wells along the Fox River south of Waukesha, in what is called the Fox River alluvium. This is also referred to as "riverbank inducement", since a portion of the water pumped by the wells comes from, or is induced from, the Fox River. The concept of Fox River alluvium wells has been studied and modeled, but the feasibility of obtaining this amount of water from four wells along the Fox River alluvium south of Waukesha is not proven (CH2M HILL and Ruekert-Mielke, 03/2002; Black & Veatch, 04/2011; USGS 08/2012). However, for the purposes of this evaluation it is assumed that this amount of water can be obtained from the Fox River alluvium.

Another 11.0 mgd firm capacity would be obtained through 12 new wells in the Troy Bedrock Valley south of Waukesha and adjacent to Vernon Marsh. The remaining 1.2 mgd firm capacity would be obtained from Waukesha's existing shallow wells 11 through 13.

The wells would pump water to a central treatment plant south of Waukesha. The water would be treated for iron, manganese, arsenic, hardness and microorganism removal. A pump station and pipelines would convey treated water to the Hillcrest reservoir in Waukesha and through the distribution system. Exhibit 11-17 shows the facilities for Alternative 3. These facilities are summarized previously in Exhibit 11-4.

11.4.3.2 Environmental Impacts

Groundwater Resources. The Troy Bedrock Valley groundwater model was used to simulate shallow aquifer groundwater drawdown for Alternative 3 (Ruekert-Mielke for SEWRPC, 01/2010). Although the City may need to extract a maximum day pumpage of 16.7 mgd from the shallow aquifer occasionally, only 10.9 mgd well pumpage and average aquifer recharge from rainfall was modeled. The results on groundwater drawdown are shown in Exhibit 11-18 (RJN Environmental Services, 04/2010). The results show significant shallow aquifer drawdown (over 90 feet) near the wells. The drawdown would be higher if more water was pumped out of the ground or during a drought.

EXHIBIT 11-17

Facilities for Alternative 3: Shallow Aquifer and Fox River Alluvium

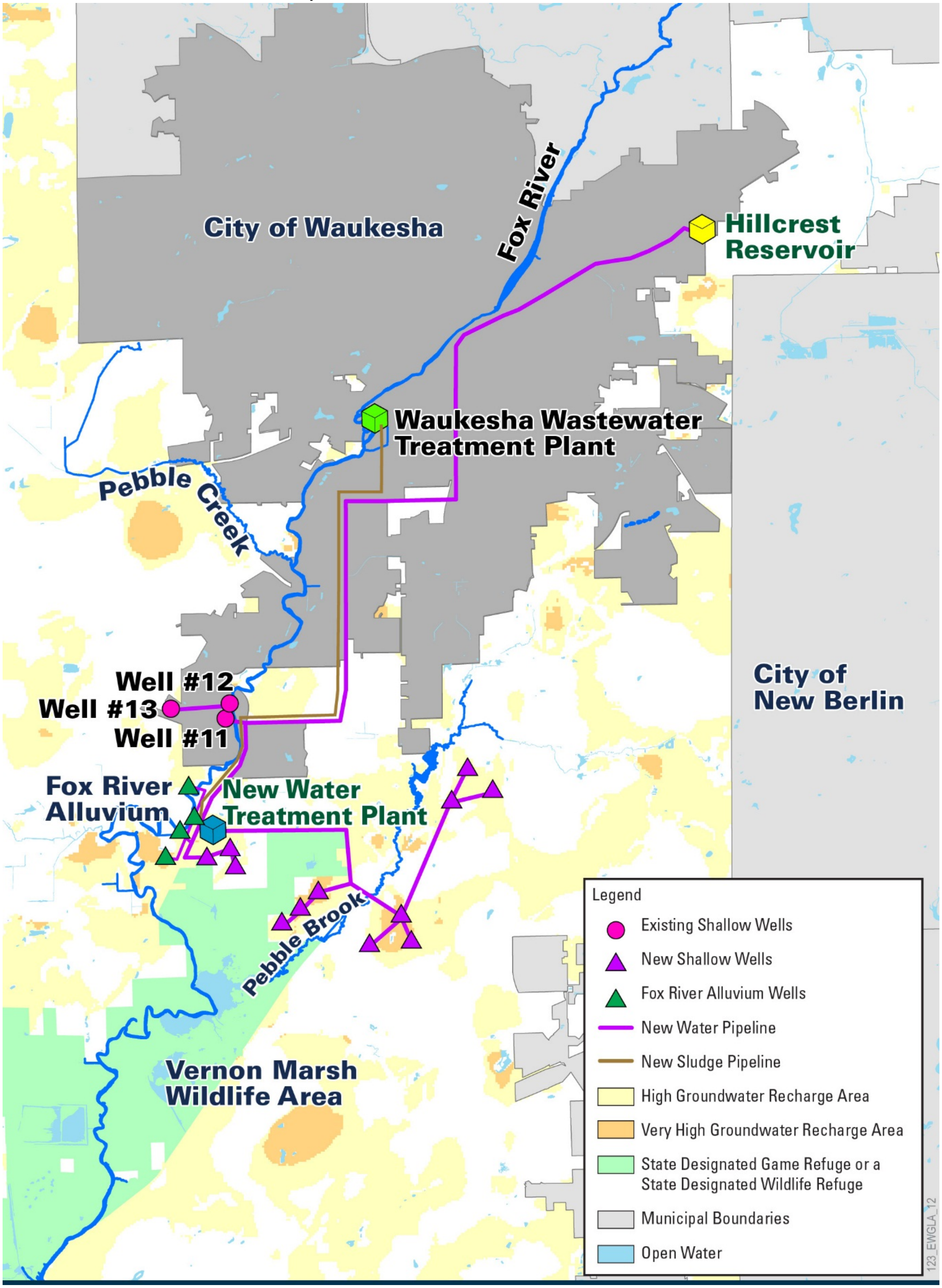
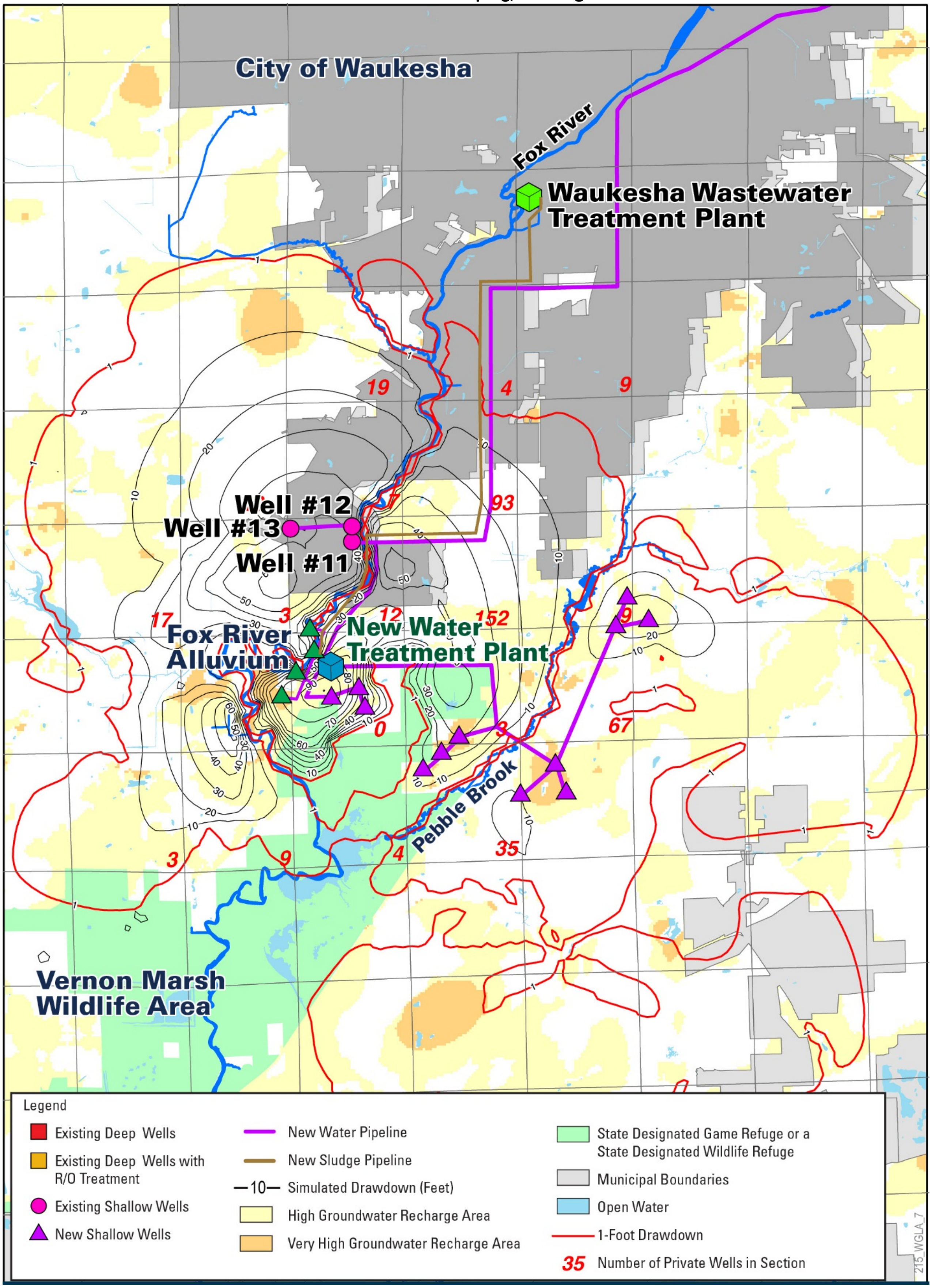


EXHIBIT 11-18

Groundwater Drawdown: Alternative 3 with 14 Wells Pumping, 10.9 mgd



Drawdown in the shallow aquifer can be reduced by spreading more wells out over a larger area and reducing the capacity of each well. Exhibit 11-19 (see next page) shows the groundwater drawdown if the number of shallow wells increases from 12 to 28 and the wellfield land area is nearly doubled. Although this reduces the drawdown from a maximum of about 90 feet to 50 feet, there is a larger area affected by reduced groundwater levels.

A benefit of Alternative 3 is that Waukesha's deep confined aquifer water withdrawal would be eliminated, and therefore deep aquifer water levels could increase under Waukesha. The amount of the actual increase in water levels in the deep aquifer would depend on how many other communities continue to use it. Increasing deep aquifer water levels would have an environmental benefit (SEWRPC, 12/2010; Cherkauer, 02/2010; USGS, 03/2007).

Aquatic Habitat. For the shallow aquifer, the Troy Bedrock Valley groundwater model was used to simulate baseflow reduction in streams and rivers (Ruekert-Mielke for SEWRPC, 01/2010). Pumping the shallow aquifer can cause adverse environmental impacts on groundwater and surface water resources (see Alternative 1 discussion). Alternative 3 would have greater adverse environmental impacts than Alternative 1, since almost twice the amount of shallow groundwater would be pumped. The Troy Bedrock Valley aquifer south of Waukesha has several sensitive environmental areas (Vernon Marsh, Pebble Brook). The Environmental Report contains additional information on environmental impacts (see Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives, Section 6.4.1.4).

The model estimated that base flow would be reduced 77 percent to Mill Brook and 34 percent to Pebble Brook in this alternative. See Exhibit 11-20 for impact on other water resources. The Fox River base flow reduction includes water induced out of the river.

Water levels would also be lowered in a large portion of the Vernon Marsh and near Pebble Brook (See Exhibit 11-18). A groundwater drawdown of 1 foot is significant in a wetland as it may affect root structures of aquatic plants. The Environmental Report estimates that over 4,000 acres of wetlands are affected by groundwater drawdown between 1 and 5 feet (see Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives, Section 6.4.3). This would have very significant adverse environmental impacts to the water ecosystems and is not sustainable.

Spreading more wells out over a larger area and reducing the capacity of each well reduces drawdown levels, but increases the area of adverse impact (See Exhibit 11-19). Therefore, more wetlands would be adversely affected. Base flow reduction increases from 34 percent to 44 percent in Pebble Brook when wells are spread out, but decreases in some other resources as shown in Exhibit 11-21 (RJN Environmental Services, 08/2013). Spreading the wells over a larger area and reducing the pumping from each well still would have a significant adverse impact on the base flow to sensitive wetlands and streams.

On a much smaller scale, the Village of Mukwonago installed a single shallow groundwater well in the southern area of the Vernon Marsh wildlife area and monitored the effects to a nearby marsh and calcareous fen, a rare Wisconsin wetland. According to the WDNR, the well appears to have created a cone of depression that is affecting the fens, along with the endangered plant species that depend on the groundwater supply (Glenzinski, 07/2006; Gaummitz, Asplund and Matthews, 06/2004). The long-term impacts of pumping this well are being evaluated by WDNR.

EXHIBIT 11-20
Baseflow Reduction in Streams with Shallow Aquifer Pumping 14 Wells for a Total of 10.9 mgd

Resource	Baseflow Reduction (%)[a]
Fox River	11[b]
Pebble Brook	34
Mill Creek	26
Mill Brook	77
Pebble Creek	13

[a] Streamflow used to calculate baseflow reduction was the Q80.

EXHIBIT 11-21
Baseflow Reduction in Streams with Shallow Aquifer Pumping 27 Wells for a Total of 10.9 mgd

Resource	Baseflow Reduction (%)[a]
Fox River	7[b]
Pebble Brook	45
Mill Creek	44
Mill Brook	100 (dry)
Pebble Creek	0

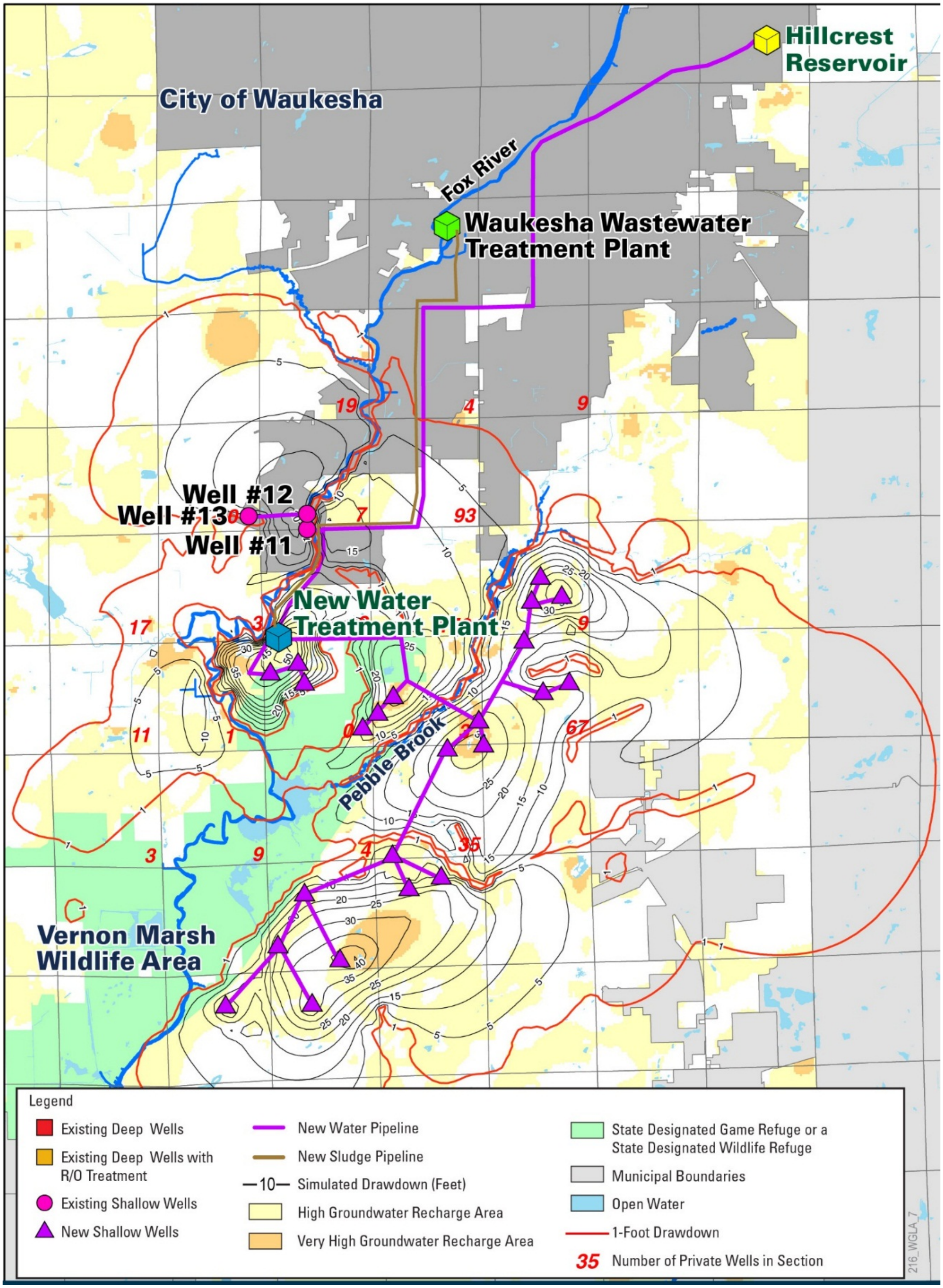
[a] Streamflow used to calculate baseflow reduction was the Q80.

[b]Includes water induced out of the river.

[b]Includes water induced out of the river.

EXHIBIT 11-19

Groundwater Drawdown: Alternative 3 with 28 Wells Pumping, 10.9 mgd



This modeling of the shallow aquifer shows that development of a wellfield for a City the size of Waukesha would be very difficult from an environmental impacts standpoint.

In order to use the shallow aquifer wellfield, the City would be required to construct water transmission mains from the shallow aquifer wellfield to the treatment plant, and from the treatment plant to Waukesha. This construction would have environmental impacts as discussed in Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives.

There are two lakes and 12 springs in the 5 to 50 gpm range in the 1 foot and greater drawdown area that could be affected.

Alternative 3 would discharge over 22,000 tons of greenhouse gases (carbon dioxide equivalent) annually through pumping from aquifers, water treatment, and pumping from the wellfield to Waukesha.

Considering the environmental impacts of Alternative 3, a rating of "significant adverse impact or risk" was applied. This alternative causes greater than 50 feet groundwater drawdown in a shallow aquifer, adversely affects much greater than 10 acres of wetlands (>4,000 acres), reduces baseflow in cold water streams greater than 25 percent, and impacts two lakes and 12 springs.

11.4.3.3 Long-Term Sustainability

Water Returned to Original Source. The Fox River alluvium water would be returned to the Fox River through the upstream Waukesha wastewater treatment plant.

None of the shallow groundwater would be returned to its original source (recharged into the aquifer). This water would eventually discharge to the ocean (See Exhibit 11-11) and local surface waters would be adversely affected.

Drought Impact. The shallow aquifer and Fox River are dependent on rainwater for recharge and are less reliable during drought conditions, when water supply is needed most. Given the modeling of the shallow aquifer conducted at average day pumping and recharge conditions, this shallow aquifer would be highly stressed during a drought when pumping is higher and recharge is lower. Furthermore, the adverse impacts of groundwater drawdown and baseflow reduction at average day water demand conditions as demonstrated by the model would be worse in a drought situation.

This alternative relies on multiple wells spread out over a large area. All wells would draw from the same aquifer and connected surface water. Relying upon one aquifer is less reliable than relying upon two aquifers as Alternative 1 does.

Riverbank filtration wells can plug over time as the ground filters water and particles collect. The amount of plugging and time frame depend on site specific conditions. Riverbank filtration wells can be cleaned to restore some capacity, but in some cases capacity decreases to levels that make the wells unproductive. This adds an element of risk to the long term sustainability of riverbank filtration wells.

Considering the long-term sustainability of Alternative 3, a rating of "significant adverse impact or risk" was applied. Less than 50 percent of the water is returned to its original source and the water supply depends on one shallow, unconfined aquifer and a small surface river.

11.4.3.4 Public Health

Contamination. The shallow aquifer water may exceed arsenic regulations in some areas (Davy Laboratories. 04/05/2007). While drinking water regulations can be met with proper treatment, if there is a malfunction in the treatment process or if new contaminants appear, the public may be exposed to greater health risk from these or other contaminants.

Potential sources of VOCs and SOCs are present in the shallow aquifer. There are 19 potential sources of contamination in the shallow aquifer wells within a 1 mile radius or 1 foot drawdown contour (WDNR, 07/2012). Of the 19 potential contamination sites, 9 sites were found to contain SOCs.

The shallow aquifer is susceptible to contamination from agricultural chemicals and road salt.

WDNR requires a wellhead protection program to protect municipal wells from contamination. Waukesha would have no zoning control to enforce the wellhead protection ordinance because the shallow wellfield is outside the City limits. Preventing a potential source of contamination such as a gas station or industry from locating near the wellfield will be difficult without owning the land. Buying large tracts of land or influencing land use and zoning on surrounding properties is possible, but costly and the effectiveness is uncertain.

Shallow aquifers are more susceptible to contamination than deep confined aquifers and very large surface water bodies, as discussed in Alternative 1. In addition, there are over 1,600 private wells in the 5 foot shallow aquifer groundwater drawdown contour (WDNR, 04/2009). Private wells are often associated with septic systems. These septic systems could be another source of contamination such as pathogenic microorganisms or nitrate, in situations where groundwater pumping pulls the contaminants towards the well.

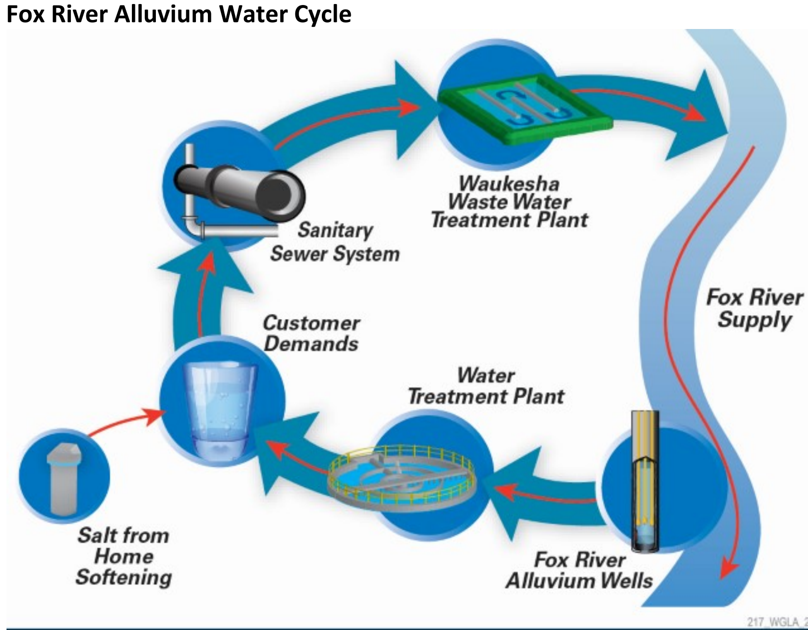
In addition, the Fox River alluvium may have exposure to additional contaminants from the Fox River. The Fox River is listed as impaired for PCBs and is known to contain compounds that may be regulated in the future such as endocrine disrupters and pharmaceuticals (WDNR, 12/2011). Fox River alluvium wells would be drawing water downstream of several wastewater treatment plant discharges, including Waukesha, Brookfield and Sussex. During dry periods, a significant portion of the Fox River flow is wastewater treatment plant effluent. Public health impacts, public perception, future regulations and multiple treatment barriers must be considered.

The shallow groundwater is high in TDS, mainly from calcium, magnesium, carbonates, chlorides and sulfate.

Under Alternative 3, the deep aquifer would no longer be used, and potential public exposure to radionuclides and other contaminants would be eliminated.

Treatment. Conventional surface water treatment would be required for the Fox River alluvium source since it is under the direct influence of surface water. In addition, arsenic removal may be required from the shallow aquifer. Surface water treatment chemicals such as ferric chloride and lime can also remove arsenic, so a separate treatment process for arsenic is not required.

EXHIBIT 11-22
Fox River Alluvium Water Cycle



The Fox River alluvium water source requires additional consideration because wastewater treatment plant discharges (from Waukesha, Brookfield and Sussex) are located upstream of the proposed Fox River alluvium wellfield. This creates a situation where wastewater effluent is recycled for potable use. This recycle system and can increase the amount of contaminants in the water supply and wastewater effluent. Any contaminant that is not removed through the wastewater treatment plant or riverbank filtration can be concentrated and increase in the water supply source. Although pumping river water through the aquifer can remove some contaminants, others like chloride, are not removed. Exhibit 11-22 is a schematic of this water supply source.

Several important public health issues must be considered with this water source:

- Riverbank inducement wells would be drawing water downstream of several wastewater treatment plant discharges, including Waukesha, Brookfield and Sussex. During dry periods, a majority of the Fox River flow is wastewater treatment plant effluent. Public health impacts, public perception, future regulations and multiple treatment barriers must be considered. Contaminants in the wastewater treatment plant effluent, such as chlorides, pharmaceuticals and personal care products, will be present in the water supply in increasing concentrations. If the water induced from the Fox River is reused (wastewater effluent discharged to the Fox River upstream of the wellfield), contaminants will increase when the water is withdrawn from the river, and discharged back into the river upstream of the wellfield. Treatment can always be installed to remove contaminants, but the risk to public health increases as contaminants in the source water increase.

Considering the public health impacts of Alternative 3, a rating of "Significant adverse impact or risk" was applied. There are greater than 10 sources of contamination in the water supply area, and at least three types of contaminants. Conventional treatment plus arsenic removal and possibly advanced treatment to remove recycled contaminants may be required.

11.4.3.5 Implementability

Facilities. This alternative requires 19 wells, 2 water treatment plants, 1 pump station and about 14 miles of transmission pipeline (Exhibit 11-4). Each well and treatment plant would require a land site. All these facilities require operation and maintenance. The shallow aquifer facilities are outside the City limits.

The new wells, water plant, and pump station would require additional operations and maintenance. Water transmission mains from the shallow aquifer wellfield to the treatment plant, and from the treatment plant to Waukesha would require, easements, and construction through rural and urban conditions. Treatment requirements for the shallow aquifers would also reduce the amount of water available to customers because the treatment requirements would require water and produce waste streams. However, the waste streams would only be about 2 to 3 percent of pumped water, much less than the TDS removal treatment in Alternative 1. Treatment of all the water supply in one treatment plant would reduce operation and maintenance efforts and costs compared to the multiple treatment plants in Alternative 1, but reduce reliability because there is only one treatment plant.

Wells Affected. There are 3,565 private wells in the 1 foot groundwater drawdown contour, and 1,675 wells within the 5 foot groundwater drawdown contour (WDNR, 04/2009). Private wells may run dry or encounter water quality problems due to additional shallow aquifer pumping. If this should occur, new wells or deeper wells would be needed.

There are 16 non-private, non-municipal wells within the 5 foot groundwater drawdown contour (WDNR, 04/2009). The capacity of these wells would also be affected by this water supply alternative.

Government Entity Coordination. There are at least six government entities to coordinate with:

- City of Waukesha
- Waukesha County
- Town of Waukesha
- City of Brookfield
- Village of Sussex
- State of Wisconsin

Although this is a moderate number of government entities, the legal issues could be significant as explained in Alternative 1. The legal issues with siting new wells and impacting other entities discussed in Alternative 1 would be much greater in Alternative 3 because the City would be installing nearly twice as many wells and they would cover a larger land area. This land is outside the Waukesha municipal boundaries. A new water treatment plant, pump station, and transmission pipes would be required to convey the treated water to the Hillcrest reservoir in Waukesha and through the distribution system. The treatment plant would be located outside the City limits and require land purchase or lease.

There are no drinking water supplies on the Fox River in Wisconsin. Using the Fox River as a drinking water supply by pumping Fox River alluvium wells may change its current designation from a recreational water source to a public drinking water source. Future regulations may include more stringent phosphorus or chloride removal at wastewater plants and new drinking water contaminant regulations. This could impact upstream discharges such as the City of Brookfield and Village of Sussex. The costs to remove chlorides or other contaminants from the water supply, and additional phosphorus or chloride at wastewater plants was not included in the cost estimate. Such costs would significantly increase the capital and operation/maintenance costs associated with this alternative.

In addition to the technical basis for determining that the shallow aquifer supply may not be implementable due to its unreliability as a supply source, relying on the shallow aquifer is uncertain from a legal perspective as discussed under Alternative 1 (page 11-23).

Considering the implementability of Alternative 3, a rating of "significant adverse impact or risk" was applied. There are more than 20 facilities and land sites to operate and maintain and much more than 500 private wells affected. The Fox River alluvium supply introduces a new set of risks and unknowns as wastewater effluent water is recycled. However, this alternative has a moderate number of government entities to coordinate with.

EXHIBIT 11-23
Summary of Evaluation Criteria for Shallow Aquifers

Major Criteria	Subcriteria	Rating	Overall
Environmental	Impact on groundwater resources	●	●
	Aquatic habitat loss	●	
Long-Term Sustainability	Water returned to original source	●	●
	Supply affected by drought	●	
Public Health	Nearby contaminated sources	●	●
	Treatment requirements	●	
	Ability to produce consistent water quality	⊙	
Implementability	Operation and maintenance complexity	●	●
	Land sites required	●	
	Municipal/county/utility coordination required	◉	
	Wells affected	●	

○ No adverse impact or risk ◉ Moderate adverse impact or risk
⊙ Minor adverse impact or risk ● Significant adverse impact or risk

Exhibit 11-23 summarizes the criteria for water supply Alternative 3.

11.4.4 Water Supply Alternative 4: Lake Michigan and Shallow Aquifer

11.4.4.1 General

Alternative 4 consists of obtaining about 45 percent the City's required potable water (4.5 mgd average day demand, 7.6 mgd maximum day demand) from a Lake Michigan water utility and the other 55 percent (5.6 mgd average day demand, 9.1 mgd maximum day demand) from the shallow aquifer in the Mississippi River basin. The shallow aquifer supply quantity is the same as in Alternative 1. This alternative would reduce the amount of water required from Lake Michigan, compared to alternative 2.

The Lake Michigan supply would be conveyed to Waukesha through a transmission pipeline and booster pump station to the Hillcrest reservoir in Waukesha. Additional distribution system piping would convey water throughout the City. Water used by Waukesha would be returned to the Lake Michigan watershed via a pump station and transmission pipe to the Root River.

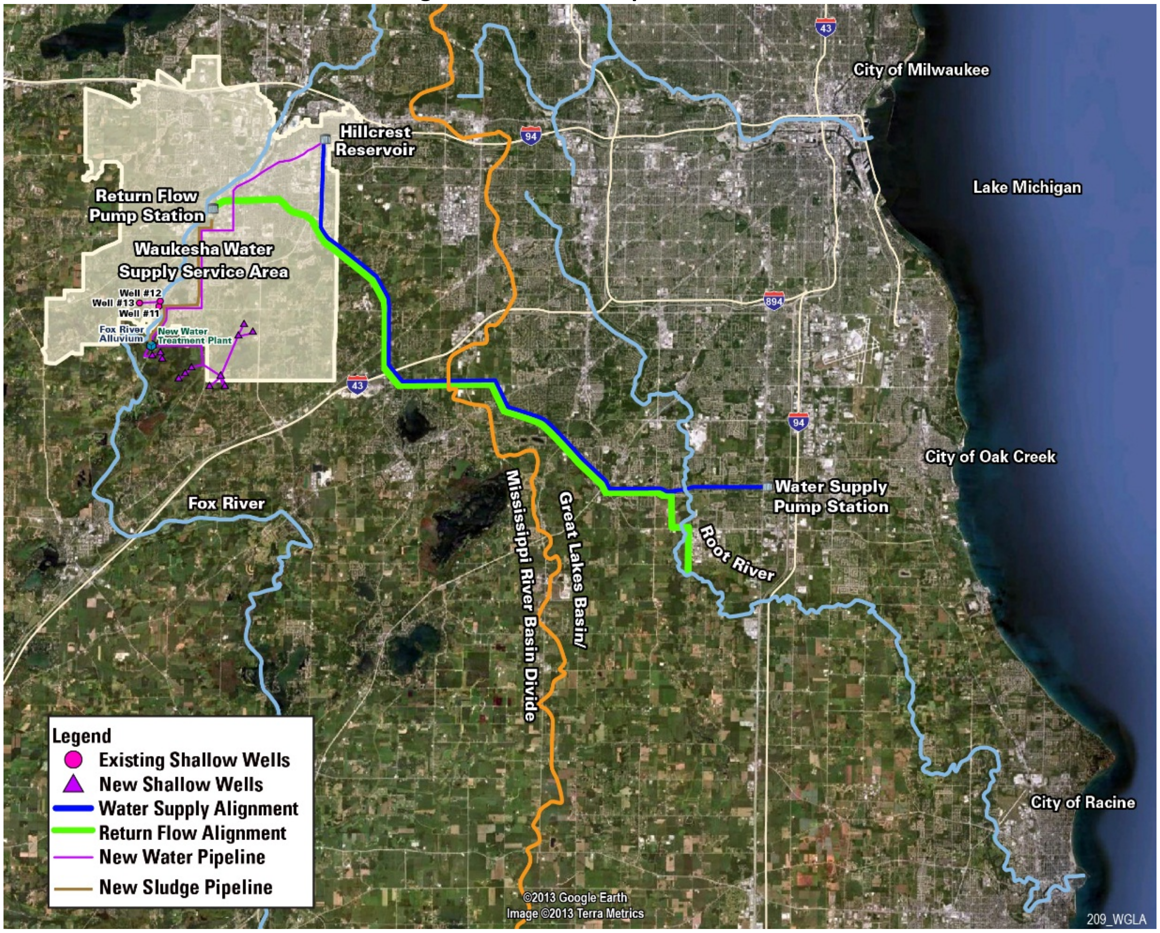
The supply from the shallow aquifer would be provided by existing and new wells. Existing shallow wells 11 through 13 would provide firm capacity for 1.2 mgd. The remaining 7.9 mgd would come from 12 wells in the Troy Bedrock Valley south of Waukesha. These wells would be combined into a central water treatment plant and the treated water pumped to the Hillcrest reservoir in Waukesha for blending with Lake Michigan water, providing consistent water quality to customers. The facilities are shown in Exhibit 11-24, and summarized in Exhibit 11-4.

11.4.4.2 Environmental Impacts

Groundwater Resources. Current and future adverse environmental impacts of pumping the shallow aquifer would be the same as Alternative 1. The results show shallow aquifer drawdown of 50 feet near the wells.

There are no groundwater resource impacts from the Lake Michigan supply. Eliminating use of the deep aquifer wells will have a positive impact on the deep aquifer by allowing water levels to rise, as discussed in Alternative 2.

EXHIBIT 11-24
Facilities for Alternative 4: Lake Michigan and Shallow Aquifer



Aquatic Habitat. Groundwater drawdown would negatively affect sensitive and valuable environmental areas such as Pebble Brook, Mill Brook, and Vernon Marsh, and the reduction in baseflow to these water resources would adversely affect ecosystems. The results are the same as Alternative 1; over 3,000 acres of wetlands are adversely affected, baseflow is reduced more than 50 percent in segments of streams, 2 lakes, 7 springs and over 3,000 wells are affected.

Home water softening would continue because shallow groundwater is two to three times as hard as Lake Michigan water. Blending the two waters will reduce the hardness, but hardness will still be relatively high and a significant reduction in home water softener use is not anticipated. However, the amount of salt used may decrease. The shallow groundwater could be softened with lime at a central plant to reduce the amount of home softening.

It is estimated that Alternative 4 would discharge over 25,000 tons of greenhouse gases per year (See Exhibit 11-10). Greenhouse gases would be produced by the pumping needed to convey water from and back to Lake Michigan. In addition, pumping from the shallow aquifer, treating the water and pumping the water to Waukesha uses energy and produces greenhouse gases.

Water transmission mains from a Lake Michigan supplier to Waukesha, the booster pump stations, and return flow pipelines from the Waukesha wastewater plant to Root River, wells and treatment plant would have environmental impacts during construction essentially the same as the Lake Michigan water supply alternative without the shallow aquifer because construction widths needed for the pipeline are the same.

Considering the environmental impacts of Alternative 4, a rating of “significant adverse impact” was applied. The significant adverse environmental impacts are mainly associated with the shallow aquifer portion of the water supply, creating groundwater drawdown of 50 feet or more, impacting 3,000 acres of wetlands, and reducing baseflow more than 50 percent in segments of streams.

11.4.4.3 Long-Term Sustainability

Water Returned to Original Source. The Lake Michigan water would be returned to its original source, but it would be mixed with shallow aquifer water since both sources are blended and treated at the wastewater plant.

The shallow aquifer portion of the water supply (55 percent) is not returned to its source in the Mississippi River basin. It is diverted to the Lake Michigan basin after mixing with Lake Michigan water and being treated at the wastewater plant. This practice would not comply with section 4.9.3(b) of the Compact regarding minimizing out of Basin return water.

Drought Impact. Shallow groundwater is susceptible to drought, as discussed in Alternatives 1 and 3. Lake Michigan water is much more resistant to drought conditions. During a drought Waukesha could rely more on Lake Michigan and less on the shallow aquifer, increasing reliability.

Considering the long-term sustainability of Alternative 4, a rating of “moderate adverse impact” was applied. About half of the water is not returned to the source. However, having a very large surface water source offsets some of the drought susceptibility of a shallow aquifer source.

11.4.4.4 Public Health

Contamination. Lake Michigan water is high quality and safe, but still has potential for contamination like all water supplies. The location of water supply intakes far from shore minimizes the potential for contamination, as with Alternative 2.

The deep aquifer would no longer be used, and potential public exposure to radionuclide and other contaminants is eliminated. However, arsenic in the shallow aquifer source could potentially expose the public to this contaminant. The agricultural chemicals, SOC and VOC sources in the shallow aquifer wellfield, as discussed in Alternative 1, would be the same in this alternative. Wellhead protection issues with the shallow aquifer also remain.

There are over 1,300 private wells in the 5 foot shallow aquifer groundwater drawdown contour (WDNR, 04/2009). Private wells will be affected by the shallow aquifer pumping and septic systems may contribute contaminants into the water supply. However, if a contamination issue should occur in the shallow aquifer, Waukesha could rely more on the Lake Michigan water supply.

Treatment. Lake Michigan would require conventional surface water treatment. The shallow aquifer would require conventional groundwater treatment plus treatment for arsenic removal. The two water sources would require blending to produce a consistent water quality to customers.

Considering the public health impacts of Alternative 4, a rating of “moderate adverse impact” was applied. There are over 10 contaminant sources and three types of contaminants in the shallow aquifer source, but the Lake Michigan source would be relied on more heavily if a contamination episode occurred. Conventional treatment plus arsenic removal would be required. Two sources of water require blending.

11.4.4.5 Implementability

Facilities. This alternative requires 15 wells, two treatment plants, three pump stations and about 52 miles of transmission main (Exhibit 11-4). Each well, pump station and treatment plant would require a land site. All these facilities require operation and maintenance. All the facilities except the return flow pump station are outside the City limits.

Water transmission mains from the shallow aquifer, Lake Michigan supplier, and return flow would require, easements, and construction through rural and urban conditions.

Waukesha would have to maintain not only the Lake Michigan supply, but also the shallow aquifer supply, treatment and pumping/blending systems. Blending the two very different waters would require attention to water chemistry so customers are receiving consistent water quality and distribution system corrosion is minimized.

Wells Affected. There are 3,420 private wells in the 1 foot groundwater drawdown contour, and 1,320 wells within the 5-foot groundwater drawdown contour (WDNR, 04/2009). Private wells may run dry or encounter water quality problems due to additional shallow aquifer pumping. If this should occur, new wells or deeper wells would be needed.

There are 11 non-private, non-municipal wells within the 5 foot groundwater drawdown contour (WDNR, 04/2009). The capacity of these wells would also be affected by this water supply alternative.

Government Entity Coordination. The same 16 government entities discussed in Alternative 2 would be required for this alternative, plus the Town of Waukesha for the shallow aquifer.

The legal issues with siting new wells and impacting other entities discussed in Alternative 1 would apply to this alternative as well. Land purchase and easement requirements for the shallow aquifer supply would be similar to Alternative 1. Land use and legal issues for wellhead protection, well and treatment plant siting remain. Public concerns over impacts to groundwater levels and long-term wetland impacts are also still present.

Alternative 4 requires an agreement with a Lake Michigan water supplier to provide water, and approval from the Governors of the Great Lakes states under the terms of the Compact. Since a large portion of Waukesha's water supply would come from shallow groundwater and be blended with Lake Michigan water, minimizing out of Basin return water to comply with section 4.9.3(b) of the Compact would not be possible.

This alternative will have the same issues and requirements of pipeline routing studies, easements, land purchase and construction through rural and urban conditions. However, the length of pipelines is larger than in alternatives 1 through 3.

Considering the implementability of Alternative 4, a rating of "significant adverse impact or risk" was applied. More than 20 facilities and 52 miles of pipe are required. Coordination with greater than 9 government entities is required and much greater than 500 private wells are affected.

Exhibit 11-25 summarizes the criteria for water supply Alternatives 4.

EXHIBIT 11-25
Summary of Evaluation Criteria for Lake Michigan and Shallow Aquifers

Major Criteria	Subcriteria	Rating	Overall
Environmental	Impact on groundwater resources	●	●
	Aquatic habitat loss	●	
Long-Term Sustainability	Water returned to original source	●	◉
	Supply affected by drought	⊙	
Public Health	Nearby contaminated sources	●	◉
	Treatment requirements	◉	
	Ability to produce consistent water quality	⊙	
Implementability	Operation and maintenance complexity	●	●
	Land sites	●	
	Government entity coordination	●	
	Wells affected	●	

○ No adverse impact or risk
⊙ Minor adverse impact or risk
◉ Moderate adverse impact or risk
● Significant adverse impact or risk

Using the deep aquifer with Lake Michigan water instead of the shallow aquifer will have similar results and impacts. However, since the deep aquifer will continue to be pumped, the benefit of increasing water levels and restoration of the natural groundwater flow toward Lake Michigan will not be realized. Pumping the shallow aquifer adversely affects more wetlands than pumping the deep aquifer, but the severe drawdown of the deep aquifer will keep Waukesha in a WDNR designated groundwater management area, subject to future regulations.

The old deep aquifer wells are less reliable than new shallow wells. The deep aquifer wells are 30 to 75 years old. The deep wells also have to remove radium through treatment. Radium treatment facilities will be over half their expected life when a Lake Michigan supply is obtained, and will require replacement in the future. Additional treatment for TDS removal in the future will be a large expense in both capital and operating costs (See Alternative 1). Other issues with using the deep aquifer for a portion of Waukesha's water supply are explained in the Alternative 1 description. For these reasons, a Lake Michigan and deep aquifer supply alternative was not developed in detail.

11.4.5 Water Supply Alternative 5: Unconfined Deep Aquifer

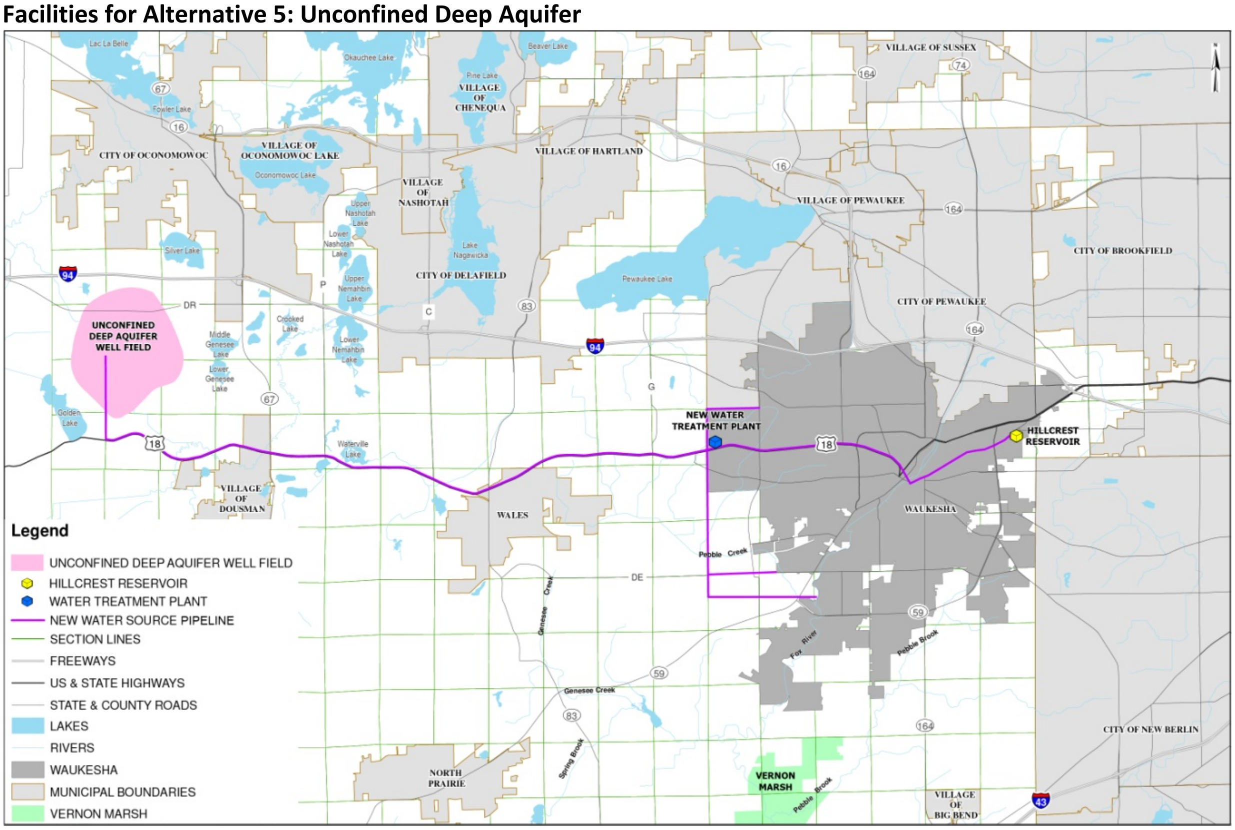
11.4.5.1 General

The deep sandstone aquifer under the City of Waukesha extends west. Approximately 10 to 12 miles west of the City, the confining shale layer subsides. Therefore, the deep sandstone aquifer is unconfined at this point. Recharge of the aquifer in this area is faster, and the deep aquifer is more hydraulically connected to the shallow aquifer above.

In this alternative, 10.1 mgd would be pumped on an annual average from the unconfined deep aquifer about 12 miles west of Waukesha. The maximum day capacity would be 16.7 mgd with the largest well out of service. Assuming a well capacity of 1.5 mgd each, 12 wells would be required for firm capacity (CH2M HILL and Ruekert-Mielke, 03/2002). The wellfield was assumed to have a minimum spacing of roughly one-half mile between wells (CH2M HILL and Ruekert-Mielke, 03/2002). The water would be pumped through a pipeline, treated to remove iron and manganese, and then distributed throughout the City of Waukesha water distribution system. Based on water quality reports from municipal wells in the area, it was assumed that radium and arsenic levels would be below those requiring treatment. The major facilities are shown in Exhibit 11-26 and summarized in Exhibit 11-4.

EXHIBIT 11-26

Facilities for Alternative 5: Unconfined Deep Aquifer



11.4.5.2 Environmental Impacts

Groundwater Resources. A USGS report indicated that water availability limitations may arise in the western Lake Michigan basin (Reeves, 2010). Pumping the deep aquifer near Waukesha was specifically mentioned, resulting in large groundwater level drawdowns, and capturing water that would have otherwise naturally discharged to Lake Michigan. This has caused a diversion of flow away from the Great Lakes basin (USGS, 03/2007).

Pumping from the unconfined deep aquifer was modeled using the SEWRPC regional groundwater model at flows between 2 mgd and 15 mgd (RJN Environmental Services, 02/2011 and 08/2013). Modeling results indicated drawdowns in the sandstone aquifer over 150 feet near the wells (7 wells pumping 10.5 mgd). Drawdowns in the shallow aquifer (above the sandstone) were about one foot near the wells (7 wells pumping at 10.5 mgd). Groundwater drawdown contours in the shallow aquifer at 10.5 mgd are shown in Exhibit 11-27, and deep aquifer drawdown is shown in Exhibit 11-28.

EXHIBIT 11-27
Groundwater Drawdown in Shallow Aquifer at 10 mgd

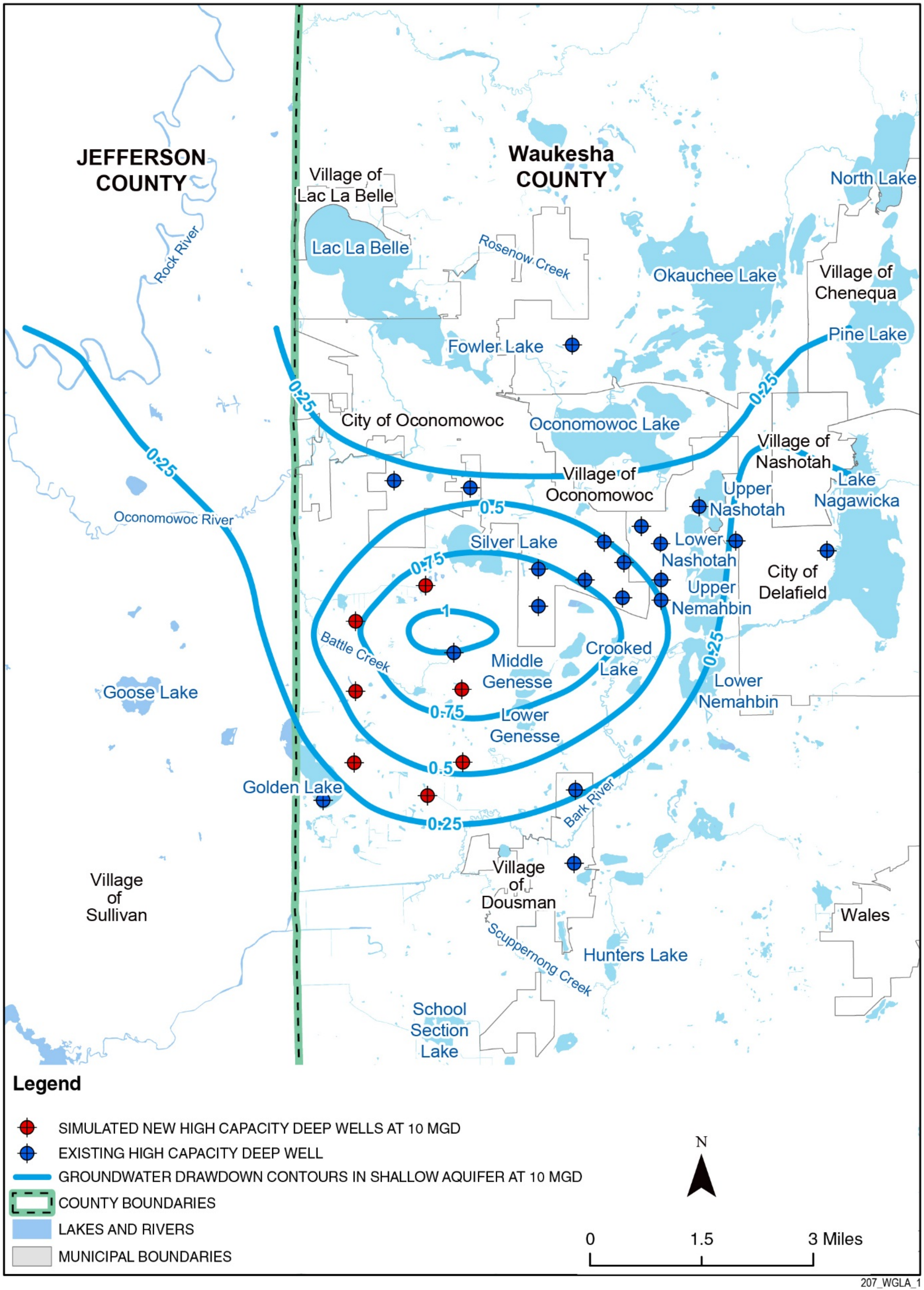
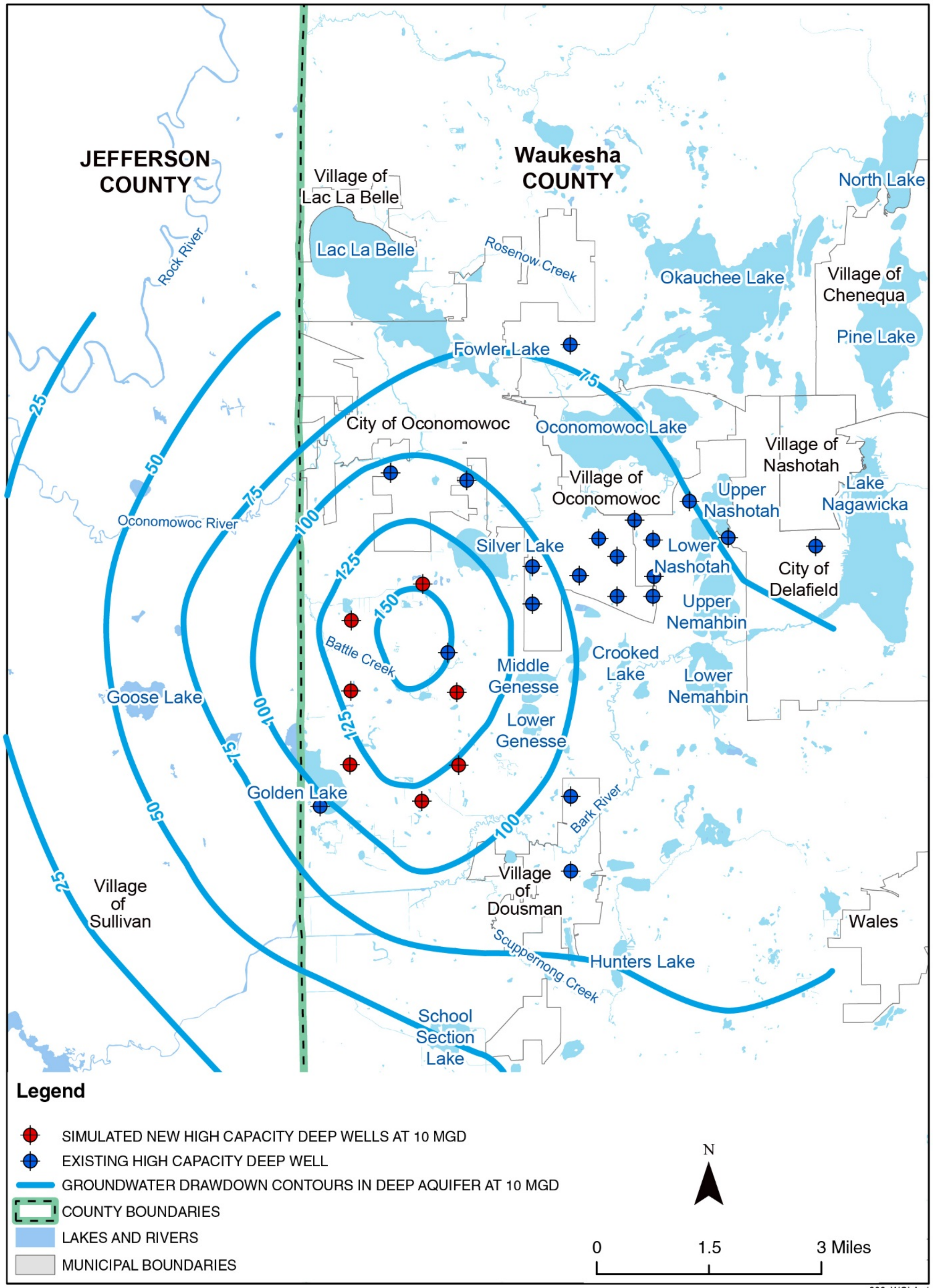


EXHIBIT 11-28

Groundwater Drawdown in Deep Sandstone Aquifer at 10 mgd



Groundwater modeling indicates that the sandstone aquifer drawdown is greater than 150 feet, an amount high enough to designate a groundwater management area (Wis. Stat. § 281.34(9)(a)).

Note that modeled groundwater drawdown extends into Jefferson and Waukesha counties. The drawdown indicated is additional drawdown from current groundwater levels. Groundwater in the unconfined deep aquifer is already about 100 feet below predevelopment groundwater levels in some areas near Oconomowoc, so actual drawdown from predevelopment is much greater than shown in Exhibit 11-28 (SEWRPC, 12/2010). In addition, the area of groundwater drawdown influence is large and extends into Jefferson County. At a 10.5 mgd pumping rate, groundwater drawdown greater than 100 feet occurs in Jefferson County, and drawdown greater than 100 feet extends about 3 miles to the southeast (RJN Environmental Services, 02/2011 and 08/2013).

Water extracted from the unconfined deep aquifer intercepts natural recharge of the deep confined sandstone aquifer near Waukesha. Removing this water will not eliminate adverse environmental impacts from drawdown in the deep confined aquifer (see Alternative 1) and still adversely affects the amount of groundwater recharging the Great Lakes basin (RJN Environmental Services, 02/2011).

Aquatic Habitat.
The shallow aquifer is above the sandstone, and these drawdowns indicate impacts on surface water sources such as rivers, streams, and lakes. Exhibit 11-28 shows groundwater drawdown contours in the unconfined deep sandstone aquifer at 10.5 mgd. It is estimated that 10.5 mgd of groundwater pumping will impact 480 acres of wetlands within the 1 foot drawdown contour line. Note that the drawdown indicates pumping at average day demands during normal recharge conditions. At maximum day demands the drawdown would be much greater. Some of the water pumped from the unconfined deep aquifer is induced from surface waters. This water is transferred from the Rock River watershed to the Fox River watershed when discharged from the Waukesha wastewater treatment plant. Transferring water from the Rock River system by pumping municipal wells for the City of Waukesha water supply and sending the water to the Fox River basin could raise concerns about diminished flow in the Rock River system. A similar Wisconsin inter-basin transfer example where concerns were raised is the Upper Sugar River system near the City of Verona, Wisconsin. When water was to be transferred out of the system for wastewater treatment, a return line discharging water to Badger Mill Creek in the Upper Sugar River Watershed was installed to maintain base flows in that system. The cost estimate assumes a return line to the Rock River watershed would not be required.

The groundwater drawdown affects a large land area, with many wetlands, lakes and streams. Water extracted from the ground reduces the water that would naturally flow to wetlands, lakes and streams (base flow). The model estimated that base flow in some surface waters near the wells would be reduced as shown in Exhibit 11-29 with this alternative, pumping at the average day flow of 10.5 mgd (RJN Environmental Services, 08/2013). The impact would be much greater at maximum day demand pumping. There are adverse environmental impacts from pumping the entire Waukesha water demand from this aquifer, especially during maximum day demands.

EXHIBIT 11-29
Baseflow Reduction from Seven Wells Pumping 10.5 mgd

Resource	Baseflow Reduction (%) from Pumping a Total of 10 mgd
Bark River	9
Silver Lake	27
Middle and Lower Genesee Lakes	16
Upper Genesee and Duck Lakes	18
Battle Creek and Laura Lake	12

Water transmission pipelines in the unconfined deep aquifer wellfield and extending to Waukesha would have environmental impacts during construction, as described in Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives.Home water softening would continue because unconfined deep aquifer groundwater is harder than Lake Michigan water. The adverse environmental impacts associated with home water softening (salt discharge to surface waters, additional water and energy use) would remain.

It is estimated that this alternative would discharge more than 27,000 tons of greenhouse gases per year (carbon dioxide equivalent). Greenhouse gases would be produced by pumping from the unconfined deep aquifer, treating the water and pumping the water to Waukesha.

Considering the environmental impacts of Alternative 5, a rating of “significant adverse impact” was applied. Deep confined aquifer levels would continue to drop, deep unconfined aquifer levels would be lowered over 200 feet, greater than 10 acres of wetlands would be adversely affected (480 acres), greater than 5 lakes are affected and baseflow in the Bark River is reduced 9 percent.

11.4.5.3 Long-Term Sustainability

Water Returned to Original Source. None of the water extracted from the unconfined deep aquifer would be returned to its source. The water would diverted from the Rock River watershed, transferred to the Fox River watershed and ultimately to the ocean.

Drought Impact. The unconfined deep aquifer is less susceptible to drought than shallow aquifers, but will still be affected by limited recharge. The unconfined deep aquifer is in the recharge zone for that aquifer, making it more reliable from a production standpoint than the deep confined aquifer or shallow aquifers.

Considering the long-term sustainability of Alternative 5, a rating of “moderate adverse impact or risk” was applied.

11.4.5.4 Public Health

Contamination. Like all aquifers, the unconfined deep aquifer is susceptible to contamination, but to a lesser degree than the shallow aquifer because surface contamination would have to travel farther. The wellfield area has 3 potential sources of contamination (WDNR, 7/2012). Of the 3 potential contamination sites, 2 sites were found to contain SOCs.

Preventing contamination will be more difficult because the wellfield is outside the City limits, and, as a result, the City will not have zoning authority to enforce a wellhead protection ordinance to protect the wells.

There are wells in the deep unconfined aquifer with radium and arsenic concentrations below the state drinking water standards and do not exceed any primary drinking water regulations.

Treatment. Treatment requirements would likely include conventional groundwater treatment with iron and manganese removal and disinfection. Home water softening would still be practiced, so the increased sodium and total dissolved solids would still be present in home drinking water.

Water would come from a single source, so there would be no need to blend waters for a consistent quality.

Considering the public health impacts of Alternative 5, a rating of “minor adverse impact or risk” was applied. There are fewer sources of contamination, only conventional treatment is required and one water source does not require blending.

11.4.5.5 Implementability

Facilities. This alternative would require the siting and construction of at least 12 wells, one pump station, 32 miles of transmission piping, a pump station and a treatment plant for removal of iron and manganese and disinfection. Waukesha would have to operate and maintain a remote wellfield and pump station. In addition, a water treatment plant would have to be operated and maintained.

Each well, pump station and treatment plant would require land acquisition.

Wells Affected. There are 158 private wells in the 1 foot groundwater drawdown contour (WDNR, 04/2009). Private wells may run dry or encounter water quality problems due to additional shallow aquifer pumping. If this should occur, new wells or deeper wells would be needed.

There are 11 municipal wells in the 50 foot drawdown contour. There are 177 non-private, non-municipal wells within the 70 foot groundwater drawdown contour (WDNR, 04/2009). The capacity of these wells would also be affected by this water supply alternative.

Government Entity Coordination. Fourteen government entities are anticipated to require coordination to construct the water supply facilities.

- City of Waukesha
- Town of Waukesha
- Waukesha County
- Jefferson County
- City of Pewaukee
- Town of Delafield
- Town of Genesee
- Town of Summit
- Village of Dousman
- Village of Wales
- City of Oconomowoc
- Village of Oconomowoc Lake
- Village of Nashotah
- State of Wisconsin

Land purchase and easement requirements for the unconfined deep aquifer supply may be more difficult to implement than those of the shallow aquifer near Waukesha because of the greater distance from Waukesha.

Pumping water from this aquifer would create a large area of groundwater drawdown. Installing high capacity wells in the unconfined aquifer west of the Maquoketa shale presents not only logistical but also definite legal problems. Installation of high capacity wells in an unconfined aquifer could result in legal challenges and expose the City to numerous damage claims from lake area homeowners, residents and businesses on private wells and municipalities. See legal discussion in Alternative 1.

The large groundwater drawdown with this alternative can adversely affect long-term viability if pumping rates must be decreased to reduce drawdown or impacts on baseflow and surface water resources. The wellfield area is far outside the City of Waukesha boundaries, and other private and municipal wells will be affected. Many lakes and surface water bodies will also be affected. These issues jeopardize long-term sustainability and reliability because wellfield production could be ordered by WDNR to be reduced or stopped.

In addition to the technical basis for determining that the deep unconfined aquifer supply may not be implementable due to its unreliability as a supply source, relying on the deep unconfined aquifer is uncertain from a legal perspective as discussed under Alternative 1 (page 11-25).

Considering the implementability of Alternative 5, a rating of "significant adverse impact or risk" was applied. There are 15 facilities to operate and maintain, 14 government entities to coordinate with, 158 private wells affected, and 11 municipal wells affected. In addition, the distance from Waukesha and impact on water resources in another county and watershed make implementation more difficult.

Exhibit 11-30 summarizes the criteria for the unconfined deep aquifer.

EXHIBIT 11-30
Summary of Evaluation Criteria for Unconfined Deep Aquifer

Major Criteria	Subcriteria	Rating	Overall
Environmental	Impact on groundwater resources	●	●
	Aquatic habitat loss	●	
Long-Term Sustainability	Water returned to original source	●	◉
	Supply affected by drought	⊙	
Public Health	Nearby contaminated sources	⊙	⊙
	Treatment requirements	⊙	
	Ability to produce consistent water quality	○	
Implementability	Operation and maintenance complexity	◉	●
	Land sites	◉	
	Government entity coordination	●	
	Wells affected	●	

○ No adverse impact or risk
⊙ Minor adverse impact or risk
◉ Moderate adverse impact or risk
● Significant adverse impact or risk

11.4.6 Water Supply Alternative 6: Multiple Sources

11.4.6.1 General

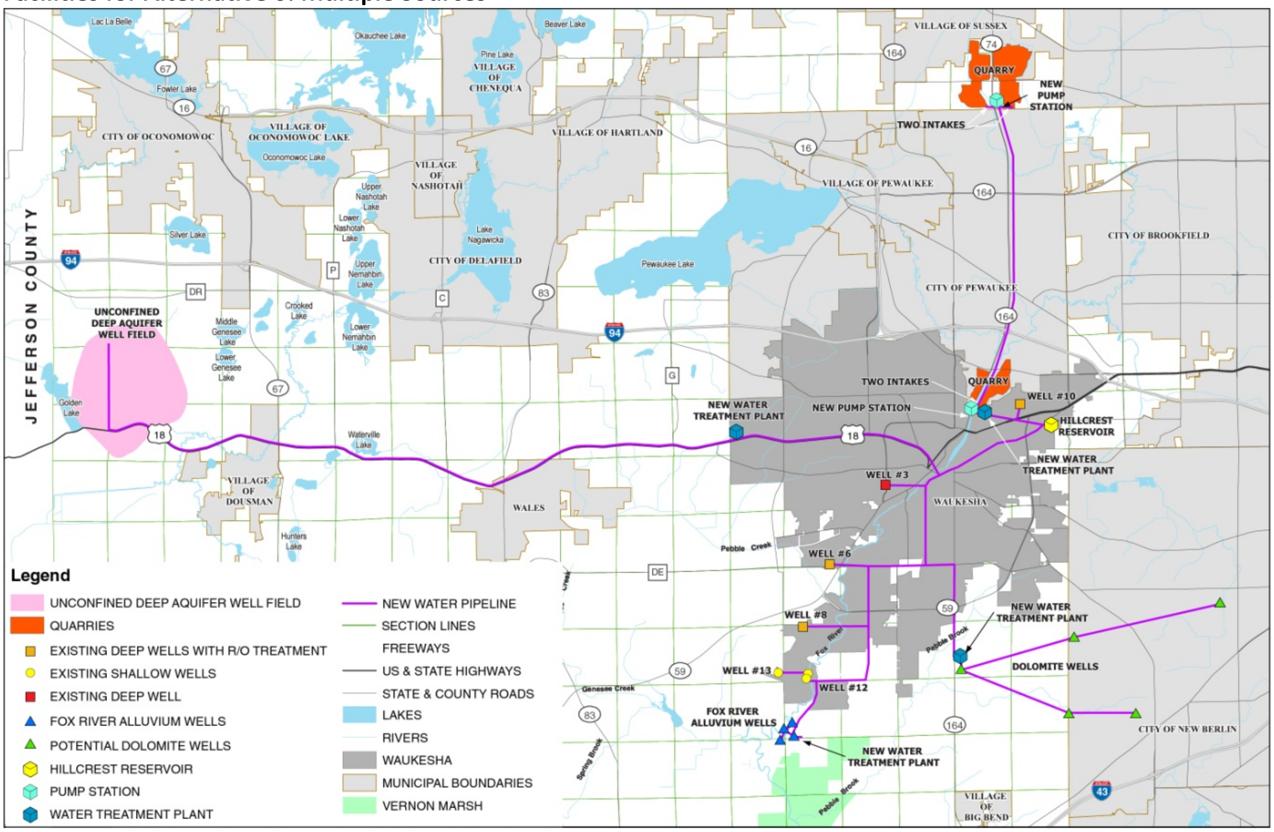
A multiple source water supply alternative was developed based on the available water resources in the area. The six water supplies in this multiple source alternative include:

- Existing deep aquifer wells in the City of Waukesha
- Existing shallow aquifer wells outside the City of Waukesha limits to the south
- New wells in the Fox River alluvium (riverbank inducement wells) outside the City of Waukesha limits to the south

- Quarries north of the City of Waukesha
- New wells in the unconfined deep aquifer west of the City of Waukesha
- New wells in the Silurian dolomite aquifer outside the City of Waukesha limits to the Southeast

A brief description of each water supply source is presented below. Facilities are shown in Exhibit 11-31. Exhibit 11-4 summarizes the water supply and treatment facilities.

EXHIBIT 11-31
Facilities for Alternative 6: Multiple Sources



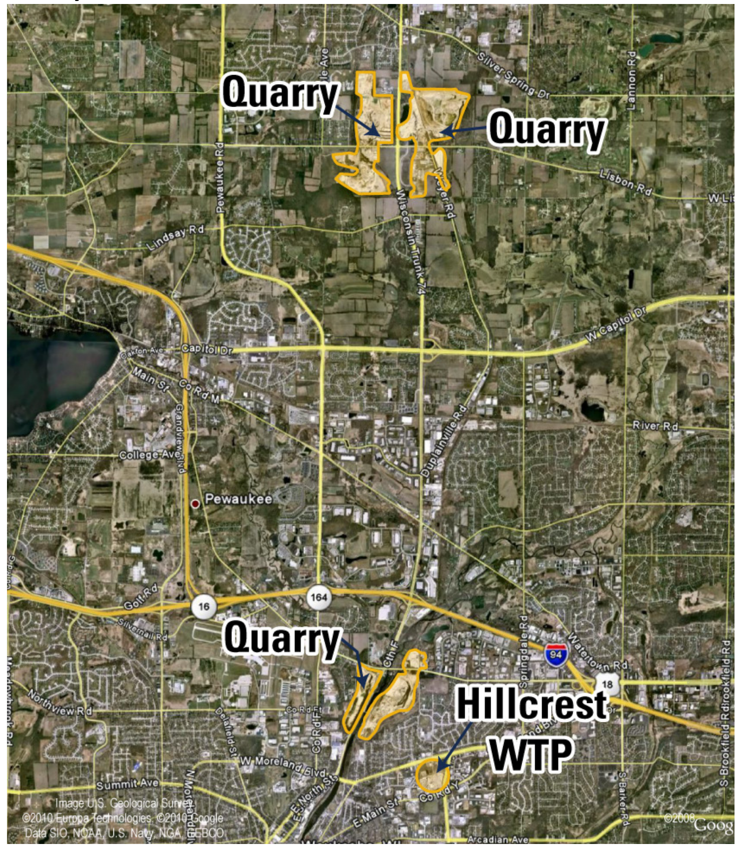
Deep Aquifer. This water supply source is described in Alternative 1. In this alternative existing deep wells (Nos. 3, 6, 8, and 10) in the City of Waukesha are used. The wells would be treated as described in Alternative 1 and piped to a blending reservoir (Hillcrest Reservoir) to provide consistent water quality to residents and protect the distribution system from corrosion and other problems from mixing different water qualities. The capacity during average day water demand would be about 2 mgd, and about 4 mgd during maximum day demand. The 2 mgd average capacity was selected because it will reduce reversing the flow of groundwater out of the Lake Michigan basin as discussed below, and increase the aquifer's water level slightly (about 50 feet).

Quarry. Potential surface water supplies north of the City of Waukesha include two active stone quarries in the town of Pewaukee WI, and two quarries in the town of Lisbon, WI. The Pewaukee quarries pump about 1 to 3 million gallons per day (mgd) and the Lisbon quarries about 3 to 6 mgd for dewatering based on 2002 to 2010 data from WDNR. All these quarries are active and not planned for drinking water supply. There are no quarries in Wisconsin used for drinking water supply, so the ability to use these quarries for water supply is questionable.

For the purposes of this evaluation it was assumed that Waukesha could access some of the water from these quarries for drinking water supply. Average day water supply was assumed to be 2.5 mgd, and about 5 mgd during maximum day demands. Less water would be available from all quarries during a drought since some of the water comes from rainfall and the rest depends on groundwater storage and recharge which is affected by drought.

Quarry water would be obtained through an intake structure in each quarry, two pump stations delivering water near the Hillcrest reservoir in Waukesha where it would be treated as surface water (Exhibit 11-31). Exhibit 11-32 shows the general location of the quarries.

EXHIBIT 11-32
Quarry Locations



Shallow Aquifer and Fox River Alluvium (Riverbank Inducement). This water source is described in Alternative 3. In this alternative, an average of 1 mgd would be pumped from existing shallow wells 11, 12 and 13, and another 1.5 mgd pumped from three new riverbank inducement wells in the Fox River alluvium. A 2.5-mgd average capacity was chosen because it uses existing facilities (wells 11 to 13), and groundwater modeling indicated that this pumping rate reduces the environmental impact compared to pumping higher capacities from this aquifer, as discussed later.

The water would be pumped to a water treatment plant, treated and pumped to the Hillcrest Reservoir for blending as shown in Exhibit 11-31.

Unconfined Deep Aquifer. This water source is described in Alternative 5. An average of 2 mgd would be pumped from the unconfined deep aquifer west of Waukesha. This capacity was chosen because groundwater modeling indicated reduced environmental impact compared to pumping higher capacities from this aquifer, as discussed later. The water would be pumped from 3 wells with a maximum capacity of about 1.5 mgd each, through a pipeline, treated to remove iron and manganese, then pumped to the Hillcrest Reservoir for blending (Exhibit 11-31).

Silurian Dolomite Aquifer. The Silurian dolomite aquifer occurs to the northeast and southeast of Waukesha. It is made up of dense, hard dolomite bedrock but has fractures that can contain and transport water. Productive wells in the aquifer are difficult to locate. A recent report estimated that a typical well could produce 0.4 to 1 mgd if properly located and developed (Ruekert-Mielke, 02/2011). This report also estimated that a total of up to 2 to 3 mgd of water could be obtained from this aquifer, if a number of assumptions were met. This may not be possible given the assumptions in the report. However, for the purposes of this alternative, it was assumed that Waukesha could locate five wells with capacities of 0.5 mgd each. The average day demand would be 1 mgd and maximum day demand 2 mgd. The water would be pumped to a water treatment plant for iron and manganese removal, then pumped to the Hillcrest reservoir for blending. Facilities are shown in Exhibit 11-31.

An evaluation of each water supply source in the multiple source alternative, based on the four criteria, follows.

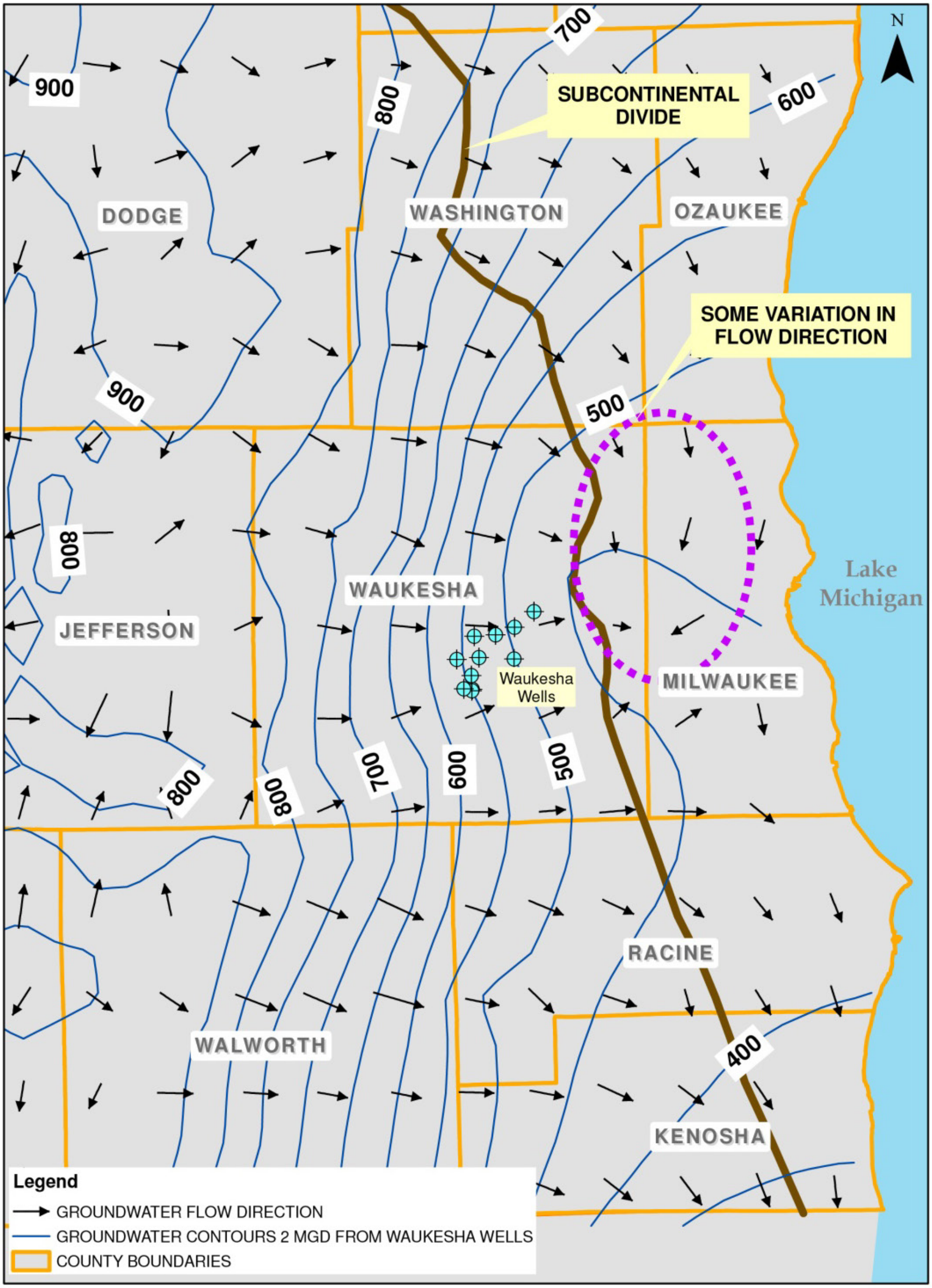
11.4.6.2 Environmental Impacts

Groundwater Resources.

Deep Confined Aquifer. Reducing pumpage from the deep aquifer lessens the adverse environmental impact of the current pumping rate. Modeling indicates that if Waukesha reduces deep aquifer pumping to about 2 mgd, reversing the flow of groundwater away from the Lake Michigan basin is significantly reduced (Exhibit 11-33; RJN Environmental Services, 02/2011). However, pumping water from the deep aquifer still reduces the amount of water that would flow to the waters of the Lake Michigan basin if no pumping occurred (Feinstein, 10/2006). In addition, deep wells in other communities would still extract water that would otherwise flow to the Lake Michigan basin.

EXHIBIT 11-33

Groundwater Flow Patterns with Reduced Pumping in Deep Aquifer



Reducing deep confined aquifer pumping to 2 mgd could create a rebound in the deep aquifer water level of about 50 feet near Waukesha (RJN Environmental Services, 02/2011). However, water levels would still be well in excess of the 150 feet of drawdown for a groundwater management area. Pumping water from the unconfined deep aquifer (another water source in this alternative) would reduce this rebound since the deep unconfined aquifer is in the recharge zone of the confined deep aquifer.

Shallow Aquifer and Fox River Alluvium. The Troy Bedrock Valley groundwater model was used to simulate shallow aquifer and Fox River alluvium groundwater drawdown with wells pumping a total of 2.7 mgd (Ruekert-Mielke for SEWRPC, 01/2010; RJN Environmental Services, 02/2011). Note that this is an average day demand value. About twice that amount would be needed during a maximum day or during a drought, increasing the environmental impacts significantly. Modeling results indicated groundwater drawdowns of 20 to 30 feet near the wells (Exhibit 11-29) (RJN Environmental Services, 02/2011).

Water extracted from the ground reduces the water that would flow naturally to wetlands, lakes, and streams (base flow). The adverse environmental impacts are less than those from pumping the entire Waukesha water demand from this aquifer (See Alternative 5).

Deep Unconfined Aquifer

A portion of the water pumped from the unconfined deep aquifer is induced from surface waters. This water is transferred from the Rock River watershed to the Fox River watershed when discharged from the Waukesha wastewater treatment plant. Transferring water from the Rock River system by pumping municipal wells for the City of Waukesha water supply and sending the water to the Fox River basin (inter-basin transfer) would raise concerns about diminished flow in the Rock River system.

Groundwater modeling at 2 mgd indicates that the unconfined sandstone aquifer drawdown is about 40 feet as shown in Exhibit 11-34 (RJN Environmental Services, 02/2011). Groundwater drawdown in the upper portion of the aquifer is shown in Exhibit 11-35. The groundwater drawdown at 2 mgd is much lower than when pumping 10 mgd (Alternative 5).

Note that modeled groundwater drawdown extends into Jefferson and Waukesha counties. The drawdown indicated is additional drawdown from current groundwater levels. Groundwater in the unconfined deep aquifer is already about 100 feet below predevelopment groundwater levels in some areas near Oconomowoc, so actual drawdown from predevelopment is close to the 150 foot drawdown that could trigger regulations for a groundwater management area.

Quarry. Groundwater levels will not change significantly by using the quarries as a water supply source since the water is already extracted and discharged into the Fox River. If the quarries were allowed to partially fill with water, groundwater levels in the shallow aquifer near the quarries could actually increase.

Silurian Dolomite Aquifer. Withdrawing water from the dolomite aquifer would lower groundwater levels, but the impact was not modeled. Since this alternative is withdrawing a relatively small amount of groundwater over a large area, the impact on groundwater levels is reduced from pumping higher amounts from a smaller area.

Aquatic Habitat.

Deep Aquifers. Water pumped from the deep aquifer removes water that would otherwise be available to local surface water resources. The USGS and WGNHS indicate that 70 percent of water pumped from the deep aquifer would have gone to inland surface waters. The remaining 30 percent originates from inside the Lake Michigan basin and 4 percent of that is contributed by Lake Michigan (Feinstein, 10/2006). Reducing natural flows to surface waters by pumping the deep aquifer has adverse environmental impacts both inside and outside the Lake Michigan basin. However, these impacts are reduced at lower pumping rates.

EXHIBIT 11-34

Groundwater Drawdown in Unconfined Deep Aquifer at 2 mgd

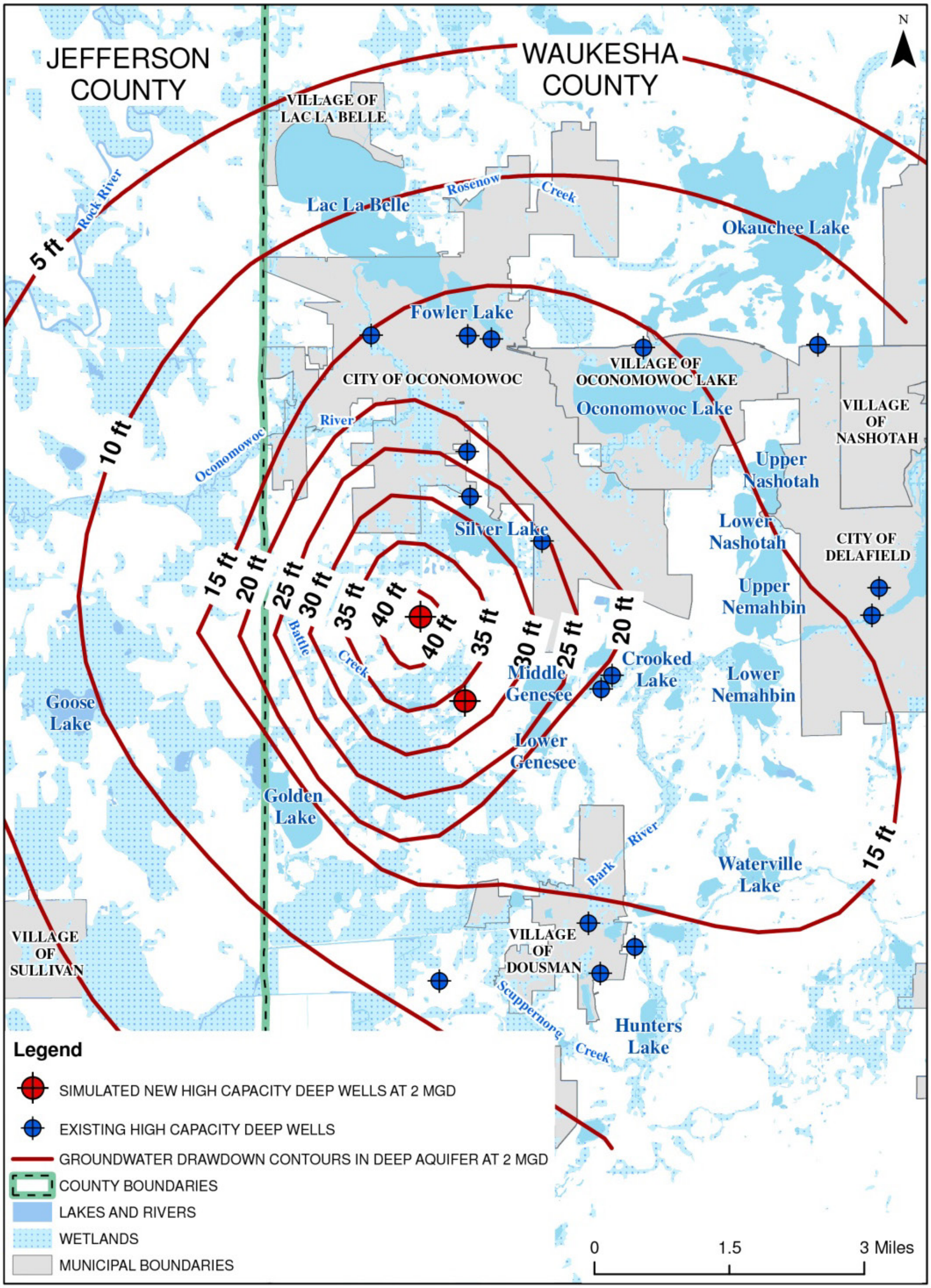
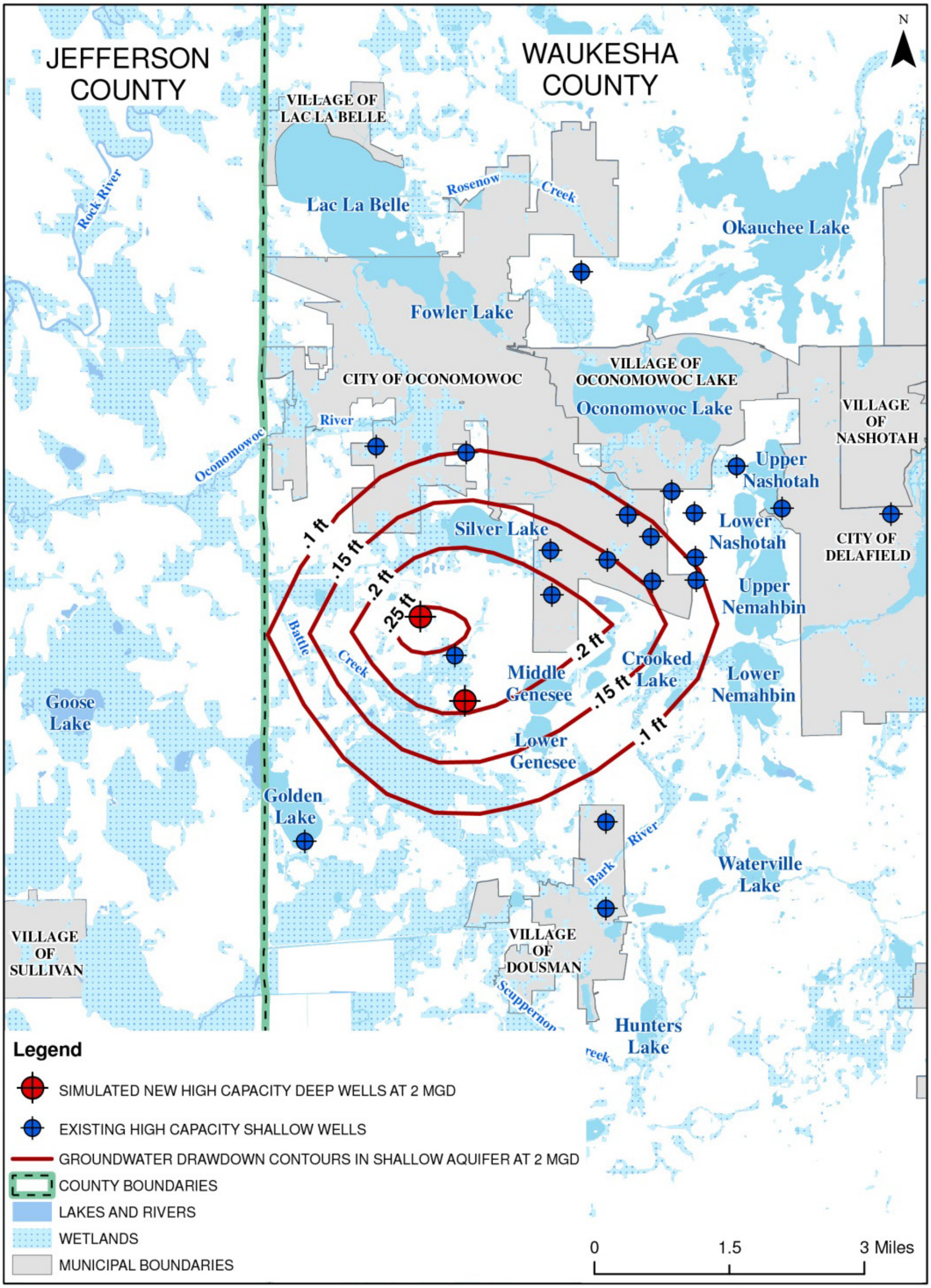


EXHIBIT 11-35

Groundwater Drawdown in Shallow Aquifer at 2 mgd



In the unconfined deep aquifer, baseflow reductions ranged from 1 to 5 percent in most surface water sources at 2 mgd (RJN Environmental Services, 08/2013). Greater than 5 lakes are affected, but the drawdown is less than in Alternative 5.

Shallow Aquifers. Pumping the shallow aquifer and Fox River alluvium (riverbank inducement) can cause adverse environmental impacts on ground and surface water resources. Pumping lesser quantities of water will reduce the environmental impacts. A groundwater drawdown of 1 foot is significant in a wetland as it may affect root structures of aquatic plants. Exhibit 11-36 (see next page) shows the area affected by a 1-foot drawdown. Near Vernon marsh, 1,252 wetland acres are in the 1 foot drawdown contour and 237 acres are in the 5 foot drawdown contour. The area is less than that from pumping the entire Waukesha water supply from this aquifer, as described in Alternative 3. Note that water pumped from the Silurian dolomite was not included in the groundwater modeling runs and could increase drawdown if pumped at the same time.

Water extracted from the ground reduces the water that would flow naturally to wetlands, lakes and streams (base flow). The model estimated that base flow would be reduced, as shown in Exhibit 11-37 with this alternative (RJN Environmental Services, 08/2013). This baseflow reduction is in the area of well influence, and can have adverse environmental impacts to the water ecosystems. However, the adverse impact is less than pumping the entire Waukesha water supply from this aquifer. Another study estimated significant baseflow reductions would occur near Waukesha when 3.9 mgd of shallow groundwater was pumped and artificial recharge was used (Cherkauer, 09/2009).

EXHIBIT 11-37
Baseflow Reduction in Streams with Shallow Aquifer Pumping for a Total of 2.7 mgd

Resource	Baseflow Reduction (%)
Fox River	3
Pebble Brook	2
Mill Creek	1
Mill Brook	53

Under this scenario, water also would be drawn from the Fox River through the riverbank wells. After use the water would be discharged back to the Fox River from the wastewater treatment plant upstream of the withdrawal location to reduce impacts on Fox River baseflow.

Quarry. The quarries currently collect rain water, surface water runoff and groundwater seeping into the quarry and pump it to the Fox River. Using this water for public drinking water supply would not significantly increase the current environmental impact based on groundwater drawdown and impact on wetlands. Baseflow in the Fox River would be reduced slightly between the quarries and the wastewater plant since the water would be discharged downstream of the quarries.

Silurian Dolomite Aquifer. Withdrawing water from the dolomite aquifer induces more recharge from the shallow aquifer and reduces the amount of water that may have been available to surface waters. Since this alternative is withdrawing a relatively small amount of groundwater over a large area, the impact on the environment is reduced.

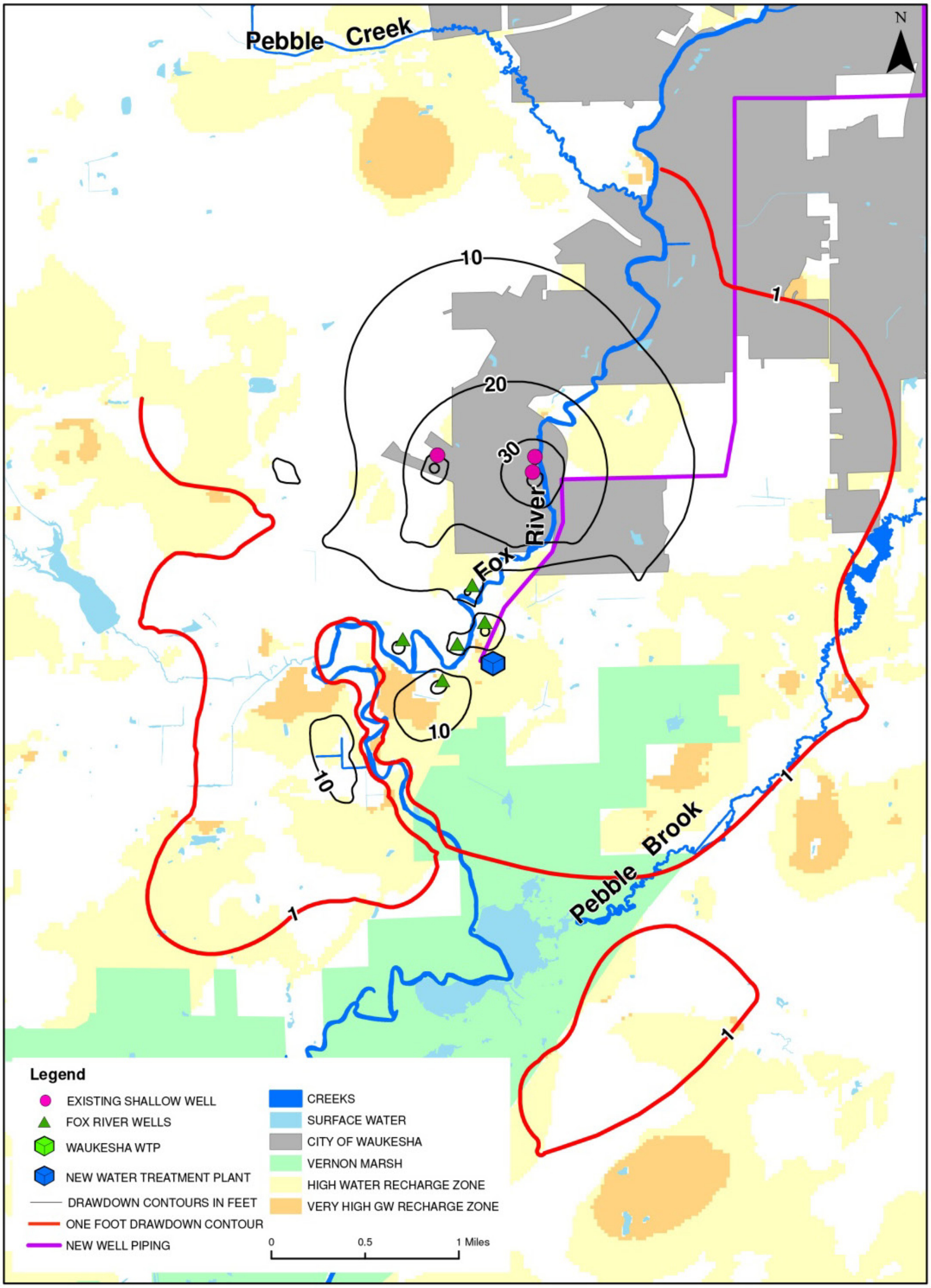
Deep and shallow groundwaters, Silurian dolomite water, and quarry water are all hard waters, encouraging use of home water softeners. Continued and expanded use of water softeners increases salt discharge into the environment (Estimated that Waukesha discharges 7.4 million pounds of salt into the Fox River each year from home water softeners through current supply from the deep confined aquifer). Continued use of hard groundwater would increase water and energy use while degrading conservation efforts.

It is estimated that this alternative would discharge more than 24,000 tons of greenhouse gases a year (carbon dioxide equivalent) through pumping from aquifers, quarry, water treatment, and pumping from the wellfield to Waukesha.

Water transmission mains extending from the wellfields and quarries to the treatment plant, and from the treatment plant to Waukesha, would have environmental impacts during construction. Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives contains additional information on environmental impacts.

EXHIBIT 11-36

Groundwater Drawdown in Shallow Aquifer Pumping 2.7 mgd



Considering the environmental impacts of this alternative, a rating of “significant adverse impact or risk” was applied. Reduced pumping from the deep aquifer would reduce the drawdown, but levels would still be well in excess of 150 feet below predevelopment. Extracting water from the shallow aquifer and riverbank inducement wells has significant adverse wetland impacts, even at lower withdrawal rates. Baseflow reduction in Mill Brook is over 50 percent. Over 1,000 acres of wetlands are adversely affected. This alternative also has the highest greenhouse gas emissions of all the alternatives due to extensive pumping and treatment from multiple sources.

11.4.6.3 Long-Term Sustainability

Water Returned to Original Source. None of the water pumped from the deep aquifer or Silurian dolomite aquifer is returned to its original source. All of this water is transferred to the Fox River and eventually to the ocean. Some of this water (deep aquifer) originated from the Lake Michigan basin.

The quarry water comes from rainfall and shallow groundwater discharge. This water is currently pumped into the Fox River. Some of this water would have flowed into the Fox River naturally through runoff and groundwater discharge. In this water supply alternative, the water would be returned to the Fox River, but downstream of the quarries at the Waukesha wastewater treatment plant.

Some of the Fox River alluvium water is returned to its source through the wastewater treatment plant effluent upstream of the wellfield. Assuming half the water from these wells originates from the river, 7 percent of the total water supply is returned to its original source.

Drought Impact. The deep aquifer is not significantly affected by drought, since the shale confining layer above the aquifer limits recharge near Waukesha. The aquifer is mainly recharged about 12 miles west of Waukesha where the shale confining layer subsides. However, pumping from the deep unconfined aquifer west of Waukesha reduces recharge and makes the deep confined aquifer less sustainable.

The shallow aquifer depends on rainwater for recharge and is less reliable during drought conditions, when water supply is needed most (see Alternatives 1 and 3).

The unconfined deep aquifer is less susceptible to drought than shallow aquifers, but will still be affected by limited recharge. The unconfined deep aquifer is in the recharge zone for that aquifer, making it more reliable from a production standpoint than the deep confined aquifer or shallow aquifers.

Drought will significantly impact water supply from the quarry since it depends on rain and shallow groundwater for water supply, both of which are adversely affected by drought. In addition, any water that is stagnant in the quarry during a drought could undergo adverse water quality impacts such as algae growth and hydrogen sulfide formation that affect public perception and could affect public health.

Although each individual water supply source in this alternative can be affected by drought, having multiple water supply sources make this alternative less susceptible to drought than alternative 3, which relies on one source that is affected by drought.

Considering the long-term sustainability of this alternative, a rating of ”significant adverse impact or risk” was applied. Less than 50 percent of the water is returned to its original source and many of the water supply sources (shallow aquifers, quarries) are significantly affected by drought.

11.4.6.4 Public Health

Contaminants. There are 400 potential sources of contamination in the deep aquifer (241), shallow aquifer (12), quarries (127) and Silurian dolomite aquifer (20) (WDNR, 07/2012). Of the 400 potential contamination sites, 19 sites were found to contain SOCs.

The deep confined aquifer exceeds drinking water radium and gross alpha regulations. While drinking water regulations can be met with proper treatment, if there is a malfunction in the treatment process or if new contaminants appear, the public may be exposed to the contaminants. However, since a smaller proportion of the total water supply is obtained from this source, the potential for radium exposure is less.

The shallow aquifer has the potential to exceed arsenic regulations in some areas, is susceptible to agricultural chemicals and can expose the public to greater risk. Shallow aquifers are more susceptible to contamination than deep confined or unconfined aquifers. The shallow wellfield is outside the City limits, and, as a result, the City would have limited zoning control to enforce a wellhead protection ordinance to protect the well.

Riverbank inducement wells in the Fox River alluvium withdraw part of their water from the Fox River. The water is used, treated at the wastewater treatment plant, and discharged back into the Fox River upstream of the wells. This reuse practice can increase contaminants and reduce public health protection. Over time, this practice will also increase salts in the water because home softening salt continuously is added to the water. High chlorides may exceed discharge permit regulations and cause expensive treatment to be implemented. Both of these factors reduce public health protection.

Using an open surface water quarry as a water supply source increases the potential for contamination from surface water, groundwater or activities in the quarry. Quarry operations use fuels and solvents that can contaminate groundwater. Although contaminated water can be treated, the contaminants must be known ahead of time so that the proper treatment technology can be built into the treatment plant to protect public health.

Surface water treatment would be required at a minimum for this water source. If other contaminants that cannot be removed by conventional surface water treatment were discovered, additional treatment would be required. Depending on the contaminant, this could significantly increase capital and operating costs.

Supplementing quarry water with water directly from the Fox River may increase the quantity of water available, but the environmental, public health, and regulatory concerns increase. Diverting surface water into direct contact with groundwater will have regulatory impacts. Storing water in a quarry would cause stagnation and adverse water quality impacts such as algae growth, lack of oxygen and release of undesirable compounds such as iron, manganese and hydrogen sulfide that can cause “rotten egg” odors in the water. Some algae are known to release toxins into the water. This would increase treatment requirements and reduce public health protection.

A report on the Silurian dolomite aquifer states: “The Silurian dolomite contains numerous fractures, voids and bedding plane enlargements that often act as open conduits for groundwater migration. Groundwater can flow through these open conduits rapidly, both horizontally and vertically, without any significant filtration. As a result, any contamination that enters the aquifer can be transported from hundreds to thousands of feet without significant attenuation.” (Ruekert-Mielke, 02/2011) This condition can cause wells to have adverse public health and environmental impacts by spreading contamination. There is significant potential for contamination in the Silurian dolomite given the fractured nature of the aquifer and potential sources of contamination. Treatment to remove contaminants is possible, but it must be in place for the specific contaminant encountered to be effective. With the wide range of potential contaminants, public health protection is reduced, and wellhead protection and monitoring must be relied on more heavily. Since this aquifer is outside the City of Waukesha limits, implementing a wellhead protection plan will be much more difficult.

Treatment. This alternative requires seven water treatment plants treating six different water sources. Treatment ranges from conventional groundwater and surface water treatment, to arsenic and radium removal. This alternative assumes than no other contaminant source enters the water suppliers. In addition, blending water from six different sources makes treatment and maintaining a consistent water quality difficult. This can impact water quality and impacts on distribution systems and home plumbing.

Considering the public health impacts of this alternative, a rating of “significant adverse impact or risk” was applied. There are many potential sources of contaminants and currently conventional treatment plus treatment for two additional contaminants is required.

11.4.6.5 Implementability

Facilities. In this alternative, Waukesha would operate and maintain four wellfields, four quarries, seven treatment plants, five pump stations, and 51 miles of pipelines. Waukesha would also have six different water qualities to blend (deep aquifer, unconfined deep aquifer, shallow aquifer, Fox River alluvium, Silurian dolomite and quarry) and try to provide a consistent water quality to customers for public health protection and distribution system water quality. This will make operation and maintenance of the water utility much more complex. This complex system reduces implementability.

Wells Affected. This water supply would impact 1,252 private wells within the 1 foot groundwater drawdown contour line and 237 private wells within the 5 foot groundwater drawdown contour line. Eight municipal wells are affected within the 10 foot groundwater drawdown contour line and 105 non-municipal, non-private wells are affected within the 15 foot groundwater drawdown contour.

Government Entity Coordination. Seventeen government entities are anticipated to require coordination to construct the water supply facilities.

- City of Waukesha
- Town of Waukesha
- Waukesha County
- Jefferson County
- Town of Pewaukee
- Town of Delafield
- Town of Genesee
- Town of Summit
- Town of Lisbon
- Village of Dousman
- Village of Wales
- City of Oconomowoc
- Village of Oconomowoc Lake
- Village of Nashotah
- City of Brookfield
- Village of Sussex
- State of Wisconsin

Land purchase and easement requirements for the water supplies are mostly out of the city of Waukesha. Lack of zoning control over adjacent lands will make wellhead protection difficult.

In addition to the technical basis for determining that the groundwater supply may not be implementable due to its unreliability as a supply source, relying on groundwater is uncertain from a legal perspective as discussed under Alternative 1 (page 11-23)

If new wells need to be installed in the future because of declining water levels in existing wells or the need to locate wells farther from surface water resources, wells may need to be located a greater distance from Waukesha. Locating wells farther from Waukesha would increase costs, energy usage, and legal/public concerns. The environmental and legal impacts described above would become more severe.

Riverbank inducement wells in the Fox River alluvium withdraw some of their water from the Fox River. The water is used, treated at the wastewater plant, and discharged back into the Fox River upstream of the wells. This reuse practice requires approval by WDNR and thus may jeopardize implementation. In addition, this water supply alternative may change the designation of the Fox River to a drinking water source, which may increase future wastewater treatment requirements for all facilities discharging into the Fox River, including Waukesha, Brookfield and Sussex.

Finding locations for adequate water supply within the Silurian dolomite is uncertain. If wells are located, they will be farther from the City of Waukesha. This makes implementation more difficult. The ability of finding and developing adequate wells in the Silurian dolomite aquifer depends on many factors including the ability to obtain land in favorable areas outside Waukesha City limits and adequate water quality.

The quarries are outside the City of Waukesha limits, owned and operated by private companies and not planned for future drinking water use. Future use or ownership of the quarry may jeopardize long-term use of the quarry as a water supply source. Even if Waukesha were able to purchase the quarries or obtain use of their water, there are significant water quality and public health concerns that may not allow their use for drinking water. Permits from the WDNR and permission from the owners of the quarry would be required. The high potential for contamination makes permitting more difficult. Since no quarries are used for drinking water in Wisconsin, permits may not be granted.

Water transmission mains would need to be constructed from water supplies to the treatment plant, and from the treatment plant to Waukesha. This would require easements, and construction through rural and urban conditions.

Considering the implementability of this alternative, a rating of “significant adverse impact or risk” was applied.

Exhibit 11-38 summarizes the criteria for this multiple source water supply alternative.

EXHIBIT 11-38
Summary of Evaluation Criteria for Multiple Source Alternative

Major Criteria	Subcriteria	Rating	Overall
Environmental Impact	Groundwater resources	●	●
	Aquatic habitat	●	
Long-Term Sustainability	Water returned to original source	●	●
	Supply affected by drought	⭘	
Public Health	Contamination	●	●
	Treatment requirements	●	
	Ability to produce consistent water quality	●	
Implementability	Operation and maintenance complexity	●	●
	Land sites	●	
	Government entity coordination	●	
	Wells affected	●	

○ No adverse impact ⭘ Moderate adverse impact
⊙ Minor adverse impact ● Significant adverse impact

11.4.7 Summary of Water Supply Alternatives Evaluation

Major studies previously conducted by the City of Waukesha (CH2M HILL and Ruekert-Mielke, 03/2002; RJN Environmental Services, 02/2011 and 08/2013) and others (SEWRPC, 12/2010; Cherkauer, 09/2009) evaluated the water supply alternatives for the City of Waukesha. Fourteen water supply sources were considered. Through these studies, potentially feasible water supply options were identified. Six alternatives for Waukesha's water supply were evaluated in detail:

1. Deep and shallow aquifers
2. Lake Michigan
3. Shallow aquifer and Fox river alluvium
4. Lake Michigan and shallow aquifer
5. Unconfined deep aquifer
6. Multiple sources (deep and shallow aquifers, quarries)

Each alternative was evaluated against four criteria:

- Environmental impact
- Long-term sustainability
- Public health
- Implementability

Exhibit 11-39 summarizes the water supply alternatives evaluation results based on the water supply alternatives evaluation criteria. The Lake Michigan water supply alternative has the least adverse environmental impacts, is the most sustainable, and most protective of public health. A Lake Michigan water supply with return flow is clearly the most environmentally sustainable alternative for the City's long-term water supply needs.

Exhibit 11-40 compares some of the key environmental impacts of groundwater supply alternatives to a Lake Michigan supply alternative. Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives, contains greater detail.

According to scientific evidence and studies, the adverse environmental impacts of the City pumping the deep and shallow aquifers are much greater than those likely to result from the proposed Great Lakes diversion.

EXHIBIT 11-39
Summary of Water Supply Alternatives Evaluation

	Major Criteria			
Water Supply Alternatives	Environmental	Long-Term Sustainability	Public Health	Implementability
1. Deep and shallow aquifers	●	●	●	●
2. Lake Michigan with return flow	⊙	○	⊙	◎
3. Shallow aquifer and riverbank inducement	●	●	●	●
4. Lake Michigan and shallow aquifer	●	◎	◎	●
5. Unconfined deep aquifer	●	◎	⊙	●
6. Multiple sources	●	●	●	●

○ No adverse impact or risk
⊙ Minor adverse impact or risk
◎ Moderate adverse impact or risk
● Significant adverse impact or risk

EXHIBIT 11-40
Summary of Key Impacts of Groundwater versus Lake Michigan Water Supplies

	Groundwater Alternatives	Lake Michigan Alternative with Return Flow
Wetland area permanently adversely affected	480 to greater than 4,000 acres	Less than 0.1 acre
Water returned to its source	0 to 25%	100%
Groundwater drawdown	90 to 600 feet	Groundwater level recovery
Existing wells affected	170 to greater than 3,400	0
Water quality in streams or lake	Chloride variance required for some alternatives	Meets water quality requirements
Baseflows	Stream segment baseflow reduction in three to five rivers, lakes, and streams	Stream segment baseflow reduction in one river

The comparative analysis of water supply alternatives shows that eliminating the pumping of the deep and shallow aquifers would eliminate a number of adverse environmental impacts and improve groundwater resources of the Great Lakes basin; assist the recovery of both surface and groundwater resources; assist in the restoration of the natural flow system wherein the deep aquifer feeds the Waters of the Great Lakes; benefit habitat restoration and fisheries of Great Lakes tributaries through the return flow; and eliminate the diversion of water from the Lake Michigan basin to the Mississippi River basin. Switching from groundwater to a Lake Michigan supply will result in a positive net benefit to the environment versus continued or increased adverse impacts resulting from the City's use of groundwater.

The scientific evidence, technical studies, and evaluation of environmental impacts support the diversion exception criterion: that the City lacks an adequate supply of potable water (Volume 2, City of Waukesha Water Supply Service Area Plan, Section 7). The groundwater supply in the deep aquifer is severely depleted, exceeds radium regulations and is not a reliable source to meet future needs. The quantity of water that can be withdrawn from the shallow aquifer for potable water supply is limited, because increased pumping would severely reduce the quantity of water available for local streams, brooks, and wetlands and thus harm the environment (Volume 5, City of Waukesha Environmental Report for Water Supply Alternatives). The City lacks a water supply that is sustainable in the long term to meet reasonable demands for a water supply in the quantity and quality that complies with applicable drinking water standards, is protective of public health, and does not have adverse environmental impacts greater than those likely to result from the proposed Great Lakes diversion.

11.4.1 Reasonable Water Supply

"'Reasonable water supply alternative' means a water supply alternative that is similar in cost to, and as environmentally sustainable and protective of public health as, the proposed new or increased diversion and that does not have greater adverse environmental impacts than the proposed new or increased diversion." Wis. Stat. § 281.346(1)(ps).

Compared to a Lake Michigan water supply with return flow, the other water supply alternatives create greater adverse environmental impacts, are less environmentally sustainable, and are less protective of public health. None of the other water supply alternatives are reasonable (Volume 1, City of Waukesha Application Summary, Section 2.4).

A Lake Michigan supply also complies with the Compact decision-making standard for reasonable use. See Compact section 4.11.5; see also Wis. Stat. § 281.346(6)(e) and Exhibit 11-41. Exhibit 11-41 summarizes each water supply alternative's compliance with Compact section 4.11.5 and Wis. Stats on reasonable use. It is not intended to be an all-inclusive listing of the pros and cons of the evaluated water supply alternatives. None of the groundwater supply alternatives comply with this decision-making standard and are, therefore, not reasonable.

11.4.2 Water Supply Planning Principles

The community water supplies planned for the long term (50 years or more) must use high quality, reliable, sustainable water sources. Failing to invest in water supply infrastructure that serves a community for the long-term results in paying for water supply development twice or more, the later investment coming due when water sources are depleted or cannot be accessed because of regulations or lawsuits.

A main principle of public drinking water supply planning is to obtain the water supply source with the highest quality and most reliability.

The American Water Works Association Statement of Policy on Public Water Supply Matters, Drinking Water Quality states: "All water utilities should deliver to the consumer drinking water that meets or surpasses all standards established by regulatory agencies. This objective is achieved most economically and effectively when the source water is taken from the highest-quality water source available. . . ."

Recommended Standards for Water Works, a well-known guide to drinking water system design published by the Great Lakes–Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers states: "Each water supply should take its raw water from the best available source which is economically reasonable and technically possible."

Wisconsin Department of Natural Resources Administrative Code NR 811.21 states: "The source of water selected as a surface water supply shall be from the best available source which is practicable. The source shall provide the highest quality water reasonably available which, with appropriate treatment and adequate safeguards, will meet the drinking water standards in ch. NR 809."

Based on its extensive technical analyses conducted over a period of many years, the City concludes that a Lake Michigan water supply adheres to the proven public water supply selection principles referred to above. A Lake Michigan water supply is the most reliable water supply alternative and the most protective of the environment and public health. Returning Lake Michigan water back to its original source is also the most environmentally sustainable and beneficial method for managing water resources. The other water supply alternatives are less reliable, less protective of public health, and less environmentally sustainable.

11.5 Conclusions

Based on its extensive technical evaluation of the various water supply alternatives, the City determined that its current water supply is unsustainable and that it needs a new water supply. A Lake Michigan water supply with return flow for the City will benefit the environment and public health as follows:

- Termination of deep aquifer pumping, which will help restore both the severely depleted groundwater levels and the natural groundwater flow regime towards the Great Lakes basin instead of away from it.

EXHIBIT 11-41

Compact Decision-Making Standard: Reasonable Use of Water

	Water Supply Alternatives					
Compact Section 4.11.5	**1. Deep and Shallow Aquifers**	**2. Lake Michigan with Return Flow**	**3. Shallow Aquifers**	**4. Lake Michigan and Shallow Aquifers**	**5. Unconfined Deep Aquifer**	**6. Multiple Sources**
a. Whether the proposed Withdrawal or Consumptive Use is planned in a fashion that provides for **efficient use of the water, and will avoid or minimize the waste of Water (*see also* Wis. Stat. § 281.346(6)(e)1.)**	● All water is **not** returned to source, resulting in inefficient use and waste.	○ All water is returned to source, resulting in efficient use and no waste.	● All water is **not** returned to source, resulting in inefficient use and waste.	● All water is **not** returned to source, resulting in inefficient use and waste.	● All water is **not** returned to source, resulting in inefficient use and waste.	● All water is **not** returned to source, resulting in inefficient use and waste.
c. The **balance between economic development, social development and environmental protection** of the proposed Withdrawal and use and other existing or planned withdrawals and water uses sharing the water source **(*see also* Wis. Stat. § 281.346(6)(e)3.)**	● Significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.	○ **No** significant adverse environmental impacts.	● Significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.	● Significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.	● Significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.	● Significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.
d. The **supply potential of the water source, considering quantity, quality, and reliability and safe yield** of hydrologically interconnected water sources **(*see also* Wis. Stat. § 281.346(6)(e)4.)**	● Supply limited by environmental impacts, drought. Does not improve safe yield of hydrologically interconnected water sources.	○ Supply **not** limited by environmental impacts or drought. Improves safe yield of hydrologically interconnected water sources.	● Supply limited by environmental impacts, drought. Does not improve safe yield of hydrologically interconnected water sources.	● Supply limited by environmental impacts, drought. Does not improve safe yield of hydrologically interconnected water sources.	● Supply limited by environmental impacts. Does not improve safe yield of hydrologically interconnected water sources.	● Supply limited by environmental impacts, drought. Does not improve safe yield of hydrologically interconnected water sources.
e. The probable degree and duration of any **adverse impacts** caused or expected to be caused by the proposed Withdrawal and use under foreseeable conditions, **to other lawful consumptive or non-consumptive uses of water** or to the quantity or quality of the Waters and Water Dependent Natural Resources of the Basin, and the proposed plans and arrangements for avoidance or mitigation of such impacts **(*see also* Wis. Stat. § 281.346(6)(e)5.)**	● Other drinking water wells affected, significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.	○ No other drinking water wells affected, **no** significant adverse environmental impacts.	● Other drinking water wells affected, significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.	● Other drinking water wells affected, significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.	● Other drinking water wells affected, significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.	● Other drinking water wells affected, significant adverse environmental impacts on lakes, streams, springs, wetlands, aquifers.

EXHIBIT 11-41

Compact Decision-Making Standard: Reasonable Use of Water

	Water Supply Alternatives					
Compact Section 4.11.5	**1. Deep and Shallow Aquifers**	**2. Lake Michigan with Return Flow**	**3. Shallow Aquifers**	**4. Lake Michigan and Shallow Aquifers**	**5. Unconfined Deep Aquifer**	**6. Multiple Sources**
f. If a Proposal includes **restoration of hydrologic conditions and functions of the Source Watershed**, the Party may consider that **(*see also* Wis. Stat. § 281.346(6)(e)6.`)**	● Deep aquifer pumping reduced but **not** eliminated. Hydrologic conditions and functions of the Great Lakes basin adversely affected.	○ Deep aquifer pumping eliminated to help restore hydrologic conditions and functions of the Great Lakes basin.	○ Deep aquifer pumping eliminated to help restore hydrologic conditions and functions of the Great Lakes basin.	○ Deep aquifer pumping eliminated to help restore hydrologic conditions and functions of the Great Lakes basin.	● Deep aquifer pumping **not** eliminated. Hydrologic conditions and functions of the Great Lakes basin adversely affected.	● Deep aquifer pumping reduced but **not** eliminated Hydrologic conditions and functions of the Great Lakes basin adversely affected.

○ Meets decision-making standard ● Does not meet decision-making standard

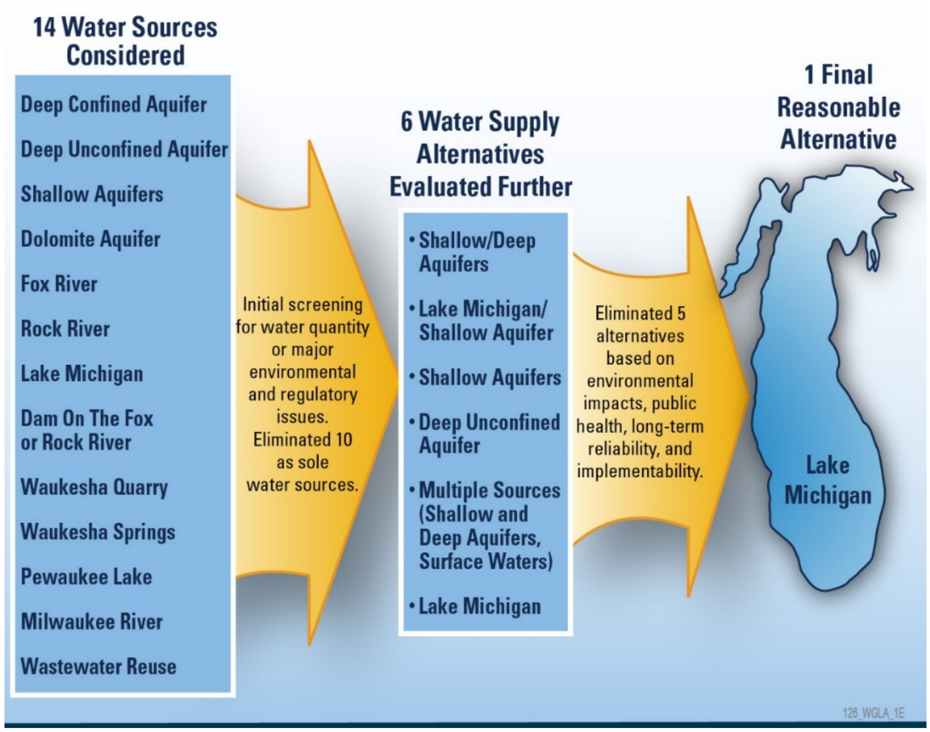
- Adverse environmental impact on lakes, streams, wetlands, and springs from using groundwater will be eliminated.
- The water volume will be returned continuously to the Great Lakes, so there will be no impact on lake levels. Recycling the water in an environmentally sustainable manner through a Great Lakes tributary will enhance aquatic habitat and fisheries, and minimize the waste of water. Returning the water to a Lake Michigan tributary creates a positive precedent for using treated wastewater as a beneficial environmental resource and minimizes introduction of out-of-basin water to the Great Lakes. There will be no adverse impacts to the quality or quantity of water in the Great Lakes.
- The amount of radium and salt released into the environment will be reduced or eliminated because radium containing groundwater will no longer compose the City's water supply and because water softener use will no longer be necessary on a wide scale.

A Lake Michigan water supply for the City is sustainable, protective of the environment and protective of public health. Switching from groundwater to a Lake Michigan supply results in more effective management and improvement of the waters and water-dependent natural resources of the Great Lakes basin.

In contrast, the other water supply alternatives are not reasonable because they have greater adverse environmental impacts, are not sustainable and are less protective of public health.

An extensive analysis of the City's water supply alternatives demonstrates that a Lake Michigan water supply with return flow and continued conservation in accordance with the Compact is the only reasonable water supply alternative for the City (Exhibit 11-42) (Compact Article 4, Section 4.9.3.d and § 281.346(4)(e)1.d., Wis. Stats.). A Lake Michigan supply also complies with the Compact's decision-making standard for reasonable use (Compact Article 4, Section 4.11.5). None of the other water supply alternatives comply with this standard and are therefore not reasonable.

EXHIBIT 11-42
One Reasonable Water Supply Alternative



The Lake Michigan alternative provides a net environmental benefit for the waters and water dependent natural resources of the Mississippi River and Lake Michigan basins, is the most reliable and environmentally sustainable in the long term and provides the most public health protection.

12. Intergovernmental Agreements and Approvals

The applicable intergovernmental approvals of the City WWSA Plan by the municipal jurisdictions included in the service area are attached in Appendix F. Also attached is a letter of intent from the Oak Creek Water and Sewer Utility to the City of Waukesha to supply potable water to the City's WWSA.

At this time, there are no wholesale agreements between the City and its current customers located outside the City municipal boundary.

At this time, there are no mutual aid agreements between the City and other public water systems.

13. Public Participation

The City conducted numerous public meetings that included discussion of the future water supply and planning area issues. During those meetings, the public had opportunities to ask questions and to make comments. Appendix G contains a list of the meetings that took place over the past 7 years, a list of comments received, a list of frequently asked questions with answers, and other public information materials.

The topics discussed generally included the following:

- Long-term water supply planning
- Population projections and water demand forecasts
- Declining groundwater supply sources
- Sustainable water resources management
- Various water supply alternatives
- City's Application for a Lake Michigan Diversion with Return Flow
- Developing additional shallow aquifer wells
- Water conservation planning
- Legal issues associated with water supplies located outside the City's jurisdiction

14. Implementing and Enforcing the Plan

The City has an established record for thorough and continuous public water system planning. Its proven process helps the City to identify and investigate alternatives, define and prioritize capital improvements, improve operating efficiency, and proactively meet regulatory requirements. The City updates its Water System Master Plan and Water Conservation Plan every 5 years. The City Water Utility Commission and City Council formally adopt water system planning documents. The WSSA Plan was adopted in April 2010. Revisions to the WSSA Plan were made to reflect subsequent evaluations made in response to WDNR requests, new administrative rules, and updated information.

To implement the WSSA Plan effectively, the City continuously invests resources in the following:

- Participation in regional water supply planning and county comprehensive planning
- Membership in the Wisconsin Groundwater Advisory Committee
- Membership in the Wisconsin Water Conservation Coalition
- Evaluation of water supply sources
- Analysis of water use by its customers
- Understanding its water system assets and performance
- Water conservation program development and implementation
- Replacement of aging infrastructure at a rate of 1 percent per year
- Forecasting future water demands
- Evaluation of alternative plans to meet future needs
- Engaging the public in water supply planning and water conservation measures

To enforce the WSSA Plan, the City will use various practices and procedures already in place to enforce conformance with a broad spectrum of requirements including water use fees established by utility tariffs, water use restrictions set forth in the water conservation plan, water metering requirements, cross-connection control, and many other state and federal regulations.

15. References

AECOM. 05/2006. *Water System Master Plan, Waukesha Water Utility*.

AECOM. 03/2012. *Water Model Update and Capital Improvement Planning, Waukesha, Wisconsin*.

AECOM. 6/2013. *Draft Technical Memorandum Water Demand Projections, Waukesha, Wisconsin.*

AWWA. 2008. *Forecasting Urban Water Demand*.

AWWA. 2009. *Water Audits and Loss Control Programs.* Manual 36.

AWWA Research Foundation. 2005. *Management of the Disposal of Radioactive Residuals in Drinking Water Treatment.*

Black & Veatch for the University of Wisconsin–Milwaukee. 04/2011. *Cost Analysis of a Conceptual Riverbank Inducement System Along the Fox River. Final Report.*

Burch, S. L. 2002. *A Comparison of Potentiometric Surfaces for the Cambrian-Ordovician Aquifers of Northeastern Illinois, 1995 and 2000*.

Council of Great Lakes Governors. 12/2005. *Great Lakes–St. Lawrence River Basin Water Resources Compact.*

CH2M HILL and Ruekert-Mielke. 03/2002. *Future Water Supply Plan for Waukesha Water Utility*.

CH2M HILL, Amy Vickers & Associates, and Beth Foy & Associates. 05/2012. *Water Conservation Plan*.

CH2M HILL and Ruekert-Mielke. 2003. *Making a Decision on Improvement: An Annex 2001 Case Study Demonstration Involving Waukesha Water Supply.*

Cherkauer, Douglas S., University of Wisconsin–Milwaukee for SEWRPC. 09/2009. *Preliminary Draft, Technical Report Number 46, Groundwater Budget Indices and their use in Assessing Water Supply Plans for Southeast Wisconsin.*

Cherkauer, Douglas S., University of Wisconsin–Milwaukee for SEWRPC. 02/2010. *Technical Report Number 46, Groundwater Budget Indices and Their Use in Assessing Water Supply Plans for Southeastern Wisconsin*.

City of Pewaukee. 03/19/2009. *City of Pewaukee Comprehensive Plan for the Year 2035*.

City of Waukesha. 04/2011. Response to WDNR Regarding Letter to Waukesha Water Utility on Application for Lake Michigan Water Supply. Response WS9.

City of Waukesha. 09/2009. *City of Waukesha Comprehensive Plan*.

Davy Laboratories. 04/05/2007. SDWA Laboratory Analysis Report.

Donohue & Associates. 09/2011a. *Final Report, Phase I Sanitary Sewer Master Plan, City of Waukesha, Wisconsin*.

Donohue & Associates. 09/2011b. *Final Report, Phase II Sanitary Sewer Master Plan, City of Waukesha, Wisconsin*.

Earth Tech. 2006. *Water System Master Plan, Waukesha Water Utility.*

Glenzinski, Brian. 07/18/2006. *Letter to City of Waukesha Common Council*.

Hey and Associates. 2003. *Stormwater Master Plan*.

Jansen, John, and Robert Taylor. 10/2000. *Time Domain Electromagnetic Induction Survey of Eastern Waukesha County and Selected Locations.*

Lee, Kwang. 1994. *Report to Milwaukee Waterworks on Texas Avenue Intake Location in 1994*.

Lee, Kwang. 1995. *Report to Oak Creek Water and Sewer Utility on Intake Location in 1995*.

Lisa Gaumnitz, T. Asplund, and M. R. Matthews. 06/2004. *"A Growing Thirst for Groundwater." Wisconsin Natural Resources.*

Reeves, H. W. 2010. *Water Availability and Use Pilot—A Multi-scale Assessment in the U.S. Great Lakes Basin.* U.S. Geological Survey Professional Paper 1778.

RJN Environmental Services, LLC. 04/2010. *Results of Groundwater Modeling Study Shallow Groundwater Source, Fox River & Vernon Marsh Area*.

RJN Environmental Services, LLC. 02/2011. *Summary of Groundwater Modeling Study*.

RJN Environmental Services, LLC. 08/2013. Letter report on groundwater flow modeling.

Ruekert-Mielke. 05/2009. *Wellhead Protection Plan: Waukesha Water Utility Well No. 13*.

Ruekert-Mielke. 07/2009. *Wellhead Protection Plan: Waukesha Water Utility Wells No. 11 and 12*.

Ruekert-Mielke. 02/2011. Letter report on the Silurian dolomite aquifer.

Schimmoller, Larry. 09/2011. "Achieving Indirect Potable Reuse without Reverse Osmosis." WateReuse Potable Water Reuse Conference.

Southeastern Wisconsin Regional Planning Commission (SEWRPC). 03/1995. *A Regional Water Quality Management Plan Southeastern Wisconsin: An Update and Status Report*.

SEWRPC. 07/2004. *Technical Report No. 11, The Population of Southeastern Wisconsin* (4th ed.).

SEWRPC. 07/2005. *The Population of Southeastern Wisconsin*.

SEWRPC. 06/2006. *A Regional Land Use Plan for Southeastern Wisconsin: 2035*.

SEWRPC. 07/2007. *A Regional Water Supply Plan for Southeastern Wisconsin.* Technical Report No. 43.

SEWRPC. 12/2007. Milwaukee Metropolitan Sewerage District. *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds*.

SEWRPC. 03/2008. Letter to Waukesha Water Utility.

SEWRPC. 12/2008. *SEWRPC Staff Memorandum, Response to Requests by the City of Waukesha Water Utility to Delineate the 20-Year Planned Water Supply Service Area*.

SEWRPC. 01/2010. *Troy Bedrock Valley Aquifer Model.* Memorandum Report Number 188. Prepared by Ruekert-Mielke.

SEWRPC. 12/2010. *A Regional Water Supply Plan for Southeastern Wisconsin*. Planning Report No. 48.

SEWRPC. 2010. *Alternate and Recommended Land Use Plans for the Town of Genesee—2010*.

SEWRPC. 02/2012. Letter to Waukesha Water Utility.

SEWRPC. Varies. *Sanitary Sewer Service Area for the City of Waukesha and Environs*. March 1999. (Amended 02/2001, 06/2002, 09/2003, 09/2004, 09/2005, 09/2006, and 12/2007.)

SEWRPC and Milwaukee Metropolitan Sewerage District. 12/2007. *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds*.

SEWRPC and Wisconsin Geologic and Natural History Survey. 06/2002. *Groundwater Resources in Southeastern Wisconsin*.

SEWRPC, Regional Water Supply Planning Advisory Committee. http://www.sewrpc.org/SEWRPC/DataResources/CommissionAdvisoryCommittees/RegionalWaterSupplyPlanningAdv.htm. Date Accessed: 08/2012

Shaffer, Kimberly H., USGS. 2009. Scientific Investigations Report: 2009-5096.

Strand Associates, Inc. 05/2011. *Wastewater Treatment Plant Facilities Plan*.

Town of Delafield, Waukesha County Department of Parks and Land Use, and Waukesha University of Wisconsin–Extension. 08/11/2009. *Town of Delafield Smart Growth Plan, Waukesha County, Wisconsin*.

Town of Waukesha, Waukesha County Department of Parks and Land Use, and Waukesha University of Wisconsin–Extension. 10/2009. *Smart Growth Plan, Comprehensive Development Plan*.

U.S. Census Bureau. 2005–2009 American Community Survey.

U.S. Census Bureau. 2005–2009. Wisconsin Quick Facts, Persons per household.

U.S. Census Bureau. 2010. City of Waukesha population.

U.S. Energy Information Administration. *Independent Statistics & Analysis: Frequently Asked Questions: Electricity Use*. 12/2011.

U.S. Environmental Protection Agency. 12/2000. National Primary Drinking Water Regulations, Radionuclides, Final Rule.

U.S. Environmental Protection Agency. 11/2010. *WaterSense Labeled Toilets*

U.S. Geological Survey (USGS). 2005. Estimated Use of Water in the United States in 2005. http://ga.water.usgs.gov/edu/wateruse/pdf/ wudomestic-2005.pdf.

USGS. 03/2007. *Groundwater in the Great Lakes Basin: The Case for Southeastern Wisconsin*. http://wi.water.usgs.gov/glpf/index.html.

USGS. 08/2012. *Development and Application of a Groundwater/ Surface-Water Flow Model using MODFLOW-NWT for the Upper Fox River Basin, Southeastern Wisconsin.* Scientific Investigations Report 2012-5108.

USGS. 2008. *Consumptive Water Use in the Great Lakes Basin. Fact Sheet 2008-3032*.

United States Congress. 12/13/2005. *Great Lakes–St. Lawrence River Basin Water Resources Compact*.

Wisconsin Geological and Natural History Survey, U.S. Geological Survey. 10/2006. *Where do the deep wells in southeastern Wisconsin get their water?*

University of Wisconsin-Milwaukee Center for Economic Development. 07/2010. A Socio-Economic Impact Analysis of the Regional Water Supply Plan for Southeastern Wisconsin.

Vernon Marsh Area Property Manager for the WDNR. Letter to City of Waukesha Common Council from Brian Glenzinski. 07/2006.

WateReuse Symposium. 09/2008. *Indirect Potable Reuse: Balancing Costs and Benefits*.

Waukesha County Department of Parks and Land Use, Waukesha University of Wisconsin–Extension, Waukesha County Municipalities. 12/2009. *A Comprehensive Development Plan for Waukesha County, Wisconsin*.

Waukesha Water Utility. 2010. Lathers property test well water quality report.

Waukesha Water Utility. 1999–2012. Annual Report of the City of Waukesha Water Utility to Public Service Commission of Wisconsin.

Waukesha Water Utility. 2001–2012. Annual Consumer Confidence Report.

Waukesha Water Utility. 2005–2010. Water pumpage data.

Waukesha Water Utility. 2009, 2010. *Waukesha Water Utility Conservation Report,* Docket-6240-WR-106.

Wisconsin Department of Natural Resources (WDNR). 2002. *Wisconsin Trout Streams, PUB-FH-306*.

Wisconsin Administrative Code. 09/2007. Chapter NR 820 Ground Water Protection.

Wisconsin Department of Natural Resources. 04/2009. *Landcover Data (WISCLAND): GIS well data files and Waukesha Water Utility data*.

Wisconsin Department of Natural Resources. 12/2011. *Wisconsin's Impaired Water Process.*

Wisconsin Department of Natural Resources. 08/2013. Letter to Milwaukee Mayor Tom Barrett regarding City of Waukesha's application to divert Lake Michigan water.

Wisconsin Department of Natural Resources, Bureau for Remediation and Redevelopment Tracking System (BRRTS). 07/2012. http://dnr.wi.gov/botw/BasicSearchAction.do

Wisconsin Act 227. 05/2008.

Wisconsin Act 310. 05/2004.

Wisconsin Administrative Code. 10/2010. *Chapter 281 Water And Sewage.*

Wisconsin Administrative Code. 03/2011. *Chapter NR 121 Areawide Water Quality Management Plans.*

Wisconsin Administrative Code. 09/2007. *Chapter NR 820 Groundwater Quantity Management*

Wisconsin Administrative Code. 08/2010. *Chapter NR 852 Water Conservation and Water Use Efficiency.*

Wisconsin Administrative Code. 09/2010. *Chapter NR 854 Water Supply Service Area Plans, Draft.*

Appendix A
Service Area Delineation Documents

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

W239 N1812 ROCKWOOD DRIVE • PO BOX 1607 • WAUKESHA, WI 53187-1607• TELEPHONE (262) 547-6721
FAX (262) 547-1103

Serving the Counties of: KENOSHA
MILWAUKEE
OZAUKEE
RACINE
WALWORTH
WASHINGTON
WAUKESHA

December 23, 2008

Mr. Daniel S. Duchniak, P.E.
General Manager
Waukesha Water Utility
115 Delafield Street
Waukesha, WI 53188

Dear Mr. Duchniak:

Pursuant to your August 13, 2008, letter request, the Southeastern Wisconsin Regional Planning Commission is hereby transmitting a copy of a document setting forth a delineation of a 20-year water supply service area attendant to the Waukesha Water Utility. This is intended to meet the requirements of the recently adopted Great Lakes Compact (2007 Wisconsin Act 227) related to the delineation of the water supply service area to be used for developing a water supply plan to support the application for obtaining a Lake Michigan water supply source. Your August 13th letter indicates that such action is being contemplated by the Utility.

The water supply service area set forth in the attached document is considered to be consistent with the planned Waukesha sewer service area as incorporated in the regional water quality management plan for southeastern Wisconsin and with the preliminary recommended regional water supply plan for southeastern Wisconsin currently being considered during a public informational period. It is assumed that public input and comment on the water supply service area will be carried out as part of the process for obtaining such comment on the City's water supply plan and related information needed to support your application.

We trust this responds to your request. Should you have any questions concerning this matter, please do not hesitate to contact us.

Sincerely,

Philip C. Evenson

Philip C. Evenson, AICP
Executive Director

PCE/RPB/pk
#141636 V1 - WAUK WATER SUPPLY DRAFT TRANSMIT LTR

Enclosure (#141582)

cc: Mr. Eric Ebersberger, WDNR-Madison (w/enclosure)
Ms. Gloria L. McCutcheon, WDNR-Milwaukee (w/enclosure)
Mr. James D'Antuono, WDNR-Waukesha (w/enclosure)
Mr. Larry Nelson, City of Waukesha (w/enclosure)
Mr. Jeffrey L. Weigel, City of Pewaukee (w/enclosure)
Mr. Thomas M. Grisa, City of Brookfield (w/enclosure)
Mr. Richard M. Czopp, Town of Brookfield (w/enclosure)
Ms. Sharon L. Leair, Town of Genesee (w/enclosure)
Mr. Paul L. Kanter, Town of Delafield (w/enclosure)
Mr. Robert J. Tallinger, Sr., Town of Waukesha (w/enclosure)

WATER SUPPLY SERVICE AREA FOR THE CITY OF WAUKESHA AND ENVIRONS

WAUKESHA COUNTY WISCONSIN

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

WATER SUPPLY SERVICE AREA FOR THE CITY OF WAUKESHA AND ENVIRONS

WAUKESHA COUNTY, WISCONSIN

Prepared by the

Southeastern Wisconsin Regional Planning Commission
W239 N1812 Rockwood Drive
P.O. Box 1607
Waukesha, Wisconsin 53187-1607
www.sewrpc.org

December 2008

SEWRPC Staff Memorandum

RESPONSE TO REQUESTS BY THE CITY OF WAUKESHA WATER UTILITY TO DELINEATE THE 20-YEAR PLANNED WATER SUPPLY SERVICE AREA FOR THE UTILITY

INTRODUCTION AND BACKGROUND

By letter of August 13, 2008, the Waukesha Water Utility requested that the Southeastern Wisconsin Regional Planning Commission provide a delineation of the water supply service area potentially attendant to the Utility. A copy of that letter request is attached hereto as Exhibit A. The request was made to support an application being considered by the Utility to obtain a Lake Michigan water supply source. This memorandum, including the attached Map 1, is intended to respond to that request.

Under the recently adopted Great Lakes Compact (2007 Wisconsin Act 227), any utility seeking a new or increased withdrawal of water from the Great Lakes basin and diverting the water to any place outside the Great Lakes basin must register with the State and provide information to the State regarding the proposed withdrawal. That information includes a water supply plan which is to be based upon a proposed water supply service area. The Act specifies that, for the purposes of the water supply plans, an areawide water quality planning agency designated by the Governor under the Wisconsin Department of Natural Resources' areawide water quality management planning rule set forth in Chapter NR 121 of the *Wisconsin Administrative Code*, shall delineate the proposed water service supply areas for all of the public water supply systems in the planning area for which the agency is designated. The Southeastern Wisconsin Regional Planning Commission is such an agency. The Act also requires that the water supply service areas be consistent with the applicable approved areawide water quality management plan for the planning area. The regional agency may also provide regional needs assessments and other regional water supply planning information to persons preparing public water supply system plans.

The Southeastern Wisconsin Regional Planning Commission is currently preparing a regional water supply plan for the Southeastern Wisconsin Region.[1] That plan includes preliminary recommendations regarding planned water supply service areas. Those service areas were developed specifically taking into account consistency with the adopted regional water quality management plan.[2] In delineating the Waukesha Water Utility water supply service area included herein, the Commission drew upon the preliminary regional water supply plan and the adopted regional water quality management plan as last amended for the City of Waukesha in December 2007.

AREA DESCRIPTION

The 20-year water supply service area attendant to the Waukesha Water Utility is shown on Map 1. Also shown on Map 1 are the environmentally significant lands in the vicinity of the planned water utility service area. Those lands consist of environmental corridors, isolated natural resource areas, and small wetlands and surface waters. The adopted regional water quality management plan places great emphasis on protection of the environmentally

---

[1]*SEWRPC Planning Report No. 52,* A Regional Water Supply Plan for Southeastern Wisconsin, *under preparation.*

[2]*SEWRPC Planning Report No. 30,* A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000; *Volume One,* Inventory Findings, *September 1978; Volume Two,* Alternative Plans, *February 1979; Volume Three,* Recommended Plan, *June 1979, as last amended for the City of Waukesha in December 2007.*

sensitive lands. Details on the delineation process and protection recommendations for these environmentally sensitive areas can be found in the City of Waukesha sewer service area plan.[3]

The existing Waukesha water supply service area includes—by definition—the entirety of City of Waukesha corporate limits plus small adjacent areas currently served by the Waukesha Water Utility. This area is shown in blue on Map 1. That area encompasses about 21.7 square miles, the majority of which (84 percent) is currently developed and served by public sewer and water supply systems. The year 2000 population residing in this area was about 65,700 persons. Under planned 2028 conditions, the resident population in the same area is expected to be about 74,500 persons, an increase of about 13 percent over the year 2000 population level.

Also shown on Map 1 in tan color, are areas in the vicinity of the City of Waukesha which could potentially be provided with municipal water supply service by the Waukesha Water Utility. That area encompasses about 17.4 square miles, of which about 9.9 square miles, or 57 percent, is currently developed. The remaining potential service area, comprising about 7.5 square miles, or 43 percent, is considered as potentially developable land. This area has been included in the planned water supply service area primarily to support the resolution of potential water supply problems associated with existing development, rather than to support new development. Under the regional land use plan, a very limited portion of this area is proposed to be developed to support the planned population level, as can be seen by the planned increase in resident population in the area. The year 2000 population residing in this area was about 9,800 persons. Under planned 2028 conditions, the resident population in the same area is expected to be about 11,300 persons, an increase of about 15 percent over the year 2000 population level. The developed areas in the potential service area are currently served by onsite sewage disposal systems and private wells. Conversion of those areas to municipal utility services would be expected only as local conditions and initiatives warrant such conversion. Absent a demonstrated need and local initiative, residents and businesses in these areas could be expected to remain on individual wells.

RELATIONSHIP TO REGIONAL WATER QUALITY MANAGEMENT PLAN/WAUKESHA SEWER SERVICE AREA PLAN

The planned Waukesha water supply service area is considered to be fully consistent with the adopted Waukesha sewer service area, as documented in the Waukesha sewer service area plan.[4] Three differences between the planned water supply service area and the planned sewer service do exist. The three differences are as follows:

- Four areas which are remote from the main sewer service area have not been included in the water supply service area. These area include three holding tank sewage disposal areas and a portion of the Village of Wales. The holding tank sewage disposal areas are businesses where holding tank wastes are conveyed to the City of Waukesha sewage treatment plant by truck. There is no reason to expect these four remote areas would ever be served by municipal water supply from the Waukesha Water Utility.

- There is an approximately 1.4-square-mile area located south of IH 94 along the Bluemound Road corridor between the Fox River and STH 164 which is included in the Waukesha sewer service area, but not the Waukesha water supply service area. While currently served by the City of Pewaukee municipal water supply system, the area is connected to the City of Waukesha sewerage system.

---

[3]*SEWRPC Community Assistance Planning Report No. 100, 2nd Edition,* Sanitary Sewer Service Area for the City of Waukesha and Environs, Waukesha County, Wisconsin, *March 1999, as last amended in December 2007.*

[4]Ibid.

- An approximately 4.4-square-mile area in the Town of Genesee located along the STH 59 and CTH X corridor, immediately west of the Town of Waukesha which is included in the water supply service area, but not the Waukesha sewer service area. That area, which includes existing residential development and one large industry, is identified as a special well casing area by the Wisconsin Department of Natural Resources, due to groundwater bacterial contamination. During the regional water supply planning program, it was determined that this area should be added to the long-term municipal water supply service area in accordance with Wisconsin Department of Natural Resources staff recommendations.

Given due consideration to the foregoing, it is concluded that the Waukesha planned water supply service area is consistent with the City of Waukesha sanitary sewer service area plan as incorporated in the adopted regional water quality management plan.

* * *

#141582 V1 - WAUK WATER SUPPLY STAFF MEMORANDUM
300-5000
PCE/RPB/pk
12/23/08

Exhibit A

Waukesha Water Utility

SERVING WAUKESHA SINCE 1886

115 DELAFIELD STREET
WAUKESHA, WI 53188-3615

Telephone: (262) 521-5272 • Fax: (262) 521-5265 • E-mail: contactus@waukesha-water.com

August 13, 2008

Mr. Philip Evenson
Southeastern Wisconsin Regional Planning Commission
P.O. Box 1607
Waukesha, WI 53187-1607

Re: Water Service Area

Phil

Dear Mr. ~~Evenson~~:

As you are aware, the City of Waukesha is considering an application for Great Lakes water to resolve its radium issues, bring our water system into final compliance with the radionuclide standard, and address the city's water needs for the foreseeable future. One requirement under the new water supply planning statute is to have the water supply service area delineated by an area-wide water quality planning agency.

The City of Waukesha Water Utility is requesting the Southeastern Wisconsin Regional Planning Commission (SEWRPC), as an authorized regional planning agency, to delineate a water service area.

We need this determination no later than December 31, 2008.

If you have any questions or need any further information, please contact me at (262) 521-5272 ext. 518.

Sincerely,

Daniel S. Duchniak, P.E.
General Manager

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION
W239 N1812 ROCKWOOD DRIVE • PO BOX 1607 • WAUKESHA, WI 53187-1607 • TELEPHONE (262) 547-6721
FAX (262) 547-1103

Serving the Counties of: KENOSHA
MILWAUKEE
OZAUKEE
RACINE
WALWORTH
WASHINGTON
WAUKESHA

March 17, 2009

Mr. Steven Crandell
Community Development Director,
City of Waukesha
201 Delafield Street
Waukesha, WI 53188-3633

Dear Mr. Crandell:

In response to your request, the Regional Planning staff has prepared an estimate of the ultimate population for the Waukesha water supply service area. The ultimate population for the water supply service is estimated at 97,400 persons. This compares to the year 2000 population of 75,500 persons and a planned year 2028 population of 85,800 persons, as set forth in the SEWRPC staff memorandum entitled "Response to Request by the City of Waukesha Water Utility to Delineate the 20-Year Planned Water Supply Service Area for the Utility." The ultimate population is an estimate of the population that could be accommodated within the water supply service area, assuming full development conditions as envisioned under the land use element of the Waukesha County comprehensive plan, with input on population densities for various residential land use categories and other aspects of the plan from your staff.

The 2028 population represents a step on the way to the 2035 population of 88,500 persons set forth in the ongoing regional water supply plan. The ultimate population within the water supply service area represents a condition beyond the 2035 planning horizon adopted for the regional water supply plan.

We trust that this responds to your request. Should you have any questions, feel free to call.

Sincerely,

Kenneth R. Yunker, P.E.
Executive Director

KRY/WJS/lgh
#143499 v1 - response to s crandell

cc: Michael G. Hahn, SEWRPC
Robert P. Biebel, SEWRPC

Estimated Buildout Population within the Planned
Waukesha Water Supply Service Area by Community

Civil Division Within Planned Waukesha Water Supply Service Area	Year 2000 Population	Buildout Population
City of Waukesha (includes portions of Town of Waukesha served by City water)	65,700	76,330
City of Pewaukee	900	1,180-1,370
Town of Genesee	1,250	1,770-1,850
Town of Waukesha	7,410	11,490-13,590
Town of Delafield	240	820-4,260
Total	75,500	91,590-97,400

For the Town of Waukesha, the Town of Genesee and the City of Pewaukee: The higher buildout population assumes that areas designated in the comprehensive plan as future low-density residential development (broadly defined as 0.7 to 2.2 dwelling units per acre) would average 1.6 dwelling units per acre, the approximate midpoint of the plan density range. The lower buildout population assumes that such areas would develop at 1.0 dwelling unit per acre—which is more typical of historic development patterns.

For the Town of Delafield: The higher buildout population assumes that much of the undeveloped area would be developed at a medium residential density of 3.6 dwelling units per acre, which could be expected if the land were annexed to, and developed as part of, the City of Waukesha. The lower buildout population assumes that much of the undeveloped area would be developed at a density of 0.33 dwelling unit per acre, which could be expected if the land remains in the Town of Delafield and is developed for residential use.

Source: SEWRPC

wjs

01/25/12

201247

YEAR 2028 POPULATION PROJECTION FOR THE WAUKESHA WATER SUPPLY SERVICE AREA

The report titled “Water Supply Service Area for the City of Waukesha and Environs,” prepared by SEWRPC and transmitted to the Waukesha Water Utility on December 23, 2008, included population projections for the Waukesha water supply service area for the year 2028. That report indicated a year 2028 population projection of 85,800 persons for the Waukesha water supply service area—including 74,500 persons in the area comprised of the City of Waukesha and the adjacent areas then served by the Waukesha Water Utility, and 11,300 persons for the balance of the water supply service area.

These projections are based upon SEWRPC population projections to the year 2035. They were derived from the SEWRPC projections for the period 2000 to 2035 by straight-line interpolation to the year 2028.

The SEWRPC projections for the year 2035 were developed in two phases. The first phase involved the projection of the year 2035 population for the Southeastern Wisconsin Region and its constituent counties, including Waukesha County, using a cohort-component population projection model. The second phase involved the allocation of the county-level population projections derived from the cohort-component model to county subareas based upon a consideration of historic trends, land availability, and local development plans. The projections are documented in SEWRPC Technical Report No. 11 (4th Edition), *The Population of Southeastern Wisconsin*, and in SEWRPC Planning Report No. 48, *A Regional Land Use Plan for Southeastern Wisconsin: 2035*.

* * *

WJS
201867
02/14/12

Appendix B
Ten Largest Costumers

WAUKESHA WATER UTILITY

LARGEST USERS REPORT - GALLONS

ACCOUNTS	2000	ACCOUNTS	2001	ACCOUNTS	2002	ACCOUNTS	2003	ACCOUNTS	2004	ACCOUNTS	2005
AMRON CORP 525 Progress Ave Waukesha, WI	25,680,800	**COOPER POWER** 2300 Badger DR Waukesha, WI	24,300,000	**COOPER POWER** 2300 Badger DR Waukesha, WI	19,800,000	**COOPER POWER** 2300 Badger DR Waukesha, WI	19,900,000	**COOPER POWER** 2300 Badger DR Waukesha, WI	20,200,000	**COOPER POWER** 1900 E North St Waukesha, WI	25,740,200
COOPER POWER 1900 E North St Waukesha, WI	56,980,500	**COOPER POWER** 1900 E North St Waukesha, WI	47,016,000	**COOPER POWER** 1900 E North St Waukesha, WI	45,090,500	**COOPER POWER** 1900 E North St Waukesha, WI	34,797,500	**COOPER POWER** 1900 E North St Waukesha, WI	28,730,500	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	66,624,000
GOLDEN GUERNSEY 2101 Delafield St Waukesha, WI	59,875,500	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	63,946,500	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	66,436,500	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	65,394,500	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	66,411,000	**WAUK CTY COURTHOUSE** 515 W Moreland Blvd Waukesha, WI	19,224,500 18,793,300
VENTURA FOODS 500 S Prairie Ave Waukesha, WI	36,056,000	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	32,413,700	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	37,698,800	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	37,559,200	**WAUK CTY COURTHOUSE** 515 W Moreland Blvd Waukesha, WI	18,793,300	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	35,818,500
NAVISTAR INT'L 1401 Perkins Ave Waukesha, WI	223,175,000	**NAVISTAR INT'L** 1401 Perkins Ave Waukesha, WI	196,335,200	**NAVISTAR INT'L** 1401 Perkins Ave Waukesha, WI	235,541,000	**INTL TRUCK & ENG** 1401 Perkins Ave Waukesha, WI	84,403,450	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	44,770,800	**INTL TRUCK & ENG** 1401 Perkins Ave Waukesha, WI	75,014,600
AGA GAS, INC 309 Sentry Dr Waukesha, WI	24,349,800	**AGA GAS, INC** 309 Sentry Dr Waukesha, WI	25,816,800	**AGA GAS, INC** 309 Sentry Dr Waukesha, WI	25,462,800	**AGA GAS, INC** 309 Sentry Dr Waukesha, WI	24,579,100	**INTL TRUCK & ENG** 1401 Perkins Ave Waukesha, WI	65,391,000	**AGA GAS, INC** 309 Sentry Dr Waukesha, WI	29,268,400
WAUKESHA FOUNDRY 1300 Lincoln Ave Waukesha, WI	36,050,500	**WAUKESHA FOUNDRY** 1300 Lincoln Ave Waukesha, WI	27,176,000	**W S ACQUISTION** 1300 Lincoln Ave Waukesha, WI	18,602,500	**WAUKESHA KRAMER** 1300 Lincoln Ave Waukesha, WI	30,180,100	**AGA GAS, INC** 309 Sentry Dr Waukesha, WI	26,767,600	**WAUKESHA KRAMER** 1300 Lincoln Ave Waukesha, WI	17,308,000
WAUKESHA MEMORIAL HOSPITAL 725 American Ave Waukesha, WI	49,033,600	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	51,611,000	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	59,223,000	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	51,444,000	**WAUKESHA KRAMER** 1300 Lincoln Ave Waukesha, WI	26,789,400	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	54,200,000
WIS CENTRIFUGAL 905 E St Paul Ave Waukesha, WI	28,965,000	**WIS CENTRIFUGAL** 905 E St Paul Ave Waukesha, WI	24,915,000	**WIS CENTRIFUGAL** 905 E St Paul Ave Waukesha, WI	25,445,000	**METALTEK INT'L** 905 E St Paul Ave Waukesha, WI	16,277,000	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	53,126,000 51,444,000	**METALTEK INT'L** 905 E St Paul Ave Waukesha, WI	22,095,000
WAUKESHA ENGINE 1000 W St Paul Ave Waukesha, WI	23,247,900	**WAUKESHA ENGINE** 1000 W St Paul Ave Waukesha, WI	24,554,000	**WAUKESHA ENGINE** 1000 W St Paul Ave Waukesha, WI	20,786,000	**WAUKESHA ENGINE** 1000 W St Paul Ave Waukesha, WI	21,617,200	**METALTEK INT'L** 905 E St Paul Ave Waukesha, WI	21,417,000	**WAUKESHA ENGINE** 1000 W St Paul Ave Waukesha, WI	17,982,700

WAUKESHA WATER UTILITY

LARGEST USERS REPORT - GALLONS

ACCOUNTS	2006	ACCOUNTS	2007	ACCOUNTS	2008	ACCOUNTS	2009	ACCOUNTS	2010
COOPER POWER 2300 Badger DR Waukesha, WI	17,400,000	**COOPER POWER** 2300 Badger DR Waukesha, WI	19,100,000	**COOPER POWER** 2300 Badger DR Waukesha, WI	19,700,000	**COOPER POWER** 2300 Badger DR Waukesha, WI	14,100,000	**CITY OF WAUKESHA** 600 Sentry Drive Waukesha, WI	16,160,000
COOPER POWER 1900 E North St Waukesha, WI	24,483,700	**COOPER POWER** 1900 E North St Waukesha, WI	24,488,400	**COOPER POWER** 1900 E North St Waukesha, WI	20,230,400	**COOPER POWER** 1900 E North St Waukesha, WI	18,656,400	**COOPER POWER** 1900 E North St Waukesha, WI	20,402,300
GOLDEN GUERNSEY 2101 Delafield St Waukesha, WI	52,640,000	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	49,777,500	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	44,787,500	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	45,695,500	**GOLDEN GUERNSEY** 2101 Delafield St Waukesha, WI	49,221,500
VENTURA FOODS 500 S Prairie Ave Waukesha, WI	34631000	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	37,260,500	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	351,200,000	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	34,027,000	**CARGILL INCORP** 620 Progress Ave Waukesha, WI	13,298,500
INTL TRUCK & ENG 1401 Perkins Ave Waukesha, WI	73,029,200	**INTL TRUCK & ENG** 1401 Perkins Ave Waukesha, WI	52,745,000	**NAVISTAR INT'L** 1401 Perkins Ave Waukesha, WI	58,438,200	**INTL TRUCK & ENG** 1401 Perkins Ave Waukesha, WI	60,580,300	**VENTURA FOODS** 500 S Prairie Ave Waukesha, WI	40,457,000
AGA GAS, INC 309 Sentry Dr Waukesha, WI	28,830,500	**AGA GAS, INC** 309 Sentry Dr Waukesha, WI	22,855,000	**AGA GAS, INC** 309 Sentry Dr Waukesha, WI	21,656,000	**WAUKESHA KRAMER** 1300 Lincoln Ave Waukesha, WI	17,572,300	**INTL TRUCK & ENG** 1401 Perkins Ave Waukesha, WI	41,795,800
WAUKESHA KRAMER 1300 Lincoln Ave Waukesha, WI	25,323,000	**WAUKESHA KRAMER** 1300 Lincoln Ave Waukesha, WI	28,523,000	**WAUKESHA KRAMER** 1300 Lincoln Ave Waukesha, WI	31,843,000	**CITY OF WAUKESHA** 600 Sentry Drive Waukesha, WI	16,820,000	**CIP HOSPITALITY** 2810 Golf Rd Waukesha, WI	13,379,000
WAUKESHA MEMORIAL HOSPITAL 725 American Ave Waukesha, WI	51,691,000	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	54,394,000	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	49,252,400	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	49,180,000	**WAUKESHA ENGINE** 1000 W St Paul Ave Waukesha, WI	22,188,400
METALTEK INT'L 905 E St Paul Ave Waukesha, WI	32,617,000	**METALTEK INT'L** 905 E St Paul Ave Waukesha, WI	27,457,000	**WIS CENTRIFUGAL** 905 E St Paul Ave Waukesha, WI	21,324,000	**METALTEK INT'L** 905 E St Paul Ave Waukesha, WI	14,748,000	**WAUKESHA MEMORIAL HOSPITAL** 725 American Ave Waukesha, WI	47,133,500
WAUKESHA ENGINE 1000 W St Paul Ave Waukesha, WI	18,238,300	**WAUKESHA ENGINE** 1000 W St Paul Ave Waukesha, WI	20,332,500	**WAUKESHA ENGINE** 1000 W St Paul Ave Waukesha, WI	19,611,200	**WAUKESHA ENGINE** 1000 W St Paul Ave Waukesha, WI	17,554,400	**METALTEK INT'L** 905 E St Paul Ave Waukesha, WI	21,881,000

Appendix C
Water Demand Projections Technical Memorandum

DRAFT
TECHNICAL MEMORANDUM
WATER DEMAND PROJECTIONS

To: **Waukesha Water Utility**

Prepared by: **Richard Hope, P.E., AECOM**

Date: **June 6, 2013**

Subject: **Water Demand Projections**
Waukesha, Wisconsin

This technical memorandum (TM) presents the approach used to project water demands for the Waukesha Water Supply Service Area (WWSSA).

The provision of water is vital to the public health and the sustainability of a community; therefore, it is extremely important that water demand projections are not underestimated. In fact, it is good practice to be conservative in the projection of water demands. The assumptions used for the basis of water demand projections should be reevaluated at regular intervals and the projections updated as necessary.

The water demand for a community is influenced by a number of factors such as population, the growth in the economy and effectiveness of water conservation. Water demand for the WWSSA was projected on the best available information on development within the WWSSA, a review of historical water demands, and the impact of the Waukesha Water Utility conservation initiative.

To account for the impact of the variables that impact water demand projection, an envelope of projected water demand for the WWSSA was developed.

1.0 WAUKESHA WATER SUPPLY SERVICE AREA (WWSSA)

Water demand has been projected for the WWSSA as delineate by Southeastern Wisconsin Regional Planning Commission (SEWRPC) and includes the City of Waukesha and areas of the Towns of Waukesha, Delafield and Genesee and the City of Pewaukee (A Regional Water Supply Plan for Southeastern Wisconsin, by SEWRPC, December 2010).

2.0 POPULATION PROJECTION FOR THE WWSSA

Population projections are important in projecting water demand as there is a close relationship between population and water demand. This section presents the population projections that are used in the projection of water demand.

2.1 SEWRPC Population Data

SEWRPC has projected a buildout population for the WWSSA of 97,400 (Attachment A, SEWRPC, January 25, 2012).

Table 1 summarizes the population projections by civil division developed by SEWRPC for the WWSSA. Due to the uncertainty in the type of future development in the civil divisions, SEWRPC provided a range of population for these areas. For the purpose of determining the 2030 population data for each of the civil divisions within the WWSSA for water demand projections, estimated 2030 populations were obtained from interpolating from the 2000 and buildout populations provided by SEWRPC and are summarized in Table 1.

TABLE 1
SUMMARY OF 2030 AND BUILDOUT POPULATION FOR WWSSA BY CIVIL DIVISION

Civil Division Within Planned Waukesha Water Supply Service Area	Year 2000 Population[3]	Estimated 2030 Population[4]	Buildout Population[3]
City of Waukesha (includes portions of Town of Waukesha currently served by City water)	65,700	71,105	76,330
City of Pewaukee[1]	900	1,042 – 1,139	1,180 – 1,370
Town of Genesee[1]	1,250	1,514 – 1,555	1,770 – 1,850
Town of Waukesha[1]	7,410	9,485 – 10,552	11,490 – 13,590
Town of Delafield[2]	240	535 – 2,284	820 – 4,260
Total	75,500	83,681 – 86,636	91,590 – 97,400

Footnotes:

1 For the Town of Waukesha, the Town of Genesee, and the City of Pewaukee: The higher buildout population assumes that areas designated in the comprehensive plan as future low-density residential development (broadly defined as 0.7 to 2.2 dwelling units per acre) would average 1.6 dwelling units per acre, the approximate midpoint of the plan density range. The lower buildout population assumes that such areas would develop at 1.0 dwelling unit per acre-which is more typical of historic development patterns.

2 For the Town of Delafield: The higher buildout population assumes that much of the undeveloped area would be developed at a medium residential density of 3.6 dwelling units per acre, which could be expected if the land were annexed to, and developed as part of, the City of Waukesha. The lower buildout population assumes that much of the undeveloped area would be developed at a density of 0.33 dwelling unit per acre, which could be expected if the land remains in the Town of Delafield and is developed for residential use.

3 Source: Attachment A, SEWRPC, January 25, 2012. William Stauber.

4 Extrapolated from available SEWRPC data.

3.0 HISTORICAL WATER USE

A review of historical water use can assist in establishing average usage rates for different types of water users.

Typically in Wisconsin water use is allocated to one of the following four categories:

1. Residential
2. Commercial
3. Other Municipal Users (Public)
4. Industrial

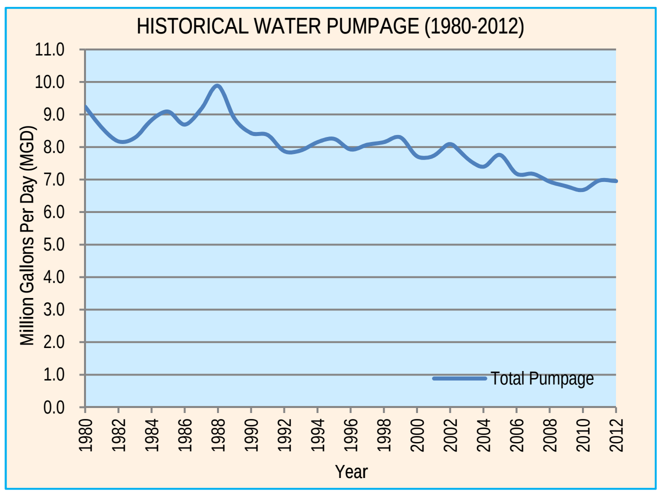


FIGURE 1: HISTORICAL WATER PUMPAGE

Projected water demand for residential, commercial and public user categories can be based on population and an estimate of per capita water use. However, industrial water demands are typically projected based on the availability of land for industrial development and a historical water use per acre of industrial land. This approach is consistent with those used by SEWRPC in the report, A Regional Water Supply Plan for Southeastern Wisconsin, December 2010.

Figure 1 presents the total pumpage historical water use for the Waukesha Water Utility, which has been steadily declining over the past two decades, from approximately 9.2 million gallons per day (MGD) in 1980 to approximately 7.0 MGD in 2012 with a peak of approximately 9.9 MGD in 1989.

3.1 Per Capita Water Demands

The total pumpage and total sales per capita water demands for Waukesha in 2012 are 97 gallons per capita per day (gpcd) and 89 gpcd, respectively. Although direct comparison of water demands between communities is not possible, Waukesha has the lowest per capita water demands compared to similar Wisconsin communities, as illustrated in Table 2.

TABLE 2
2012 WATER DEMANDS FOR OTHER WISCONSIN COMMUNITIES

Municipality	Population	Total Pumpage		Total Sales		Residential	
		MGY	gpcd	MGY	gpcd	MGY	gpcd
Kenosha	101,832	5,329	143	4,274	115	1,839	49
La Crosse	51,790	3,921	207	3,378	179	946	50
Milwaukee	862,524	37,920	120	32,909	105	10,973	35
Madison	248,907	10,659	117	9,587	106	3,346	37
Racine	112,564	6,880	167	5,634	137	1,909	46
Waukesha	71,697	2,537	97	2,328	89	1,053	40

Historical per capita water demand was analyzed for residential, commercial, and public user categories. A ten year period (2003 through 2012) was used to determine average historical per capita water demands as the ten year average minimizes the impact of yearly fluctuation in water demand. Table 3 presents a summary of historical per capita water demand statistics for the period from 2003 through 2012. Attachment B includes tables summarizing historical water sales and pumpage data used to develop average water demand data for the period from 2003 through 2012.

TABLE 3
HISTORICAL PER CAPITA WATER DEMANDS (2003 – 2012)

Category	Maximum	Minimum	2012	Average
Residential	48 gpcd (2005)	39 gpcd (2011)	40 gpcd	43 gpcd
Commercial	37 gpcd (2003)	31 gpcd (2011)	32 gpcd	33 gpcd
Public	5 gpcd (2003)	4 gpcd (2010)	4 gpcd	4 gpcd
gpcd – gallons per capita per day				

3.2 Industrial Water Usage

The industrial water usage has decreased since 1980 as illustrated in Figure 2. As previously discussed, industrial water usage is typically projected based on a historical review of water use per acre of industrial land per day.

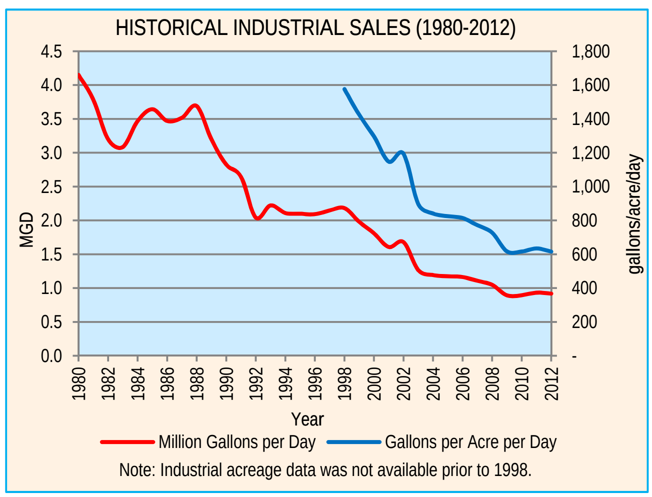


FIGURE 2: HISTORICAL INDUSTRIAL SALES

Industrial water demand is related to the type of industrial development and is based on the land available for industrial development and the average industrial water demand. It was estimated that at the end of 2012, approximately 342 acres of land zoned for industrial development within the WWSSA were not serviced by the Waukesha Water Utility. The 342 acres was interpolated from available 2010 and buildout industrial acreage included in Attachment C. The 342 acres is composed of undeveloped industrial zoned land within the City of Waukesha and land zoned industrial (developed and undeveloped) in the portions of the WWSSA outside the City of Waukesha and currently not served by the Waukesha Water Utility. It was assumed that all industrial land will be fully developed by 2030.

Figure 2 presents the historical industrial sales since 1989 and shows a decline in water use per acre of industrial land. The per acre water demand for industrial users has decreased from approximately 1,147 gallons per acre per day in 2001 to approximately 616 gallons per acre per day in 2012. The current per acre water demand of approximately 616 is considered low when compared to the assumption of 1,500 gallons per acre per day used by SEWRPC in the report, A Regional Water Supply Plan for Southeastern Wisconsin report, December 2010.

The water demand by industrial users can be impacted by the health of the economy. In the recent decade, WWSSA along with the nation and Wisconsin as a whole, has experienced difficult economic times, affecting industries across all sectors. The recession has affected all aspects of life and business, including water usage. The first significantly observed decline in the economy was seen in 2001 and then again in 2009, as indicated by Figure 3 and Figure 4 (Wisconsin Economic Outlook, Wisconsin Department of Revenue, December 2010). As stated in the Wisconsin Economic Outlook report (December 2010), the second largest employment sector (the largest sector before 2008) in Milwaukee-Waukesha-West Allis metropolitan statistical area is "trade, transportation, and utilities" or as classified in this evaluation as "industrial". This sector has taken a dramatic hit in terms of employment from the economic recession. This will also have an impact on water use for industrial purposes.

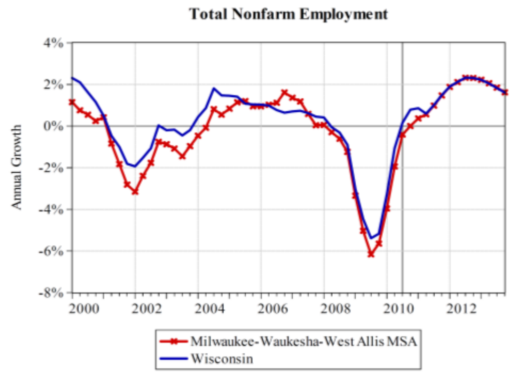


FIGURE 3: TOTAL NONFARM EMPLOYMENT

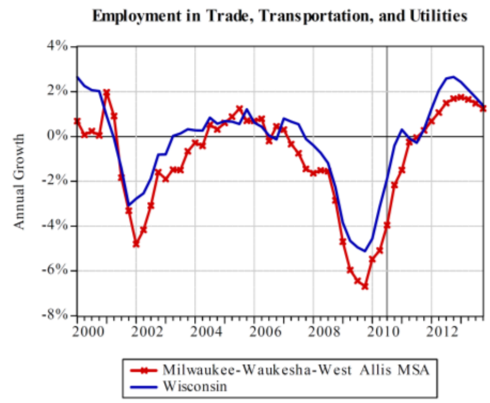


FIGURE 4: TRADE, TRANSPORATION, & UTILITY EMPLOYMENT

While it is not possible to directly correlate the reduction in industrial water demand to the recession, it is realistic to assume that it did have an impact. Therefore, a high and low projection of industrial water demand was established based on the water demand per industrial acre prior to the 2001 down turn in the economy and the average over the last five years (2008-2012).

Table 4 presents a summary of historical industrial statistics.

TABLE 4
HISTORICAL INDUSTRIAL WATER USAGE

Description	Water Demand
2000 Industrial Usage[1]	1,297 gallons/acre/day
2008-2012 Average Industrial Usage[1]	642 gallons/acre/day
SEWRPC Industrial Usage Projection[2]	1,500 gallons/acre/day
2010 Industrial Acreage Developed with City of Waukesha	1,452 acres
Total Industrial Acreage	1,832 acres

Footnote:
1 Developed from developed industrial acreage and industrial sales.
2 From A Regional Water Supply Plan for Southeastern Wisconsin, by SEWRPC, December 2010.

3.3 Unaccounted for Water

Another important consideration in the projection of water demands is the level of unaccounted for water (UFW). UFW is the difference between the total water supplied (total pumpage) and the total water sales. For the period from 2008 through 2012, the average UFW for the Waukesha Water Utility was approximately 8 percent and will be used in this evaluation (Figure 5). This is below the American Water Works Association (AWWA) guideline for UFW of 10 percent. The Water Efficiency Potential Study for Wisconsin prepared for the Public Service Commission of Wisconsin and the Wisconsin Department of Natural Resources by Camp Dresser & McKee, Inc and Water Accountability provided information on the water loss for Wisconsin water systems. It reported that the average water loss for large water systems in Wisconsin was 17 percent.

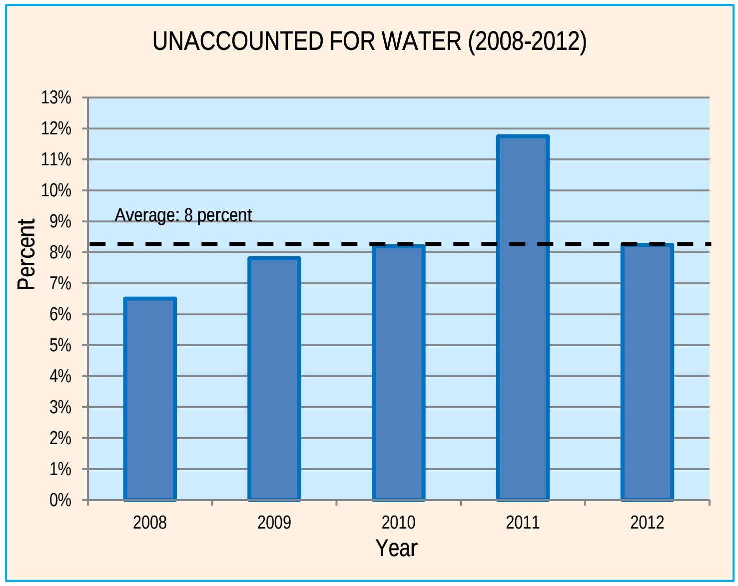


FIGURE 5: HISTORICAL UNACCOUNTED-FOR WATER

4.0 WATER CONSERVATION

Environmental, social, and political influences have raised the awareness of the need to conserve water. The Waukesha Water Utility first initiated water conservation efforts in 2006 and has continuously increased efforts as documented in the Updated Water Conservation Plan, May 2012, CH2M HILL. Table 5 summarizes the historical and projected water conservation based on water conservation planning by the Waukesha Water Utility as documented in the Updated Water Conservation Plan. Total reduction in water demand due to water conservation is projected to be 1 MGD in 2050 (buildout)

TABLE 5
HISTORICAL AND PROJECTED WATER CONSERVATION

Description	2006	2012	2016	2030	2050
Residential	0.0 MG	35.4 MG	67.0 MG	148.1 MG	296.2 MG
Commercial	0.0 MG	9.3 MG	16.0 MG	29.0 MG	58.0 MG
Public	0.0 MG	0.0 MG	1.5 MG	1.5 MG	3.0 MG
Industrial	0.0 MG	0.5 MG	2.2 MG	2.9 MG	5.8 MG
Total (MG)	0.0 MG	45.2 MG	86.7 MG	181.5 MG	363.0 MG
Total (MGD)	0.0 MGD	0.1 MGD	0.2 MGD	0.5 MGD	1.0 MGD

Waukesha has implemented a number of recognized strategies to conserve water. However, the effectiveness of these strategies is influenced by the customer and the impact of conservation can vary over time; therefore, the projected water demand has been established with and without the impact of water conservation.

Table 6 presents the per capita demand without the current and projected water saving due to water conservation projected in Table 5. Figure 6 illustrates the trend in per capita water demand for Waukesha since 1980 for residential, commercial and public use categories without the impact of water conservation.

TABLE 6
HISTORICAL PER CAPITA WATER DEMANDS (2003 – 2012) WITHOUT CONSERVATION

	Maximum	Minimum	2012	Average
Residential	48 gpcd (2005)	40 gpcd (2011)	42 gpcd	44 gpcd
Commercial	37 gpcd (2003)	31 gpcd (2010)	32 gpcd	33 gpcd
Public	5 gpcd (2004)	4 gpcd (2010)	4 gpcd	4 gpcd

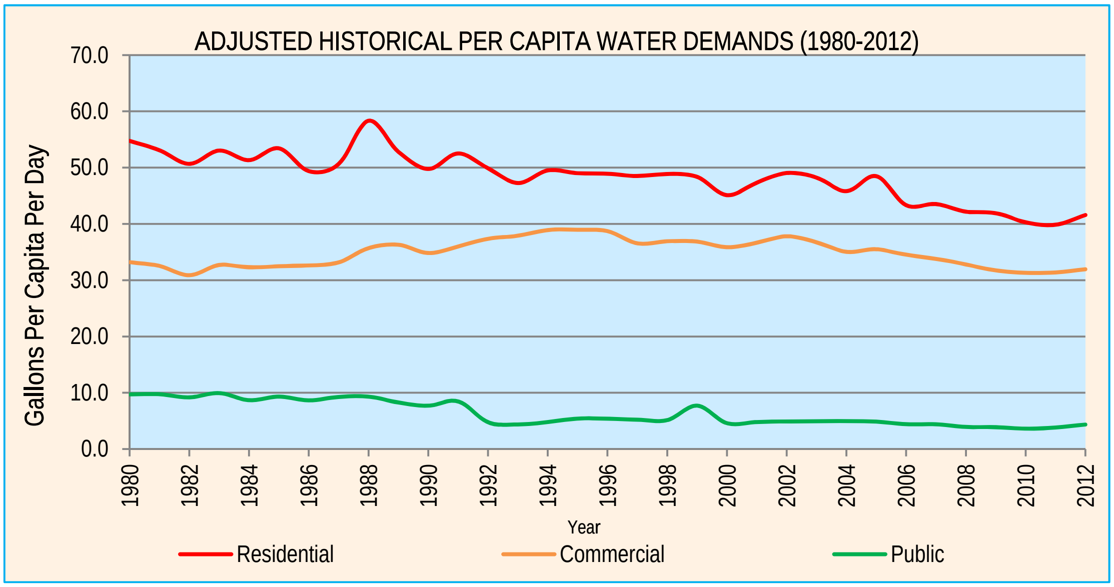


FIGURE 6: HISTORICAL PER CAPITA WATER DEMANDS WITHOUT CONSERVATION

The conservation initiative does not affect the high industrial water demand established, because it is based off the 2001 prior to the down turn in the economy demand, which is also prior to the conservation efforts. The lower industrial water demand (an average over the last five years: 2008-2012) was adjusted to account for the impact of water conservation, however due to the magnitude of the industrial sales compared to that of the water savings, the five year average of 642 gallons per acre per day did not change.

5.0 PROJECTED WATER DEMAND ASSUMPTIONS

As discussed previously uncertainties that impact the projection of water demand exist; therefore, an envelope of projected water demand was developed. The envelope of water demand for 2030 and buildout for the WWSSA was developed based on following scenarios:

1. Without the impact of water conservation and industrial water demand (gallons/acre/day) at 2001 levels due to recovery in the economy.
2. With the impact of water conservation and industrial water demand (gallons/acre/day) at 2001 levels due to recovery in the economy.
3. Without the impact of water conservation and industrial water demand (gallons/acres/day) at average for last five years (2008-2012).
4. With the impact of water conservation and economy industrial water demand (gallons/acres/day) at average for last five years (2008-2012).

Water demand projections were developed for the four scenarios based on the assumptions summarized in Table 7.

TABLE 7
PROJECTED WATER DEMAND ASSUMPTIONS

<table>
<tr><th>Scenario</th><th>Population</th><th>UFW</th><th>Residential</th><th>Commercial</th><th>Public</th><th>Industrial (Economy - Table 3)</th><th>Conservation</th></tr>
<tr><td>Without the impact of water conservation and industrial water demand (gallons/acre/day) at 2001 levels due to recovery in the economy</td><td rowspan="4">High Range Limit (Table 1)</td><td rowspan="4">Five Year Average: 8%</td><td colspan="3" rowspan="4">10 Year Average of per Capita Water Demands (Table 6)
44 gpcd 33 gpcd 4 gpcd</td><td rowspan="2">Actual Usage
From Year 2000
1,297 gallons/acre/day</td><td>None</td></tr>
<tr><td>With the impact of water conservation and industrial water demand (gallons/acre/day) at 2001 levels due to recovery in the economy</td><td>Deduct Projected Water Conservation</td></tr>
<tr><td>Without the impact of water conservation and industrial water demand (gallons/acres/day) at average for last five years (2008-2012)</td><td rowspan="2">5 Year Average
642 gallons/acre/day</td><td>None</td></tr>
<tr><td>With the impact of water conservation and economy industrial water demand (gallons/acres/day) at average for last five years (2008-2012)</td><td>Deduct Projected Water Conservation</td></tr>
</table>

6.0 PROJECTED WATER DEMANDS

Based on the documented assumptions, presented above, Figure 7 and Figure 8 illustrate the envelope of projected average day water demand and maximum day water demand for the WWSSA, respectively.

The projected average day and maximum day water demand for each of the four scenarios for 2030 and Buildout are summarized in Table 8.

TABLE 8
PROJECTED WATER DEMAND BASED ON HISTORICAL WATER DEMANDS

Description	2030		Buildout	
	Average Day	Maximum Day	Average Day	Maximum Day
Population	86,636		97,400	
Without the impact of water conservation and industrial water demand (gallons/acre/day) at 2001 levels due to recovery in the economy	10.2 MGD	16.9 MGD	11.2 MGD	18.5 MGD
With the impact of water conservation and industrial water demand (gallons/acre/day) at 2001 levels due to recovery in the economy	9.7 MGD	16.1 MGD	10.1 MGD	16.7 MGD
Without the impact of water conservation and industrial water demand (gallons/acres/day) at average for last five years (2008-2012)	8.9 MGD	14.8 MGD	9.9 MGD	16.4 MGD
With the impact of water conservation and economy industrial water demand (gallons/acres/day) at average for last five years (2008-2012)	8.4 MGD	13.9 MGD	8.8 MGD	14.6 MGD

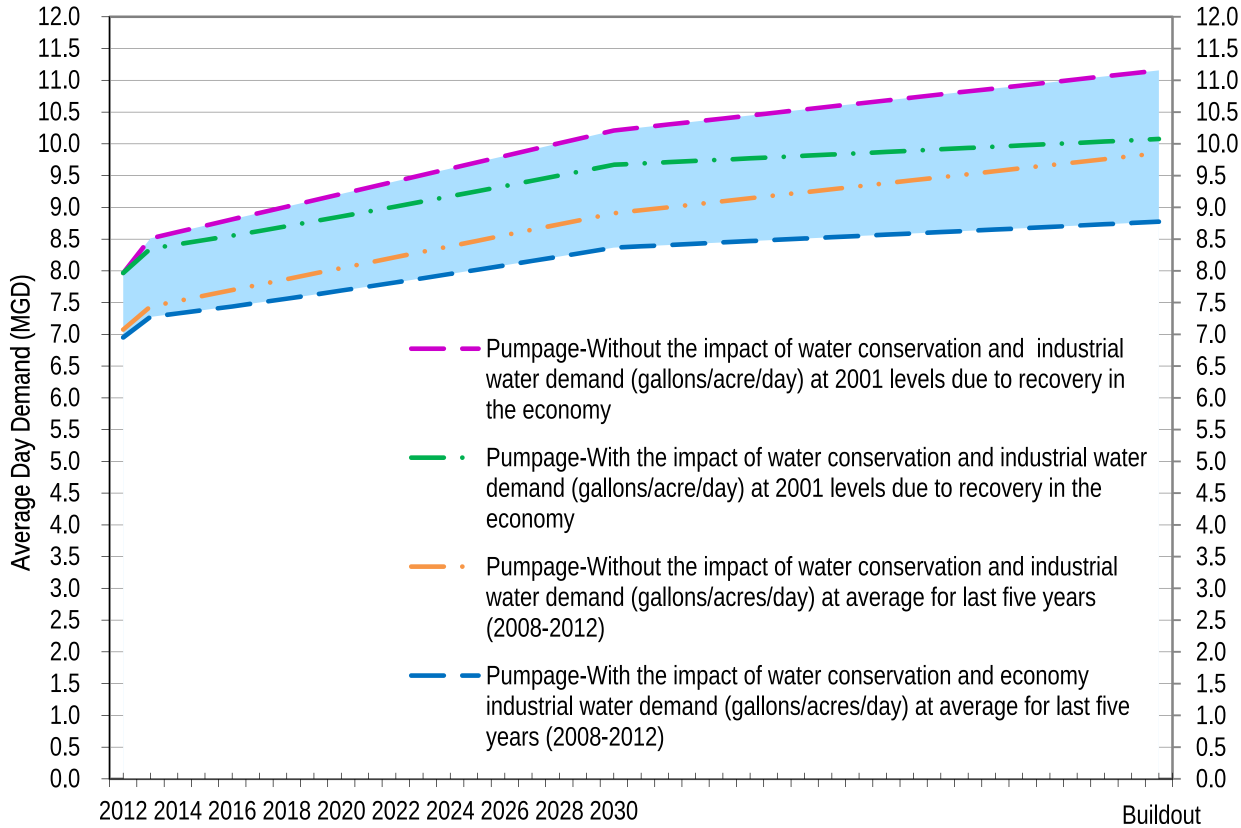


FIGURE 7: PROJECTED AVERAGE DAY WATER DEMANDS WITH ENVELOPE

6.1 Maximum Day Water Demand

Maximum day water demand is used to design water system facilities. A statistical analysis was performed to evaluate the maximum day water demand for the period from 2003 through 2012 which is presented in Attachment B. The analysis establishes a 1.66 maximum day factor with a 98 percent probability of this water demand not being exceeded. This is consistent with the maximum day factor of 1.70 used by SEWRPC in the report, A Regional Water Supply Plan for Southeastern Wisconsin.

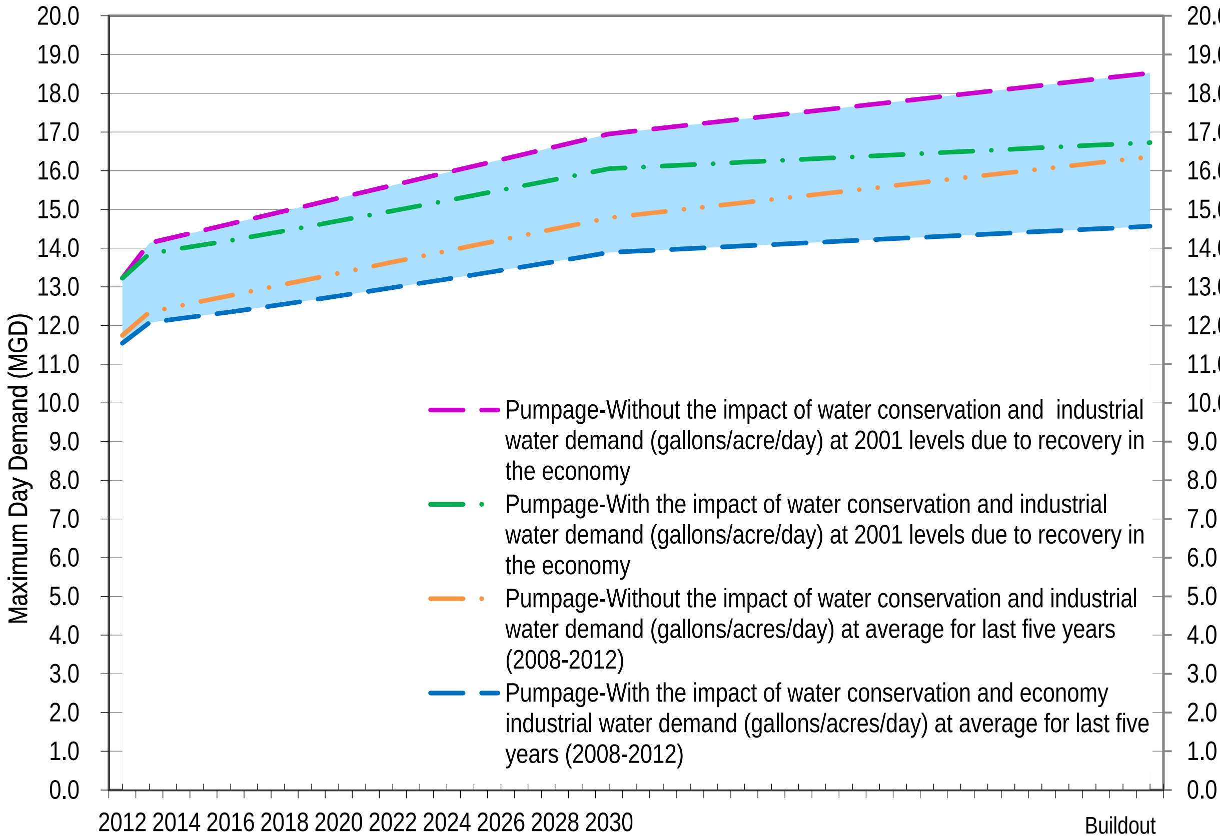


FIGURE 8: PROJECTED MAXIMUM DAY WATER DEMANDS WITH ENVELOPE

7.0 SEWRPC WATER DEMAND PROJECTION

In the study, A Regional Water Supply Plan for Southeastern Wisconsin, by SEWRPC, December 2010, 2035 average day pumpage was projected for the Waukesha Water Utility to be 9.8 MGD (Table F-7, Attachment D). Interpolating from the 2000 water demand data (basis of the SEWRPC projection), the 2030 projected average day pumpage for the Waukesha Water Utility is estimated to be approximately 9.5 MGD.

The projected 2030 average day water demand envelope estimated from this evaluation ranged from 10.2 MGD to 8.4 MGD. The projected 2030 water demand from the SEWRPC analysis (9.5 MGD) falls within the developed water demand envelope.

It is recommended for planning purpose the projected water demand for the scenario “With the impact of water conservation and industrial water demand (gallons/acre/day) at 2001 levels due to recovery in the economy” be used. This represents a projected 2030 average day water demand and maximum day water demand of 9.7 MGD and 16.1 MGD, respectively. This compares to an interpolated 2030 average day demand water demand and maximum day water demand based on the SEWPRC analysis of 9.5 MGD and 16.15 MGD respectively.

8.0 PROJECTED WATER DEMANDS BY CIVIL DIVISION

Table 9 and Table 10 summarize the estimated projected water demands for 2030 and buildout, respectively for the civil division within the WWSSA using projected water demand envelope based on the scenario “With the impact of water conservation and industrial water demand (gallons/acre/day) at 2001 levels due to recovery in the economy”. The residential, commercial, public (other municipal uses) and UFW water demand projections are based on population projections and the industrial projections based on acreage (Attachment B).

TABLE 9
PROJECTED 2030 WATER DEMAND BY CIVIL DIVISION FOR WWSSA
WITH THE IMPACT OF WATER CONSERVATION AND INDUSTRIAL WATER DEMAND (GALLONS/ACRE/DAY) AT 2001 LEVELS DUE TO RECOVERY IN THE ECONOMY

Civil Division	Estimated 2030 Population	Residential Sales (MGD)	Commercial Sales (MGD)	Public Sales (MGD)	Industrial Acreage (Acres)	Industrial Sales (MGD)	UFW (MGD)	Total (MGD)
City of Waukesha	71,105	2.80	2.28	0.28	1,643	2.12	0.65	8.1
Town of Pewaukee	1,139	0.04	0.04	0.00	--	--	0.01	0.1
Town of Genesse	1,555	0.06	0.05	0.01	38	0.05	0.01	0.2
Town of Waukesha	10,552	0.41	0.34	0.04	152	0.20	0.09	1.1
Town of Delafield	2,284	0.09	0.07	0.01	--	--	0.01	0.2
Total	86,635	3.41	2.78	0.34	1,832	2.37	0.77	9.7

TABLE 10
PROJECTED BUILDOUT WATER DEMAND BY CIVIL DIVISION FOR WWSSA
WITH THE IMPACT OF WATER CONSERVATION AND INDUSTRIAL WATER DEMAND (GALLONS/ACRE/DAY) AT 2001 LEVELS DUE TO RECOVERY IN THE ECONOMY

Civil Division	Estimated Buildout Population	Residential Sales (MGD)	Commercial Sales (MGD)	Public Sales (MGD)	Industrial Acreage (Acres)	Industrial Sales (MGD)	UFW (MGD)	Total (MGD)
City of Waukesha	76,330	2.72	2.39	0.30	1,643	2.12	0.65	8.2
Town of Pewaukee	1,370	0.05	0.04	0.01	--	--	0.01	0.1
Town of Genesse	1,850	0.07	0.06	0.01	38	0.05	0.02	0.2
Town of Waukesha	13,590	0.48	0.43	0.05	152	0.20	0.10	1.3
Town of Delafield	4,260	0.15	0.13	0.02	--	--	0.03	0.3
Total	97,400	3.47	3.06	0.38	1,832	2.36	0.81	10.1

9.0 SUMMARY

This TM documents the approach used to evaluate historical water use, the impact of conservation and the economy to develop an envelope of projected water demands. Table 11 summarizes the projected water demands for five year periods to 2030 and buildout for the WWSSA.

TABLE 11
FIVE YEAR PERIOD WATER DEMAND PROJECTIONS FOR WWSSA

Description		Actual	Projected Water Demands (MGD)							
		2012	2015	2020	2025	2030	2035	2040	2045	Buildout
Population		71,697	74,187	78,337	82,486	86,636	89,327	92,018	94,709	97,400
Residential Sales	44 gpcd	2.9	3.1	3.2	3.3	3.4	3.4	3.4	3.5	3.5
Public Sales	4 gpcd	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Commercial Sales	33 gpcd	2.3	2.4	2.5	2.7	2.8	2.8	2.9	3.0	3.1
Industrial Sales	1,297 gallons/acre/day	0.9	2.0	2.1	2.2	2.4	2.4	2.4	2.4	2.4
Total Sales		6.4	7.8	8.2	8.5	8.9	9.0	9.1	9.2	9.3
Unaccounted for Water (8%)		0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8
Total Pumpage		7.0	8.5	8.9	9.3	9.7	9.8	9.9	10.0	10.1
Maximum Day		10.8	14.1	14.8	15.4	16.1	16.2	16.4	16.6	16.7

ATTACHMENT A

ESTIMATED BUILDOUT POPULATION WITHIN THE PLANNED WAUKESHA WATER SUPPLY SERVICE AREA BY COMMUNITY, SEWRPC, JANUARY 25, 2012, WILLIAM STAUBER (WJS)

Estimated Buildout Population within the Planned Waukesha Water Supply Service Area by Community

Civil Division Within Planned Waukesha Water Supply Service Area	Year 2000 Population	Buildout Population
City of Waukesha (includes portions of Town of Waukesha served by City water)	65,700	76,330
City of Pewaukee	900	1,180-1,370
Town of Genesee	1,250	1,770-1,850
Town of Waukesha	7,410	11,490-13,590
Town of Delafield	240	820-4,260
Total	75,500	91,590-97,400

For the Town of Waukesha, the Town of Genesee and the City of Pewaukee: The higher buildout population assumes that areas designated in the comprehensive plan as future low-density residential development (broadly defined as 0.7 to 2.2 dwelling units per acre) would average 1.6 dwelling units per acre, the approximate midpoint of the plan density range. The lower buildout population assumes that such areas would develop at 1.0 dwelling unit per acre—which is more typical of historic development patterns.

For the Town of Delafield: The higher buildout population assumes that much of the undeveloped area would be developed at a medium residential density of 3.6 dwelling units per acre, which could be expected if the land were annexed to, and developed as part of, the City of Waukesha. The lower buildout population assumes that much of the undeveloped area would be developed at a density of 0.33 dwelling unit per acre, which could be expected if the land remains in the Town of Delafield and is developed for residential use.

Source: SEWRPC

wjs

01/25/12

201247

ATTACHMENT B

SUMMARY OF INDUSTRIAL ACREAGE BY CIVIL DIVISION FOR WWSSA

SUMMARY OF INDUSTRIAL ACREAGE WITHIN THE WWSSA

Year 2000			
	DEVELOPED		
MUNICIPALITY	NO	YES	Grand Total
City of Waukesha	247.44	1,395.37	1,642.81
Town of Genesee		37.57	37.57
Town of Waukesha	83.28	68.38	151.66
Grand Total	330.72	1,501.31	1,832.04

Year 2010			
	DEVELOPED		
MUNICIPALITY	NO	YES	Grand Total
City of Waukesha	191.10	1,451.71	1,642.81
Town of Genesee		37.57	37.57
Town of Waukesha	81.45	70.21	151.66
Grand Total	272.55	1,559.48	1,832.04

P:\60299880\400-Technical\400 Demand_projections\projections\[Chapter3_2011_ver4.xlsx]industrial

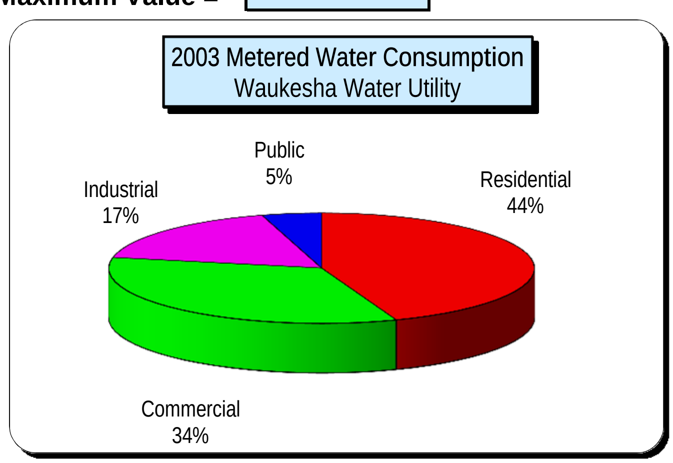
ATTACHMENT C

HISTORICAL WATER SALES, PUMPAGE, PER CAPITA DEMAND, AND MAXIMUM DAY DEMAND STATISTICAL ANALYSIS

TABLE 1
WATER SALES AND PUMPAGE HISTORY
WAUKESHA, WISCONSIN

Year	Annual Water Sales (MGY)					Total Sales (MGY)	Total Pumpage (MGY)	Percent Pumpage Metered
	Residential	Commercial	Industrial	Public	Other			
1970	822.892	276.190	1,535.995	169.083	11.906	2,816.1	3,006.8	93.7%
1971	890.447	280.171	1,447.088	167.631	19.188	2,804.5	3,012.4	93.1%
1972	881.497	287.192	1,565.355	172.490	31.935	2,938.5	3,072.7	95.6%
1973	975.877	323.378	1,465.842	192.700	15.252	2,973.0	3,128.1	95.0%
1974	1,025.621	328.510	1,537.468	**206.624**	13.291	3,111.5	3,242.7	96.0%
1975	1,052.895	330.920	1,594.955	187.992	21.310	3,188.1	3,336.3	95.6%
1976	1,216.208	312.331	1,539.435	192.299	**43.691**	3,304.0	3,337.7	99.0%
1977	**1,221.868**	318.338	1,528.131	186.411	25.995	3,280.7	3,297.2	99.5%
1978	1,210.372	331.961	1,575.439	192.370	25.298	3,335.4	3,376.2	98.8%
1979	1,010.523	611.688	**1,610.236**	182.680	35.070	3,450.2	3,526.8	97.8%
1980	1,006.519	610.472	1,514.522	178.821	21.278	3,331.6	3,372.4	98.8%
1981	988.866	605.862	1,381.485	181.293	28.538	3,186.0	3,137.9	**101.5%**
1982	955.905	582.575	1,167.949	173.322	31.914	2,911.7	2,983.5	97.6%
1983	1,013.178	624.780	1,125.678	190.081	21.608	2,975.3	3,025.1	98.4%
1984	992.981	624.760	1,265.934	167.928	9.780	3,061.4	3,222.1	95.0%
1985	1,046.448	636.325	1,329.419	182.512	17.915	3,212.6	3,317.3	96.8%
1986	979.119	646.851	1,266.090	171.550	16.013	3,079.6	3,172.0	97.1%
1987	1,016.124	665.474	1,283.305	186.079	17.982	3,169.0	3,348.3	94.6%
1988	1,184.474	724.986	1,346.657	189.440	16.381	**3,461.9**	**3,606.7**	96.0%
1989	1,085.159	745.900	1,166.538	169.859	16.908	3,184.4	3,239.0	98.3%
1990	1,034.574	724.123	1,030.874	160.143	1.042	2,950.8	3,076.6	95.9%
1991	1,104.334	756.742	965.288	178.332	35.004	3,039.7	3,054.8	99.5%
1992	1,060.875	794.856	745.217	101.682	0.000	2,702.6	2,873.2	94.1%
1993	1,016.286	815.077	810.622	94.230	0.000	2,736.2	2,882.5	94.9%
1994	1,076.528	846.078	769.630	104.456	0.000	2,796.7	2,974.1	94.0%
1995	1,077.515	856.522	765.975	119.209	0.000	2,819.2	3,011.5	93.6%
1996	1,087.119	860.396	763.133	120.014	0.000	2,830.7	2,892.3	97.9%
1997	1,089.493	821.105	783.390	117.377	0.000	2,811.4	2,945.3	95.5%
1998	1,109.478	837.823	796.217	116.833	0.000	2,860.4	2,974.5	96.2%
1999	1,112.499	847.914	722.097	177.408	0.000	2,859.9	3,028.4	94.4%
2000	1,067.184	848.664	660.364	108.873	0.000	2,685.1	2,816.7	95.3%
2001	1,128.475	874.030	586.552	114.492	0.000	2,703.5	2,822.0	95.8%
2002	1,185.745	**914.138**	612.856	119.173	0.000	2,831.9	2,953.2	95.9%
2003	1,176.115	895.850	461.885	120.071	0.000	2,653.9	2,795.9	94.9%
2004	1,117.325	854.624	435.004	121.601	0.000	2,528.6	2,699.0	93.7%
2005	1,193.851	874.418	428.518	120.126	0.000	2,616.9	2,831.5	92.4%
2006	1,077.127	858.062	424.603	109.846	0.000	2,469.6	2,620.5	94.2%
2007	1,086.542	846.566	404.079	110.532	0.000	2,447.7	2,618.7	93.5%
2008	1,056.650	827.543	382.413	99.646	0.000	2,366.3	2,531.0	93.5%
2009	1,054.288	806.736	325.667	99.619	0.000	2,286.3	2,479.9	92.2%
2010	1,016.670	801.714	326.289	93.491	0.000	2,238.2	2,438.0	91.8%
2011	1,002.628	803.917	340.464	99.126	0.000	2,246.1	2,545.1	88.3%
2012	1,052.779	826.637	334.776	114.020	0.000	2,328.2	2,537.4	91.8%

Maximum Value =



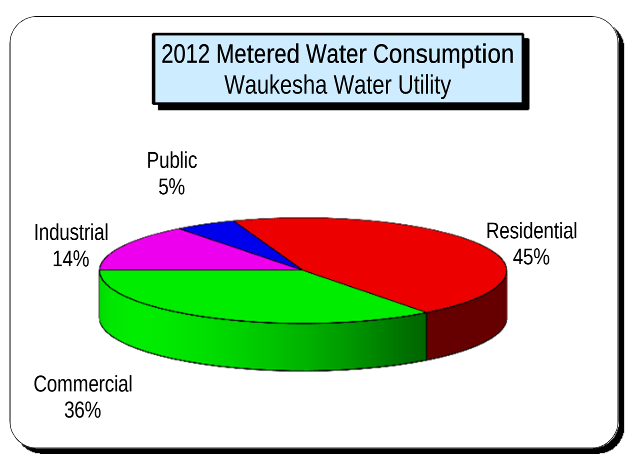
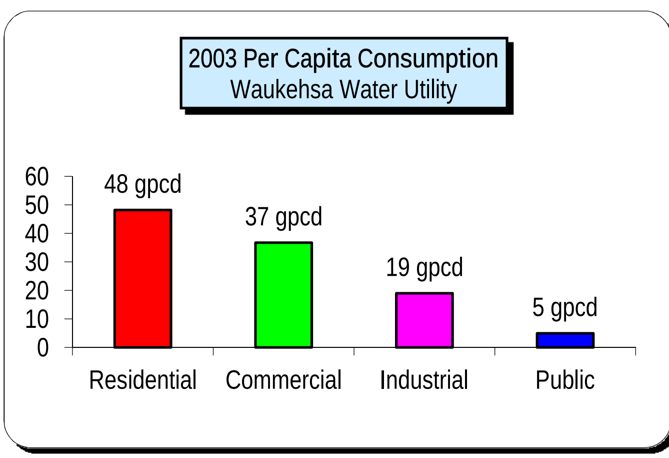


TABLE 2
HISTORICAL PER CAPITA CONSUMPTION
WAUKESHA WATER UTILITY
WAUKESHA, WISCONSIN

Year	Estimated Population	Gallons per capita per day				
		Residential	Commercial	Industrial	Public	Total Sales
1970	39,695	56.8	19.1	106.0	11.7	194
1971	40,762	59.8	18.8	97.3	11.3	188
1972	41,829	57.7	18.8	102.5	11.3	192
1973	42,896	62.3	20.7	93.6	12.3	190
1974	43,963	63.9	20.5	95.8	12.9	194
1975	45,030	64.1	20.1	97.0	11.4	194
1976	46,097	72.3	18.6	91.5	11.4	196
1977	47,164	71.0	18.5	88.8	10.8	191
1978	48,231	68.8	18.9	89.5	10.9	189
1979	49,298	56.2	34.0	89.5	10.2	192
1980	50,365	54.8	33.2	82.4	9.7	181
1981	51,024	53.1	32.5	74.2	9.7	171
1982	51,684	50.7	30.9	61.9	9.2	154
1983	52,343	53.0	32.7	58.9	9.9	156
1984	53,002	51.3	32.3	65.4	8.7	158
1985	53,662	53.4	32.5	67.9	9.3	164
1986	54,321	49.4	32.6	63.9	8.7	155
1987	54,980	50.6	33.2	63.9	9.3	158
1988	55,639	58.3	35.7	66.3	9.3	170
1989	56,299	52.8	36.3	56.8	8.3	155
1990	56,958	49.8	34.8	49.6	7.7	142
1991	57,613	52.5	36.0	45.9	8.5	145
1992	58,268	49.9	37.4	35.0	4.8	127
1993	58,923	47.3	37.9	37.7	4.4	127
1994	59,578	49.5	38.9	35.4	4.8	129
1995	60,232	49.0	39.0	34.8	5.4	128
1996	60,887	48.9	38.7	34.3	5.4	127
1997	61,542	48.5	36.6	34.9	5.2	125
1998	62,197	48.9	36.9	35.1	5.1	126
1999	63,027	48.4	36.9	31.4	7.7	124
2000	64,825	45.1	35.9	27.9	4.6	113
2001	65,324	47.3	36.7	24.6	4.8	113
2002	66,237	49.0	37.8	25.3	4.9	117
2003	66,807	48.2	36.7	18.9	4.9	109
2004	66,816	45.8	35.0	17.8	5.0	104
2005	67,466	48.5	35.5	17.4	4.9	106
2006	68,117	43.3	34.5	17.1	4.4	99
2007	68,767	43.3	33.7	16.1	4.4	98
2008	69,417	41.7	32.7	15.1	3.9	93
2009	70,068	41.2	31.5	12.7	3.9	89
2010	70,718	39.4	31.1	12.6	3.6	87
2011	70,867	38.8	31.1	13.2	3.8	87
2012	71,697	40.2	31.6	12.8	4.4	89

Maximum Value =



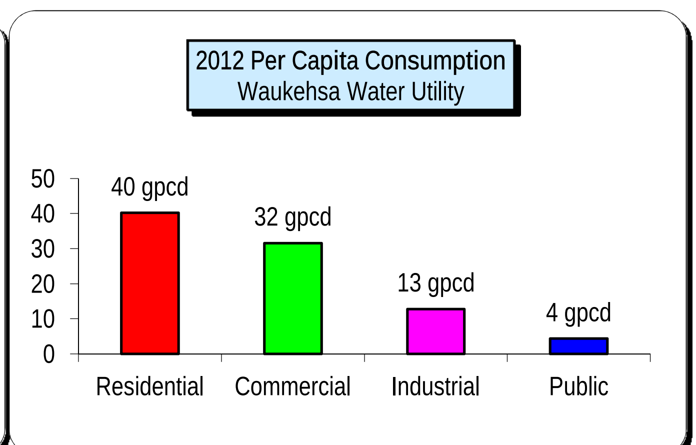


TABLE 3

STATISTICAL ANALYSIS:
RATIO OF MAXIMUM TO AVERAGE DAY DEMAND

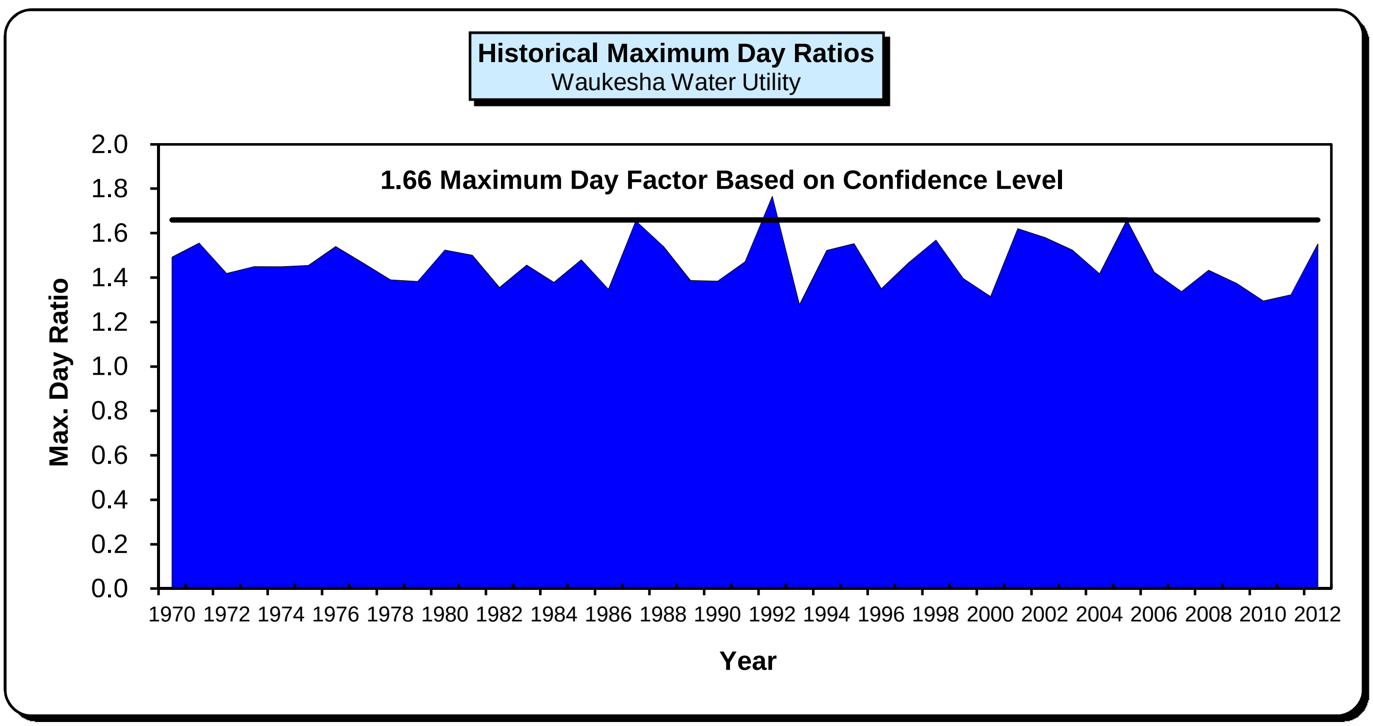
WAUKESHA WATER UTILITY
WAUKESHA, WISCONSIN

	2003 to 2012	1970 to 2012
Number of years of Data	10	43
Maximum Ratio - Max. to Avg. Day Pumpage	165.9%	176.6%
Minimum Ratio - Max. to Avg. Day Pumpage	129.5%	127.8%
Average Ratio Max. to Avg. Day Pumpage	143.4%	146.1%
Standard Deviation	10.8%	10.5%

Confidence Level (%)	Ratio of Max. to Avg. Day Pumpage (2003 to 2012)	Ratio of Max. to Avg. Day Pumpage (1970 to 2012)
80%	153%	155%
85%	155%	157%
90%	157%	160%
95%	161%	163%
98%	166%	168%
99%	169%	171%

Note

The "Confidence Level" represents the probability (%) that in any given year, the actual ratio of maximum to average day pumpage will be less than or equal to the ratio indicated in the table. The ratios in the table were determined based on a statistical analysis of historical ratios over each period of analysis, assuming a normal distribution.

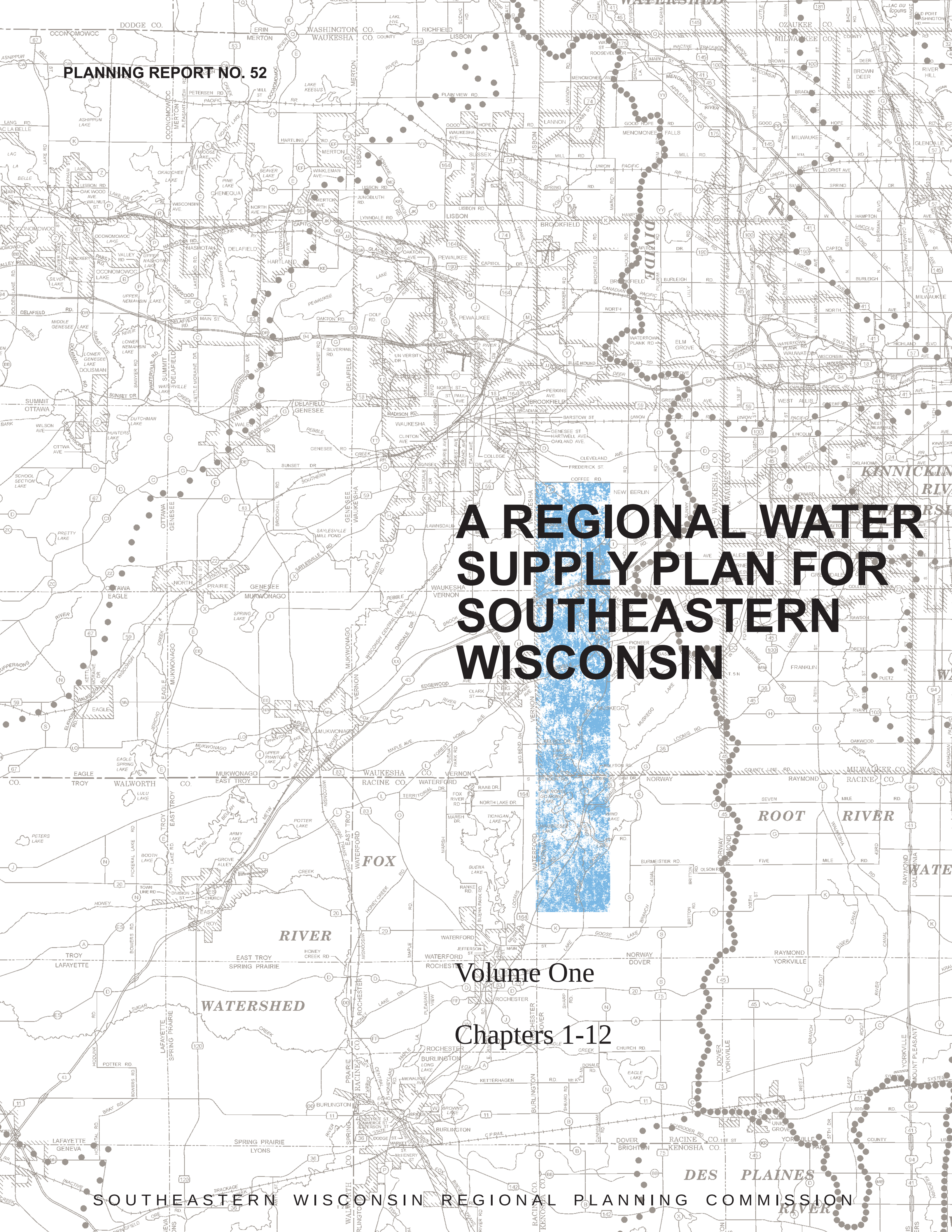


P:\60299880\400-Technical\400 Demand_projections\projections\[Chapter3_2011_ver4.xlsx]Table 3-12

ATTACHMENT D

SEWRPC, TABLE F-7, A REGIONAL WATER SUPPLY PLAN FOR SOUTHEASTERN WISCONSIN, DECEMBER 2010

PLANNING REPORT NO. 52



A REGIONAL WATER SUPPLY PLAN FOR SOUTHEASTERN WISCONSIN

Volume One

Chapters 1-12

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

Table F-7

MUNICIPAL WATER SERVICE AREA WATER DEMAND AND RELATED PUMPAGE DATA FOR WAUKESHA COUNTY: 2000 AND 2035

	Current 2000 Water Use			Estimated Water Use Increase 2000 to 2035								Planned Year 2035 Water Use and Pumpage			
				Residential Water Use		Industrial Water Use		Commercial and Institutional Water Use		Other Municipal Uses					
Utility	Average Day Water Use[a] (gallons per day X 1,000)	Average Day Pumpage[a] (gallons per day X 1,000)	Maximum Day Pumpage[a] (gallons per day X 1,000)	Increase in Population Served	Average Day Water Use[b] (gallons per day X 1,000)	Increase in Area Served (acres)	Average Day Water Use[c] (gallons per day X 1,000)	Increase in Area Served (acres)	Average Day Water Use[d] (gallons per day X 1,000)	Increase in Area Served (acres)	Average Day Water Use[e] (gallons per day X 1,000)	Calculated Average Day Water Use[f] (gallons per day X 1,000)	Average Day Water Use Adjusted for Water Conservation[g] (gallons per day X 1,000)	Average Day Pumpage[h] (gallons per day X 1,000)	Maximum Day Pumpage[i] (gallons per day X 1,000)
City of Brookfield Municipal Water Utility	2,971	3,659	4,545	20,950	1,467	39	59	1,084	867	906	91	5,454	4,908	6,045	9,374
Delafield Municipal Water Utility	85	95	218	12,300	861	42	63	419	335	1,496	150	1,494	1,344	1,503	2,982
City of Muskego Public Water Utility	525	586	1,075	20,850	1,460	102	153	315	252	1,389	139	2,528	2,276	2,540	5,400
City of New Berlin Water Utility (east)	1,527	1,777	2,547	2,900	203	48	72	168	134	486	49	1,985	1,906	2,218	3,824
City of New Berlin Water Utility (west)	1,279	1,488	2,133	8,300	581	334	501	498	398	119	12	2,771	2,494	2,902	4,656
City of Oconomowoc Utilities	1,296	1,562	2,609	9,800	686	357	536	453	362	1,471	147	3,027	2,785	3,356	5,790
City of Pewaukee Water and Sewer Utility	889	1,150	1,793	8,150	571	224	336	371	297	614	61	2,154	1,938	2,507	4,935
City of Waukesha Water Utility	7,356	7,770	10,147	23,500	1,645	371	557	783	626	1,451	145	10,329	9,296	9,819	13,437
Village of Butler Public Water Utility	363	404	670	0	0	60	90	11	9	-64	-6	455	437	487	782
Dousman Water Utility	133	148	234	3,150	221	14	21	72	58	353	35	467	430	479	811
Village of Eagle Municipal Water Utility	130	145	566	200	14	51	77	37	30	-51	-5	245	230	257	775
Hartland Municipal Water Utility	801	923	1,472	3,650	256	69	104	174	139	459	46	1,345	1,237	1,426	2,617
Village of Menomonee Falls Water Utility (east)	2,779	3,565	5,293	4,650	326	389	584	657	526	522	52	4,266	4,095	5,253	8,935
Village of Menomonee Falls Water Utility (west)	140	180	267	6,650	466	94	141	71	57	518	52	855	787	1,011	1,604
Mukwonago Municipal Water Utility	520	636	896	5,350	375	120	180	289	231	627	63	1,368	1,232	1,506	2,217
Village of Pewaukee Water Utility	655	849	1,220	3,450	242	23	35	192	154	298	30	1,114	1,003	1,300	1,977
Village of Sussex Water Utility	836	996	1,812	7,950	557	179	269	210	168	532	53	1,882	1,694	2,018	3,692
Brookfield Sanitary District No. 4	819	1,029	1,392	200	14	42	63	228	182	-240	-24	1,054	970	1,219	1,689
Village of Big Bend	- -	- -	- -	2,200	154	106	159	171	137	258	26	476	438	512	807
Village of Elm Grove	- -	- -	- -	6,650	466	0	0	210	168	508	51	684	657	769	1,299
Village of Lannon	- -	- -	- -	1,700	119	95	143	66	53	341	34	348	321	375	591
Village of North Prairie	- -	- -	- -	2,900	203	58	87	91	73	295	30	392	361	422	665
Village of Wales	- -	- -	- -	1,600	112	12	18	110	88	48	5	223	205	240	378

Table F-7 (continued)

Utility	Current 2000 Water Use			Estimated Water Use Increase 2000 to 2035								Planned Year 2035 Water Use and Pumpage			
				Residential Water Use		Industrial Water Use		Commercial and Institutional Water Use		Other Municipal Uses					
	Average Day Water Use[a] (gallons per day X 1,000)	Average Day Pumpage[a] (gallons per day X 1,000)	Maximum Day Pumpage[a] (gallons per day X 1,000)	Increase in Population Served	Average Day Water Use[b] (gallons per day X 1,000)	Increase in Area Served (acres)	Average Day Water Use[c] (gallons per day X 1,000)	Increase in Area Served (acres)	Average Day Water Use[d] (gallons per day X 1,000)	Increase in Area Served (acres)	Average Day Water Use[e] (gallons per day X 1,000)	Calculated Average Day Water Use[f] (gallons per day X 1,000)	Average Day Water Use Adjusted for Water Conservation[g] (gallons per day X 1,000)	Average Day Pumpage[h] (gallons per day X 1,000)	Maximum Day Pumpage[i] (gallons per day X 1,000)
Town of Eagle-Eagle Spring Lake Area...........................	- -	- -	- -	450	32	2	3	6	5	0	0	39	36	42	67
Town of Oconomowoc-Okauchee Lake Area-	- -	- -	- -	7,250	508	5	8	124	99	825	83	697	641	750	1,182
Town of Ottawa-Pretty Lake Area	- -	- -	- -	250	18	1	2	1	1	24	2	22	20	24	38
Town of Summit-Golden Lake Area	- -	- -	- -	200	14	0	0	1	1	8	1	16	14	17	26
Total	23,104	26,962	38,889	165,200	11,564	2,837	4,256	6,812	5,450	13,193	1,319	45,692	41,755	48,997	80,550

[a] *Data based upon year 2000 Public Service Commission Reports data for water sales, except the City of New Berlin Water Utility data which is based upon estimated year 2006 data provided by the City of New Berlin Water Utility.*

[b] *Based upon 70 gallons per capita per day.*

[c] *Based upon 1,500 gallons per acre per day.*

[d] *Based upon 800 gallons per acre per day.*

[e] *Based upon 100 gallons per acre of urban services area per day.*

[f] *The sum of the existing average 2000 water use and the expected incremental average day water use through 2035.*

[g] *Adjustment varies from 4 to 10 percent reduction based upon utility. See SEWRPC Technical Report No. 43,* State-of-the-Art of Water Supply Practices*, dated July 2007, Chapter VII.*

[h] *Based upon same ratio of average day pumpage to average day water use as in 2000.*

[i] *Based upon the three-year average (2000, 2001, and 2002) ratio of maximum day pumpage to average day pumpage, adjusted by from 2 to 8 percent for additional water conservation measure impacts over and above the adjustment for average day water use. See SEWRPC Technical Report No. 43,* State-of-the-Art of Water Supply Practices*, dated July 2007, Chapter VII.*

Source: SEWRPC.

Appendix D
Water Conservation Plan

Final

Water Conservation Plan

Prepared for

Waukesha Water Utility

May 2012

Amy Vickers & Associates, Inc.
Water Planning, Policy, and Management

CH2MHILL®

Beth Foy & Associates, LLC

Final

Water Conservation Plan

Prepared for

Waukesha Water Utility

May 2012

CH2MHILL®

135 S. 84th Street
Suite 400
Milwaukee, WI 53214

Acknowledgements

City of Waukesha Water Utility Commission

Dan Warren, Commission President

Greg Zinda, Commission Secretary

Joseph J Piatt, Ph.D., M.S.C.E., Commissioner

Bill Boyle, Commissioner

Gerald Couri, Commissioner

Terry Thieme (Alderman), Commissioner

Mayor Jeff Scrima, Commissioner

Waukesha Water Utility Staff

Dan Duchniak, General Manager

Nancy Quirk, P.E., Technical Services Manager

Mary K. Adelmeyer, Water Resources Assistant

Scott B. Lange, Water Quality Technician

Water Conservation Stakeholder Committee

Bill Boyle, WWU Commissioner, resident

Pete Conine, City of Waukesha Wastewater Utility

Victoria Hekkers, Katydid Owner and City landlord

James Hill, Waukesha Memorial Hospital

Mark Keckeisen, Waukesha County Buildings

Suzanne Kelley, Waukesha County Business Alliance

Jim Lombardi, Pure Power Technology

Ezra Myer, Clean Wisconsin

Glen Norder, Waukesha School District

Joe Piatt, Carroll University, WWU Commissioner

Gina Sanchez, La Casa de Esperanza

Pete Traczek, City Parks and Forestry

Andy Yencha, UW-Extension, Fox River Basin educator

We gratefully acknowledge the assistance and time of other contributors to the 2012 Water Conservation Plan update including:

Participants in the customer interviews and survey and the planning consultant team members from Amy Vickers & Associates, Inc., Amherst, MA, Beth Foy and Associates, Menomonee Falls, WI, and the team at CH2M HILL

Executive Summary

Water conservation is an important element in the City of Waukesha (City) long-range water supply strategy. To rely on water conservation savings as a source of supply, the City adopted its 2006 Water Conservation and Protection Plan, which set forth water savings goals and recommendations for conservation program management and source water protection. Since 2006, the City implemented a variety of conservation measures, including the following:

- First in the state to implement inclining block water rate structure to encourage conservation
- City ordinance to restrict outdoor irrigation
- High-efficiency toilet rebates
- School and general public information and education campaigns

Introduction

Through this update to its Water Conservation Plan (Plan), the City is establishing a path forward to achieve greater water use efficiency and is documenting its commitment to water conservation and meeting the environmental standards of the Great Lakes–St. Lawrence River Basin Water Resources Compact (Compact). Further, this Plan complies with the conservation targets and tactics established in the State of Wisconsin Compact implementation rule, NR 852 Water Conservation and Water Use Efficiency (NR 852). The requirements of NR 852 are mandatory for new or increased diversions from the Great Lakes. NR 852 prescribes wide-ranging water conservation and efficiency measures (CEMs) for public water systems with an overall requirement of a 10 percent reduction in water use, or increase in water reuse or efficiency. A 10 percent reduction in water use is equivalent to approximately 1 million gallons per day (mgd) for the ultimate buildout condition of the City's water supply service area. While the Plan is focused on conservation activities over the next 5 years, the recommendations for program implementation, monitoring, evaluation and refinement are consistent with 20-year (2030) and ultimate buildout (2050) water savings goals listed in Table ES-1.

TABLE ES-1
Target Water Savings from Conservation and Water Use Efficiency

Year	Average Day Demand Flowrate (mgd)	Cumulative Volume (MG)
2016	0.2	86.8
2030	0.5	182.5
2050 (Ultimate Buildout)	1.0	365

Note: Estimated cumulative savings through 2011 is 36.4 million gallons (MG).

Water Conservation Goals and Objectives

The City's water conservation goals include the following:

- Reducing average day demand by 0.5 mgd by year 2030 and by 1.0 mgd by year 2050.

The objectives met to achieve the City's goals and develop this Plan include the following:

- Comply with NR 852
- Align with the Southeastern Wisconsin Regional Planning Commission 2035 Regional Water Supply Plan
- Incorporate stakeholder and customer input in the evaluation of CEMs
- Use the Alliance for Water Efficiency (AWE) Water Conservation Tracking Tool (AWE Tool) to estimate CEM cost-effectiveness
- Be inclusive of all City customer classes
- Target highest potential savings

- Pursue cost-effective CEMs; leverage lessons learned from other conservation programs across the country and from its own experiences with implementation
- Promote conservation awareness

Key Elements of the Plan

Reaching the City's water savings goals requires capital investment, additional staff time, and cooperation and enthusiasm from a broad range of the citizenry. For these reasons, the City is using a robust planning process to identify and evaluate CEMs for best fit in Waukesha. The approach, shown in Figure ES-1, integrates implementing, monitoring, and refinement of conservation measures to enhance program efficiency. This approach is supported by proven tools, like the AWE Water Conservation Tracking Tool (Tool) used to calculate the estimated costs and benefits of CEMs. The resources, in combination with experienced Waukesha Water Utility (WWU) staff and an engaged water conservation stakeholder committee, resulted in the following key elements of the City's Plan:

- Conservation program flexibility, allowing City discretion to change which measures are implemented, the schedule and the balance between the measures from year to year.
- Youth and public education, especially to meet goals in 2030 and beyond. In the next 5 years, the City will present easily understood, clearly communicated information to help customers understand and manage their water use.
- Financial incentives such as rebates or possible grants for innovative site-specific water saving measures with demonstrated savings, especially for commercial and industrial customers.
- Reduction of excess and inefficient outdoor irrigation.
- Increased collaboration with water conservation partners.
- Continued water conservation pricing.

FIGURE ES-1
Water Conservation Planning Process

Evaluation of conservation measures

Following the publishing of NR 852 in 2011 and prior to the development of this Plan, the City evaluated numerous CEMs using the AWE Tool. This tool is a water conservation calculator that is recommend by the Wisconsin Department of Natural Resources (WDNR) under NR 852 for estimating water savings and costs associated with CEMs. The initial analysis using the AWE Tool resulted in a short list of candidate CEMs for further evaluation by WWU and stakeholders. Stakeholders were engaged in the water conservation planning process through an online survey, strategic customer interviews, and participation in the water conservation stakeholder committee. Engaging the City's customers and active community members provided valuable insights regarding the level of awareness of the need for conservation and ways to achieve it. The stakeholder committee input helped establish a baseline for the City's approach to future public information and education activities. Furthermore, successfully engaging a broad range of stakeholder interests provided useful perspectives used to evaluate CEMs and community acceptance of proposed conservation measures.

Benefit-Cost Analysis

A benefit-cost (B:C) analysis was conducted to compare the costs and benefits of implementing each CEM. Using the AWE Tool, cost encompassed monetary costs and environmental costs, including for example greenhouse gas emissions. Benefits were estimated in monetary terms and as water volumes saved. The CEMs that resulted in neutral or positive B:C ratios, and the projected water savings, are listed in Table ES-2.

TABLE ES-2
Summary of B:C Ratio and Projected Water Savings

Activity	City B:C Ratio	Customer B:C Ratio	Projected Water Savings (gallons) Years 2012 - 2016
Residential high-efficiency toilets (HETs), $100 rebate	3.7	271	7,325,700
Multi-family residential HET direct install, $100 rebate	5.6	38.9	113,000
Commercial tank-type HET, $100 rebate	3.5	24.1	34,500
Commercial valve-type HET	3.5	23.9	57,500
Industrial tank-type HET, $100 rebate	3.5	23.9	80,400
Industrial valve-type HET, $100 rebate	3.5	23.9	80,400
Public tank-type HET, $100 rebate	3.5	23.9	80,400
Public valve-type HET, $100 rebate	3.5	23.9	80,400
Residential water-efficient showerhead	378	3.1	866,200
Multi-family residential water-efficient showerhead	6.9	6.8	11,400
Commercial water-efficient showerhead	6.9	7.4	4,100
Industrial water-efficient showerhead	5.4	7.3	16,500
Public water-efficient showerhead	4.9	6.7	15,200
Residential indoor water use surveys	0	N/A	73,000
Multi-family residential indoor water user surveys	0	N/A	4,000
Commercial indoor water use surveys	0	N/A	17,000
Industrial indoor water use surveys	0	N/A	21,700
Public indoor water use surveys	0	N/A	21,700
Commercial outdoor water use surveys	0	N/A	N/A
Public outdoor water use surveys	0	3.0	N/A
Commercial urinals, $100 rebate	1.2	3.0	93,100
Industrial urinals, $100 rebate	1.2	3.0	93,100
Public urinals, $100 rebate	1.2	3.0	93,100
Commercial spray-rinse valves rebates	6.4	478	1,414,300
Industrial spray-rinse valves rebates	6.0	444	1,414,300
Public spray-rinse valves rebates	6.0	444	1,414,300
Public ~~HE~~ clothes washer rebate	-0.3	N/A	7,000

Note: N/A = unknown at this time

Recommended Implementation Plan

The recommended implementation plan for the next 5 years is summarized in Table ES-3. It includes the following elements:

- New and expanded fixture rebate measures to accelerate replacement of less efficient devices
- Expanded public education and information

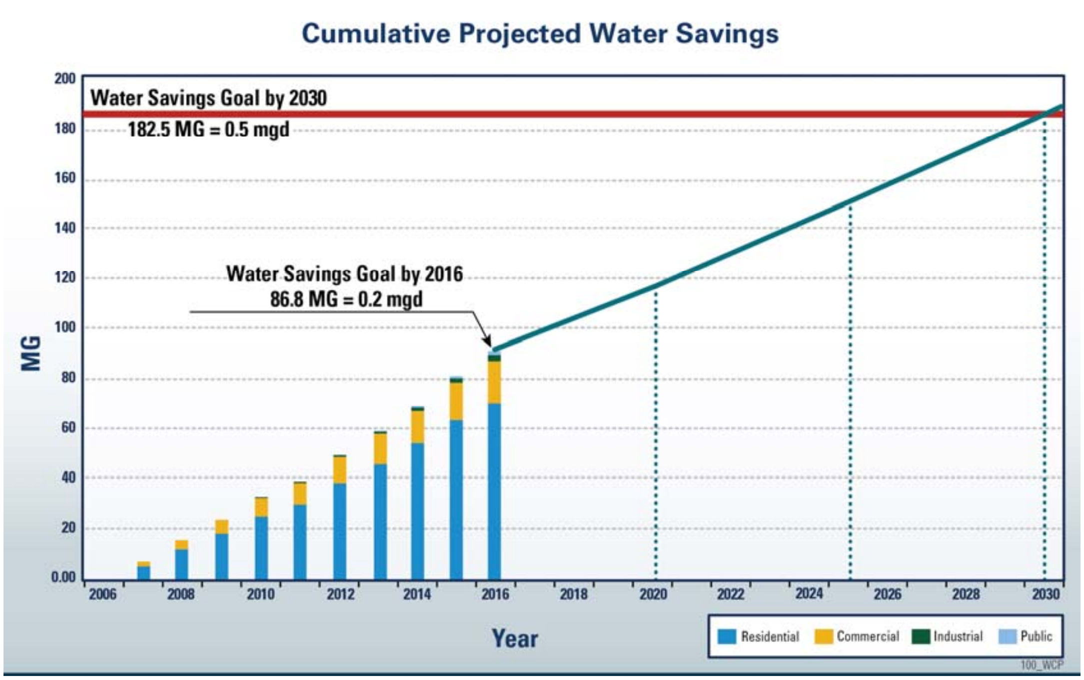
- Additional customer water audits to design tailored customer demand management strategies
- Increase program data gathering and monitoring to measure program effectiveness

TABLE ES-3
Estimated Costs—Water Conservation Program

Activity Name	2012	2013	2014	2015	2016
Toilet rebates	$5,500	$20,800	$24,900	$33,100	$35,900
Showerhead rebates		$500	$0	$3000	$0
Indoor water use audits	$0	$13,100	$14,400	$14,400	$16,000
Outdoor water use audits	$0	$0	$600	$400	$400
Urinal rebates	$0	$0	$0	$2,900	$3,900
Spray-rinse valve rebates	$0	$2,200	$1,300	$1,300	$2,500
Leak detection, mains, and hydrants	$7,000	$10,000	$10,000	$10,000	$10,000
Pilot project or tailored incentives	$0	$0	$5,000	$5,000	$5,000
Subtotal	$12,500	$36,500	$45,900	$52,500	$62,700
Public education and outreach	$10,500	$10,500	$10,500	$10,500	$10,500
Program management, auditing, reporting, customer service, sprinkler ordinance	$34,800	$38,000	$45,000	$45,000	$45,000
Estimated Program Cost Total	$57,800	$95,100	$106,700	$117,900	$124,200

Figure ES-2 shows how projected water savings over the next 5 years contribute to the City's long-term goals. Annually, the City will refine design of conservation program to maximize water savings, return on investment, and customer satisfaction. In 5 years, the City will formally update its water conservation plan and adjust planning strategies to account for actual savings accomplished and future conditions.

FIGURE ES-2
Water Savings Goal and Projected Water Savings



The implementation strategy shown in Table ES-4 is designed to build a strong foundation and support for the programs in Year 1 (2012) through public education and incentives for residential customers, particularly the top 10 percent water users. Starting in Year 2 (2013), the program focus would expand to include incentives for commercial and industrial customers. As the program expands over the subsequent 3 years (2014 to 2016), additional measures would be emphasized to capture the greatest savings and the lowest costs. Preliminary mid-term (6 to 10 years) and long-term (10 to 30 years) implementation schedules for the City’s water conservation program are outlined to provide guidance to future updates to the Plan.

TABLE ES-4
Near-Term Implementation Plan (1 to 5 Years)

Program Element	2012	2013	2014	2015	2016
Municipal Infrastructure	Continue leak audits, meter calibration and replacement, pressure management, and other distribution system measures. Purchase leak correlator for distribution surveys and train staff.	Continue leak audits, meter calibration and replacement pressure management, and other distribution system measures. Begin discussions with wastewater utility on water savings opportunities. Conduct leak detection surveys of mains and hydrants.	Continue leak audits, meter calibration and replacement, pressure management, and other distribution system measures. Identify top 1 to 5 parks with high outdoor water use and estimate retrofit costs. Work with the City and county to identify potential public facility retrofit opportunities. Conduct leak detection surveys of mains and hydrants.	Continue leak audits, meter calibration and replacement, pressure management, and other distribution system measures. Begin planning unidirectional flushing program. Work with parks department, the City, and the county to identify irrigation retrofit funding opportunities. Conduct leak detection surveys of mains and hydrants.	Continue leak audits, meter calibration and replacement pressure management, and other distribution system measures. Finalize unidirectional flushing program plan. Begin discussions with City staff regarding low-impact development opportunities. Conduct a public facility retrofit/ demonstration project. Conduct leak detection surveys of mains and hydrants.
Public and School Education and Information	Continue school programs and tours. Begin planning Teach the Teacher workshops. Begin collaboration with the county and other groups for speakers series on water conservation. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects.	Continue school programs and tours. Continue collaboration with other stakeholder groups. Hold Teach the Teacher workshop(s). Enhance the WWU Web site to expand online resource library and rebate application/tracking. Continue partnerships to spread conservation message. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects. Train WWU and City staff to present water conservation presentations for neighborhoods and other community groups. Plan 2013 speakers bureau to target key groups.	Continue school programs and tours. Continue collaboration with other stakeholder groups. Hold Teach the Teacher workshop(s) and reduce staff time spent in schools and on tours. Hold workshop with green industry partners, such as irrigators, landscapers, and nurseries, on water-efficient practices. Continue partnerships to spread conservation message. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects. Conduct media training workshop on water conservation measures and programs. Plan and solicit sponsors for annual conservation awards breakfast.	Continue school programs and tours. Continue collaboration with other stakeholder groups. Hold Teach the Teacher workshop(s) and reduce staff time spent in schools and on tours. Hold irrigator training workshop. Hold workshop/participate in association meeting(s) for commercial, industrial, and institutional (CII; public) customer group(s). Continue partnerships to spread conservation message. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects. Host annual conservation awards breakfast.	Continue school programs and tours. Continue collaboration with other stakeholder groups. Hold Teach the Teacher workshop(s) and reduce staff time spent in schools and on tours. Hold irrigator training workshop. Hold workshop/participate in association meeting(s) for CII customer group(s). Continue partnerships to spread conservation message. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects. Host annual conservation awards breakfast.
Rebates and Incentives: Residential	Provide $100 HET rebate and publicize program. Plan and initiate showerhead rebate/distribution program. Revamp applications and information packets. Develop plan for onsite residential audits for public housing and large irrigation users.	Continue HET rebate, showerhead rebate/distribution, and water use audits. Develop online water use calculator and self-audit tool. Publicize sprinkler rebate program and plan strategic communication plan focused on landscaping, such as WWU newsletter articles, Web site information, presentations, and press releases. Conduct onsite irrigation audits for large users.	Continue HET rebate, showerhead rebate/distribution, and water use audits. Continue existing rebate programs.	Continue HET rebate, showerhead rebate/distribution, and water use audits. Hold HET distribution event to distribute a target number of toilets in 1 day.	Continue HET rebate, showerhead rebate/distribution, and water use audits.
Rebates and Incentives: CII	Expand HET rebate program to include commercial and light industrial customers. Meet with colleges and hospitals to begin program design.	Continue HET rebate, commercial audits, and sprinkler program. Initiate showerhead rebate/installation program.	Continue HET rebate, commercial audits, and sprinkler program. Continue showerhead rebate/installation program.	Continue HET rebate, commercial audits, and sprinkler program. Continue showerhead rebate/installation program.	Continue HET rebate, commercial audits, and sprinkler program. Continue showerhead rebate/installation program.

TABLE ES-4
Near-Term Implementation Plan (1 to 5 Years)

Program Element	2012	2013	2014	2015	2016
	Continue to provide information on commercial audits and develop plan for onsite audit program. Continue to work with Waukesha Housing Authority on retrofit program. Develop plan for top 1 percent of CII users.	Initiate spray-rinse valve rebate program. Initiate pilot program with Waukesha Housing Authority for minor plumbing and leak repair (combined with fixture replacement). Initiate first phase of fixture replacement/ retrofit program with college. Plan 2014 CII focus (for example, focus on restaurants, schools, or medical facilities).	Continue spray-rinse valve rebate program. Continue/expand Housing Authority program. Plan expansion of minor plumbing repair program to other low income and senior customers.	Continue spray-rinse valve rebate program. Expand minor plumbing and leak repair program. Initiate urinal rebate program.	Continue spray-rinse valve rebate program. Continue urinal rebate program.
Policies, Regulations, and Enforcement	Continue to administer and publicize sprinkling ordinance (continue 2013–2016).	Begin research on various conservation policies to estimate potential savings and costs. Further explore water conservation requirements in WWU service rules.	Begin stakeholder discussions regarding selected policies.	Draft language for selected policies.	Begin process for approval of selected policies.
Reporting, Monitoring, and Plan Updates	Streamlined databases to facilitate auditing and reporting. CEM effectiveness audit/monitoring. Prepare and submit annual report to the Public Service Commission (PSC). Host meeting to present annual results to Stakeholder Committee.	Continue database management, annual effectiveness auditing, annual reporting, and stakeholder engagement.	Continue database management, annual effectiveness auditing, annual reporting, and stakeholder engagement.	Continue database management, annual effectiveness auditing, annual reporting, and stakeholder engagement.	Continue database management, annual effectiveness auditing, annual reporting, and stakeholder engagement. Complete conservation plan update.
Estimated Cumulative Water Savings	45.2 million gallons (MG)	55.3 MG	65.4 MG	75.8 MG	86.8 MG
Estimated Staff Resources	800 hours	1,200 hours	1,200 hours	1,500 hours	1,500 hours
Total Estimated Budget	$57,800	$95,100	$106,700	$117,900	$124,200

Contents

Tables

Figures

Appendixes

Acronyms and Abbreviations

AWE	Alliance for Water Efficiency
AWE Tool	Alliance for Water Efficiency Water Conservation Tracking Tool
AWWA	American Water Works Association
B:C	benefit to cost
CEM	Conservation and Efficiency Measure
CII	commercial, industrial, and institutional (public)
City	City of Waukesha
gal/day	gallons per day
gpcd	gallons per capita per day
HET	high-efficiency toilet
ILI	infrastructure leakage index
MG	million gallons
mgd	million gallons per day
NAICS	North American Industry Classification System
NR 852	Wisconsin Administrative Code Chapter NR 852
Plan	Water Conservation Plan and Protection Plan
PSC	Public Service Commission
psi	pounds per square inch
PWS	public water supply
SEWRPC	Southeastern Wisconsin Regional Planning Commission
TIRL	technical indicator for real losses
USEPA	United States Environmental Protection Agency
WDNR	Wisconsin Department of Natural Resources
WWU	Waukesha Water Utility

1.0 Introduction

The City of Waukesha (City) adopted its Water Conservation and Protection Plan in 2006. Since then, the City has implemented a wide variety of conservation and efficiency measures (CEMs). In 2011, the City submitted the Water Conservation Plan Supplement to the Wisconsin Department of Natural Resources (WDNR) as part of its draft Application for a Lake Michigan Water Supply. The City is applying for a Great Lakes water supply with return flow to meet its long-term water supply needs. Whether its drinking water supply is Lake Michigan or groundwater, the City must have a long-term water supply plan that includes an increased level of water conservation.

This Water Conservation Plan (Plan) update to the 2006 Water Conservation and Protection Plan is the next stage of the City's water conservation program. Presenting new goals, planning analysis, and stakeholder input, the Plan articulates the water conservation vision and implementation strategies to increase water use efficiency over a 5- to 10-year implementation period. The elements of the 2006 plan related to water quality protection are not addressed in this Plan.

1.1 Purpose

The purpose the Plan is to establish the path forward for customer service-oriented water use efficiency planning and implementation. Building on its conservation efforts since the 2006 Water Conservation and Protection Plan, the City has conducted a planning process grounded in data and stakeholder input to identify programs and policies to achieve its long-range water conservation goals. The Plan focuses on key strategies for the next 5 years, after which time the City will again formally update the Plan. A framework for longer-term water conservation strategies is provided without the level of detailed analysis conducted through 2016.

1.2 Background

Waukesha has been a water conservation leader in the State of Wisconsin since the adoption of its 2006 plan in which it set forth goals to reduce water use and conserve limited available public water supplies. In 2008, it became the first Wisconsin utility to issue rebates to incent customers to install water-saving 1.28-gallons-per-flush toilets.

In 2010, WDNR led the development of a new state rule which establishes certain mandatory water conservation and efficiency measures for withdrawals in the Great Lakes basin and water loss approvals statewide. That rule, Wisconsin Administrative Code Chapter NR 852 Water Conservation and Water Use Efficiency (NR 852), was adopted January 2011. In 2011, the City prepared a Water Conservation Plan Supplement that is consistent with NR 852 and establishes a framework for the current update to the Plan. In keeping with the City's goals, the content of the Water Conservation Plan Supplement is incorporated in this Plan.

1.3 Drivers for Water Conservation

Expanded conservation efforts within WWU's service area are being driven by several factors, including the following:

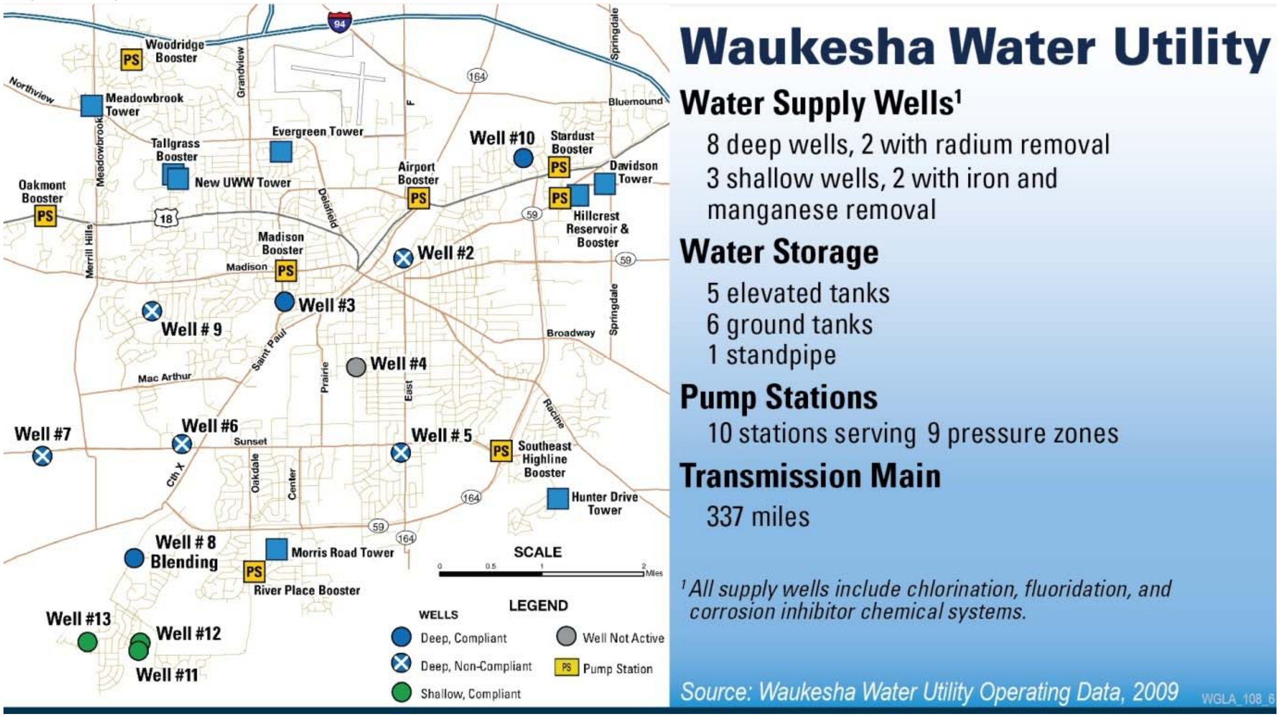
- Demands for residential, commercial, and industrial water use are expected to grow over time, and conservation can stretch limited water supply.
- Reduced peak daily and seasonal water use, which may be a means to defer future water treatment plant and delivery system expansion costs.
- Requirement to submit a Water Conservation Plan to WDNR in accordance with NR 852.

1.4 City Water System and Service Area

1.4.1 Current Water System

The City of Waukesha water system includes groundwater supply, treatment, storage, and conveyance assets, which are summarized Figure 1-1 and described in detail in the City of Waukesha Water Supply Service Area Plan. The water system has a total capacity of 17.9 million gallons per day (mgd).

FIGURE 1-1
Major Utility Assets



1.4.2 Water Supply Service Area

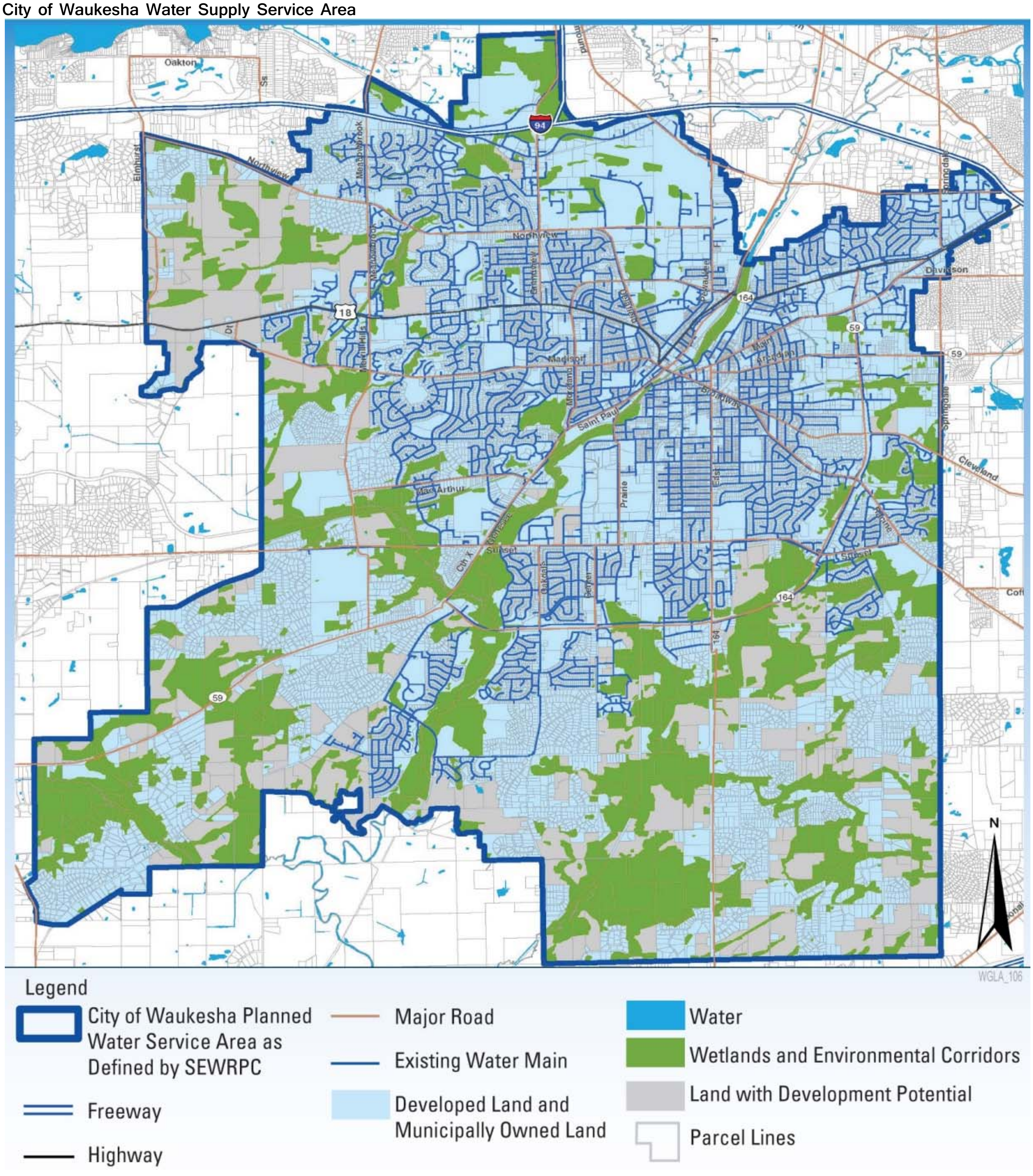
The City presently provides water service to the City of Waukesha and limited properties that are located outside the city limits. For long-range water supply planning, the Southeastern Regional Planning Commission (SEWRPC) delineated the City of Waukesha water supply service area that includes nearby parts of neighboring communities. The water supply service area includes 3.7 percent of the City of Pewaukee, 9 percent of the Town of Delafield, 14.9 percent of the Town of Genesee, and 83.6 percent of the Town of Waukesha. One reason the areas are candidates for future municipal water service is because of past private well contamination by pathogens, pollution, and naturally occurring elements in the groundwater. If there is a need and a request for public water service, the City's municipal water system may be expanded to serve the areas that are currently served by private wells and septic systems. To the extent practical, the water supply service area is consistent with the City's delineated sewer service area.

The City of Waukesha water supply service area shown in Figure 1-2 represents the full development land use, envisioned in the Waukesha County Comprehensive Plan. Full development, or buildout, condition is projected to occur sometime around 2050, based on historical state population trends. SEWRPC prepared population projections for the water supply service area including 85,800 people in 2028, 88,500 people in 2035, and an ultimate buildout population of 97,400 people (Figure 1-3). The projections are based on municipal estimates from the State of Wisconsin Department of Administration and multiple planning factors, including but not limited to land use, household size, demographic trends, and community development plans.

1.4.3 Water Conservation Applied Across the Water Service Area

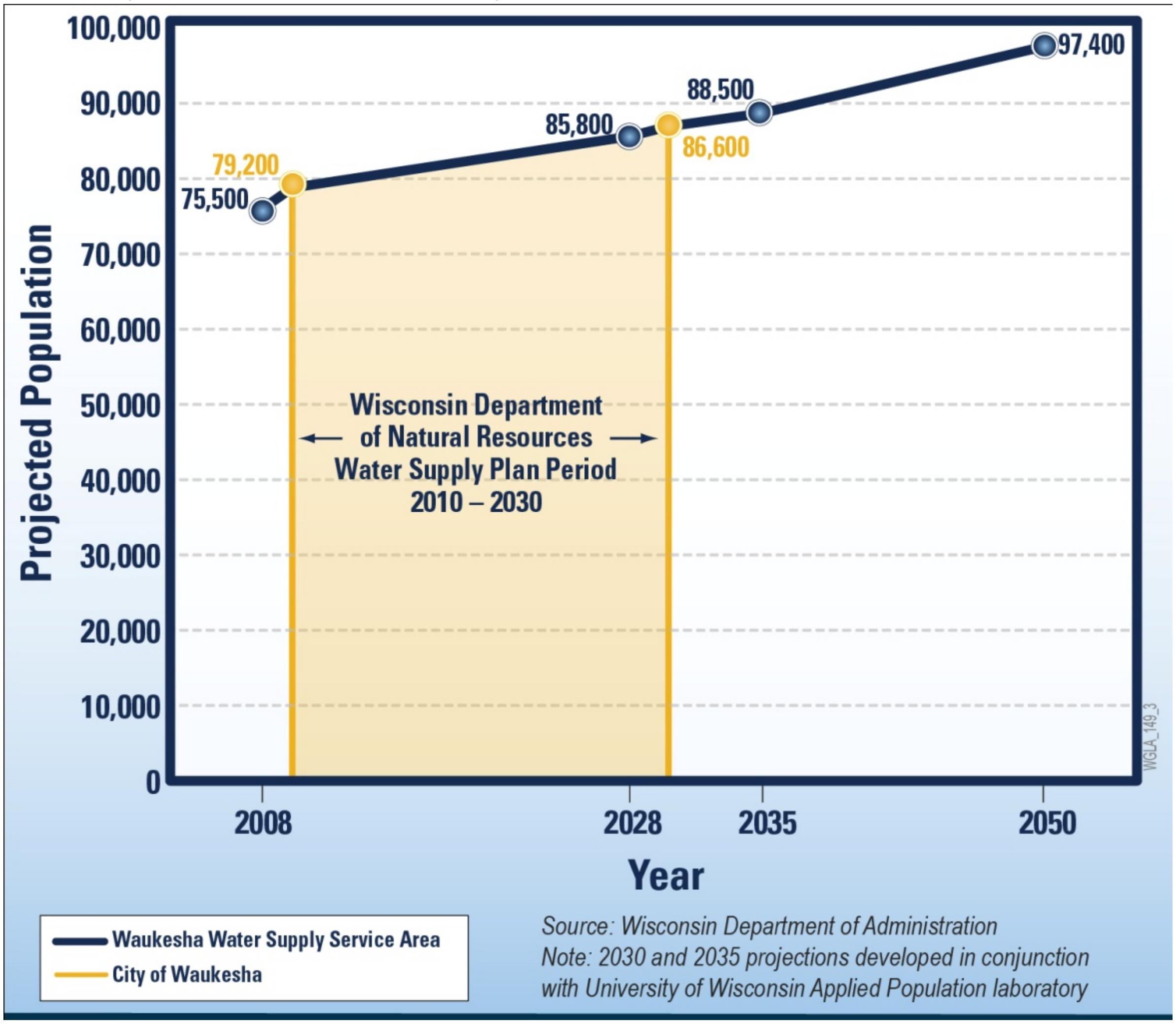
The water conservation measures implemented by the City apply to its customers, whether they are located within city limits or not. Under current water service rules regulated by the Wisconsin Public Service Commission (PSC), all customers are subject to the City's conservation measures, including the water rate schedule, outdoor water use restrictions, and financial incentives to install water-saving toilets. If water service is extended to areas outside the City, customers will be required to adhere to the City's conservation program as established in the service rules as well as in future service contracts. The City will provide water conservation public education to new customers and make available information, services and incentives to help its customers use water wisely.

FIGURE 1-2
City of Waukesha Water Supply Service Area



Source: Adapted from Water Supply Service Area for the City of Waukesha and Environs, Waukesha County, Wisconsin, SEWRPC, December 2008

FIGURE 1-3
Water Supply Service Area Plan Population Projections



2.0 City Goals and Objectives

2.1 Conservation Background

The City has demonstrated its commitment to conservation. Since the adoption of the 2006 Conservation Plan, the City has successfully advanced various water conservation measures through public information and education, regulations like the City ordinance to restrict outdoor water use, the inclining block water rate structure that encourages conservation, collaborative partnerships, and incentive programs. Water use in the City has been reduced, in part, because of the measures. Other factors that influence water use include weather, economic conditions, changes in population, and changes in industrial and commercial customers served. Reduced water use is illustrated by the following aggregate metrics:

- Between the base year of 2005 and 2010[1], total water pumped from wells was reduced 14.0 percent.[2]
- Between 2005 and 2010, peak season pumping (May 1 to October 1) was reduced 19.4 percent.[3]
- Since 2005, declining water use reduced the number of days water demand exceeded 10 mgd from 28 days to zero. The City has an operational goal to pump 10 mgd or less, to help meet its radium compliance order and stipulation.[4]
- Residential customers who have replaced a toilet in conjunction with the City's rebate program are estimated to be saving an average of 9,000 to 11,000 gallons per year depending on household size.[5]
- By regulation, the City annually submits detailed information on the performance and costs of its conservation program to the PSC.

2.2 Goals and Objectives

The City's water conservation goals include the following:

- Reducing average day demand by 0.5 mgd by year 2030 and by 1.0 mgd by year 2050. The water savings represent 5 and 10 percent water savings in average day demand, respectively, of projected baseline (not conservation-related) water demands between 2010 and 2050.

Objectives for the planning process used in the development of this Plan include the following:

- Developing planning analysis and implementation time lines in a manner consistent with NR 852 and the SEWRPC 2035 Regional Water Supply Plan
- Leveraging lessons learned from implementation of existing City CEMs
- Incorporating stakeholder and customer input in the evaluation of CEMs
- To the extent practical, using the Alliance for Water Efficiency (AWE) Water Conservation Tracking Tool (AWE Tool) to estimate CEM cost-effectiveness

---

[1] 2010 data represents the most recent complete year of City performance data.

[2] Annual Reports of City of Waukesha Water Utility to the Public Service Commission of Wisconsin, 2005–2010.

[3] City peak season water pumping data, May through September, 2005–2010.

[4] Waukesha Water Utility Report on Water Conservation Programs to the Public Service Commission of Wisconsin, 2010.

[5] Ibid.

3.0 Planning Approach

3.1 Project Team

From the City Common Council to the Water Utility Commission and throughout the dedicated Waukesha Water Utility staff, the City has demonstrated its commitment to efficient water use. The project team for this planning effort was led by Waukesha Water Utility' s conservation team with support from a consulting team of local and national experts that supported the stakeholder involvement effort and provided technical analyses.

3.2 Water Conservation Planning by the City

For the City, water conservation planning is a long-term process accomplished in phases of research, evaluation, implementation, monitoring, and adaptation. The process used, shown in Figure 3-1, is modeled, in part, after guidance published in American Water Works Association (AWWA) Manual 52, *Water Conservation Programs—A Planning Manual* (AWWA, 2010). Key steps in this planning process are summarized in the following subsections.

3.2.1 Research, Goal Setting, and Potential CEM Identification

Gathering information, setting conservation priorities, establishing goals, and identifying candidate CEMs comprise "Research." The City reviews its detailed water demand forecast, uses published guidance from AWWA, AWE, and the U.S. Environmental Protection Agency (USEPA), and collaborates with leading water conservation experts to set practical goals and maintain a successful conservation program. Between now and 2030, the City will expand its water conservation program to achieve the following water use savings goals set forth in its Application for Lake Michigan Water Supply:

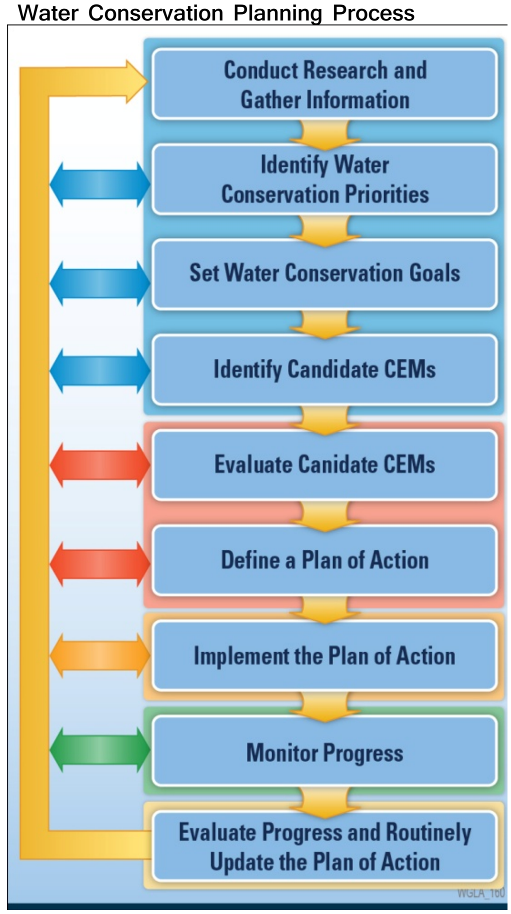
- An additional 0.5 mgd between 2010 and 2030
- An additional 0.5 mgd between 2030 and 2050, for a total savings of 1 mgd (about 10 percent of the City's average day demand) by 2050

To identify candidate CEMs for evaluation, the City considers a wide range of criteria including water use by customer class, the water system infrastructure, water system standard operating and maintenance procedures, state regulations, and existing conservation measures.

3.2.2 Evaluation and Planning

Feasible CEMs are evaluated on the basis of economic and non-economic considerations. The cost-effectiveness of candidate activities is analyzed on the basis of potential water savings and probable costs to the City and its customers with a conservation calculator, like the AWE Tool. Other measures are evaluated on the basis of qualitative and other non-economic criteria like perceptions of how well the public is educated on a water conservation issue, customer acceptance of a particular measure or how water use behaviors change in response to water price. After input from customers and other stakeholders, a plan of action is prepared by selecting a package of conservation measures for implementation.

FIGURE 3-1
Water Conservation Planning Process



3.2.3 Implementation

Ultimately, the City gains approval for CEM implementation through review by the Water Utility Commission and, if appropriate, with the City Common Council. Whenever possible, the City partners with other organizations like the Wisconsin Water Conservation Coalition, the Waukesha school district or Wisconsin Focus on Energy to implement measures as economically as possible.

Successful performance of the City's conservation program is achieved when water use efficiency is improved in a cost-effective manner while customers' needs are met. Implementing CEMs in a stepwise manner provides the City flexibility to monitor and make improvements to the program as needed in response to changing consumption patterns, technology, and customer expectations. Additionally, multi-year forecasting allows the City to plan for changes in revenues and expenditures associated with water demand reductions.

3.2.4 Monitoring

To monitor the real costs and water savings that result from implementing CEMs, the City continually gathers and reviews extensive water use and financial data. To determine the overall effectiveness of CEMs, the City solicits feedback from customers. Monitoring the results of water conservation efforts is a part of routine City operations. Annually, the City reports a detailed analysis of the water conservation program to the PSC.

3.2.5 Updating

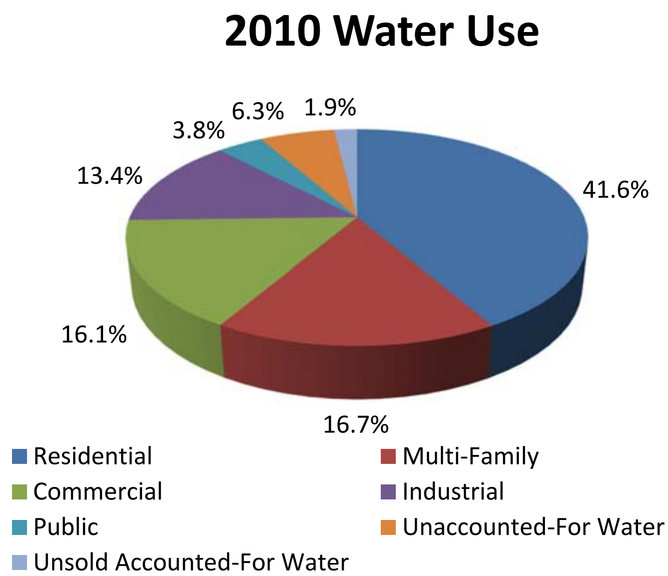
At least annually, CEMs in the City's water conservation program will be reviewed and modified, as appropriate, to improve performance. In this process, the City will accomplish the following:

- Identify efficiency measures and performance goals based on extensive research.
- Communicate the City's vision for water use efficiency to customers.
- Educate customers, using a broad spectrum of media, about the costs and benefits of water conservation.
- Implement measures that provide monetary benefits and water use savings.
- Make informed decisions about needed changes to the conservation program based on measured water use and customer feedback.

4.0 Water Use and Customer Profile

Data on historical water use, population projections, regional county, and City land use plans, as well as water conservation and efficiency goals, were used to prepare water supply service area water demand forecasts. For water use efficiency measures to be effective, the City uses the data and information to design elements of its water conservation program.

FIGURE 4-1
City of Waukesha Water Use (2010)



4.1 Historical Water Use

Figure 4-1 and Table 4-1 summarize water use by customer class and historical water consumption for the period 1999 to 2010. Residential customers, including multi-family residential customers, consistently represent the City's largest customer class. The City's residential population increased about 12 percent between 1999 and 2010. Since 1999, water use by single-family residential customers has decreased by 8.6 percent. Over this same period, total water pumping decreased 19.4 percent.

Since adoption of the 2006 Water Conservation and Protection Plan additional focus was provided on water use efficiency. This is evidenced by the greater than 14 percent reduction in total pumping from wells between 2005 and 2010. Some water use reduction may be attributed to weak economic conditions and seasonal rainfall, and installation of water-conserving fixtures over the same period; however, some of the water saved can be attributed to water conservation education, regulation, and incentives.

TABLE 4-1
City of Waukesha Historical Annual Water Consumption

Year	Residential	Commercial	Industrial	Public	Total Water Sales	Total Pumpage	Water Used but not Sold	Unaccounted for Water	Unaccounted for Water, %
2010	1,016,670	801,974	326,289	93,491	2,238,164	2,437,964	47,113	152,687	6
2009	1,054,288	806,736	325,667	99,619	2,286,310	2,479,895	27,930	165,655	7
2008	1,056,650	827,543	382,413	99,646	2,366,252	2,530,964	37,879	126,833	4
2007	1,086,542	846,566	404,079	110,532	2,447,719	2,618,682	3,791	167,172	6
2006	1,077,127	858,062	424,603	109,846	2,469,638	2,620,450	14,676	136,136	5
2005	1,193,851	874,418	428,518	120,126	2,616,913	2,831,510	5,054	209,543	7
2004	1,117,325	854,624	435,004	121,601	2,528,554	2,698,980	6,169	164,257	6
2003	1,176,115	895,850	461,885	120,071	2,653,921	2,795,859	3,228	138,710	5
2002	1,185,745	914,138	612,856	119,173	2,831,912	2,953,216	21,540	99,764	3
2001	1,128,475	874,030	586,552	114,492	2,703,549	2,821,969	37,909	80,511	3
2000	1,067,184	848,664	660,364	108,873	2,685,085	2,836,141	19,057	131,630	5
1999	1,112,499	847,914	722,097	177,408	2,859,918	3,028,414	n/a	168,496	6

Note: Consumption volume values are given in 1,000s of gallons. Examples of "water used but not sold" include water used for main flushing, water treatment processes, and firefighting. Examples of "unaccounted for water" include water improperly measured because of meter inaccuracies and service connection leakage.

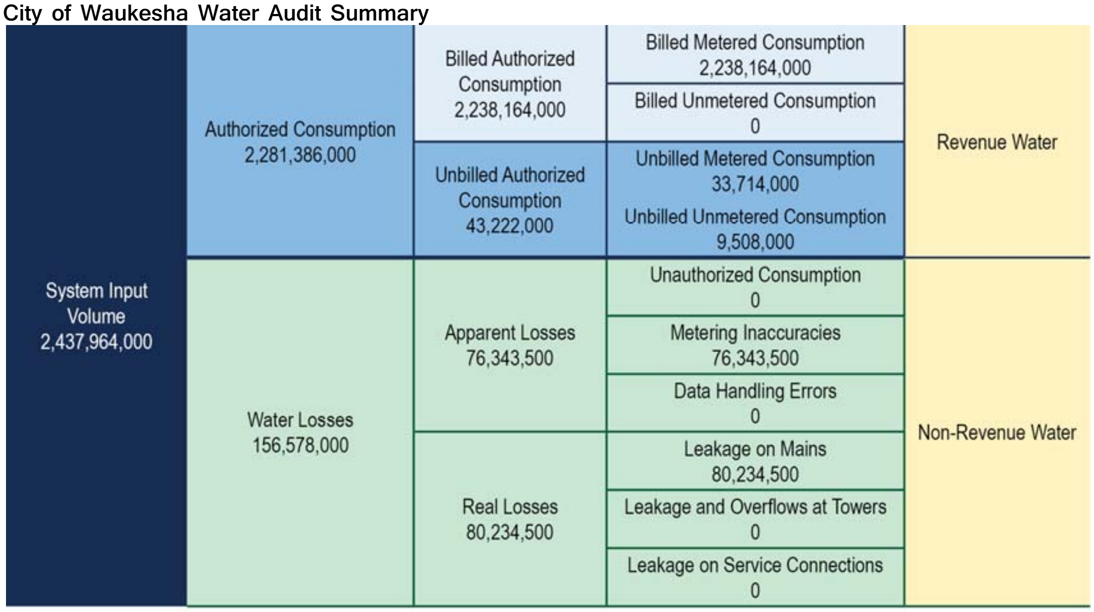
4.1.1 Water Use Audit

In 2006, as part of its comprehensive Water System Master Plan, the City conducted a water use audit following the method developed by the International Water Association Water Loss Task Force and adopted in the latest version of the AWWA *Manual of Water Supply Practices M36 Water Audits and Water Loss Control Programs*. The results of the analysis are summarized in Appendix D[6] and include the following:

- The City's technical indicator for real losses (TIRL), a measure of the total volume of water losses in a distribution system, is 21 gallons per service connection, the fourth lowest among 34 communities surveyed with TIRL values ranging from 10 to 215 gallons per connection.[7]
- The City's infrastructure leakage index (ILI), a measure of how well a distribution system is managed with respect to real water loss from leakage, is approximately 1.3, significantly less than the average of 5 from among the communities surveyed.[8]

The City prepared a less detailed water audit of 2010 system performance, presented in Figure 4-2.

FIGURE 4-2
City of Waukesha Water Audit Summary



4.1.2 Nonrevenue Water

The difference between total pumpage and total water sales is termed nonrevenue water and is usually expressed as a percentage. The portion of nonrevenue water attributed to leakage, meter inaccuracies, and other unknown losses is often termed *unaccounted-for water* (or real losses) and can be an indicator of the condition of the water system. Between 1999 and 2010, the unaccounted-for water has ranged from 3 to 7 percent (Table 4-1). In 2010, unaccounted-for water was equivalent to 7 gallons per capita per day (gpcd). The City operates and maintains its water system to minimize unaccounted water well below the AWWA-recommended 10 percent and the PSC action level of 15 percent.

---

[6] Earth Tech. May 2006. *Water System Master Plan, City of Waukesha.*

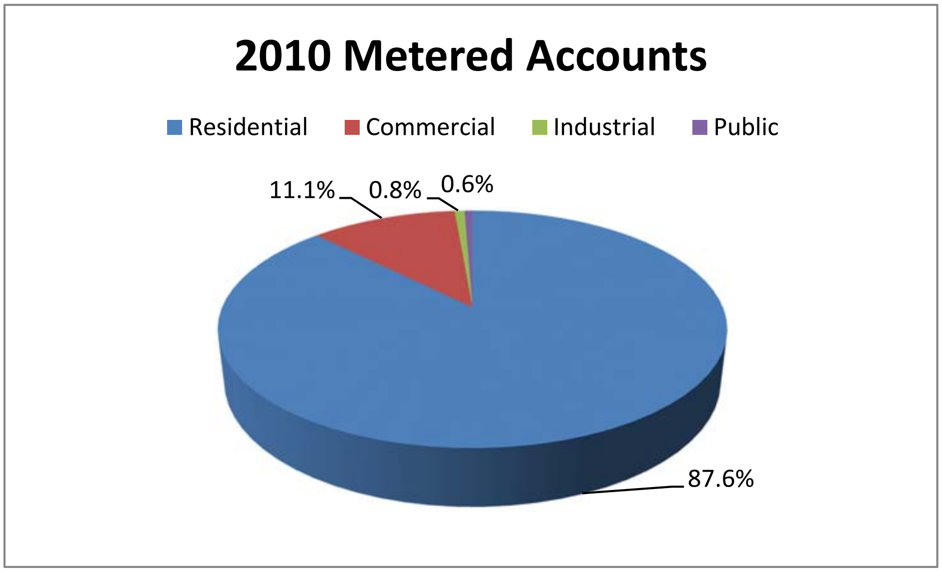
[7] Lambert, A., D. Huntington, and T.G. Brown. 2002. "Water Loss Management in North America: Just How Good Is It?" *Water Loss Control Manual.*

[8] Ibid.

4.1.3 Metered Water Customers

To account accurately for water use and to comply with state regulations, all City customers are metered. Figure 4-3 summarizes the percentage and number of the system's meters by customer class.

FIGURE 4-3
City of Waukesha Metered Water Accounts (2010)



	Number of Meters				
Year	Residential	Commercial	Industrial	Public Authority	Total
2010	17,124	2,170	147	118	19,559
2009	16,955	2,264	147	117	19,483
2008	16,827	2,276	144	116	19,363
2007	16,677	2,264	141	116	19,198
2006	16,501	2,235	144	123	19,003
2005	16,295	2,189	144	121	18,749
2004	15,983	2,141	144	119	18,387
2003	15,686	2,112	144	119	18,061
2002	15,508	2,101	143	119	17,871
2001	15,209	2,038	142	120	17.509
2000	14,754	1,952	138	119	16,963
1999	14,593	1,925	137	119	16,774

Source: City of Waukesha Water Annual Reports to the Wisconsin Public Service Commission, 1999–2010.

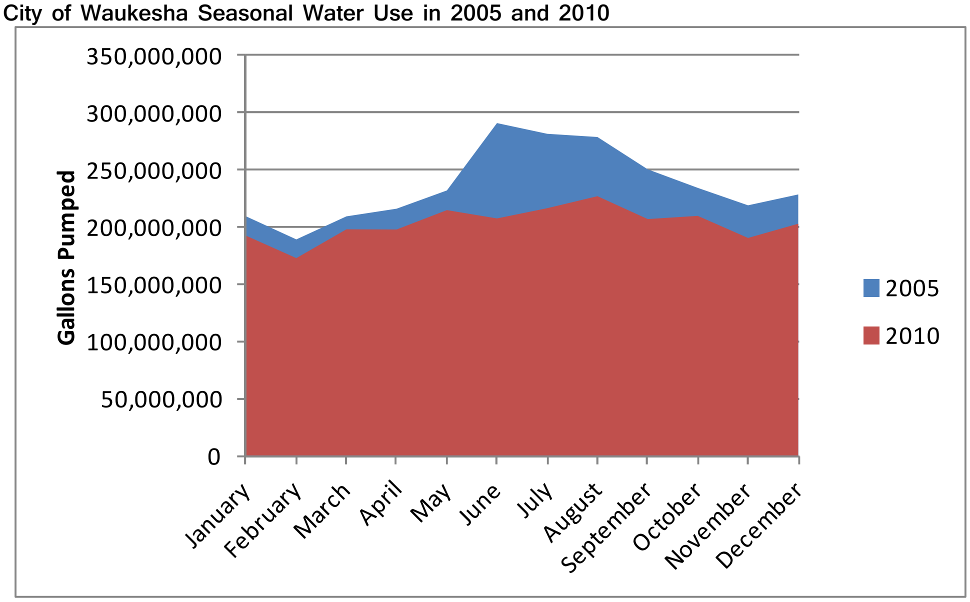
4.2 Variations in Customer Demand

Water demand varies and is typically influenced by several factors including precipitation, temperature, economic conditions, personal income, and community conservation goals. While reductions in water use in wet and cool years or increases in water use associated with higher personal income may be observed, correlating how the factors affect one another is not a straightforward process. Quantification and disaggregation of the effect of variables such as weather (especially temperature and rainfall), economic conditions, and public awareness on water use require extensive data collection and analysis. Results of the City's review of available water use-related data indicating trends that provide insights into long-range water demand forecasts are described below.

4.2.1 Seasonal Variation in Water Demand

Seasonal water use patterns provide helpful information regarding water use in the City's service area. Figure 4-4 presents monthly water use in 2005 (before the 2006 Water Conservation and Protection Plan) and in 2010. In 2006, the City adopted a municipal ordinance restricting lawn and landscape irrigation to no more than 2 days per week between May 1 and October 1. Since Waukesha's water conservation ordinance has been in effect, seasonal peak water demands have declined significantly. While the City must plan for a peak pumping season from May through September, its water demand forecasts for the future assume the City will continue to restrict peak season outdoor water use.

FIGURE 4-4
City of Waukesha Seasonal Water Use in 2005 and 2010



Source: City of Waukesha Annual Report to the Wisconsin Public Service Commission, 2010.

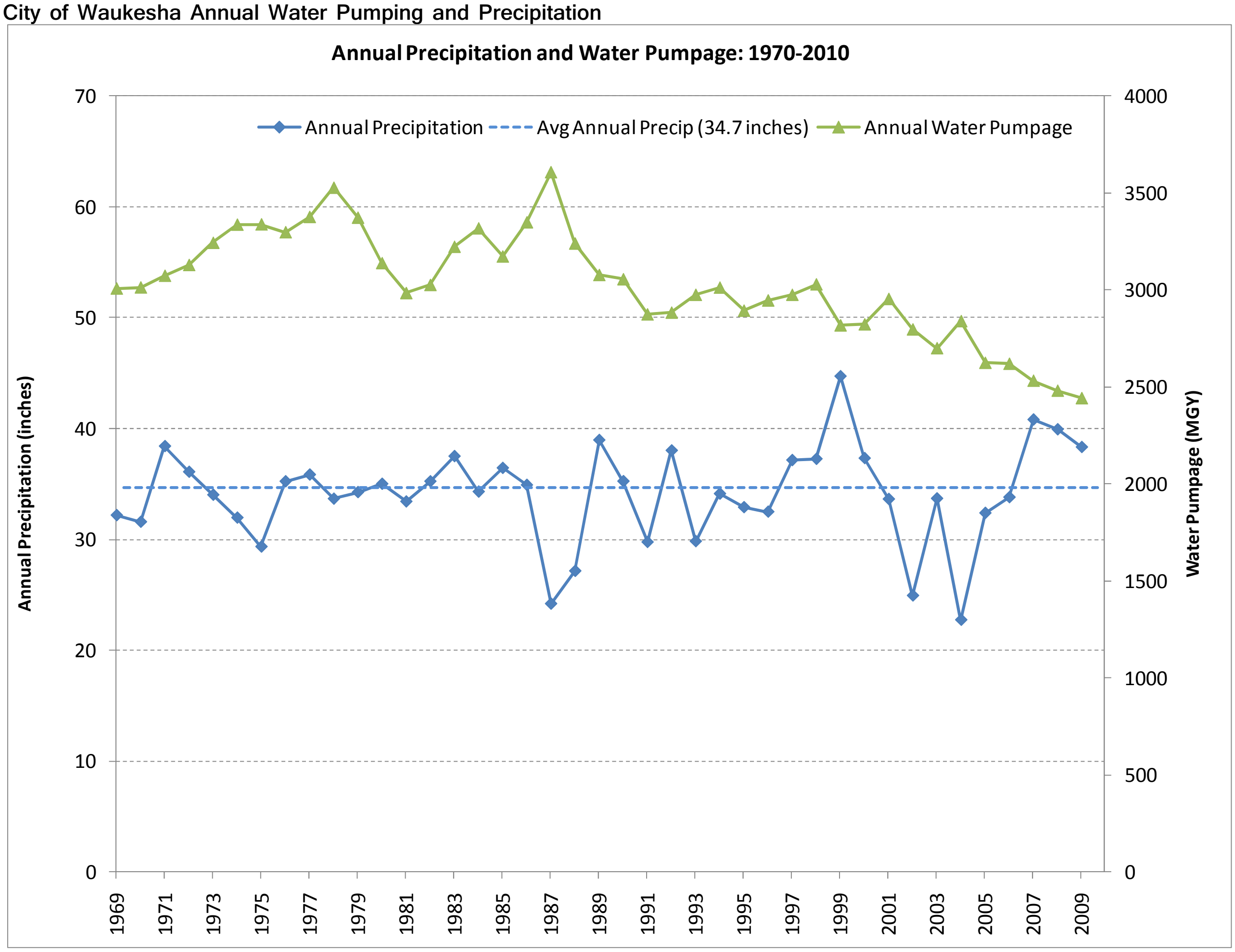
4.2.2 Water Demand Variation with Precipitation

Local climate conditions (such as temperature and wind) and precipitation events (duration, number, and intensity of rainfall and snow) vary widely throughout the year and from year-to year. To some extent, their effect on water use can be observed. In Waukesha, for example, some years that experienced high precipitation correlate with reduced demands, such as 2008 through 2010, as shown in Figure 4-5, while in other years they do not.

To look for high-level water use trends, the City reviewed the annual water pumpage and precipitation data over the past 40 years, summarized in Figure 4-5. The data indicate a declining trend in the volume of water pumped to meet City demand. This trend may be attributed to many factors, including new water conserving appliances required by code since the mid 1990s, the City's water conservation measures, and the recent economic downturn. The data also illustrate that water demand in the City increases in years of below-average rainfall.

Even though the City receives an average of 34.7 inches of precipitation annually and has implemented a conservation program, it must plan for periods of abnormally dry to moderate drought conditions or high temperatures when water demands may increase or supplies may be constrained. Sound engineering practice requires planning for potential droughts to ensure adequate water supply availability to meet essential water needs, such as those for residential sanitation, firefighting, economic stability, system maintenance, and other similar requirements.

FIGURE 4-5
City of Waukesha Annual Water Pumping and Precipitation



4.2.3 Water Demand Variation due to Economic Conditions

During the economic downturn of the last several years, water use in the City has declined. In fact, water use, both in terms of volume and water use intensity, is at record low levels. During a weak economy, discretionary water use typically declines, and customers make changes in their behavior, processes, appliances, and equipment to use water more efficiently. In recent years, the City's commercial and industrial customers have implemented water use efficiency measures to reduce or maintain the cost of providing their services and products. With respect to long-term planning, the City considers the impacts of economic cycles transitory. That is, when economic conditions improve during the future planning period, the forces that restrain growth and water use will be removed and water demand will return to higher levels and gradually increase with future economic growth. Thus, in such a future planning horizon, growth in the commercial and industrial water use sectors is expected to occur at a faster rate than for the residential sector.

4.2.4 Diurnal Variation in Customer Demand

Table 4-2 summarizes historical variation in average day and maximum day demand over the past 10 years, with the ratio of the annual maximum day to average day water pumpage ranging from a low of 1.31 to 1.66.

Based on analysis of the City's pumpage data for a 40-year period (1970 to 2010), the maximum day to average day pumping factor used for water system facility design is 1.68. The analysis of this system performance metric is included in Appendix A, Summary of Water Requirements. As shown in Appendix A, the appropriate average to peak day ratio used for long-term planning and design (1.68) reflects that value with a 98 percent confidence level (that is, probability) that the actual peak day pumping will be of equal or lesser value. This value is just slightly higher than the average to peak ratio in 2005. Although average to peak ratio appears to be trending downward since 2005, it is unknown how much of the decrease is due to reliable long-term water use efficiency and how much is due to rainfall, the economy, and other factors.

TABLE 4-2
City of Waukesha Maximum and Average Daily Flow, 1999–2010

Year	Average Day Pumpage (mgd)	Maximum Day Pumpage (mgd)	Maximum Pumpage Date	Ratio of Maximum to Average Day
2010	6.69	8.65	08/28	1.29
2009	6.79	9.35	08/04	1.38
2008	6.91	9.93	08/19	1.43
2007	7.17	9.79	07/24	1.36
2006	7.18	10.23	07/18	1.42
2005	7.76	12.87	06/23	1.66
2004	7.39	10.48	09/13	1.42
2003	7.66	11.67	08.22	1.52
2002	8.09	12.78	07/17	1.58
2001	7.73	12.53	07/09	1.62
2000	7.72	10.15	06/27	1.31
1999	8.30	11.59	07/07	1.40

Source: City of Waukesha operating data.

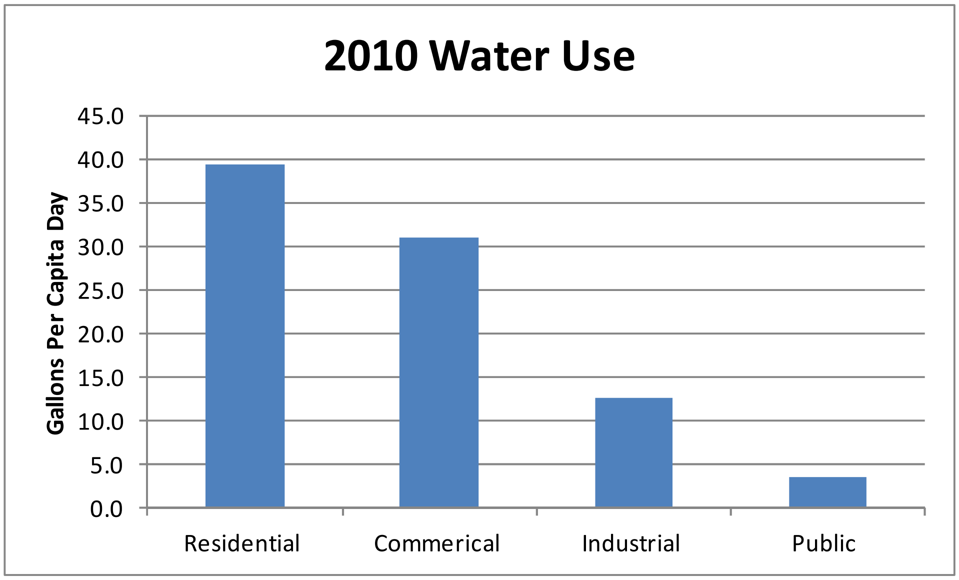
4.3 Water Use Analysis Findings and Assessment

4.3.1 Per Capita Water Use

Water use intensity by sector (residential or commercial, industrial, and institutional [CII]) is often correlated to a community's population as an indicator of water efficiency and trends over time as populations grow or change. Figure 4-6 summarizes usage per person for various water use sectors—customer classes—based on water sales records and the population of 70,781[9]. To comply with state reporting requirements, commercial water sales include multi-family residential accounts. Consequently, the water use intensity factors showing in Figure 4-6 are general indicators of water use, which are helpful to observe trends, like decreased water use over the past 10 years in all customer classes. However, the general and accepted measures are not as specific and insightful for conservation planning for a specific utility as the factors determined by the percentile analysis of water use presented in Section 4.2.3.

[9] U.S. Census Bureau. 2010. City of Waukesha Population.

FIGURE 4-6
City of Waukesha Per Capita Per Day Water Use (2010)



Year	Residential	Commercial	Industrial	Public
2010	39.4	31.1	12.6	3.6
2009	42.0	32.1	13.0	4.0
2008	42.6	33.3	15.4	4.0
2007	43.9	34.2	16.3	4.5
2006	43.6	34.7	17.2	4.4
2005	48.2	35.3	19.3	7.5
2004	45.8	35.0	17.8	5.0
2003	48.2	36.7	18.9	4.9
2002	49.0	37.8	25.3	4.9
2001	47.3	36.7	24.6	4.8
2000	45.1	35.9	27.9	4.6
1999	48.4	36.9	31.4	7.7

Note: Values are given as gallons per capita per day.

Source: City of Waukesha operating data.

4.3.2 Percentile Analysis of Customer Water Use

As part of the planning process, a detailed assessment of City customers' historical water demand was made based on a rank and percentile analysis of water use for each customer category prepared by project team member, Amy Vickers & Associates, Inc.

A rank and percentile analysis of customer water use identifies the ordinal and percentage ranks of customer water demands. This information is useful for water conservation program planning because it identifies customer groups and subgroups by their potential for water savings from conservation based on their volume, relative level, and patterns of water use. Classifying water users by the characteristics can help to pinpoint the types of water efficiency measures that may be most beneficial to adopt. For example, top or high water-using residential customers often have a significant potential for water savings from efficiency measures that reduce lawn irrigation water waste, among other measures. In contrast, homes with below-average water demands typically use little or no water outdoors and are more likely to realize water savings from indoor measures, such as leak repairs.

4.3.2.1 Summary of Customer Water Use Data and Analysis Results

Three years (36 months) of customer metered water billing data, from January 2008 through December 2010, were analyzed for Waukesha Water Utility's (WWU's) seven categories of customer accounts, which include four residential categories and three non-residential categories:

- **Residential—**Residential water demand typically includes indoor water-using activities, such as those for bathroom, kitchen, and laundry, and outdoor water use, such as that for lawn irrigation, swimming pools, and car washing. The following four categories of residential customers were analyzed:
  - Single-family Residential
  - Two-family Residential
  - Three-family Residential
  - Multi-family Residential
- **Non-residential—**Non-residential water using activities include a wide range of water end uses, from appliances, plumbing fixtures, commercial kitchen equipment, and medical equipment to sophisticated water cooling, heating, and treatment systems, among many others. The City's three categories of non-residential customers were analyzed:
  - Commercial (such as retail, restaurants, office buildings, medical facilities, and private schools)
  - Industrial (such as manufacturing, processing, warehouses, and dairies,
  - Public (such as municipal buildings, public facilities, parks, public schools, and institutions)

A summary of residential and nonresidential customer accounts and water use characteristics from 2008 through 2010 is shown in Table 4-3. The water billing (metered consumption) data summarized in Table 4-3 are the basis for a closer assessment of how customers within each category are using water. The information can be used to help identify those conservation measures that would be likely to be effective for certain customers and to assist in prioritizing markets for different measures. For example, customers with very low outdoor usage are not likely to save significant volumes of water with more efficient irrigation systems; therefore, an irrigation technology rebate would not be a high priority for such customers.

TABLE 4-3
City of Waukesha Categorical and Average Customer Water Use Characteristics, 2008–2010

Customer Category	Active Accounts, Number	Active Accounts, Percent	Total Customer Demand, Gallons	Total Customer Demand, Percent	Average Month Demand, Gallons	Average Account Demand, gal/day	Estimated Average Account Indoor Demand, gal/day	Estimated Average Account Outdoor Demand, gal/day	Estimated Average Account Outdoor Water Use, Percent
Residential									
Residential—Single-family	15,659	79.7	2,680,005,700	38.9	4,754	156	108	49	31
Residential—Multi-family	968	4.9	1,226,233,900	17.8	35,188	1,157	1,069	88	8
Residential—Two-family	1,451	7.4	441,119,300	6.4	8,445	278	232	45	16
Residential—Three-family	81	0.4	27,515,900	0.4	9,436	310	178	133	43
Total Residential	**18,159**	**92.4**	**4,374,874,800**	**63.5**					

TABLE 4-3
City of Waukesha Categorical and Average Customer Water Use Characteristics, 2008–2010

Customer Category	Active Accounts, Number	Active Accounts, Percent	Total Customer Demand, Gallons	Total Customer Demand, Percent	Average Month Demand, Gallons	Average Account Demand, gal/day	Estimated Average Account Indoor Demand, gal/day	Estimated Average Account Outdoor Demand, gal/day	Estimated Average Account Outdoor Water Use, Percent
Nonresidential									
Commercial	1,225	6.2	1,187,364,000	17.2	26,924	885	686	199	22
Industrial	145	0.7	1,034,506,100	15.0	198,181	6,515	5,104	1,411	22
Public	120	0.6	293,666,300	4.3	67,978	2,235	1,194	1,041	47
Total Non-residential	1,490	7.6	2,515,536,400	36.5					
GRAND TOTAL	**19,649**	**100.0**	**6,890,411,200**	**100.0**					

A summary of findings from the rank and percentile water use analysis of the seven customer categories for historical water demands between January 2008 and December 2010 are summarized in Table 4-4.

TABLE 4-4
Combined All Seven Customer Categories: Water Use Characteristics, By Percentile, 2008–2010

Account Percentile	No. Active Accounts[1]	Total Demand, Gallons	Percent Demand of ALL Accounts	Average Month Demand, Gallons	Average Account Demand, gal/day	Estimated Average Account Indoor Demand[2], gal/day	Estimated Average Account Outdoor Demand[3], gal/day	Estimated Average Account Outdoor Water Use, Percent
All Accounts	19,649	6,890,411,200	100	350,907	11,535	8,570	2,965	26
Top 1% of Accounts	196	766,768,500	11	7,003,168	230,216	148,489	81,727	35
Top 10% of Accounts	1,965	2,987,117,100	43	2,469,323	81,174	58,958	22,216	27
Top 25% of Accounts	4,912	4,363,240,300	63	1,217,203	40,013	29,154	10,860	27
Top 50% of Accounts	9,825	5,645,640,700	82	666,571	21,912	16,142	5,771	26
Bottom 50% of Accounts	9,825	1,244,770,500	18	35,243	1,159	746	412	36
TOTAL	**19,649**	**6,890,411,200**		**701,814**	**23,071**	**16,888**	**6,183**	**62**

Note:
[1] Number of active accounts shown may not add due to rounding.
[2] Based on an average of the 3 lowest months per year, 2008-2010
[3] Average annualized, 2008-2010

The findings from this analysis lay a strong technical foundation for many of the recommendations presented in Section 7. Key findings from this analysis include the following:

- Percentile demands of all customers indicate that the largest potential future water savings from conservation are likely in the top 50 percent of accounts:
  - The top 10 percent uses 43 percent of all customer demands; most are the largest commercial, industrial, and public accounts.
  - The top 50 percent uses 82 percent of all customer demands.
  - The bottom 50 percent uses only 18 percent of all City customer demand; these customers likely have a much lower per-account potential for water savings compared to the top 50 percent of customers.
- Residential single-family customer water use:
  - On average, single-family residential customers have relatively low water use.
  - *However, the top 10 percent of single-family residential customers are using disproportionately high volumes of water.*
- Two-, three-, and multi-family customer water use:
  - For multi-family customers, it is difficult to assess water use efficiency without account-specific population or occupancy data and because the number of units can vary significantly by account.
  - It is likely that the top 10 percent of two- and three-family customers are inefficient users.
- Bottom 50 percent of residential users (single-, two-, three-, and multi-family):
  - Low occupancy, part-time residents, and water-thriftiness may explain many of the customers' very low usage, but at least spot checks are warranted to confirm those potential reasons. In some cases, meter problems, such as sizing, calibration, or theft, may be factors that warrant follow-up action.
- CII (public) customer water use:
  - The top 1 to 10 percent of users are the highest priority for future water conservation efforts because they likely have the greatest potential for water savings per customer.
  - Individual nonresidential users use water at their facilities in a myriad of ways that are often not comparable from customer-to-customer; therefore, it is important to remember that high water use does not necessarily mean that water is being used inefficiently.
  - The best approach for large- and medium-sized commercial, industrial, and public/institutional customers is usually to implement targeted programs by business/public sector and water end-use similarities (such as cooling towers, metal finishing, food processing, etc.) with the effort and resource allocation equal to the savings potential.

4.3.2.2 Detailed Customer Water Use Data and Analysis Results

Detailed results of the percentile analysis for the seven customer categories are provided in Tables 4-5 through 4-11. Water use efficiency assessments for multi-family, commercial, industrial, and public[10] customers can only be roughly assessed because these customer types represent a diverse range of water end uses, users, and property types that are not easily comparable (for instance, a dairy operation compared to a foundry). Further, some nonresidential customers using large volumes of water are not necessarily inefficient users (for instance, a beverage bottling plant that also employs an air sterilization process for bottles).

[10] Throughout this Plan, commercial, industrial and institutional (CII) customers are referred to as a single category. Institutional customers generally include public facilities; however, for this assessment, public institutions were analyzed separately. Other institutional such as hospitals and private schools users were included in the commercial category.

Furthermore, benchmark water use data are available for only a small number of nonresidential water usages, such as hospital beds, to provide some information about water use efficiency, as described in this section. For these customers, volume and seasonal demand characteristics can be useful indicators for targeting future water-saving programs.

TABLE 4-5
Residential (Single-Family) Customers' Water Use Characteristics, By Percentile, 2008–2010

Single-Family Account Percentile	No. Active Accounts[1]	Total Demand, Gallons	Percent Demand of Single-Family Accounts	Average Month Demand, Gallons[2]	Estimated Average Account Outdoor Water Use, Percent[3]	Average Gallons Per Capita Per Day, gpcd [4]
All Accounts	15,659	2,680,005,700	100	4,754	31	60
Top 1% of Accounts	157	86,355,500	3	15,319	44	194
Top 10% of Accounts	1,566	549,879,300	21	9,754	30	123
Top 25% of Accounts	3,915	1,123,101,300	42	7,969	33	101
Top 50% of Accounts	7,830	1,857,302,700	69	6,589	32	83
Bottom 50% of Accounts	7,830	822,703,000	31	2,919	29	37

Note:
1. Number of active accounts shown may not add due to rounding.
2. Based on an average of the 3 lowest months per year.
3. Based on an average of the 3 highest months per year.
4. Based on an average of 2.6 persons per household.

Source: U.S. Census Bureau, 2005–2009 American Community Survey.

Key findings for single-family customer category percentile analysis:

- Average single-family account:
  - Relatively low water use compared to national average.
  - An average of 60 gpcd is relatively water efficient, falling below the national household average of 98 gpcd (U.S. Geological Survey, 2005).
- Top 1 percent of customers:
  - Very high water use.
  - An average of 194 gpcd is more than 3 times the average single-family household served by the City, and nearly twice the national average of 98 gpcd.
  - Estimated outdoor water use is very high, more than 4.5 times the average single-family account.
  - Estimated indoor water use is more than 2.5 times higher than the average single-family account.
  - Customers likely have the highest potential for saving water from both indoor and outdoor water efficiency measures.
- Top 10 percent of customers:
  - High water use.
  - An average of 123 gpcd is more than 2 times the average single-family household, and above the national average of 98 gpcd.
  - Customers likely have a high potential for saving water from both indoor and outdoor water efficiency measures.

- Top 25 percent to 50 percent of customers:
  - Use is close to national average.
  - Averages of 101 gpcd (top 25 percent) to 83 gpcd (top 50 percent) are close to the national average of 98 gpcd.
  - Customers have some potential for saving water from both indoor and outdoor water efficiency measures.
- Bottom 50 percent of customers:
  - Very low water use; Super Savers.
  - Average of 37 gpcd is 62 percent of average use (60 gpcd) for all single-family customers, and roughly one-third of the national average (98 gpcd).
  - Average water use figures in this single-family group may reflect some single occupancy, other small households, and part-time occupied or infrequently occupied households, such as part-time residents and unoccupied houses for sale or under foreclosure. A disproportionate number of accounts in this group had zero water use recorded for at least 1 year. Nevertheless, even the relatively higher water users in this percentile group use less than the average single-family household.
  - This single-family percentile group appears to be already very water thrifty and/or not a full-time water user with a relatively low potential for future water savings from conservation.

TABLE 4-6
Residential (Two-Family) Customers' Water Use Characteristics, By Percentile, 2008–2010

Two-Family Account Percentile	No. Active Accounts [1]	Total Demand, Gallons	Percent Demand of Two-Family Accounts	Average. Month Demand, Gallons	Estimated Average Account Outdoor Water Use, Percent2	Average Gallons Per Capita Per Day, gpcd [3]
All Accounts	1,451	441,119,300	100	8,445	16	58
Top 1% of Accounts	15	14,669,300	3	28,083	63	192
Top 10% of Accounts	145	88,747,800	20	16,990	35	116
Top 25% of Accounts	363	182,554,000	41	13,979	30	96
Top 50% of Accounts	726	301,618,200	68	11,548	21	79
Bottom 50% of Accounts	726	139,501,100	32	5,341	17	37

Note:
[1] Number of active accounts shown may not add due to rounding.
[2] Based on an average of the 3 highest months
[3] Based on an average of 2.4 persons per household in a two-family dwelling (average 4.8 persons per account).

Source: U.S. Census Bureau, Wisconsin Quick Facts, Persons per household, 2005–2009.

Key findings for two-family customer category percentile analysis:

- Average two-family account:
  - Relatively low water use compared to national average.
  - Average of 58 gpcd is relatively water efficient, falling below the national household average of 98 gpcd (U.S. Geological Survey, 2005). The figure is very similar to the average 60 gpcd for all single-family accounts.
- Top 1 percent of customers:
  - Very high water use.

  - Average of 192 gpcd is more than 3 times the average two-family household, and nearly twice the national average of 98 gpcd.
  - Estimated outdoor water use is very high, representing 63 percent of demand and more than 12 times the average two-family account.
  - Estimated indoor water use is more than 1.5 times higher than the average two-family account.
  - Customers likely have the highest potential for saving water from both indoor and outdoor water efficiency measures.
- Top 10 percent of customers:
  - High water use.
  - An average of 116 gpcd is nearly 2 times the average two-family household, and above the national average of 98 gpcd.
  - Customers likely have a high potential for saving water from both indoor and outdoor water efficiency measures.
- Top 25 percent to 50 percent customers:
  - Use is close to national average.
  - Averages of 96 gpcd (top 25 percent) and 79 gpcd (top 50 percent) are close and below the national average of 98 gpcd.
  - Customers have some potential for saving water from both indoor and outdoor water efficiency measures.
- Bottom 50 percent customers:
  - Very low water use; Super Savers.
  - Average of 37 gpcd is 62 percent of average use (60 gpcd) for all two-family (and single-family) customers, and roughly one-third of the national average (98 gpcd).
  - Average water use figures in this two-family group may reflect some single-occupancy, other small households, and part-time occupied or infrequently occupied households, such as part-time residents and unoccupied houses for sale or under foreclosure. A disproportionate number of accounts in this group had zero water use recorded for at least 1 year. Nevertheless, even the relatively higher water users in this percentile group use less than the average two-family and single-family household.
  - Customers on average are already very water-thrifty and have a relatively low potential for future water savings from conservation.

TABLE 4-7
Residential (Three-Family) Customers' Water Use Characteristics, By Percentile, 2008–2010

Three-Family Account Percentile	No. Active Accounts[1]	Total Demand, Gallons	Percent Demand of Three-Family Accounts	Average Month Demand, Gallons	Estimated Average Account Outdoor Water Use, Percent[2]	Average Gallons Per Capita Per Day, gpcd[3]
All Accounts	81	27,515,900	100	9,436	43	43
Top 1% of Accounts	1	752,400	3	20,900	39	95
Top 10% of Accounts	8	5,188,800	19	17,794	69	81
Top 25% of Accounts	20	11,149,600	41	15,294	47	70

TABLE 4-7
Residential (Three-Family) Customers' Water Use Characteristics, By Percentile, 2008–2010

Three-Family Account Percentile	No. Active Accounts[1]	Total Demand, Gallons	Percent Demand of Three-Family Accounts	Average Month Demand, Gallons	Estimated Average Account Outdoor Water Use, Percent[2]	Average Gallons Per Capita Per Day, gpcd[3]
Top 50% of Accounts	41	18,698,700	68	12,825	41	59
Bottom 50% of Accounts	41	8,817,200	32	6,047	55	28

Note:
[1] Number of active accounts shown may not add due to rounding.
[2] Based on an average of the 3 highest months per year.
[3] Based on an average of 2.4 persons per household in a three-family dwelling (average 7.2 persons per account).

Source: U.S. Census Bureau, Wisconsin Quick Facts, Persons per household, 2005–2009.

Key findings for three-family customer category percentile analysis:

- Average three-family account:
  - Very low water use compared to national average.
  - An average of 43 gpcd is very water efficient at less than half the national household average of 98 gpcd (U.S. Geological Survey, 2005).
- Top 1 percent of customers:
  - Comparable to average U.S. household.
  - An average of 95 gpcd is more than 2 times the average three-family household but is very close to the national average of 98 gpcd.
  - These customers use one-third more water than the average single-family household does.
  - Estimated indoor and outdoor water use percentages are also close to national averages.
  - Customers likely have a moderate potential for saving water from both indoor and outdoor water efficiency measures
- Top 10 percent, 25 percent, and 50 percent of customers:
  - Use is below national average, some higher than average single-family households.
  - Averages of 81 gpcd (top 10 percent), 70 gpcd (top 25 percent), and 59 gpcd (top 50 percent) are below the national average of 98 gpcd, and are relatively water-efficient.
  - Customers likely have a moderate potential for saving water from both indoor and outdoor water efficiency measures.
- Bottom 50 percent of customers:
  - Very low water use; Super Savers.
  - An average of 28 gpcd is roughly one-third of the national average.
  - Average water use figures in this group may reflect some single and small households and temporarily unoccupied or infrequently occupied households, such as part-time residents and unoccupied houses for sale or under foreclosure. A disproportionate number of accounts in this group had zero water use recorded for at least 1 year.
  - Customers on average are already very water-thrifty and have a relatively low potential for future water savings from conservation.

TABLE 4-8
Residential (Multi-Family) Customers' Water Use Characteristics, By Percentile, 2008–2010

Multi-Family Family Account Percentile	No. Active Accounts [1]	Total Demand, Gallons	Percent Demand of Multi-Family Accounts	Average Month Demand, Gallons	Estimated Average Account Outdoor Demand, gal/day[2]	Estimated Average Account Seasonal / Outdoor Water Use, Percent
All Accounts	968	1,226,233,900	100	35,188	88	8
Top 1% of Accounts	10	108,007,700	9	309,939	3,155	31
Top 10% of Accounts	97	461,751,500	38	132,504	1,872	43
Top 25% of Accounts	242	766,008,300	62	87,926	844	29
Top 50% of Accounts	484	1,011,683,900	83	58,063	186	10
Bottom 50% of Accounts	484	214,550,000	17	12,313	138	34

Note:

[1] Number of active accounts shown may not add due to rounding. The total number of Commercial accounts shown is higher than the number of Commercial properties, since some large customer properties have multiple meters (and separate billing accounts).

[2] Based on the 3 highest months per year.

Key findings for multi-family customer category percentile analysis:

- Average multi-family account:
  - Wide variation in use.
  - An average of 1,157 gallons per day (gal/day) per account cannot be easily evaluated for water use efficiency.
  - The estimated outdoor use (8 percent) is very low.
- Top 10 percent of customers:
  - Use 2 times more than average two- and three-family accounts.
  - These customers also have high (43 percent) outdoor water use.
- Bottom 50 percent of customers:
  - Low water use.
  - An average of 405 gal/day per account is low, especially if there are at least 2 to 3 dwelling units per account.
- Outdoor use may be more representative of seasonal than irrigation water demands
  - Transient populations, such as students, may reflect seasonal water use variation. Multi-family buildings often have little or no landscaping that can be attributed to outdoor usages, such as lawn irrigation and pools.

TABLE 4-9

Commercial Customers' Water Use Characteristics, By Percentile, 2008–2010

Commercial Account Percentile	No. Active Accounts [1]	Total Demand, Gallons	Percent Demand of Commercial Accounts	Average Month Demand, Gallons	Estimated Average Account Outdoor Demand, gal/day[2]	Estimated Average Seasonal / Outdoor Water Use, Percent
All Accounts	**1,225**	**1,187,364,000**	**100**	**26,924**	**199**	**22**
Top 1% of Accounts	12	346,639,300	29	786,030	7,400	29
Top 10% of Accounts	123	821,679,200	69	186,322	1,370	22
Top 25% of Accounts	306	1,029,974,700	87	93,422	674	22
Top 50% of Accounts	613	1,144,308,000	96	51,896	384	23
Bottom 50% of Accounts	613	43,056,000	4	1,953	27	42

Note:

[1] Number of active accounts shown may not add due to rounding. The total number of Commercial accounts shown is higher than the number of Commercial properties, since some large customer properties have multiple meters (and separate billing accounts).

[2] Average annualized, 2008–2010.

Key findings for commercial customer category percentile analysis:

- Top (highest) volume commercial accounts use a disproportionate volume of water:
  - The top 1 percent of accounts uses 29 percent of commercial water demand.
    - Includes hospitals and medical and senior care centers
    - Moderately high (29 percent) seasonal/outdoor demands
  - The top 10 percent of accounts use 69 percent of commercial water demand.
    - Includes hotels, spas, restaurants, and office parks
  - Top 25 percent to 50 percent accounts represent a wide range of North American Industry Classification System (NAICS) establishments, some with many different types of water use.
- The bottom (lowest) volume 50 percent of commercial accounts represent only 4 percent of demand:
  - The average account use is 64 gal/day, ranging from 1 to 170 gal/day.
  - Very low accounts should be checked for meter size accuracy and calibration, or explanation for very low use, and possible theft.
  - Some very low use accounts may also reflect a low-use or infrequently used submeter. Current economic conditions may also be a factor for some customers.
  - Meters that are undersized and not calibrated represent potential revenue losses that could be recouped.
- Outdoor use may be more representative of seasonal than irrigation water demands.
  - Twenty-two percent of average commercial account water demands appear to be for seasonal or outdoor water usages. However, a wide range in seasonal usage can be found with some accounts.

TABLE 4-10
Industrial Customers' Water Use Characteristics, By Percentile, 2008–2010

Industrial Account Percentile	No. Active Accounts [1]	Total Demand, Gallons	Percent Demand of Industrial Accounts	Average Month Demand, Gallons	Estimated Average Account Outdoor Demand, gal/day[2]	Estimated Average Account Seasonal / Outdoor Water Use, Percent
All Accounts	**145**	**1,034,506,100**	**100**	**198,181**	**1,411**	**22**
Top 1% of Accounts	1	160,814,300	16	4,467,064	64,224	44
Top 10% of Accounts	15	870,559,200	84	1,667,738	11,798	22
Top 25% of Accounts	36	997,315,700	96	764,227	5,295	21
Top 50% of Accounts	73	1,024,428,300	99	392,501	2,829	22
Bottom 50% of Accounts	73	10,077,800	1	3,861	42	33

Note:
[1] Number of active accounts shown may not add due to rounding. The total number of Industrial accounts shown is higher than the number of Industrial properties, since some large customer properties have multiple meters (and separate billing accounts).
[2] Average annualized, 2008–2010.

Key findings for industrial customer category percentile analysis:

- Top (highest) volume industrial accounts use a substantial percentage of water used by industrial customers:
  - The top 1 percent of accounts (1 customer) uses 16 percent of industrial water demand.
    - High (44 percent) seasonal/outdoor water demands
  - The top 10 percent of accounts use 84 percent of industrial water demand
    - Includes processing operations for metal and food, manufacturing, and warehouses
  - The top 50 percent of accounts represent the City's largest users among all customer categories.
- The bottom (lowest) volume, 50 percent of industrial accounts, represents only 1 percent of demand.
  - The average account use is 127 gal/day, ranging from 2 gal/day to 322 gal/day, which is very low for an industrial account.
  - Very low accounts should be check for meter size accuracy and calibration, explanation for very low use, and possible theft.
  - Some very low use accounts may also reflect a low-use or infrequently used submeter. Current economic conditions may also be a factor for some customers.
  - Meters that are undersized and not calibrated represent potential revenue losses that could be recouped.
  - Very low industrial accounts with legitimate low usage may be more appropriately classified as commercial accounts.
- Outdoor use may be more representative of seasonal than irrigation water demands:
  - Twenty-two percent of average industrial account water demands appear to be for seasonal or outdoor water usages. However, a wide range in seasonal usage can be found with some accounts.

TABLE 4-11
Public Customers' Water Use Characteristics, By Percentile, 2008–2010

Public Account Percentile	No. Active Accounts [1]	Total Demand, Gallons	Percent Demand of Public Accounts	Average Month Demand, Gallons	Estimated Average Account Outdoor Demand, gal/day[2]	Estimated Average Account Seasonal / Outdoor Water Use, Percent
All Accounts	**120**	**293,666,300**	**100**	**67,978**	**1,041**	**47**
Top 1% of Accounts	1	49,530,000	17	1,375,833	5,872	13
Top 10% of Accounts	12	189,311,300	64	438,221	6,477	45
Top 25% of Accounts	30	253,136,700	86	234,386	3,583	46
Top 50% of Accounts	60	287,600,900	98	133,149	2,053	47
Bottom 50% of Accounts	60	6,065,400	2	2,808	38	42

Note:
[1] Number of active accounts shown may not add due to rounding. The total number of Public accounts shown is higher than the number of Public properties, since some large customer properties have multiple meters (and separate billing accounts).
[2] Average annualized, 2008–2010.

Key findings for public customer category percentile analysis:

- The top (highest) volume public accounts use a disproportionate volume of water:
  - The top 1 percent of accounts (1 customer) uses 17 percent of public account water demand.
    - City of Waukesha Wastewater Treatment Plant
  - The top 50 percent of accounts use 98 percent of public account water demand.
    - Schools, courthouses, jails, office buildings, parks, and recreation
  - The top 50 percent of accounts have high outdoor/seasonal usage (approximately 47 percent of the total gpcd is seasonal use).
    - School, playing field, and park irrigation
    - Pools
- The bottom (lowest) volume, 50 percent of public accounts, represents only 2 percent of demand.
  - The average account use is 92 gal/day, which is very low for a public building or facility.
  - Outdoor water use is estimated to be 42 percent; some of the accounts may be for seasonal usage.
  - Very low accounts should be checked for meter size accuracy and calibration, explanation for very low use, and possible theft.
  - Some very low use accounts may also reflect low-use or infrequently used submeters.
  - Meters that are undersized and not calibrated represent potential revenue losses that could be recouped.

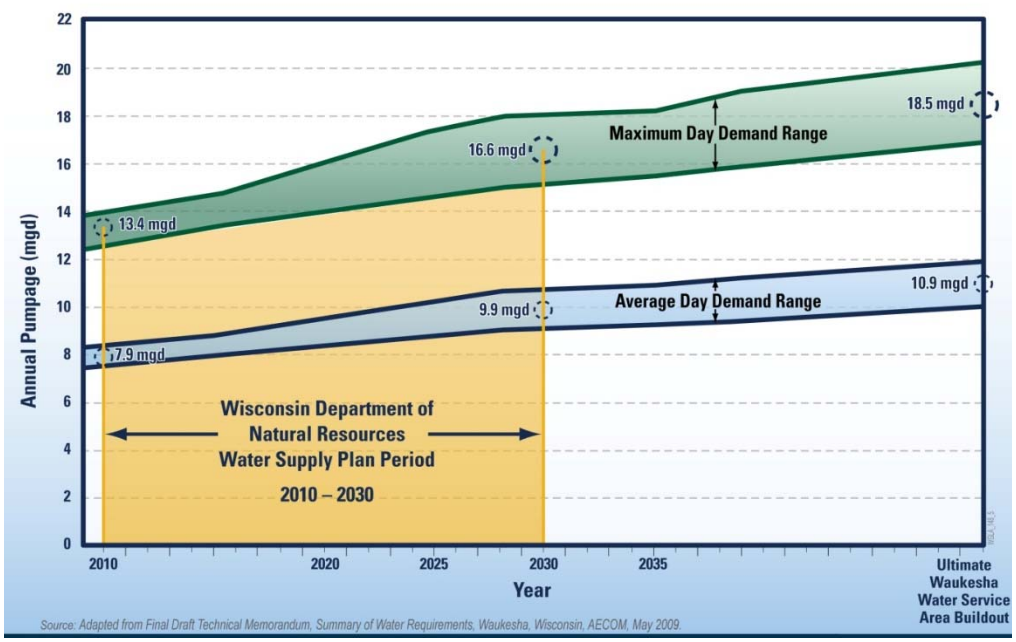
4.4 Water Demand Forecasts

As part of its 2006 water system master plan, the City prepared water demand forecasts. The forecasts were updated in 2009 to reflect updated water service area population projections and City water use after implementation of conservation measures. Appendix A, Summary of Water Requirements, contains the analysis of future water demands used during the planning process. Figure 4-7 shows the average day and maximum day water demand projections.

The future water demand forecasts are based on the following major assumptions:

- The City's water conservation program is maintained and expanded to meet long-term conservation goals and customer needs.
- If water conservation measures are not in place, the estimated increase in water demand from 2009 levels is forecast to be 0.5 mgd in 2030 and 1 mgd in 2050. That is, without water conservation, the projected average day demand would be 10.4 mgd in 2030 and 11.9 mgd in 2050.
- The target 10 percent savings of 1 mgd average day flow by 2050 complies with *A Regional Water Supply Plan for Southeastern Wisconsin* (SEWRPC, 2010), which evaluated several levels of water conservation ranging from 4 to 10 percent reductions of average daily demand.
- The ranges of future water forecasts shown in Figure 4-7 were determined by applying water use intensity factors, water savings from conservation, and some contingency to address uncertainty associated in long-term water supply planning for the project population. The uncertainties considered include drought, changes in customer class (particularly the number and type of commercial and industrial users), and prevailing economic conditions.

FIGURE 4-7
Water Demand Forecasts



5.0 Conservation and Efficiency Measures

The City has implemented or completed the water CEMs specified by Wisconsin Administrative Code Chapter NR 852, Tables 1 and 2. The CEMs implemented by the City have not resulted in adverse environmental impacts. The environmental soundness of proposed future CEMs will be evaluated prior to implementation to ensure that water savings are not gained at the expense of other important environmental considerations—for example, at the cost of higher energy use and greater carbon footprint. Existing conservation efforts are discussed in Sections 5.1 and 5.2. Additional CEMs for consideration and evaluation in the planning process are identified in Section 5.3.

5.1 Conservation and Efficiency Measures, NR 852 Table 1

NR 852 requires all Public Water Supply (PWS) systems applying for a new or increased withdrawal, diversion, or water loss to provide documentation showing implementation or completion of specified CEMs that do not require retrofitting. Prior to the submission of its application for a Great Lakes diversion with return flow, the City has implemented all the CEMs in NR 852 Table 1. The City will continue the best practices on an ongoing basis into the future.

5.1.1 PWS-1, Water Use Audit

CEM #	Description	Required Element
PWS-1	Water Use Audit	Perform a water use audit and prepare written documentation of the audit results using the process outlined in one of the following: 1. Public water systems regulated by the PSC shall follow the audit procedures indicted in ch. PSC 185. 2. Public water systems not regulated by the PSC, shall submit water use audit results with the water conservation plan required in s. NR 852.07.

The City continuously audits water use with the following established practices:

- Measures and records all water that is withdrawn from groundwater aquifers.
- Measures and records all water that used in water treatment processes.
- Measures and records all the water pumped at distribution system booster stations.
- Meters and records all water use by customer class.
- Measures and records water used each month for flushing, firefighting, and main breaks.
- Calculates the percentage of unaccounted-for water each month and reports it to the PSC annually.
- Performs customer water audit and repairs leaks in response to billing system alerts that detect water usage above and below the normal usage of that meter.

The City prepared a water use audit in 2006 in accordance with ch. PSC 185, as described in Section 3, Water Use, and presented in detail in Appendix D. The City used the water use audit to understand more clearly the system's condition and water balance; that is, the volumes of water supplied and used. This understanding helped identify ways to minimize nonrevenue water, or water that has been produced and "lost" before it reaches the customer. For example, to minimize non-revenue water, the City implements capital improvements, such as looping mains to eliminate dead ends and minimize the volume of water that would be lost to routine main flushing.

5.1.2 PWS-2, Leak Detection and Repair Program

CEM #	Description	Required Element
PWS-2	Leak Detection and Repair Program	Prepare a written program to control system losses in accordance with one of the following: 1. Public water systems regulated by the PSC shall follow the procedures indicated in ch. PSC 185 regarding system losses. 2. If a public water system not regulated by the PSC has 1,000 or more service connections and system losses greater than 15 percent, or has fewer than 1,000 service connections and system losses greater than 25 percent, the public water system shall complete a survey of leaks using one of the available technical methods and complete a corrective action plan.

The City complies with the procedures regulated by the PSC in ch. PSC 185 regarding system water losses. The water system has very low unaccounted-for water, which includes water loss from leaks. The City operates and maintains its water system to minimize unaccounted-for water to typically 5 percent, well below the AWWA-recommended 10 percent, the PSC action level of 15 percent and the requirement for a leak detection and repair program established in PWS-2. Nonetheless, the City has implemented leak prevention, detection, and repair measures as described in the following paragraphs.

The City's water distribution system has very few water main breaks that result in water loss. The average number of annual main breaks from 2005 to 2010 was approximately 25, and typically is 30 or fewer. Appendix C contains leak data and an evaluation of leaks in the City's water system. The evaluation concluded that main breaks are not a major contributor to water loss in the City's system.

To minimize leaks, the City reinvests in its system with ongoing water main replacement projects. Investment varies annually, but the 2011 capital budget for water transmission and distribution main replacement is $2.5 million.[11] This proactive investment strategy to replace aging infrastructure limits system water loss and contributes to the City's low water loss rates.

To detect and repair leaks early, the City is undertaking routine watermain and fire hydrant leak detection surveys. Surveys are initially targeting watermains installed in the 1920s, 1930s, and 1950s because historically they have the highest occurrence of main breaks, watermains located within roadway reconstruction projects, and hydrants subject to routine annual inspection The City also searches for leaks by routinely monitoring customer meter readings. When meter readings are unusually high or low, the City investigates the cause promptly to avoid wasted water or inaccurate water measurement. In this way, leaks are identified and repaired in a timely manner. In addition, upon customer request, the City conducts water use studies to define water use trends and look for leaks.

5.1.3 PWS-3, Information and Education Outreach

CEM #	Description	Required Element
PWS-3	Information and Education Outreach	1. Provide information to employees and customers regarding water conservation and water use efficiency. Include all of the following items: reasons why water conservation is necessary, consequences of not conserving water, and actions needed to achieve the water conservation goals of the community. Provide information and education in an effective format to customers and employees specific to landscape watering practices. Public water supply systems regulated by the PSC shall follow the utility billing procedures indicated in ch. PSC 185. 2. Develop and deliver a training plan to educate and train employees on the implementation of water conservation and efficiency measures at public water system facilities. Information and education materials shall be made available to the department.

[11] City of Waukesha Water Utility annual budget.

Using lessons learned by other cities across the country, the City designed its water conservation program with education and outreach as the cornerstone. Through a wide array of events, media, and strategic collaborations, the City's customers have been made aware of the City's conservation goals and been given resources to help them save water. In addition to traditional communication channels, the City's inclining block water rate structures have been designed to communicate a price signal to customers. Customers learn that greater costs result from higher water use.

The City designs and delivers water conservation and water use efficiency information to its customers through a variety of communication channels. A library of outreach program materials is included on the City's Web site. Because of its efforts, ranging from educating thousands of City elementary school students to showcasing customer water conservation success stories, the City has been recognized by the Waukesha School District Most Valuable Partner Award (2007) and the Wisconsin Water Association's Water Efficiency Award (2008).

Through education and outreach, the City has learned that its customers value saving money, understanding local water issues, and doing the right thing. The City also learned that its customers are willing to change their water use practices. For example, through the Residential Customer Challenge in 2008, some City customers reduced water use by 50 percent.[12]

The City has also learned the value of strategic partnerships in getting the message out. In particular, the City's innovative collaboration with the Wisconsin Water Conservation Coalition advances outreach to the residential, commercial, and industrial sectors and creates the opportunity to neighboring communities to coordinate conservation efforts.

The City trains its employees annually on water conservation so that they may serve as ambassadors of the program and help enforce water use restrictions. Employees, particularly those who interface directly with customers, are provided with resources like standard forms and information to help them educate customers and, if necessary, enforce conservation measures like the sprinkler ordinance.

5.1.4 PWS-4, Source Measurement

CEM #	Description	Required Element
PWS-4	Source Measurement	Measure or estimate all water withdrawals monthly or more frequently to allow for identifying and understanding variability in water use over time. Public water supply systems regulated by the PSC shall follow the metering requirements provided in ch. PSC 185.

The City measures water withdrawals daily and reports all water meter data in accordance with ch. PSC 185. In addition, the City meters all of its customer connections. The City complies with the meter flow testing and accuracy requirements stipulated in ch. PSC 185.

Section 3 summarizes 11 years of water production and water use data. The City uses this information to understand better the variability of water use over time for each customer class. It also uses the information to design effective conservation measures, including the sprinkler ordinance to shave peak season flows, and an inclining rate block structure. Such information also is used to identify water trends and to develop future programs to encourage water savings.

5.2 Conservation and Efficiency Measures, NR 852 Table 2

In addition to the mandatory measures required in Table 1, the CEMs identified in NR 852 Table 2 are required to be implemented by Tier 3 applicants for Great Lakes diversion. The City has implemented all of the measures in Table 2. The City will maintain the best practices on an ongoing basis into the future.

[12] City of Waukesha customer meter data.

5.2.1 PWS-R1, Distribution System Pressure Management

CEM #	Description	Required Element
PWS-R1	Distribution System Pressure Management	Analyze distribution system pressure management to identify opportunities to reduce water use and minimize plumbing fixture leaks.

Following development of the City's 2006 water system master plan, an analysis of distribution system pressure management was conducted. Conclusions from this work, contained in Appendix C, include the following:

- The distribution system is operated to meet pressure requirements stipulated in Wisconsin Administrative Code NR 811.70 (4). The requirements include maintaining a minimum 20 pounds per square inch (psi) of pressure under all conditions and maintaining pressures from 35 to 100 psi under normal static conditions.
- The system's eight pressure zones are designed to deliver adequate water supply and pressure over widely varied service area topography.
- Through comparison of published drinking water industry benchmarks and historical system performance data, pressure does not appear to be a major contributor to main breaks or leaks.
- The City notifies its customers via mailings when they make occasional adjustments to system pressures due to system upgrades. They use this opportunity to further educate their customers about checking for and repairing potential leaks in their home.

5.2.2 PWS-R2, Residential Demand Management Program

CEM #	Description	Required Element
PWS-R2	Residential Demand Management Program	Establish and publicize a program to complete residential customer water use audits and leak surveys upon customer request based on high or aberrant water use. In developing the program, a waiver of liability and written permission from the customer may be needed.

The City provides resources for residential customers to conduct home water use audits. For example, in 2010 the City started and will maintain distribution of leak tablets along with home water audit guidance in conjunction with USEPA's WaterSense Fix-A-Leak Week promotional event.

In addition, upon customer request, the City will conduct a water use study by monitoring real-time water use to define water use trends and look for leaks.

Furthermore, because residential customers represent the City's largest customer class in terms of water consumption and number of connections, residential demand management is the initial focus for the City's water conservation program. Early activities include customer outreach and information, a residential water use reduction contest, fixture replacement incentives, and policies to encourage efficient outdoor water use. These residential demand management measures have resulted in water savings:

- Toilet rebate program participants save over 15,000 gallons per year.[13] As of 2010, the total volume of water saved from the toilet rebate program was 1,430,825 gallons.[14]
- Between 2005 and 2009, peak season pumping was reduced 16.8 percent.
- Since 2005, declining water use reduced the number of days water demand exceeded 10 mgd from 28 to 0. The City has an operational goal to pump 10 mgd or less, to meet its radium compliance consent order.
- There is a declining trend in peak season use.

[13] City residential meter reading data, 2008–2010.

[14] Waukesha Water Utility Report on Water Conservation Programs to the Public Service Commission of Wisconsin, 2010.

5.2.3 PWS-R3, Commercial and Industrial Demand Management Program

CEM #	Description	Required Element
PWS-R3	Commercial and Industrial Demand Management Program	Establish and publicize a program to complete commercial and industrial customer water use audits and leak surveys upon customer request based on high or aberrant water use. In developing the program, a waiver of liability and written permission from the customer may be needed.

The largest industrial customers in the City include food processors, metal processors, foundries, and health care facilities. The City actively provides water conservation information to the industries it serves. Through the Wisconsin Water Conservation Coalition, representatives of several large industrial customers collaborate with the City to promote and accomplish water conservation. Some examples include the following:

- Navistar Waukesha Manufacturing performed a water use assessment and replaced hard water in its cooling tower applications with softened water. As a result, less water is added to the system and fewer purge cycles are needed. Automatic shutoff valves and controls further optimize water use in the water cooled heat exchangers. The effort saves 15,000,000 gallons per year, a 23 percent decrease in water usage, saves $30,000 annually, and has a return on investment of 6 months.[15, 16]
- Dean Foods/Golden Guernsey Dairy conducted a water audit and identified several water saving ideas. The company implemented changes to water lubricated systems, cooling water recirculation in homogenizing units, and wash water handling with an estimated total water savings of 1,850,000 gallons per year.
- GE Healthcare Waukesha Campus focused water conservation efforts on employee education, installation of faucet aerators, leak detection, and reducing water wasted in janitorial services. The resultant water savings is 324,000 gallons per year.[17]

Through the Wisconsin Water Conservation Coalition, the City has worked with commercial class customers to promote water conservation in restaurants, use of rain barrels in the City’s business district, and development of “green” residential homes with high-efficiency plumbing fixtures and gray-water systems.

5.2.4 PWS-R4, Water Reuse

CEM #	Description	Required Element
PWS-R4	Water Reuse	Conduct a technical assessment to evaluate the feasibility of water reuse in the operation of the facility. Implement water reuse projects identified by the assessment and allowed under current state law.

The City has evaluated the feasibility of water reuse in the operation of its water supply, treatment, and distribution facilities. There are negligible opportunities for water reuse for the following reasons:

- Plumbing fixtures in the Administration Building have been retrofit with high-efficiency units.
- Landscaped areas are not irrigated.
- Water used in water treatment processes cannot be recycled because of high radium concentrations.

Based on preliminary outreach with industrial customers, the City will investigate industrial water reuse opportunities. For example, it may be cost-effective to replace water used for seasonal irrigation with spent cooling water that otherwise would be discharged to the sewer.

[15] Navistar Waukesha Manufacturing, WAU Use Softened Make-Up Water to Furnace Cooling Tower, 11/22/2010.

[16] Case Study: Pure Power Technologies Water Savings Summary. 2010.

[17] GE Healthcare water conservation summary presentation, 2010.

5.3 Potential CEMs

In addition to infrastructure management measures, successful water conservation programs across the country incorporate a combination of public information, incentives, and regulations to achieve efficient water use across their service area. CEMs are focused on operating a water-tight water treatment and distribution system, public and school-age education, and a portfolio of measures to address water used by utility customers. To increase the effectiveness of water conservation programs, utilities generally select a small number of CEMs for implementation initially and grow the program over time. The CEMs will be selected by the City with consideration given to regulatory requirements, budget and staffing constraints, detailed customer water use analysis, and stakeholder/customer input. Candidate CEMs were evaluated and scored by a group of citizens, business leaders, and community representatives serving on a water conservation stakeholder committee discussed in more detail in Section 6.

5.3.1 Infrastructure Management

Infrastructure management CEMs to be implemented during the planning horizon include the following activities:

- Continue use of the City’s hydraulic distribution system model to evaluate and further optimize pressure and customer demand changes.
- Maintain implementation of the present leak mitigation measures.
- Implement water main and service connection leak detection survey and repair program at a level where water savings benefits exceed program costs.
- Continue to measure source water.
- Continue to individually meter and bill customers.
- Continue to replace 3- to 6-inch turbine meters with more accurate compound meters.
- Study conversion from quarterly to monthly utility billing.

5.3.2 Public Information and Education and School Education

No conservation program can be successful without the informed participation of its customers. Therefore, the City will continue to gather data and work closely with customers so that it can measure the water saved from changed water use behaviors and their associated costs. Specific outreach activities the City is considering in the near-term future include the following:

- Expanding its Web site’s online library of resources
- Making available to customers an online water use calculator
- Expanding the City’s school water education program to include ”Teach the Teacher” workshops

5.3.3 Customer Demand Management Measures and Incentives

The measures in this summary represent a menu of potential CEMs that were identified for consideration and discussion by the stakeholder committee. A more detailed description of the measures is included in Appendix E. Those measures recommended for inclusion in the Plan are further discussed in Section 7.

5.3.4 Residential Measures

- Water use audits
- High-efficiency toilet (HET) model rebates and/or distribution
- High-efficiency clothes washers rebates
- Water-efficient showerhead rebates and/or distribution
- High efficiency water heater replacement rebates
- Leak and minor plumbing repair program
- Water softener replacement rebates

- Irrigation audits
- Rain gauge or sensor rebates and/or distribution
- Irrigation technology rebates
- Landscape/turf replacement program

5.3.5 Commercial, Industrial, and Institutional Measures (includes Public Customers)

- Water use audits
- Pint or half-gallon urinal rebates
- HET model rebates or distribution
- Water-efficient showerheads
- High-efficiency clothes washers rebates
- High-efficiency water heater rebates
- Kitchen water use
  - Commercial dishwashing rebates
  - Pre-rinse spray valves
  - Ice machine replacement
- Industrial and customer-specific water use
  - Cooling tower rebates
  - Commercial and industrial customer conservation retrofit rebate
  - Vehicle washing/ carwashes
  - Public facilities retrofit
- Landscape audits: large irrigation areas
- Irrigation technology rebate
- Landscape/turf replacement program
- Rainwater capture/ condensate reuse program
- Water recycling (reuse)

5.3.6 Policies and Regulation

In addition to education and incentives, policies, inclining block water rate structure, and regulations such as the City's existing sprinkling ordinance can be effective ways to achieve conservation. Those considered in this planning process are summarized in the following list:

- Leak inspection and repair prior to property resale or lease
- Fixture and equipment retrofit or replacement upon property resale or lease
- Year round lawn and landscape sprinkling schedule, maximum one day per week
- Decorative water features water use restrictions (fountains, waterfalls, other decorative features, and pools)
- Annual irrigation inspection for large landscapes
- Conservation Standards for new construction
- Water waste prevention ordinance
- Monthly billing

6.0 Stakeholder Input and CEM Evaluation

During the fall of 2011, representative water users and other key stakeholders were identified to form a stakeholder committee that could provide input to the water conservation planning process. Through a series of workshops, stakeholder committee members gained knowledge to actively participate in the technical evaluation of CEMs, provided valuable input on approaches to implementing CEMs, and offered review comments on the City's Water Conservation Plan.

6.1 Initial Screening of CEMs

As part of the development of the Water Conservation Plan Supplement (CH2M HILL, 2011), the City evaluated numerous CEMs using the AWE Tool. This tool is a water conservation calculator that is recommend under Wisconsin Administrative Code NR 852 for estimating water savings and costs associated with CEMs. The initial analysis using the AWE Tool resulted in a short list of candidate CEMs for further evaluation by WWU and stakeholders. The CEMs are described in Appendix E.

6.2 Stakeholder Input

Information gathered from the stakeholder committee provided valuable insights regarding the level of awareness of the need for conservation and ways to achieve it. The stakeholder committee input helped establish a baseline for the City's approach to future public information and education activities. Furthermore, engaging a broad range of stakeholder interests provided useful information on CEMs that are likely to be implemented.

During the planning process, stakeholder input was gathered using the following three methods:

1. Stakeholder Committee
2. Stakeholder Interviews
3. Survey

6.2.1 Stakeholder Committee

6.2.1.1 Committee Membership

The City created a water conservation stakeholder committee representing a diverse group of interests, including business, healthcare, developers, residents, community-based organizations, education, and others. The purpose for the committee was to create a way to get meaningful input from a variety of perspectives about the future of water conservation in the City as well as to get a sense of the community's understanding of conservation.

6.2.1.2 CEM Evaluation Process Overview

The process for involving stakeholders in the evaluation of CEMs took place in three meetings. Each meeting was designed to provide the stakeholders with the information and tools needed to prioritize candidate CEMs and provide input to the City conservation program.

Stakeholders score potential Conservation and Efficiency Measures during their meeting

- **Meeting 1, November 17, 2011—**During this meeting, stakeholders were provided background information on the utility, existing conservation activities, and the conservation planning process. They discussed and refined evaluation criteria to be used to prioritize conservation measures as a group. Evaluation criteria encompassed a variety of factors that include quantifiable criteria such as cost per million gallons saved and estimated savings per unit installed. Other criteria that address community values and customer acceptance were also useful considerations when selecting and prioritizing measures for implementation.

- **Meeting 2, December 13, 2011—**Brief descriptions of proposed CEMs were presented (Appendix E). After discussion, the committee members scored each measure using the criteria refined during Meeting 1. Each measure was evaluated from 1 to 5 with 1 being the lowest ranking and a 5 being the highest. Scores were combined to determine overall ranking of the measures. The result of this process was a prioritized ranking of measures that were considered by the City along with local knowledge of feasibility, compliance with state regulations, and financial factors. The prioritization provided insights about which measures are likely to achieve the most success and be supported by customers.
- **Meeting 3, January 24, 2012—**The final meeting, held after the draft 2012 Conservation Plan was prepared, provided feedback to the City before the plan was finalized and considered by the Water Utility Commission.

6.2.1.3 Evaluation Criteria

Based loosely on guidance in AWWA Manual of Water Supply Practices, the criteria used in the ranking process (listed in Table 6-1) reflect stakeholder comments and discussion during the committee meetings. Some of the criteria are technical in nature (for example, estimated savings and costs) and were ranked by WWU staff and presented for review by the stakeholder committee. Other criteria are value-based and were applied by the committee members.

TABLE 6-1
Water Conservation and Efficiency Measures Evaluation Criteria

Criterion	Description	Key questions	Who applies criterion
Cost-effectiveness	Assesses the return on investment for a given measure. Metrics may include cost per million gallons per day (or acre-feet per year) of savings.	What is the cost for volume of expected savings? What is the administrative cost? How is reduced water use from the program as a whole likely to affect future water rates?	WWU
Technology/ market maturity	Seeks to assess the availability of a given device or best management practice in the local area as well as the track record of a device or technology.	To what degree is the proposed device or practice developed from a technical perspective? Is the measure available to customers locally?	WWU
Time to implement	Assesses the time needed for WWU to implement a measure considering additional research, stakeholder input, and technical evaluation needed.	Are standards in place to establish water saving specifications for the technology or CEM proposed? How long will it take to develop accountability procedures or contracts to implement the measure?	WWU
Certainty of savings	Assesses the likelihood that potential savings will actually be achieved. Some measures may have a high potential for saving water, but rely heavily on behavioral changes or other conditions.	Have potential savings from this measure been realized in other places? Are conditions that lead to maximum savings from this measure likely to occur?	WWU
Magnitude (relative volume) of savings	Evaluates the potential for total savings of a given measure.	Will the total estimate savings from this measure materially contribute to the savings goal? What is the savings potential? Are there many customers who can implement this measure?	WWU
Complements sustainable use of other natural resources	Assesses the balance of potential water savings with other natural resources such as energy, water quality, urban forests, and solid waste.	Is the measure consistent with other best practices such as those to protect water quality or reduce energy conservation? Does it complement efforts to protect the urban forest or create additional solid waste?	WWU and Stakeholder Committee Members

TABLE 6-1
Water Conservation and Efficiency Measures Evaluation Criteria

Criterion	Description	Key questions	Who applies criterion
Service area match	Seeks to determine if the measure fits the community's housing stock, businesses, climate, and water use patterns.	Does this measure make sense in Waukesha given the age of our housing, businesses, and our winter climate?	Stakeholder Committee Members
Customer acceptance	Assesses customers' and/or water users perceptions of fairness, convenience, likelihood of their willingness to implement the measure.	Does implementation of the measure benefit the customer and/ or water users who implement it? Are customers and/or water users likely to participate in the program or implement the measure? Are the measures accessible to all utility customers and water users? Has it been done elsewhere?	Stakeholder Committee Members
Customer or water users ability to implement	Evaluates the ability of WWU's customers and/or water users to implement the measure.	How feasible will it be for WWU's customers and/or water users to implement the measure? Factors could include legal, financial, and political components, among others.	Stakeholder Committee Members

6.2.1.4 Ranking Results

During the second meeting, the stakeholder committee scored each of the CEM's presented. The composite scores were combined with the WWU staff scores. The averages for each measure are presented in Tables 6-2 through 6-4. The CEMs with the highest average scores are most likely to be accepted by WWU customers and achieve greater and more reliable savings and those less likely to be effective. Measures with lower ranking were generally not selected for near-term implementation and may be more beneficial for future consideration based on technology advances, changing financial consideration, after further study, or other factors.

TABLE 6-2
Indoor Measures for Residential Customers

Residential Indoor CEMs	Average
HET—$100 rebates/distribution	4.22
Water-efficient showerhead $20 rebates/distribution	4.12
High-efficiency clothes washer—$50 rebates	3.94
Water use surveys/audits	3.67
Leak and minor plumbing repair program	3.39
Water softener replacement	2.82
High-efficiency water heater replacement	2.75

TABLE 6-3
Outdoor Measures for Residential and Commercial, Industrial and Institutional Customers

Residential Outdoor CEMs	Average
Irrigation audits	3.59
Rain gauge or sensor	3.44
Irrigation technology rebate	2.64
Landscape/turf replacement	2.54
CII Outdoor CEMs	**Average**
Landscape surveys/audit: large irrigation areas	3.76
Irrigation technology	2.78
Landscape/turf replacement program	2.73
Rainwater capture/condensate reuse incentive	2.62
Water recycling/reuse	2.35

TABLE 6-4
Indoor Measures for Industrial and Institutional Customers

CII Indoor CEMs	Average
HET model rebates or distribution	4.49
High-efficiency showerhead rebates	4.08
Water use surveys/audits	3.84
Pint or half-gallon urinal rebates or distribution	3.81
Public buildings demonstration retrofit	3.78
High-efficiency clothes washer rebates	3.71
Pre-rinse spray valve replacement	3.68
Cooling tower audit	3.62
Ice machine replacement	3.57
Commercial and industrial customer conservation retrofit/rebate	3.54
Commercial dishwashing rebates	3.42
Vehicle washing/carwashes	3.31
High-efficiency water heater rebates	3.16

In addition to the specific incentive-based CEMs evaluated, the WWU desired stakeholder feedback on potential policies that could be developed during the planning horizon. The measures presented in Table 6-5 include a variety of policies that have been implemented by communities around the country. The potential savings associated with these policies have not been quantified at this point. It is anticipated that such detailed evaluations would be performed during the implementation period.

TABLE 6-5
Potential Policies and Miscellaneous Measures

Policies and Miscellaneous Measures	Average
Building standards for new construction	4.20
Monthly billing	4.05
Leak inspection and repair upon resale or lease	4.00
Fixture retrofit or replacement upon resale or lease	3.46
Water waste prevention ordinance	3.34
Annual irrigation inspections	3.14
Year-round 1 day per week sprinkling	2.98
Decorative water fountains and swimming pool covers	2.89

6.2.1.5 Other Committee Findings

The Conservation Stakeholder Committee met for the third time on January 24, 2012. The goal of the meeting was to provide comments on the Draft Plan; the comments and suggestions were incorporated into the Final Plan. Additionally, the Committee developed a set of consensus messages regarding Waukesha's conservation program and plan. To be successful, the plan must meet the following criteria:

- **Cost-effective.** The proposed conservation plan considered cost-effectiveness and return on investment from both customers' and the utility's perspective. The majority of water-saving measures appear to be cost-effective. During implementation, WWU should focus on the largest water-using customers (the top 10 percent) to get the "biggest bang for the buck."
- **Flexible and Innovative.** To be effective over time, the conservation program should be flexible, allowing the utility staff the discretion to change which measures are implemented, the schedule and the balance between the measures from year to year. Implementation has to be adaptive process with routine trial, assessment and study over time to determine what will work in Waukesha. The plan should allow for innovative ways to save water, such as using sources other than treated water (such as discharges from cooling towers or the wastewater treatment plant) for non-drinking purposes (such as sewer flushing or construction and landscape irrigation).
- **Education and Outreach.** The long-term success of the conservation program lies in the education of our youth, especially to meet the 2030 goals. In the near-term, the City must present easily understood, clearly communicated information for customers to that they can benchmark and manage their water use. While an underlying message of all communication strategies is that using water efficiently provides benefits to the environment and makes sense financially, information should be tailored to reach customers such as multi-family users, customers in the central city, and bilingual speakers.
- **Water Supply Portfolio.** Conservation and water-use efficiency is very important and a key strategy in meeting future water needs; however, it is only one strategy to meet long-term water supply needs.
- **Efficiency measures should fit Waukesha.** Conservation measures, including incentives and policies, should focus on implementing both water-saving technologies and changing water use behavior. Measures should include code revisions for new construction as well as for renovations, and should consider potential unintended consequences that could arise. For example, for some campuses with onsite piping with small scopes, lower flows could lead to collection system maintenance issues.
- **Financial and Other Incentives.** Conservation programs should provide financial incentives such as rebates or possible grants for innovative site-specific water saving measures with demonstrated savings. The savings may

be particularly effective in this economy. In addition to financial incentives, the City should consider non-financial incentives such as awards, publicity for water-savings, and rewards for water-savers.

- **Strategic Investments.** The utility should consider strategically investing in certain activities that advance water conservation efforts and awareness, such as monthly billing, if the benefits outweigh the costs.

6.2.2 Stakeholder Interviews

In addition to the ranking completed by the stakeholder committee, WWU also conducted interviews with customers representative of the largest water users to gather more detailed information about how the customers use water, their awareness of conservation measures and effective ways the utility can assist in water-use efficiency for these customers. Because each industry is different, the feedback from the customers can help WWU tailor programs to best meet customers' needs while achieving the utility overall water use reduction goals. Interviews were conducted with the following customers:

- Waukesha County
- Waukesha Memorial Hospital
- MetalTek
- Country Springs Hotel

Key messages learned during the interviews include the following:

- For hospitals and patient care facilities, care must be taken so that water-saving equipment such as faucet aerators do not conflict with best practices for infection control.
- While some facilities may provide their own laundering services, Waukesha Memorial Hospital outsources its laundry service; thus, a one-size-fits-all approach may not be as effective as programs tailored for individual customers.
- Many industries that use a significant amount of water already have implemented some water use efficiency measures. For example, MetalTek will be installing sub-meters to determine the specific water users within their plant. They reuse and recycle water.
- Focusing on measures that save water and other resources are preferred; WWU should consider programs similar to those offered by WE Energies.
- Some organizations have outreach and training programs and may be able to add water conservation awareness to their offerings. For example, Waukesha County's Partners in Training program could be an opportunity to bring in a conservation expert to talk to various county communities about conservation.
- WWU could consider adding a small fee to its utility bills to fund conservation programs, similar to the fee assessed by WE Energies for the Wisconsin Focus on Energy initiative.
- Payback periods to recoup investment range in the 2- to 3-year timeframe.

6.2.3 Conservation Awareness Surveys

Two important elements of a successful conservation program include a well-designed public education and awareness program and a reasonable estimate of the "market" for conservation technologies. To gather baseline information , the project team conducted a survey to gauge customer awareness and the extent of their water-saving practices. Ideally, a random survey would be conducted on a statistically significant number of WWU customers to validate the findings of the survey conducted for this planning effort. Due to time and budget constraints, a survey of utility employees was conducted as a proxy for customers within the service area.

Approximately 75 survey responses (12 percent of employees) were received. The results were used to provide local data on the potential market for various measures. For example, about 38 percent of the respondents indicated that they had retrofitted their homes with water-saving toilets. While one could conclude that utility employees are likely to have a higher awareness of conservation activities, it was reasonable to assume that about 30 to 40 percent of the homeowners within WWU service area have also changed out their toilets—or, only additional savings from about 60 to 70 percent of single family residential customers could be achieved through additional toilet retrofits. Another example of how the data was used to calibrate planning assumptions relates to outdoor water use; 65.8 percent of the respondents indicated that they never water their lawn. This is consistent with the detailed customer water use analysis presented in Section 4 and suggests that programs designed to replace turf or irrigation systems would likely not result in significant water savings for a large percentage of WWU residential customers. If implemented, the programs would be focused on a small number of the top users.

6.3 CEM Cost-effectiveness with AWE Tool

An evaluation of cost-effectiveness is not appropriate for all CEMs. For example, public education is essential to a successful water conservation program, but water savings gained from outreach activities cannot be readily measured. Instead, the effectiveness of these activities is gauged primarily through qualitative benchmarks such as customer satisfaction, changes in customer water use behaviors, and knowledge gained. Other CEMs, like fixture replacement, lend themselves to an evaluation of cost-effectiveness. Candidate CEMs selected for the cost-effectiveness evaluation met the following specific criteria:

- Saves water so that less is needed to meet future demands
- Ranks high in the joint WWU and stakeholder evaluation process
- Provides long-term benefits from avoided capital, operating, and maintenance costs
- Maintains or improves customer satisfaction

6.4 AWE Tool Results

With the goal of saving 0.5 mgd by 2030, the guidance provided in NR 852, and the City's experience gained from existing conservation activities, the AWE Tool was used to analyze several CEMs. Over 40 program activities were evaluated and those projected to be the most cost effective are listed in Table 6-6.

The B:C ratio for each CEM for WWU and its customers is presented in Table 6-1. A conservation measure with a ratio greater than 1 is an improvement. Measures with a ratio less than 1 will be re-evaluated, when appropriate, to consider changes to the program activity or to consider other non-economic benefits.

TABLE 6-6
Summary of B:C Ratio and Projected Water Savings

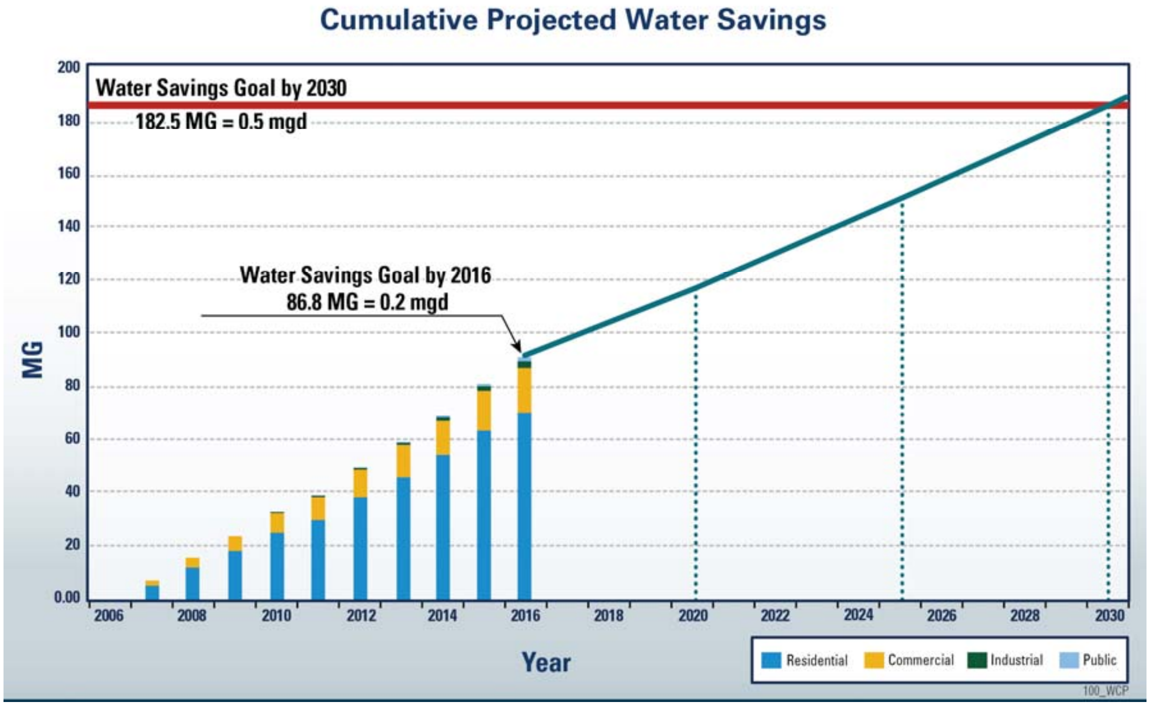
Activity	Utility B:C Ratio	Customer B:C Ratio	Projected Water Savings (gallons) Years 2012–2016
Residential HETs, $100 rebate	3.7	271	7,325,700
Multi-family residential HET direct install, $100 rebate	5.6	38.9	113,000
Commercial tank-type HET, $100 rebate	3.5	24.1	34,500
Commercial valve-type HET	3.5	23.9	57,500
Industrial tank-type HET, $100 rebate	3.5	23.9	80,400
Industrial valve-type HET, $100 rebate	3.5	23.9	80,400
Public tank-type HET, $100 rebate	3.5	23.9	80,400
Public valve-type HET, $100 rebate	3.5	23.9	80,400
Residential water-efficient showerhead	378	3.1	866,200
Multi-family residential water-efficient showerhead	6.9	6.8	11,400
Commercial water-efficient showerhead	6.9	7.4	4,100
Industrial water-efficient showerhead	5.4	7.3	16,500

TABLE 6-6
Summary of B:C Ratio and Projected Water Savings

Activity	Utility B:C Ratio	Customer B:C Ratio	Projected Water Savings (gallons) Years 2012–2016
Public water-efficient showerhead	4.9	6.7	15,200
Residential indoor water use surveys	-0.1	N/A	73,000
Multi-family residential indoor water user surveys	0	N/A	4,000
Commercial indoor water use surveys	0	N/A	17,000
Industrial indoor water use surveys	0	N/A	21,700
Public indoor water use surveys	0	N/A	21,700
Commercial outdoor water use surveys	0	N/A	-55,800
Public outdoor water use surveys	0	3.0	-55,800
Commercial urinals, $100 rebate	1.2	3.0	93,100
Industrial urinals, $100 rebate	1.2	3.0	93,100
Public urinals, $100 rebate	1.2	3.0	93,100
Commercial spray-rinse valves rebates	6.4	478	1,414,300
Industrial spray-rinse valves rebates	6.0	444	1,414,300
Public spray-rinse valves rebates	6.0	444	1,414,300
Public high-efficiency clothes washer rebate	-0.3	N/A	7,000

The menu of CEMs establishes the baseline of activities the City will implement to reduce water use by 0.5 mgd by 2030. The activities will be expanded between 2030 and 2050 to achieve an additional 0.5 mgd savings that will result in ultimate savings of 1.0 mgd, or 10 percent. The estimated cumulative water use savings shown in Figure 6-1 represent the results of the program activities by customer class and code-driven, or passive, water savings. Code-driven water savings occur as the result codes requirements for more water-efficient plumbing fixtures. Appendix G presents the estimated water savings from each conservation activity.

FIGURE 6-1
Projected Water Savings



7.0 Recommended Program CEMs

Section 7.0 presents key recommendations for Waukesha's future water conservation program elements, including conservation and efficiency measures, incentives and related implementation strategies. The recommendations are based on Waukesha's prior water conservation program achievements and findings, extensive historical and customer water use analysis, extensive input from stakeholders, and a B:C analysis. The recommendations presented in this section are framed in part using findings from the rank and percentile analysis of customer water use because it provide additional focus for smaller segments of each customer category. The framework provides a good way to prioritize CEMs that are likely to save water effectively. Various measures were then ranked by the Stakeholder Committee.

Projected water savings and estimated benefits and costs associated with the recommended CEMs described in this section are presented in Section 8, Recommended Plan.

7.1 Context for Conservation Recommendations

7.1.1 Opportunities for Conservation

As the City has demonstrated since adoption of the 2006 Plan, water use efficiency can be increased through a combination of policies, education and incentives that promote installation of water-saving technologies. Based on the rank and percentile analysis, opportunities for effective conservation measures have been identified and are summarized in Table 7-1.

TABLE 7-1
Recommended Priorities for Various Customer Categories Based on Rank and Percentile Analysis

Customer Category	High Priority	Moderate Priority	Low Priority
Residential—Single-family and Two-Family	**Top 10 percent of users** Measures to reduce both high indoor and outdoor water use such as audits, rebates, and utility service rules or ordinances related to irrigation	**Top 11 to 50 percent of users** Measures to reduce both high indoor and outdoor water use	**Bottom 50 percent of users** Emphasize maintenance measures such as faucet and toilet leak detection, minor plumbing repairs, and self-help tools
Residential—Three-family and Multiple-family		**Top 1 to 50 percent of users** Emphasize measures to reduce both high indoor and outdoor water use such as audits, rebates, and utility service rules or ordinances related to irrigation	**Bottom 50 percent of users** Emphasize maintenance measures such as faucet and toilet leak detection and minor plumbing repairs
Commercial	**Top 1 to 10 percent of users** Water Use audits; upgrades and replacement of equipment, appliances, and fixtures		Provide information through Web-based and print materials, industry advisory groups, etc.
Industrial	**Top 1 to 50 percent of users** Water Use audits; upgrades and replacement of equipment, appliances, and fixtures	**Bottom 50 percent of users** Continue meter calibration program and ongoing study of optimum meter models to ensure low flows are recorded for customers with large meters	
Public (Institutional)	**Top 1 percent** (largest customer) Partner with wastewater utility to explore potential reuse/backwash opportunities	Benchmarking project for area schools to establish metrics	Water use audits; upgrades and replacement of equipment, appliances, and fixtures

7.1.2 Potential Challenges for Conservation Program

WWU has a 2011 staffing level of 32 employees and an operating budget of approximately $7.4 million. Given the WWU's size and available resources, it is recommended that the conservation program expand slowly with annual work plans focused on specific measures and customer categories.

During implementation, challenges to implementation must be addressed and, potentially, mitigated. Examples of challenges to the implementation of a conservation plan include the following:

- Increased spending demands of an already stretched budget—that is, competition for funding against other essential programs
- Initiation of spending in a troubled economy
- Actual savings less than estimated savings due to the current economy, such as fewer new developments to implement the measures

Furthermore, while conservation programs typically save utilities money in the long term by reducing energy and other variable operating costs and deferring costs for expanded water treatment facilities, reducing water sold can have short-term consequences for the utility's budget. Gradual implementation will facilitate greater financial stability and allow for multi-year financial forecasts that provide adequate time for customers and utility managers to adjust.

7.2 Water Utility and Other Municipal Infrastructure

The City operates and maintains its water system to minimize unaccounted-for water ranges from 3 to 7 percent, well below the AWWA-recommended 10 percent and the PSC action level of 15 percent. Therefore, few additional system operational measures appear to be necessary at this time to further reduce WWU's unaccounted-for water. Recommendations for additional utility infrastructure CEMs are addressed in this section. Additionally, other water savings can be achieved in other municipal facilities and infrastructure, including the following recommendations:

- Continue measures currently in place (Section 5.3) to maintain the system's efficiency.
- Develop a unidirectional flushing program within the next 5 years and initiate program within 10 years. Unidirectional flushing thoroughly cleans water mains and requires less water than conventional flushing.
- Explore a partnership with WWU to assess water savings opportunities and costs.
- Install efficient irrigation systems and other landscape practices to save water in City parks and other irrigated areas.
- Consider low-impact development techniques such as re-grading and rain gardens in rights-of-way and other irrigated areas to conserve water, reduce stormwater runoff, and improve stormwater quality.

7.3 Public Education and Information

WWU actively provides information to its staff, the public, its customers, and school-age children. Communication is the foundation of a successful conservation program. The first step is to provide a foundation of the importance of conservation and then build upon that to encourage participation in a particular program. Given the available resources, it will be important for WWU to partner with others in the community to reach the broadest number of water customers. Key recommendations for the outreach and education include the following:

- Leverage technology to stretch limited resources.
  - Expand the WWU Web site's online library of resources and work to have other agencies and non-profit groups include the WWU Web site link on their Web sites.
  - Make online water use calculator available to customers.

  - Provide water-saving information on program-specific (CEM) matters and streamline rebate processing and tracking using Web-based applications.
  - Develop software program to manage data used to track water use to facilitate internal reporting and reporting to regulatory agencies (such as PSC).
- Develop partnerships with public and private organizations to spread the conservation message.
  - Provide "Teach the Teacher" workshops to augment limited staff resources for school education program.
  - Work with local universities to establish internship programs, course-related projects to collect and analyze data, and lecture series related to water resource management and conservation.
  - Work with Waukesha County's "Partners in Training" program to bring in a conservation expert to talk to various county communities about conservation.
  - Train WWU and City staff to present conservation programs as part of a WWU speakers bureau.
  - Work with Wisconsin Focus on Energy and WE Energies on conservation information and rebate programs.
  - Continue to work with business groups to distribute a limited number of rain barrels to raise awareness about water use.
  - Continue to work with regional conservation groups to develop conservation awareness programs.
- Market CEMs to specific customer groups.
  - Implement annual or biannual themes that focus written materials, workshops, and meetings on specific high water use customers or specific water uses. (For example, one theme might be a 1-year focused effort for hospitals followed by years for schools, manufacturers, or parks. General conservation messages and information will be available, but not a priority effort, during that year.)
  - Expand water use audit program to provide self-audits for residential customers using the online calculator recommended previously, and also to provide a limited number of field irrigation audits for the top 10 percent of residential users.
  - Conduct a limited number of industrial audits each year for top users to assist owners and operators in identifying water-saving measures unique to their sites.
  - Conduct a limited number of onsite irrigation audits for CII customers and residential customers with large irrigated acreage.
  - Hold industry- or customer-specific workshops or training sessions for specific programs (for example, work with a restaurant association to develop focused outreach to restaurants for commercial kitchen CEMs).
  - Conduct individual meetings with top CII users to assist with savings measures.
- Work with local media, professional associations, and non-profit groups to publish articles on the benefits of water conservation and specific programs.

7.4 Rebates and Other Incentives

Incentives to encourage conservation include financial incentives such as rebates and other approaches. Financial incentives can include rebates, equipment or fixture distributions, or direct installation or repairs. While similar in nature, financial incentive program design will differ between the programs to meet the needs of residential and CII customers.

7.4.1 Residential Incentives

The following are incentives for residential customers:

- Increase the number of HETs installed by residential customers because they provide significant savings with a high degree of certainty.
  - Increase the expenditure per toilet from $25 per toilet to $100.
  - Develop a distribution program to efficiently use staff resources in a single annual event rather than administering rebates throughout the year.
  - Develop an installation program for qualifying low-income customers and public housing.
- Implement a showerhead replacement program.
  - In collaboration with housing managers, develop an installation program for qualifying low-income customers and public housing.
  - Distribute and install showerheads as part of an onsite audit or toilet replacement program.
  - Consider a rebate program to encourage replacement for those users who would not be likely to install showerheads available for distribution.
- Establish a high-efficiency clothes washer rebate program.
- Develop a leak and minor plumbing repair program for qualifying low-income customers and public housing.
- Distribute rain gauges or sensors to high water users with large lots or high peak seasonal use.
- Establish an irrigation technology or sprinkler head replacement rebate.
- Develop a recognition program for customers who meet conservation goals.

7.4.2 Commercial, Industrial, and Institutional (Public) Incentives

CII customers typically have unique water using characteristics even within the same industry. Therefore, evaluating potential measures and developing implementation approaches takes time. This planning effort was constrained by budget and time and did not include detailed industry- and customer-specific analyses.

Recommendations for the customer categories identify measures that are anticipated to be effective; however, some additional research may be required during the implementation period. Key recommendations include the following activities:

- Expand the HET model replacement program to include light commercial applications and other CII facilities where their use is recommended. This program can be done through rebates, distribution, or direct installation approaches.
- Provide rebates for water-efficient showerheads for facilities with showers, such as schools with locker rooms or dormitories, hospitals, and hotels.
- Implement the other incentives listed in Section 5.3.3.2 over time with priority given to those measures needing little or no further research, apply to high water use customers and are the most cost-effective.
- Develop a recognition or conservation certification programs for customers who meet conservation goals or standards, such as manufacturers, institutions, and homeowners that have achieved significant water savings through conservation.
- Form customer working group(s) or councils to share ideas for saving water and to provide feedback to WWU staff on new CEMs or ways to more effectively administer programs.

7.4.3 Partnerships

Regional partnerships can be an effective way to share costs and effectively use limited resources. Some potential recommendations regarding partnerships include the following:

- Where applicable, develop inter-local agreements with other utilities in the region for joint installation programs or purchasing of fixtures and appliances such as HET models for distribution.
- Coordinate public messaging, link Web resources, and build a shared program identity or brand that represents the region and its partners.

7.4.4 Data Collection and Evaluation

One of the most difficult challenges for a conservation program is evaluating the effectives of various measures and programs over time. Early in the implementation process, WWU should develop a database to track expenditures, water use by customers to conduct before-and-after studies for program participants, water savings attributed to specific measures, and other similar information. Recommendations regarding data collection include the following:

- Long-term customer water use efficiency tracking:
  - Benchmark common end users, such as schools and hospitals, to develop metrics such as gallons per day per student, per square foot, or per bed.
  - Continue adding NAICS codes to customer accounts. This step will help WWU over the long term to be able to quickly identify water demand trends and conservation program priorities among customer groups.
  - Link customer accounts with the rebate application and receipt processing data to facilitate future before–and-after evaluations and other program evaluations.

7.5 Policies, Regulation, and Governance

A number of policies were explored during the planning process and evaluated by the stakeholder group. The policies will require time to develop and vet with customers, decision makers, and other stakeholders before they are proposed for final adoption as municipal ordinances or water service rules.

7.5.1 New Construction

Generally, implementing water-saving elements in new buildings and construction is more cost-effective than retrofitting existing structures and landscapes.

Develop water-saving standards for new construction. This ordinance would establish requirements for new construction to require certain water efficiency standards for indoor and outdoor water use.

7.5.2 Waste Prevention and Leak Repair

Require leak inspection and repair upon resale or lease. This utility service rule or ordinance would require that a property be inspected for existing and potential indoor and outdoor leaks prior to signing of property resale or lease agreements. This policy could be implemented in one of several ways, such as at the point a property owner seeks a certificate of occupancy or when a new customer initiates water service. Generally, the policy would provide that indoor leak inspections and repair be conducted.

Develop a water waste prevention ordinance. Water waste prevention ordinances establish general rules for water use that prevent non-beneficial use of water. Because many such practices increase water runoff, they can also benefit stormwater quality efforts. Elements of such a policy could include the following: prohibiting offsite runoff from hose washing of driveways, sidewalks, and patios; prohibiting car washing in paved areas (such as, parking lots and driveways); increased cycles of concentration for new cooling towers; prohibiting single-pass water-cooled ice machines; and requiring positive shutoff valves for handheld dishwashing wands.

Require annual irrigation inspections for customers with large irrigated areas. This utility service rule or ordinance would establish requirements for irrigation system inspections for large properties, such as properties irrigating 5 acres or more, athletic fields, and golf courses. Generally, the policy would require annual inspections and completion of a simple form documenting that an inspection was conducted and any necessary water waste repairs and adjustments were made.

7.5.3 Billing and Pricing

Evaluate costs and benefits of monthly billing. More frequent billing increases customer awareness of water use and can help identify customer water leaks more quickly. The financial signal from seasonal or inverted block rates (that is, higher cost per gallon of water used as volume increases) is stronger with more frequent billing and may offset some of the additional costs required for a monthly billing system.

Ensure full-cost recovery. Water pricing plays a role in a comprehensive conservation program. Conducting cost-of-service studies enables a utility to allocate those capital and variable costs to the highest water users that contribute to those costs. This policy can be accomplished through rate structures, meter fees, surcharges, and other methods. Full-cost recovery is also a way to maintain the utility's financial stability over time as water consumption is reduced as a result of conservation programs.

7.5.4 Enforcement

Investigate whether amending WWU water service rules, rather than establishing ordinances, would be allowed as a means to enhance enforcement of water use regulations and policies. Used by some utilities, such as the Southern Nevada Water Authority, this approach would allow WWU to exact a fee directly on a customer's water bill for violating water use restrictions instead of managing a burdensome and costly court or hearing process.

7.5.5 Other Policies for Consideration in the Long Term

Some policies that have been implemented by other utilities across the country may be appropriate for WWU as its conservation program develops over the longer-term. Policies for longer-term implementation include the following:

- Requiring fixture and appliance replacement upon resale, lease, or change of occupancy
- Year-round lawn and landscape sprinkling schedule with additional restrictions, such as a maximum of 1 day per week or reduced hours
- Requiring efficiency measures for decorative water features, fountains, and swimming pools

7.6 Other Recommendations

In addition to those activities that directly save water or provide public education and information, other activities, described in this subsection, are recommended for inclusion in the implementation plan.

7.6.1 Annual Reporting

WWU prepares annual reports to the PSC as required and will continue to do so. An additional recommendation related to annual reporting is that WWU should consider reconvening the Conservation Stakeholder Committee annually to present information on the implementation status, seek customer feedback, and solicit help with implementation challenges.

7.6.2 Monitoring Plan

To monitor the actual costs and water savings that result from implementing CEMs, the City should continue to gather and review water use and financial data. To determine the overall effectiveness of CEMs, the City solicits feedback from customers. Monitoring the results of water conservation efforts is a part of routine City operations. Annually, the City reports a detailed analysis of the water conservation program to the PSC.

To facilitate collection and reporting of the extensive data, WWU should consider developing Web-based rebate application and tracking processes and leverage database tools to collect information and generate reports required by the PSC and for its own management purposes. Potentially, WWU could partner with one of the local colleges to develop the database tools as a course project.

7.6.3 Updating Conservation Plan

The implementation plan presented in Section 8 is a road map for implementing water conservation programs and measures to achieve the City's conservation goals. Considerably more detail is provided for activities in the first 5 years of the program than in later years. To keep pace with changing conditions, enhanced technologies, and customer water use patterns, actual implementation should be flexible. CEMs, programs, policies, and education/marketing efforts should be adjusted based on actual results. Furthermore, several of the more complicated recommendations require detailed research that may result in actual implementation being substantially different from that discussed in this plan.

A more formal update to the plan should be conducted every 5 years.

8.0 Recommended Plan

This section presents the recommended Water Conservation Plan for a 5-year planning period, 2012 to 2016. Projected water savings, benefits, costs, recommended program budget, and describes the implementation schedule based on the recommended CEMs (Section 7). The recommended Plan is the summation of the results of research, input from stakeholders and customers, and detailed analysis by WWU staff and the consultant team.

8.1 Projected Water Savings

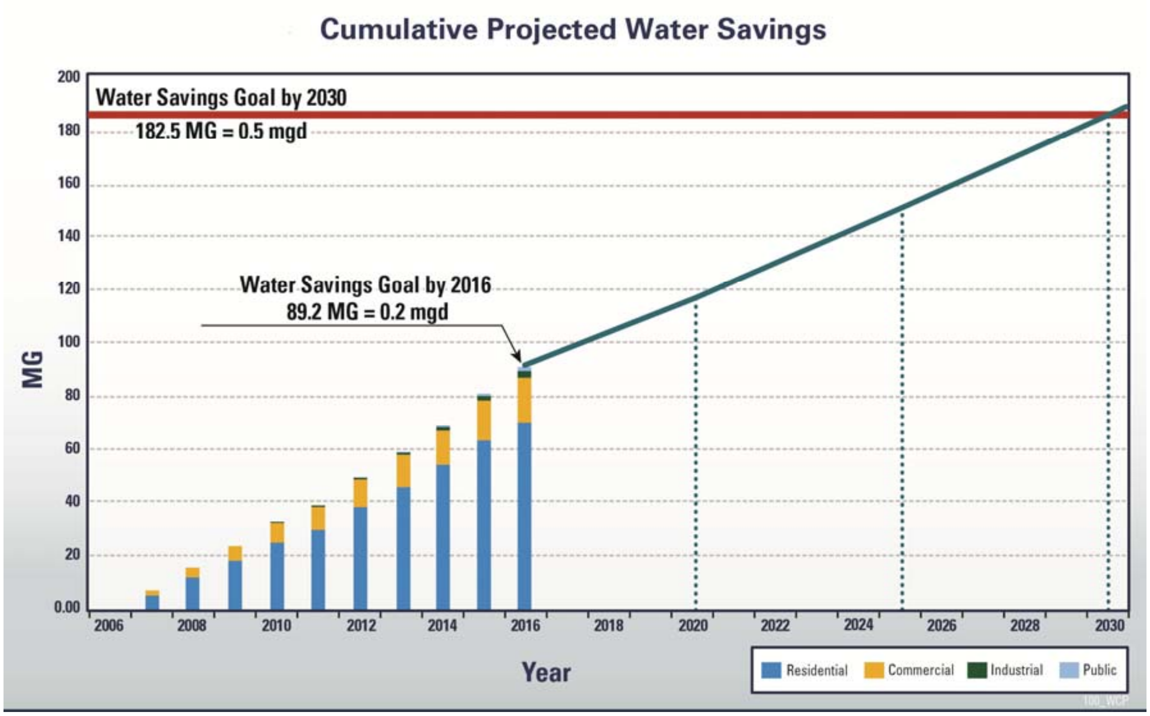
The City's water conservation goal is to reduce annual average demand by 0.5 mgd by year 2030. This flow rate is equivalent to a cumulative volume of about 182.5 million gallons (MG) water saved through year 2030. The AWE Tool was used to estimate the projected water savings from conservation program measures and from passive savings that are the result of plumbing code changes that require water efficient fixtures. The estimated water savings since 2006 and the projected water savings from the recommended CEMs through 2016 are summarized in Figure 8-1. The result is over 86 MG saved through year 2016, which indicates the City will be in a strong position to achieve its water savings goal of 182.5 MG by 2030.

This approach reflects a gradual but significant expansion of the conservation program. As noted in Section 7, it is important to maintain credibility through well-planned and administered conservation measures. Successful conservation programs across the country have suffered set-backs resulting from launching measures that were difficult for customers to use and difficult to administrator. Therefore, it is recommended the program now focus on expanding conservation measures with the highest potential for cost-effective water savings and on learning more about the City's top 1 and top 10 percent water users to target future conservation measures. The actions will ensure a strong return on the City's investment while maintaining customer satisfaction and utility service standards.

TABLE 8-1
Total Projected Cumulative Water Savings (million gallons per year)

Customer Class	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Residential	6.1	12.0	17.7	23.0	28.1	35.4	43.2	51.0	59.1	67.0
Commercial	1.7	3.4	5.0	6.5	7.9	9.3	11.0	12.5	14.1	16.0
Industrial	0.1	0.2	0.2	0.3	0.4	0.5	0.8	1.2	1.6	2.2
Public	-	-	-	-	-	-	0.3	0.6	0.9	1.5
Total	7.9	15.5	22.9	29.8	36.4	45.2	55.3	65.4	75.8	86.8

FIGURE 8-1
Projected Water Savings



8.2 Other Projected Benefits

Water conservation provides other benefits to the City and its customers, including the following:

- Reduced wastewater pumping and treatment costs
- Reduced water pumping and treatment costs
- Reduced volume of water needed to meet projected future water demands
- Fewer greenhouse gas emissions from water and wastewater treatment and pumping

Some estimated projected savings resulting from the implementation of water-saving CEMs are summarized in Table 8-2.

TABLE 8-2
Estimated Savings from Utility-Avoided Costs

Avoided Cost Type	2012	2013	2014	2015	2016
Water Supply	$400	$1,100	$2,100	$3,400	$5,300
Wastewater	$300	$900	$1,600	$2,600	$4,100

8.3 Benefit-Cost Analysis

As noted in Section 6.4, CEMs were evaluated using the AWE Tool to estimate B:C ratio. Those selected for implementation are summarized in Table 8-3.

TABLE 8-3
Summary of B:C Ratio and Projected Water Savings

Activity	Utility B:C Ratio	Customer B:C Ratio	Projected Water Savings (gallons) Years 2012-2016
Residential HETs, $100 rebate	3.7	271	7,325,700
Multi-family residential HET direct install, $100 rebate	5.6	38.9	113,000
Commercial tank-type HET, $100 rebate	3.5	24.1	34,500
Commercial valve-type HET	3.5	23.9	57,500
Industrial tank-type HET, $100 rebate	3.5	23.9	80,400
Industrial valve-type HET, $100 rebate	3.5	23.9	80,400
Public tank-type HET, $100 rebate	3.5	23.9	80,400
Public valve-type HET, $100 rebate	3.5	23.9	80,400
Residential water-efficient showerhead	378	3.1	866,200
Multi-family residential water-efficient showerhead	6.9	6.8	11,400
Commercial water-efficient showerhead	6.9	7.4	4,100
Industrial water-efficient showerhead	5.4	7.3	16,500
Public water-efficient showerhead	4.9	6.7	15,200
Residential indoor water use surveys	-0.1	N/A	73,000
Multi-family residential indoor water user surveys	0	N/A	4,000
Commercial indoor water use surveys	0	N/A	17,000
Industrial indoor water use surveys	0	N/A	21,700
Public indoor water use surveys	0	N/A	21,700
Commercial outdoor water use surveys	0	N/A	-55,800
Public outdoor water use surveys	0	3.0	-55,800
Commercial urinals, $100 rebate	1.2	3.0	93,100
Industrial urinals, $100 rebate	1.2	3.0	93,100
Public urinals, $100 rebate	1.2	3.0	93,100
Commercial spray-rinse valves rebates	6.4	478	1,414,300
Industrial spray-rinse valves rebates	6.0	444	1,414,300
Public spray-rinse valves rebates	6.0	444	1,414,300
Public high-efficiency clothes washer rebate	-0.3	N/A	7,000

8.4 Projected Program Costs

The projected costs of water saving CEMs are summarized in Table 8-4. Activity details and allocation of program costs across all customer sectors are included in Appendix G. Cost estimates include rebates, customer water use audits, public education and outreach, and administrative costs for program management, performance auditing, customer service and annual reporting. It was assumed that WWU staff would administer the program. The cost estimates rely, in part, on data provided in the AWE Tool with adjustments for local conditions and considerations. The cost estimates prepared with the AWE Tool assume a nominal interest rate of 4.18 percent and an inflation rate of 3.7 percent.

TABLE 8-4
Estimated Costs—Water Conservation Program

Activity Name	2012	2013	2014	2015	2016
Toilet rebates	$5,500	$20,800	$24,900	$33,100	$35,900
Showerhead rebates/installations		$500	$0	$3000	$0
Indoor water use audits	$0	$13,100	$14,400	$14,400	$16,000
Outdoor water use audits	$0	$0	$600	$400	$400
Urinal rebates	$0	$0	$0	$2,900	$3,900
Spray-rinse valve rebates	$0	$2,200	$1,300	$1,300	$2,500
Leak detection mains and hydrants	$7,000	$10,000	$10,000	$10,000	$10,000
Pilot project or tailored incentives	$0	$0	$5,000	$5,000	$5,000
Subtotal	$12,500	$46,600	$51,200	$62,400	$68,700
Public education and outreach	$10,500	$10,500	$10,500	$10,500	$10,500
Program management, auditing, reporting, customer service, sprinkler ordinance	$34,800	$38,000	$45,000	$45,000	$45,000
Estimated Program Cost Total	$57,800	$95,100	$106,700	$117,900	$124,200

8.5 Recommended Implementation Schedule

The recommended annual program implementation schedule for each CEM over the 5-year planning period is designed to realize Waukesha's water-saving goals and is presented in Table 8-5. The implementation strategy is designed to build a strong foundation and support for the programs in Year 1 (2012) through public education and incentives for residential water users. Voluntary conservation would be expected to lead to the greatest savings, particularly for existing homes. Starting in Year 2 (2013), the program focus would expand to include incentives for CII customers. As the program expands over the subsequent 3 years (2014 to 2016), additional measures would be emphasized within various customer "markets" to effect the greatest savings and the lowest costs. For example, after voluntary incentive and public information/education measures are initiated, program efforts may expand to include new water conservation rules that may be required to meet Waukesha's water savings goals. Other program elements may ramp-up more slowly due to limitations of both staff and funding resources.

To assist with Waukesha's budget planning and to provide a guide for implementing the recommended CEMs, Table 8-1 in Section 8.3 also reflects the recommended annual conservation program budget over the next 5 years. Actual implementation should be flexible and thus may change as the program continues to evolve.

Administrative needs over the 5-year implementation phase for the Plan includes additional customer service representative training and reporting activities to effectively communicate and manage the conservation incentive programs. The tasks and related budget requirements are shown in the proposed budget described earlier in this section. The administrative requirements include contracts for purchasing or installation of conservation fixtures, an efficient rebate tracking and accounting method that would apply credits to customer accounts, and similar activities. Data management efforts are anticipated to increase over time as the conservation program is expanded.

The preliminary mid-term (6 to 10 years) and long-term (10 to 30 years) implementation schedules for the City's water conservation program, designed to meet its long-term 30-year goals, are outlined in tables provided in Appendix F. The schedules and their respective program components will likely be revised when this 5-year Plan is next updated in 2017. Prior to the next Plan, the City will know whether its long-term water supply will be Great Lakes water. Great Lakes water has lower hardness (about 7 grains) compared to current groundwater supplies (typically 28 grains). An estimated water savings of 29 MG per year may be realized when customers reduce or discontinue using water softeners. If the City's long-term water supply is Great Lakes water, it will implement a public education campaign to explain the potential water savings and operational and maintenance cost savings provided by reduced or discontinued water softener use.

TABLE 8-5
Near-Term Implementation Plan (1 to 5 Years)

Program Element	2012	2013	2014	2015	2016
Municipal Infrastructure	Continue leak audits, meter calibration and replacement, pressure management, and other distribution system measures. Purchase leak correlator for distribution surveys and train staff.	Continue leak audits, meter calibration and replacement pressure management, and other distribution system measures. Begin discussions with wastewater utility on water savings opportunities. Conduct leak detection surveys of mains and hydrants.	Continue leak audits, meter calibration and replacement, pressure management, and other distribution system measures. Identify top 1 to 5 parks with high outdoor water use and estimate retrofit costs. Work with the City and county to identify potential public facility retrofit opportunities. Conduct leak detection surveys of mains and hydrants.	Continue leak audits, meter calibration and replacement, pressure management, and other distribution system measures. Begin planning unidirectional flushing program. Work with parks department, the City, and the county to identify irrigation retrofit funding opportunities. Conduct leak detection surveys of mains and hydrants.	Continue leak audits, meter calibration and replacement pressure management, and other distribution system measures. Finalize unidirectional flushing program plan. Begin discussions with City staff regarding low-impact development opportunities. Conduct a public facility retrofit/ demonstration project. Conduct leak detection surveys of mains and hydrants.
Public and School Education and Information	Continue school programs and tours. Begin planning Teach the Teacher workshops. Begin collaboration with the county and other groups for speakers series on water conservation. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects.	Continue school programs and tours. Continue collaboration with other stakeholder groups. Hold Teach the Teacher workshop(s). Enhance the WWU Web site to expand online resource library and rebate application/tracking. Continue partnerships to spread conservation message. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects. Train WWU and City staff to present water conservation presentations for neighborhoods and other community groups. Plan 2013 speakers bureau to target key groups.	Continue school programs and tours. Continue collaboration with other stakeholder groups. Hold Teach the Teacher workshop(s) and reduce staff time spent in schools and on tours. Hold workshop with green industry partners, such as irrigators, landscapers, and nurseries, on water-efficient practices. Continue partnerships to spread conservation message. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects. Conduct media training workshop on water conservation measures and programs. Plan and solicit sponsors for annual conservation awards breakfast.	Continue school programs and tours. Continue collaboration with other stakeholder groups. Hold Teach the Teacher workshop(s) and reduce staff time spent in schools and on tours. Hold irrigator training workshop. Hold workshop/participate in association meeting(s) for CII customer group(s). Continue partnerships to spread conservation message. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects. Host annual conservation awards breakfast.	Continue school programs and tours. Continue collaboration with other stakeholder groups. Hold Teach the Teacher workshop(s) and reduce staff time spent in schools and on tours. Hold irrigator training workshop. Hold workshop/participate in association meeting(s) for CII customer group(s). Continue partnerships to spread conservation message. Participate in Wisconsin Conservation Coalition and business alliance on events. Work with local college(s) on additional water resources/conservation programs and course projects. Host annual conservation awards breakfast.
Rebates and Incentives: Residential	Provide $100 HET rebate and publicize program. Plan and initiate showerhead rebate/distribution program. Revamp applications and information packets. Develop plan for onsite residential audits for public housing and large irrigation users.	Continue HET rebate, showerhead rebate/distribution, and water use audits. Develop online water use calculator and self-audit tool. Publicize sprinkler rebate program and plan strategic communication plan focused on landscaping, such as WWU newsletter articles, Web site information, presentations, and press releases. Conduct onsite irrigation audits for large users.	Continue HET rebate, showerhead rebate/distribution, and water use audits. Continue existing rebate programs.	Continue HET rebate, showerhead rebate/distribution, and water use audits. Hold HET distribution event to distribute a target number of toilets in 1 day.	Continue HET rebate, showerhead rebate/distribution, and water use audits.
Rebates and Incentives: CII	Expand HET rebate program to include commercial and light industrial customers. Meet with colleges and hospitals to begin program design.	Continue HET rebate, commercial audits, and sprinkler program. Initiate showerhead rebate/installation program.	Continue HET rebate, commercial audits, and sprinkler program. Continue showerhead rebate/installation program.	Continue HET rebate, commercial audits, and sprinkler program. Continue showerhead rebate/installation program.	Continue HET rebate, commercial audits, and sprinkler program. Continue showerhead rebate/installation program.

TABLE 8-5
Near-Term Implementation Plan (1 to 5 Years)

Program Element	2012	2013	2014	2015	2016
	Continue to provide information on commercial audits and develop plan for onsite audit program. Continue to work with Waukesha Housing Authority on retrofit program. Develop plan for top 1 percent of CII users.	Initiate spray-rinse valve rebate program. Initiate pilot program with Waukesha Housing Authority for minor plumbing and leak repair (combined with fixture replacement). Initiate first phase of fixture replacement/ retrofit program with college. Plan 2014 CII focus (for example, focus on restaurants, schools, or medical facilities).	Continue spray-rinse valve rebate program. Continue/expand Housing Authority program. Plan expansion of minor plumbing repair program to other low income and senior customers.	Continue spray-rinse valve rebate program. Expand minor plumbing and leak repair program. Initiate urinal rebate program.	Continue spray-rinse valve rebate program. Continue urinal rebate program.
Policies, Regulations, and Enforcement	Continue to administer and publicize sprinkling ordinance (continue 2013–2016).	Begin research on various conservation policies to estimate potential savings and costs. Further explore water conservation requirements in WWU service rules.	Begin stakeholder discussions regarding selected policies.	Draft language for selected policies.	Begin process for approval of selected policies.
Reporting, Monitoring, and Plan Updates	Streamlined databases to facilitate auditing and reporting. CEM effectiveness audit/monitoring. Prepare and submit annual report to PSC. Host meeting to present annual results to Stakeholder Committee.	Continue database management, annual effectiveness auditing, annual reporting, and stakeholder engagement.	Continue database management, annual effectiveness auditing, annual reporting, and stakeholder engagement.	Continue database management, annual effectiveness auditing, annual reporting, and stakeholder engagement.	Continue database management, annual effectiveness auditing, annual reporting, and stakeholder engagement. Complete conservation plan update.
Estimated Cumulative Water Savings	45.2 MG	55.3 MG	65.4 MG	75.8 MG	86.8 MG
Estimated Staff Resources	800 hours	1,200 hours	1,200 hours	1,500 hours	1,500 hours
Total Estimated Budget	$57,800	$95,100	$106,700	$117,900	$124,200

9.0 References

AWWA. 2009. *Water Audits and Loss Control Programs.* Manual 36.

AWWA. 2010. *Water Conservation Programs—A Planning Manual.* Manual 52.

Beecher, Janice A. 2010. "The Conservation Conundrum: How Declining Demand Affects Water Utilities."*Journal AWWA.* February.

Camp, Dresser & McKee, Inc. and Water Accountability, LLC. 2011. *Water Efficiency Potential Study for Wisconsin.*

CH2M HILL. 2011. *Water Conservation Plan Supplement.* April.

City of Waukesha, Wisconsin. 2010. *Draft Application for Lake Michigan Water Supply.* May.

Earth Tech. 2006. *Water System Master Plan, Waukesha Water Utility.*

Hoffman, H. W. 2008. "Capturing the Water You Already Have: Using Alternate Onsite Sources." *Journal AWWA.* May.

Rockaway, T. D., P. A. Coomes, J. Rivard, and B. Kornstein. 2011. "Residential Water Use Trends in North America. *Journal AWWA.* February.

SEWRPC. 2010. *Regional Water Supply Plan for Southeastern Wisconsin,* Technical Report No. 52. December.

Vickers, Amy. 2001. *Handbook of Water Use and Conservation: Homes, Landscapes, Businesses, Industries, Farms* (WaterPlow Press, Amherst, MA).

Waukesha Water Utility. 2005–2010. Water pumpage data.

Waukesha Water Utility. 1999–2010. Annual Report of the City of Waukesha Water Utility to Public Service Commission of Wisconsin.

Waukesha Water Utility. 2009, 2010. Waukesha Water Utility Conservation Report, Docket-6240-WR-106.

U.S. Census Bureau. 2005-2009. American Community Survey.

U.S. Census Bureau. 2005-2009. Wisconsin Quick Facts, Persons per household.

U.S. Census Bureau. 2010. City of Waukesha population.

U.S. Geological Survey. 2005. Estimated Use of Water in the United States in 2005. http://ga.water.usgs.gov/edu/wateruse/pdf/wudomestic-2005.pdf.

Appendix A
Summary of Water Requirements

AECOM

200 Indiana Avenue
Stevens Point, WI
54481

T 715.341.8110
F 715.341.7390
www.aecom.com

Final Draft Technical Memorandum

May 28, 2009

To: Nancy Quirk, Waukesha Water Utility

Copy: Richard Hope, AECOM

From: Kathy Beduhn, AECOM

Subject: **Summary of Water Requirements**
Waukesha, Wisconsin

As part of the 2006 Water System Master Plan project, historical water customer demands and pumpage records were reviewed and future water requirements were projected. This technical memorandum summarizes updated water pumpage projections considering 2006, 2007, and 2008 water pumpage and sales information and updated population projections for the City of Waukesha.

POPULATION PROJECTIONS

The Wisconsin Department of Administration estimated the 2008 population of the City of Waukesha to be 68,030.

The following table summarizes the population projections developed by the Southeastern Wisconsin Regional Planning Commission for the Waukesha water supply service area that were used to update water pumpage projections.

SUMMARY OF POPULATION PROJECTIONS

Year	Population
2028	85,800
2035	88,500
Ultimate	97,400

Source: Letter from Southeastern Wisconsin Regional Planning Commission dated March 17, 2009 (included in Attachment A).

WATER CONSUMPTION

The following sections summarize historical water consumption including water metered and sold to customers, total water pumpage, per capita water usage, and system maximum day demand.

Metered Water Sales and Water Pumpage

A summary of historical water sales and pumpage is provided in Table 1. Water sales and total pumpage have decreased slightly in the past 5 years. Over the 39-year period of data summarized in the table, water sales varied from a low of 2,366 million gallons per year (MGY) in 2008 to a high of 3,462 MGY in 1988. Total pumpage over the 39-year period has varied from a low of 2,366 MGY in 2008 to 3,607 MGY in 1988.

Per Capita Water Usage

City of Waukesha residential, commercial, and public water usage can be related to the City's population. An analysis of per capital water consumption for each of these customer classifications was performed from sales records and is summarized in Table 2. As indicated in this table, overall per capita sales to residential, commercial, and public customers have all remained fairly constant or declined slightly since the early 1990s. Figure 1 illustrates the City of Waukesha per capital consumption trends since 1970.

To project future water needs, the average daily water usage projection for customers was updated to reflect recent trends in water consumption. The per capital water consumption rate is summarized in the following table.

PER CAPITA WATER CONSUMPTION RATE

Per Capita Sales	Residential	Commercial	Public
Average 1970 to 2008	53 gpcd	32 gpcd	8 gpcd
Maximum 1970 to 2008	72 gpcd	39 gpcd	13 gpcd
Minimum 1970 to 2008	43 gpcd	19 gpcd	4 gpcd
Average 2000 to 2008	46 gpcd	36 gpcd	5 gpcd
Average 2005 to 2008	45 gpcd	34 gpcd	4 gpcd
Used for Projection	45 gpcd	35 gpcd	5 gpcd
Note: gpcd = gallons per capita per day			

System Maximum Day Pumpage

Table 3 summarizes the average and maximum day pumpage for each year from 1970 to 2008. A statistical analysis was performed of historical maximum day pumpage ratios. Two periods of analysis were examined, the entire period of 1970 to 2008, and the latest 11-year period from 1998 to 2008. Table 4 summarizes the results of this analysis.

Table 4 also includes an analysis of expected maximum day pumpage ratios for various confidence levels. To evaluation future water supply needs, a maximum day pumpage ratio of 168 percent was used which provides a confidence level of 98 percent based on maximum day pumpage ratios over the last 39 years and an approximately 96 percent confidence level over the last 11 years

WATER CONSUMPTION AND PUMPAGE PROJECTIONS

Water sales and pumpage projections were based on assumptions of water demand, coupled with estimates of future populations. A detailed summary of the individual components of the projected water sales and pumpage requirements is provided in Table 5. The industrial sales projections are based on planning data provided during the Water System Master Plan project that included an ultimate industrial acreage slightly less than the existing acreage and some large customer surveys indicating a decline in current water usage. In addition, unaccounted-for water (difference between pumpage and sales) was estimated to be 7 percent.

Figure 2 and Figure 3 illustrate the projected average and maximum day water supply requirements, respectively. The supply projections for the ultimate population projection for the City of Waukesha are illustrated as year 2050. The lower band illustrated on Figures 2 and 3 represents the projected water supply requirements based on current knowledge of water usage and population trends; however, there are uncertainties inherent to these projections. Because of the importance of not underestimating the future water supply needs, upper bands for projected water supply requirements were established. The upper bands for water supply projections illustrated in Figure 2 (average day) and Figure 3 (maximum day) are based on the following:

1. Residential per capita demand increased from 45 gpcd to 50 gpcd.
2. Commercial per capita demand increased from 35 gpcd to 39 gpcd.
3. Public per capita demand increased from 5 gpcd to 6 gpcd.
4. Increased population projection for 2028 by 10 percent to 94,380.
5. Increased population projection for 2035 by 10 percent to 97,350.
6. Increased ultimate population projection by 10 percent to 107,140.
7. Population projection was assumed to remain as projected to 2015 and then estimated linearly to the 2028 increased population projection.

It is recommended for long-term planning purpose that the upper band for average and maximum day water supply be used. It is also recommended that water supply be continually updated to ensure a proactive response to changes in population growth, development, and water demand patterns are addressed

SUMMARY

The following table summarizes the upper band of water supply needs for the City of Waukesha which is recommended to be used for planning purposes.

SUMMARY OF WATER SUPPLY NEEDS

Year	Average Day Demand	Maximum Day Demand
2015	8.8 MGD	14.8 MGD
2028	10.7 MGD	18.0 MGD
2035	11.0 MGD	18.5 MGD
Ultimate (2050)	12.0 MGD	20.2 MGD
Note: MGD= million gallons per day		

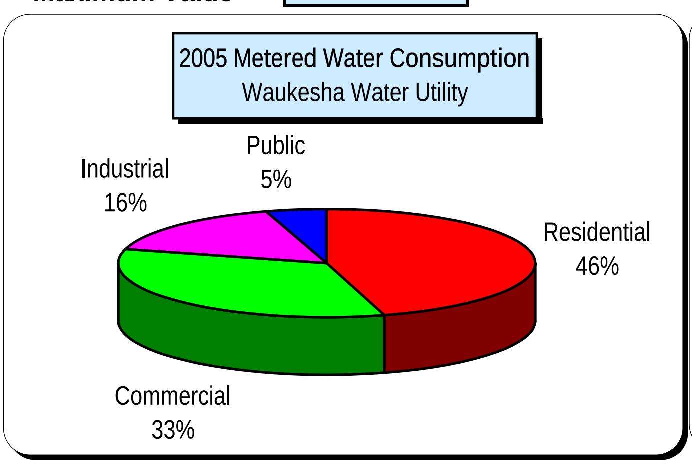
I:\work\projects\105762\wp\n1\finaldraft090528_wau_demand_tm.doc

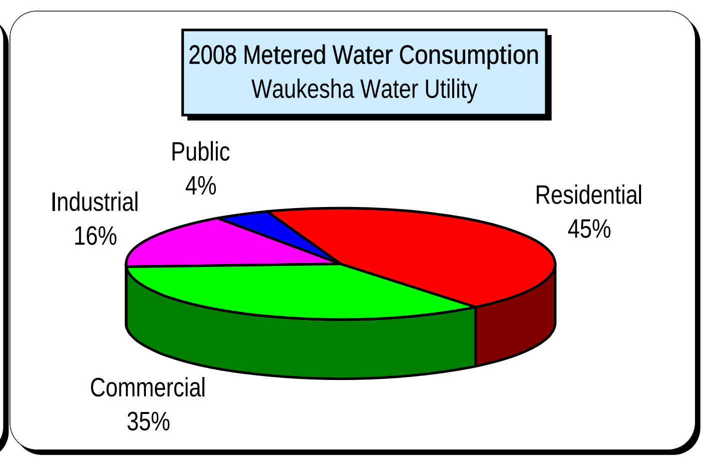
TABLES

TABLE 1
WATER SALES AND PUMPAGE HISTORY
WAUKESHA, WISCONSIN

Year	Annual Water Sales (MGY)					Total Sales (MGY)	Total Pumpage (MGY)	Percent Pumpage Metered
	Residential	Commercial	Industrial	Public	Other			
1970	822.892	276.190	1,535.995	169.083	11.906	2,816.1	3,006.8	93.7%
1971	890.447	280.171	1,447.088	167.631	19.188	2,804.5	3,012.4	93.1%
1972	881.497	287.192	1,565.355	172.490	31.935	2,938.5	3,072.7	95.6%
1973	975.877	323.378	1,465.842	192.700	15.252	2,973.0	3,128.1	95.0%
1974	1,025.621	328.510	1,537.468	**206.624**	13.291	3,111.5	3,242.7	96.0%
1975	1,052.895	330.920	1,594.955	187.992	21.310	3,188.1	3,336.3	95.6%
1976	1,216.208	312.331	1,539.435	192.299	**43.691**	3,304.0	3,337.7	99.0%
1977	**1,221.868**	318.338	1,528.131	186.411	25.995	3,280.7	3,297.2	99.5%
1978	1,210.372	331.961	1,575.439	192.370	25.298	3,335.4	3,376.2	98.8%
1979	1,010.523	611.688	**1,610.236**	182.680	35.070	3,450.2	3,526.8	97.8%
1980	1,006.519	610.472	1,514.522	178.821	21.278	3,331.6	3,372.4	98.8%
1981	988.866	605.862	1,381.485	181.293	28.538	3,186.0	3,137.9	**101.5%**
1982	955.905	582.575	1,167.949	173.322	31.914	2,911.7	2,983.5	97.6%
1983	1,013.178	624.780	1,125.678	190.081	21.608	2,975.3	3,025.1	98.4%
1984	992.981	624.760	1,265.934	167.928	9.780	3,061.4	3,222.1	95.0%
1985	1,046.448	636.325	1,329.419	182.512	17.915	3,212.6	3,317.3	96.8%
1986	979.119	646.851	1,266.090	171.550	16.013	3,079.6	3,172.0	97.1%
1987	1,016.124	665.474	1,283.305	186.079	17.982	3,169.0	3,348.3	94.6%
1988	1,184.474	724.986	1,346.657	189.440	16.381	**3,461.9**	**3,606.7**	96.0%
1989	1,085.159	745.900	1,166.538	169.859	16.908	3,184.4	3,239.0	98.3%
1990	1,034.574	724.123	1,030.874	160.143	1.042	2,950.8	3,076.6	95.9%
1991	1,104.334	756.742	965.288	178.332	35.004	3,039.7	3,054.8	99.5%
1992	1,060.875	794.856	745.217	101.682	0.000	2,702.6	2,873.2	94.1%
1993	1,016.286	815.077	810.622	94.230	0.000	2,736.2	2,882.5	94.9%
1994	1,076.528	846.078	769.630	104.456	0.000	2,796.7	2,974.1	94.0%
1995	1,077.515	856.522	765.975	119.209	0.000	2,819.2	3,011.5	93.6%
1996	1,087.119	860.396	763.133	120.014	0.000	2,830.7	2,892.3	97.9%
1997	1,089.493	821.105	783.390	117.377	0.000	2,811.4	2,945.3	95.5%
1998	1,109.478	837.823	796.217	116.833	0.000	2,860.4	2,974.5	96.2%
1999	1,112.499	847.914	722.097	177.408	0.000	2,859.9	3,028.4	94.4%
2000	1,067.184	848.664	660.364	108.873	0.000	2,685.1	2,816.7	95.3%
2001	1,128.475	874.030	586.552	114.492	0.000	2,703.5	2,822.0	95.8%
2002	1,185.745	**914.138**	612.856	119.173	0.000	2,831.9	2,953.2	95.9%
2003	1,176.115	895.850	461.885	120.071	0.000	2,653.9	2,795.9	94.9%
2004	1,117.325	854.624	435.004	121.601	0.000	2,528.6	2,699.0	93.7%
2005	1,193.851	874.418	428.518	120.126	0.000	2,616.9	2,831.5	92.4%
2006	1,077.127	858.062	424.603	109.846	0.000	2,469.6	2,620.5	94.2%
2007	1,086.542	846.566	404.079	110.532	0.000	2,447.7	2,618.7	93.5%
2008	1,056.650	827.543	382.413	99.646	0.000	2,366.3	2,531.0	93.5%

Maximum Value =



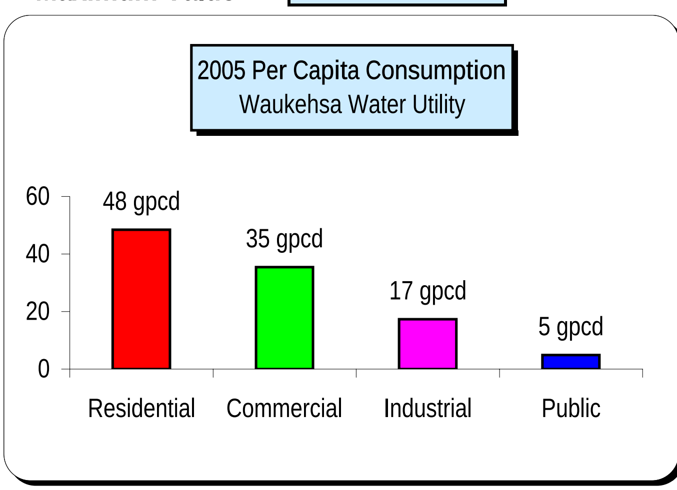


L:\work\Projects\105762\eng\demand analysis\[Chapter3_2008.xls]Table 3-02

TABLE 2
HISTORICAL PER CAPITA CONSUMPTION
WAUKESHA WATER UTILITY
WAUKESHA, WISCONSIN

Year	Estimated Population	Gallons per capita per day Residential	Commercial	Industrial	Public	Total
1970	39,695	56.8	19.1	106.0	11.7	194
1971	40,762	59.8	18.8	97.3	11.3	188
1972	41,829	57.7	18.8	102.5	11.3	192
1973	42,896	62.3	20.7	93.6	12.3	190
1974	43,963	63.9	20.5	95.8	12.9	194
1975	45,030	64.1	20.1	97.0	11.4	194
1976	46,097	72.3	18.6	91.5	11.4	196
1977	47,164	71.0	18.5	88.8	10.8	191
1978	48,231	68.8	18.9	89.5	10.9	189
1979	49,298	56.2	34.0	89.5	10.2	192
1980	50,365	54.8	33.2	82.4	9.7	181
1981	51,024	53.1	32.5	74.2	9.7	171
1982	51,684	50.7	30.9	61.9	9.2	154
1983	52,343	53.0	32.7	58.9	9.9	156
1984	53,002	51.3	32.3	65.4	8.7	158
1985	53,662	53.4	32.5	67.9	9.3	164
1986	54,321	49.4	32.6	63.9	8.7	155
1987	54,980	50.6	33.2	63.9	9.3	158
1988	55,639	58.3	35.7	66.3	9.3	170
1989	56,299	52.8	36.3	56.8	8.3	155
1990	56,958	49.8	34.8	49.6	7.7	142
1991	57,613	52.5	36.0	45.9	8.5	145
1992	58,268	49.9	37.4	35.0	4.8	127
1993	58,923	47.3	37.9	37.7	4.4	127
1994	59,578	49.5	38.9	35.4	4.8	129
1995	60,232	49.0	39.0	34.8	5.4	128
1996	60,887	48.9	38.7	34.3	5.4	127
1997	61,542	48.5	36.6	34.9	5.2	125
1998	62,197	48.9	36.9	35.1	5.1	126
1999	63,027	48.4	36.9	31.4	7.7	124
2000	64,825	45.1	35.9	27.9	4.6	113
2001	65,324	47.3	36.7	24.6	4.8	113
2002	66,237	49.0	37.8	25.3	4.9	117
2003	66,807	48.2	36.7	18.9	4.9	109
2004	66,816	45.8	35.0	17.8	5.0	104
2005	67,580	48.4	35.4	17.4	4.9	106
2006	67,750	43.6	34.7	17.2	4.4	100
2007	67,880	43.9	34.2	16.3	4.5	99
2008	68,030	42.6	33.4	15.4	4.0	96

Maximum Value =



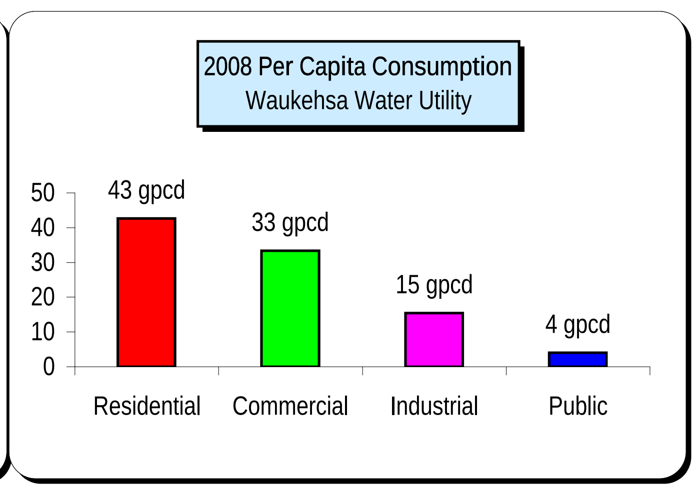
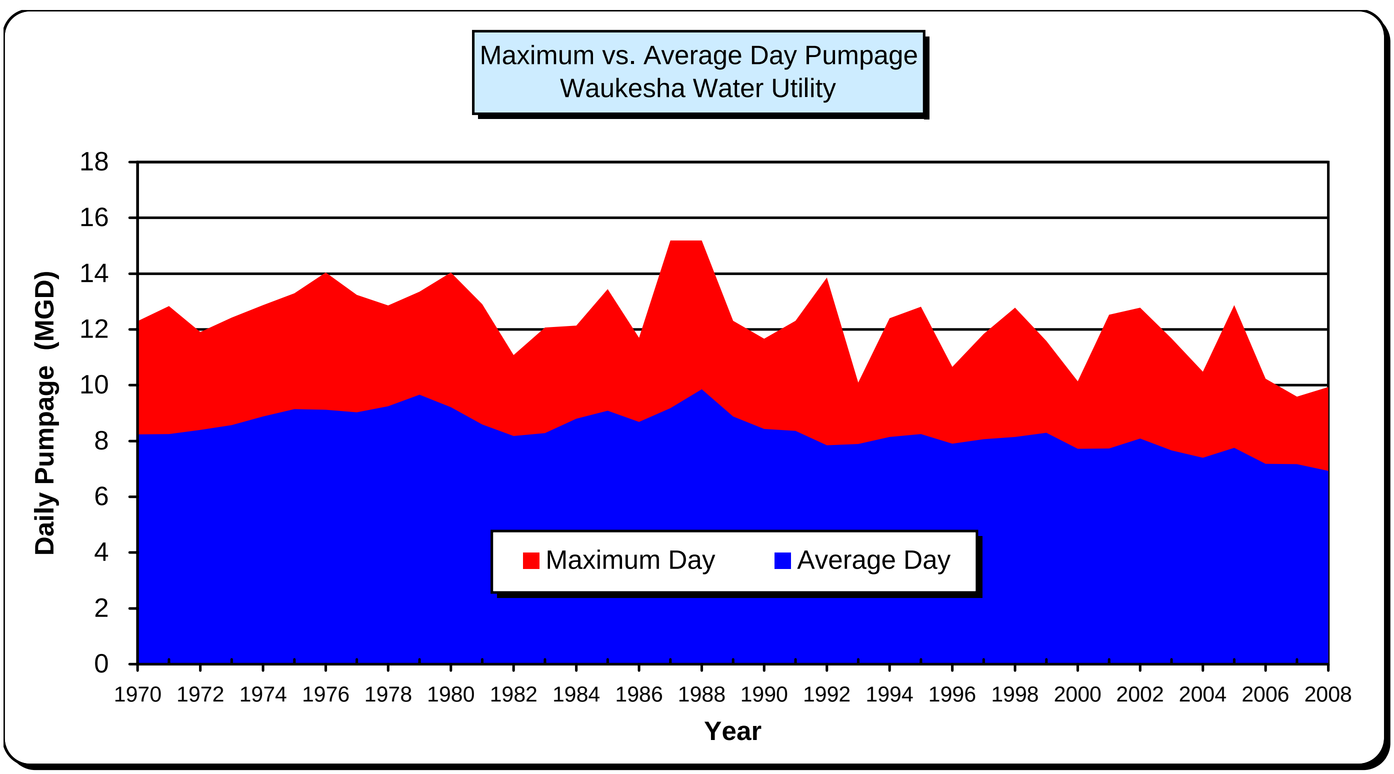


TABLE 3
DAILY PUMPAGE VARIATIONS
WAUKESHA WATER UTILITY
WAUKESHA, WISCONSIN

Year	Avg. Day Pumpage (MGD)	Max. Day Pumpage (MGD)	Date of Maximum Day	Ratio of Max. to Avg. Day	Year	Avg. Day Pumpage (MGD)	Max. Day Pumpage (MGD)	Date of Maximum Day	Ratio of Max. to Avg. Day
1970	8.24	12.30	07/07	1.49	1990	8.43	11.67	07/17	1.38
1971	8.25	12.84	07/07	1.56	1991	8.37	12.31	08/28	1.47
1972	8.40	11.91	05/25	1.42	1992	7.85	13.86	06/11	1.77
1973	8.57	12.42	07/18	1.45	1993	7.90	10.09	08/27	1.28
1974	8.88	12.87	07/19	1.45	1994	8.15	12.40	06/19	1.52
1975	9.14	13.30	07/31	1.45	1995	8.25	12.81	06/22	1.55
1976	9.12	14.04	07/17	1.54	1996	7.90	10.66	08/14	1.35
1977	9.03	13.24	05/13	1.47	1997	8.07	11.84	06/10	1.47
1978	9.25	12.86	08/14	1.39	1998	8.15	12.79	07/14	1.57
1979	9.66	13.35	07/19	1.38	1999	8.30	11.59	07/07	1.40
1980	9.21	14.04	06/25	1.52	2000	7.72	10.15	06/27	1.31
1981	8.60	12.91	07/08	1.50	2001	7.73	12.53	07/09	1.62
1982	8.17	11.08	06/07	1.36	2002	8.09	12.78	07/17	1.58
1983	8.29	12.07	06/22	1.46	2003	7.66	11.67	08/22	1.52
1984	8.80	12.13	08/06	1.38	2004	7.39	10.48	09/13	1.42
1985	9.09	13.45	07/17	1.48	2005	7.76	12.87	06/23	1.66
1986	8.69	11.71	07/18	1.35	2006	7.18	10.23	07/18	1.42
1987	9.17	15.19	06/18	1.66	2007	7.17	9.59	06/14	1.34
1988	9.85	15.20	06/29	1.54	2008	6.93	9.93	08/19	1.43
1989	8.87	12.31	06/23	1.39					



L:\work\Projects\105762\eng\demand analysis\[Chapter3_2008.xls]Table 3-11

TABLE 4

STATISTICAL ANALYSIS:
RATIO OF MAXIMUM TO AVERAGE DAY DEMAND

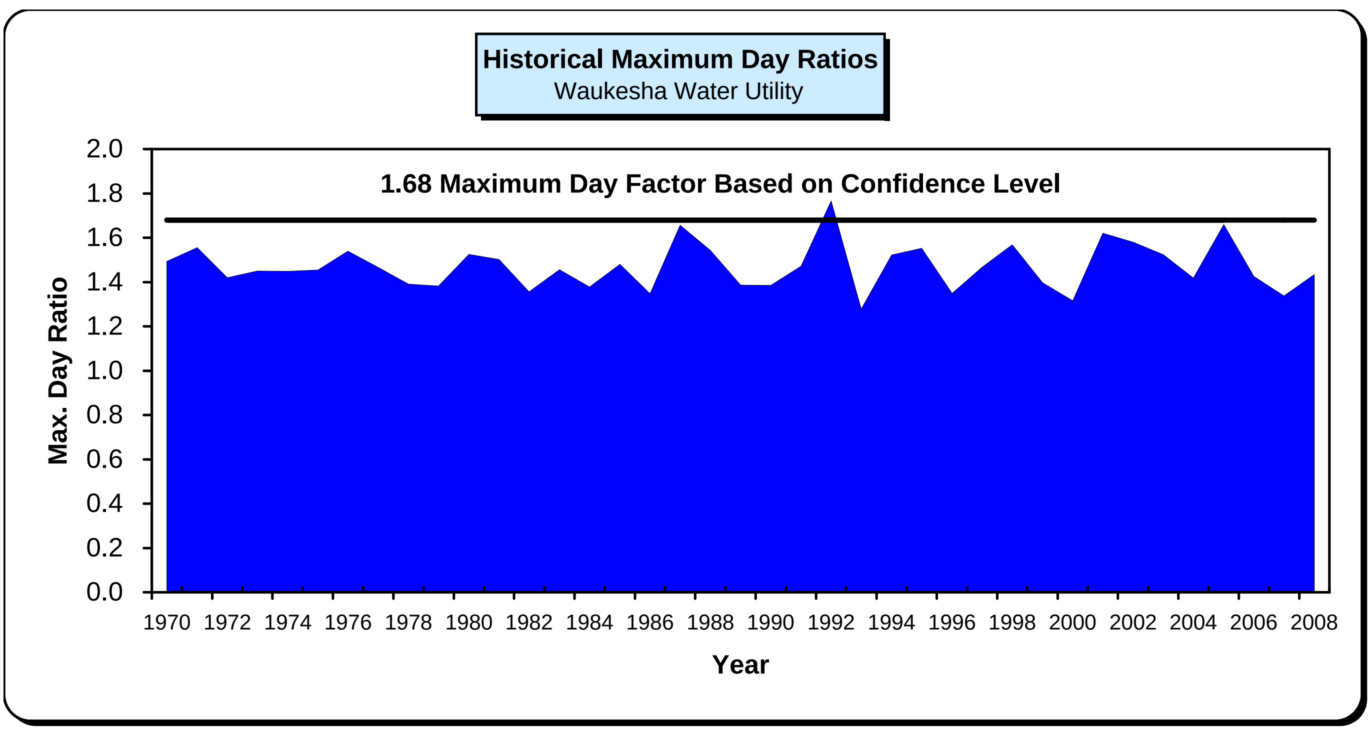
WAUKESHA WATER UTILITY
WAUKESHA, WISCONSIN

	1998 to 2008	1970 to 2008
Number of years of Data	11	39
Maximum Ratio - Max. to Avg. Day Pumpage	165.9%	176.6%
Minimum Ratio - Max. to Avg. Day Pumpage	131.5%	127.8%
Average Ratio Max. to Avg. Day Pumpage	148.0%	146.9%
Standard Deviation	11.1%	10.3%

Confidence Level (%)	Ratio of Max. to Avg. Day Pumpage	Ratio of Max. to Avg. Day Pumpage
80%	157%	156%
85%	159%	158%
90%	162%	160%
95%	166%	164%
98%	171%	168%
99%	174%	171%

Note

The "Confidence Level" represents the probability (%) that in any given year, the actual ratio of maximum to average day pumpage will be less than or equal to the ratio indicated in the table. The ratios in the table were determined based on a statistical analysis of historical ratios over each period of analysis, assuming a normal distribution.



L:\work\Projects\105762\eng\demand analysis\[Chapter3_2008.xls]Table 3-12

TABLE 5

WATER SALES AND PUMPAGE PROJECTIONS

WAUKESHA WATER UTILITY

WAUKESHA, WISCONSIN

Customer Classification	Actual 2008	Projected 2028	Projected 2035	Projected Ultimate
Population Served	68,030	85,800	88,500	97,400
Residential Sales				
Per Capita Sales (gpcd)	43	45	45	45
Annual Sales (MGY)	1,057	1,410	1,450	1,600
Public Sales				
Per Capita Sales (gpcd)	4	5	5	5
Annual Sales (MGY)	100	160	160	180
Commercial Sales				
Per Capita Sales (gpcd)	33	35	35	35
Annual Sales (MGY)	828	1,100	1,130	1,240
Industrial Sales				
Annual Sales:				
Existing Sales (MGY)	382	415	400	400
TOTAL METERED SALES (MGY)	***2,370***	***3,090***	***3,140***	***3,420***
Unaccounted-For Water (MGY)	161	230	240	260
TOTAL PUMPAGE (MGY)	***2,531***	***3,320***	***3,380***	***3,680***
AVERAGE DAY DEMAND (MGD)	**6.93**	**9.10**	**9.26**	**10.08**
MAXIMUM DAY DEMAND (MGD)	**9.93**	**15.28**	**15.56**	**16.94**

Notes:

Projected populations from Southeastern Wisconsin Regional Planning Commission letter dated March 17, 2009.

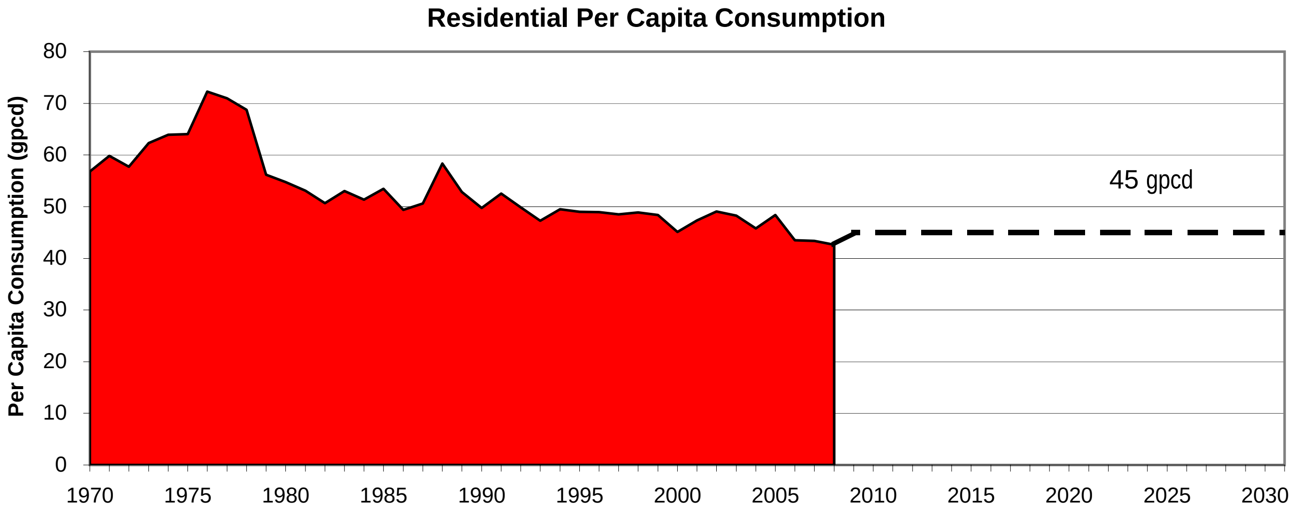
Industrial sales projections based on planning data provided during Water System Master Plan project of ultimate industrial acreage slighly decreasing from existing acreage and some large customer surveys indicating decline in water usage.

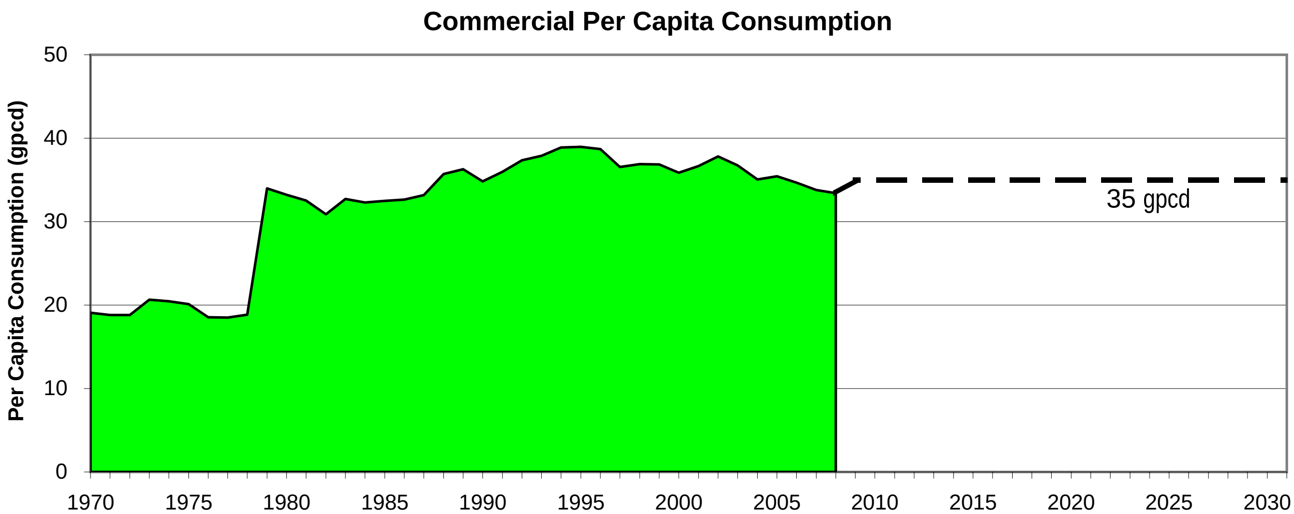
Unaccounted-for water was projected at 7% of total pumpage for future years.

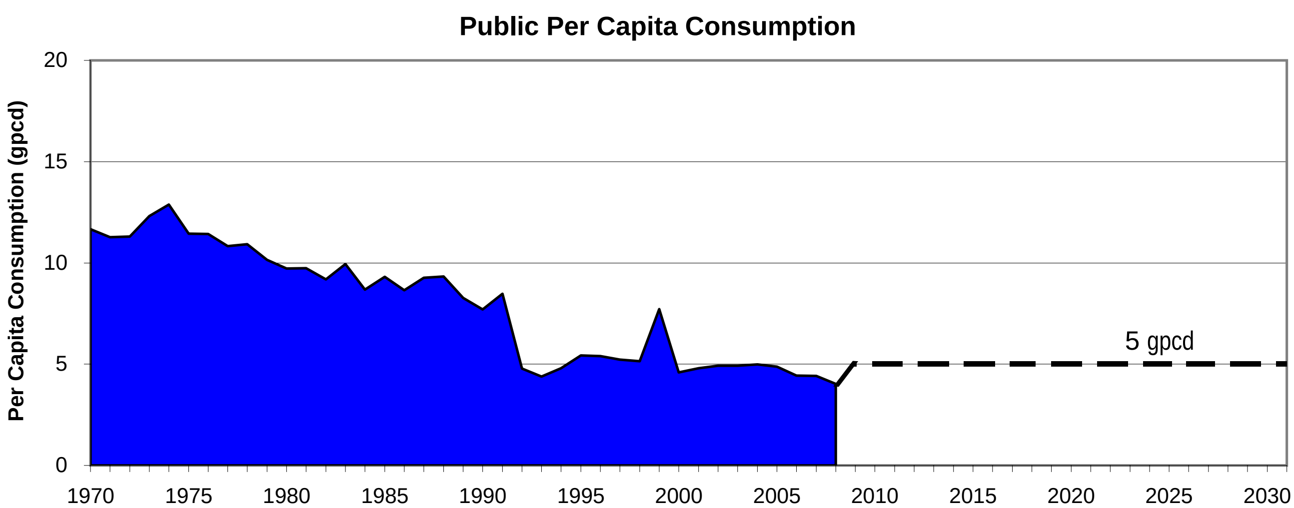
Maximum day demand 1.68 times average day demand.

L:\work\Projects\105762\eng\demand analysis\[Chapter3_2008.xls]Table 3-14

FIGURES







AECOM

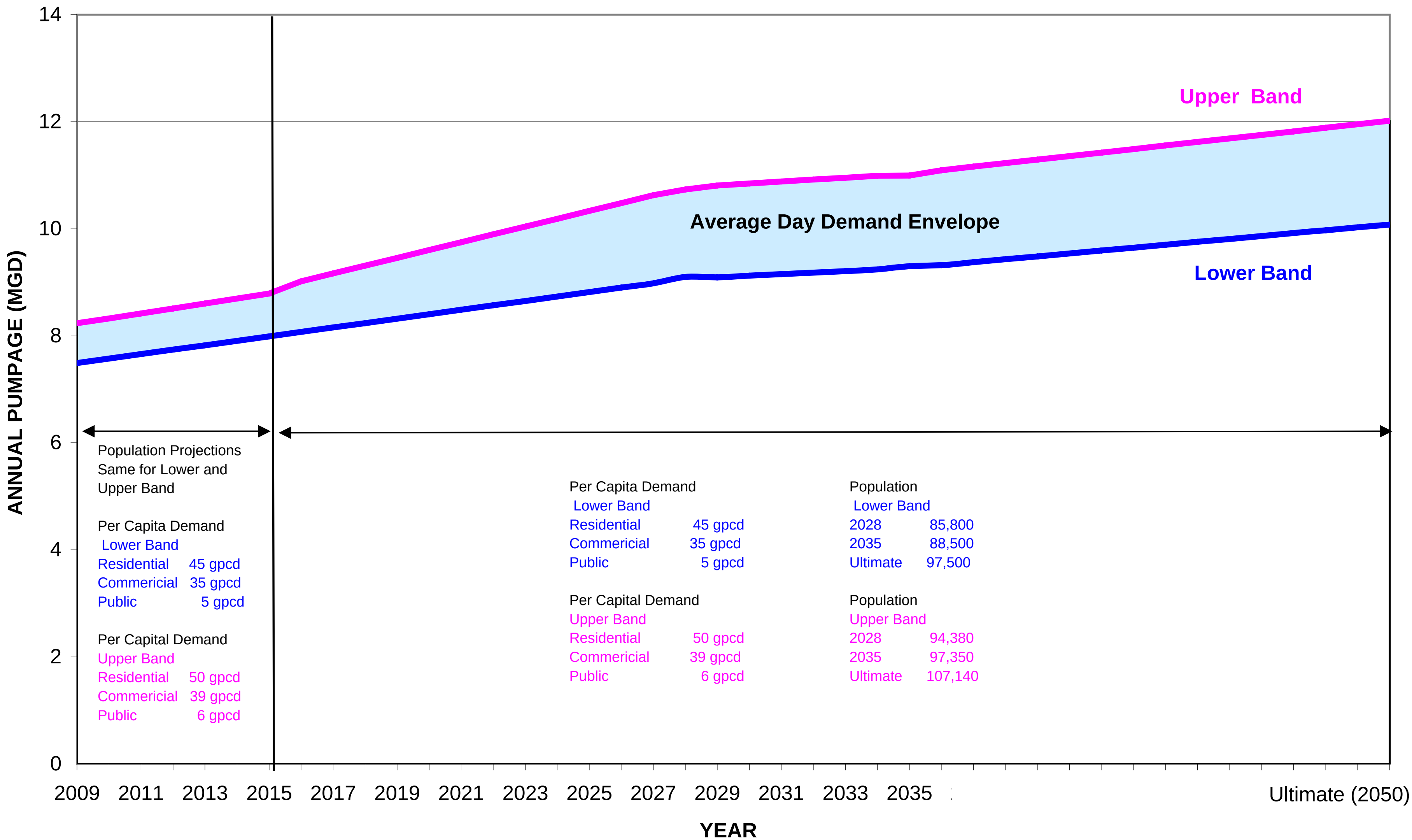
FIGURE 1
HISTORICAL PER CAPITA CONSUMPTION
WAUKESHA WATER UTILITY
WAUKESHA, WISCONSIN

MAY 2009

105762

L:\work\Projects\105762\eng\demand analysis\[Chapter3_2008.xls]Figure 3-04

L:\work\Projects\105762\eng\demand analysis\[Chapter3_2008.xls]Figure 2

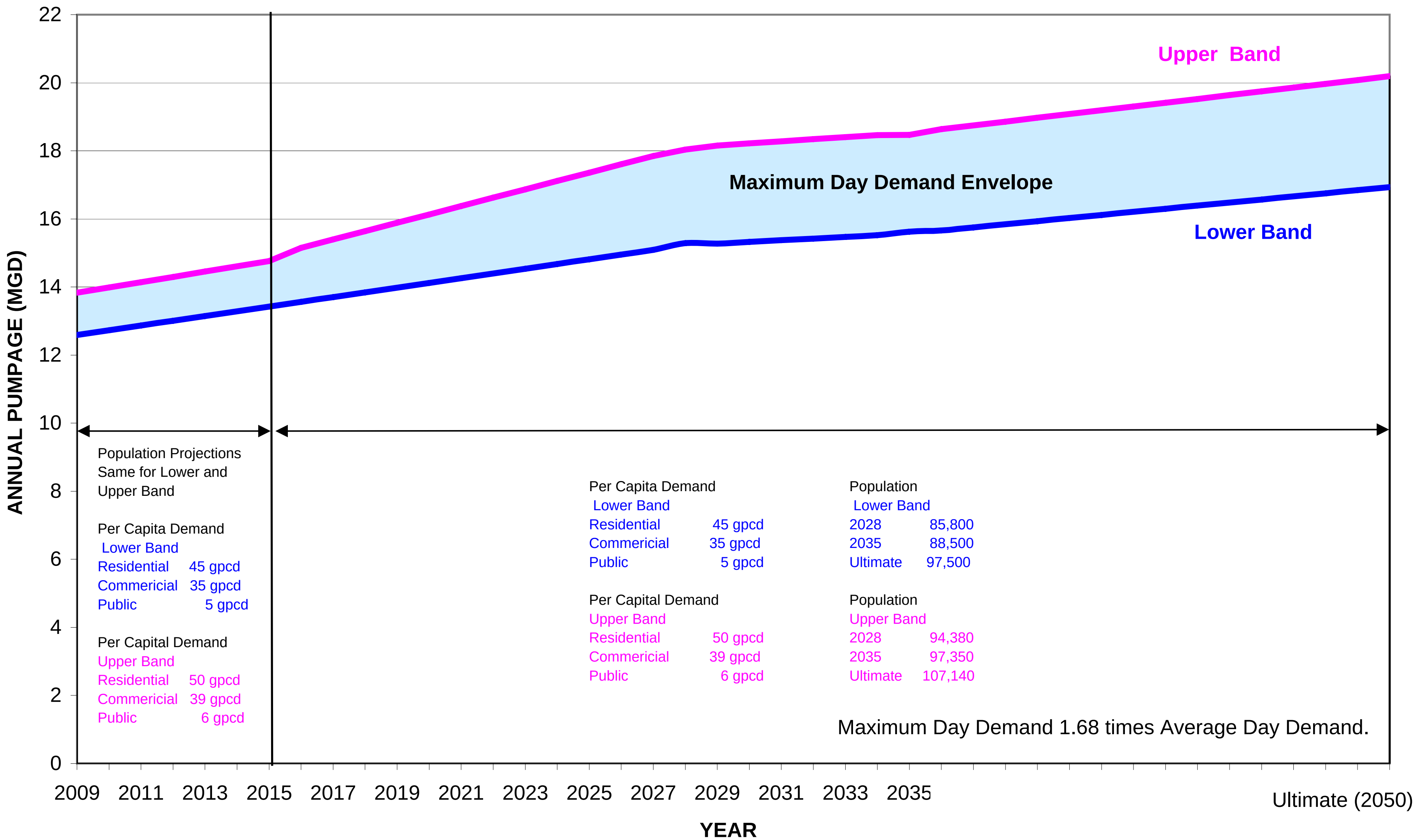


AECOM

FIGURE 2
ANNUAL AVERAGE DAY
WATER PUMPAGE PROJECTIONS
WAUKESHA WATER UTILITY
WAUKESHA, WISCONSIN

MAY 2009 105762

L:\work\Projects\105762\eng\demand analysis\[Chapter3_2008.xls]Figure 3



AECOM

FIGURE 3
ANNUAL MAXIMUM DAY
WATER PUMPAGE PROJECTIONS
WAUKESHA WATER UTILITY
WAUKESHA, WISCONSIN

MAY 2009 105762

ATTACHMENT A

POPULATION PROJECTIONS

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

W239 N1812 ROCKWOOD DRIVE • PO BOX 1607 • WAUKESHA, WI 53187-1607 • **TELEPHONE (262) 547-6721**
FAX (262) 547-1103

Serving the Counties of: KENOSHA
MILWAUKEE
OZAUKEE
RACINE
WALWORTH
WASHINGTON
WAUKESHA

March 17, 2009

Mr. Steven Crandell
Community Development Director,
City of Waukesha
201 Delafield Street
Waukesha, WI 53188-3633

Dear Mr. Crandell:

In response to your request, the Regional Planning staff has prepared an estimate of the ultimate population for the Waukesha water supply service area. The ultimate population for the water supply service is estimated at 97,400 persons. This compares to the year 2000 population of 75,500 persons and a planned year 2028 population of 85,800 persons, as set forth in the SEWRPC staff memorandum entitled "Response to Request by the City of Waukesha Water Utility to Delineate the 20-Year Planned Water Supply Service Area for the Utility." The ultimate population is an estimate of the population that could be accommodated within the water supply service area, assuming full development conditions as envisioned under the land use element of the Waukesha County comprehensive plan, with input on population densities for various residential land use categories and other aspects of the plan from your staff.

The 2028 population represents a step on the way to the 2035 population of 88,500 persons set forth in the ongoing regional water supply plan. The ultimate population within the water supply service area represents a condition beyond the 2035 planning horizon adopted for the regional water supply plan.

We trust that this responds to your request. Should you have any questions, feel free to call.

Sincerely,

Kenneth R. Yunker

Kenneth R. Yunker, P.E.
Executive Director

KRY/WJS/lgh
#143499 v1 - response to s crandell

cc: Michael G. Hahn, SEWRPC
Robert P. Biebel, SEWRPC

Appendix B
City PSC Compliance Status

Public Service Commission of Wisconsin

Eric Callisto, Chairperson
Mark Meyer, Commissioner
Lauren Azar, Commissioner

610 North Whitney Way
P.O. Box 7854
Madison, WI 53707-7854

March 9, 2011 – **VIA EMAIL**

Mr. Dan Duchniak, General Manager
Waukesha Water Utility
115 Delafield Street
Waukesha, Wisconsin 53188
dduchniak@waukesha-water.com

Re: PSC Compliance Status File: 6240

Dear Mr. Duchniak:

This letter confirms that the Waukesha Water Utility is a utility in good standing with the Public Service Commission. The utility is in compliance with its annual reporting requirements and has not been found to be in violation of the standards for water public utility service in Chapter PSC 185, Wis. Adm. Code.

Sincerely,

David Sheard

David Sheard, P.E.
Assistant Administrator
Division of Water, Compliance and Consumer Affairs

JJR:DAS:pc:w:\water\correspondence\ripp\Waukesha Compliance Letter.doc

cc: Nancy Quirk, Technical Services Manager

Appendix C
System Pressure Management

AECOM
200 Indiana Avenue
Stevens Point, WI 54481
www.aecom.com

715 341 8110 tel
715 341 7390 fax

Final
Memorandum

To	Nancy Quirk, Waukesha Water Utility
CC	Kathy Beduhn, AECOM
Subject	Distribution Water System Pressure Waukesha Water Utility
From	Richard Hope, AECOM
Date	February 25, 2011

1.0 INTRODUCTION

The City of Waukesha has submitted an application to the Wisconsin Department of Natural Resources (DNR) for the diversion of Lake Michigan water. The DNR has requested additional information on and clarification of the application. Specifically, Wisconsin Administrative Code NR 852 (Table 2) requires the review of distribution system pressure management to determine if opportunities exist to reduce water system pressure and minimize water loss, and the DNR has requested clarification of whether Waukesha Water Utility is operating the water system within acceptable water system pressures, especially with respect to minimizing water loss. This memorandum responds to that specific request for clarification.

The Wisconsin Administrative Code NR 852 requiring the review of the distribution system pressure management is documented below.

Table 2. Required Conservation and Efficiency Measures
Wisconsin Administrative Code NR 852

CEM #	Description	Required Elements
Public Water Supply Water Use Sector (PWS)		
PWS-R1	Distribution System Pressure Management	Analyze distribution system pressure management to identify opportunities to reduce water use and minimize plumbing fixture leaks.

AECOM prepared the Water System Master Plan (August 2006) for the Waukesha Water Utility. As part of the Water System Master Plan a calibrated hydraulic model was developed and used to assist in the evaluation of system capacity and water system pressure throughout the water system. AECOM has the experience in the evaluation of water systems and specific knowledge of the Waukesha water system to provide an opinion on the whether the water system is being operated within acceptable water system pressures.

2.0 WATER SYSTEM PRESSURE

A water system needs to be designed so that adequate water system pressure is available to meet customers' needs and to provide required fire flows. In addition, regulatory requirements specify minimum pressure requirements because of health concerns that can results from the ingress of water into the water mains.

Wisconsin Administrative Code Clause 811.70 (4) discusses system pressure:

> (4) PRESSURE. All water mains, including those not designed to provide fire protection, shall be sized after a hydraulic analysis based on flow demands and pressure requirements. The minimum and maximum normal static pressure in the distribution system shall be 35 psi and 100 psi, respectively, at ground level. The system shall be designed and operated to maintain a minimum residual pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow.

Further guidelines are provided in the Ten State Standard:

> 8.2 SYSTEM DESIGN
>
> 8.2.1 Pressure
>
> All water mains, including those not designed to provide fire protection, shall be sized after a hydraulic analysis (is completed) based on flow demands and pressure requirements. The system shall be designed to maintain a minimum pressure of 20 psi (140 kPa) at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 60 to 80 psi (410 - 550 kPa) and not less than 35 psi (240 kPa).

3.0 WAUKESHA WATER SYSTEM

Water system pressure varies throughout a distribution system due to topography and water demands. The service area for the Waukesha Water Utility has a varied topography (with elevations ranging from approximately 780 feet to 1,050 feet. To accommodate this topography change, the Waukesha Water Utility water distribution system is divided into eight pressure zones. Each pressure zone was developed to maintain system pressure within regulatory requirements.

As part of the Water System Master Plan, a detailed evaluation of the water system pressure in each pressure zone was performed. To assist in the evaluation of water system pressures and available fire flow, a detailed hydraulic model of the Waukesha water system was developed. The model allowed system pressures and fire flows to be evaluated under a range of existing and future water demand and operating conditions.

The evaluation confirmed that water system pressures were adequate to meet customer needs and fire flow requirements. One of the recommendations resulting from the evaluation was to readjust some of the pressure zone boundaries to better serve residents. The Waukesha Water Utility has implemented the recommended pressure zone boundary realignments; that realignment has improved system pressure, and from a hydraulic prospective the water system pressures are optimized.

4.0 BENEFITS OF LOWER SYSTEM PRESSURES

The previous section discussed the hydraulic reasons for the current water system pressures to ensure adequate flow to customers and the required fire flows. However, operating a water system at a lower water system pressure can have the following benefits:

1. Reduction in the number of water main failures (breaks/leaks)
2. Reduction in loss of water at leaks

These benefits and their impact on the Waukesha water system are addressed in greater detail in the following sections.

4.1. Reduction in Water Main Failures

Water mains are designed to withstand a specific pressure in excess of the pressure the pipe will experience. As with most assets, as the water main ages, its condition deteriorates, and the water main will eventually fail. Water utilities are continually replacing/rehabilitating water mains to minimize water main failures. Table 1 provides details of the number of water breaks that the Waukesha Water Utility has repaired since 2005. To benchmark this with industry guidelines, the failure rate has been converted to number of breaks per 100 miles, based on the 330 miles of water main that comprise the Waukesha water system.

Table 1. Water Main Breaks

Year	Total Number of Water Main Breaks	Water Main Breaks/100 miles of Water Mains
2005	23	7.0
2006	10	3.0
2007	21	6.4
2008	31	9.4
2009	32	9.7
2010	30	9.1

Many factors besides water main pressure—such as pipe material and corrosion—affect water main failure rate, so it is not possible to provide a standard for the allowable number of water main breaks per 100 miles. However, research from the Water Research Foundation provides the data in Table 2 regarding criteria for water main breaks/leaks.

Table 2. Criteria for Water Main Breaks/Leaks

Reference	Criteria
Distribution System Performance Evaluation American Water Works Association (AWWA) Research Foundation, 1995	Typical goal: 25-30 breaks and leaks per 100 miles
Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analysis Report, AWWA, 2007	Top quartile performance range: 14.9–21.7 breaks and leaks per 100 miles
Water Audits and Loss Control Programs, AWWA M36, 2009	Performance goals: no more than 15 reported breaks and leaks per 100 miles

Therefore, the Waukesha Water Utility is well below the criteria presented in Table 2 and it does not appear that water system pressure is a major contributor to water main failure.

4.2 Reduction in Loss of Water at Leaks

The volume of water that is lost from a leak depends on water system pressure. The higher the system pressure, the greater the volume of water that will be lost through the leak; therefore, reducing system pressure reduces the volume of water lost. However, it is important to note that reducing pressure does not eliminate existing leaks.

Typically water loss, or unaccounted-for water (UFW), is specified as a percentage of water supplied, and that is how water loss is reported to the Public Service Commission (PSC) in Waukesha's annual reports. Table 3 provides a summary of UFW from 2005 to 2009.

Table 3. Unaccounted-for Water

Year	Percentage of UFW
2005	7
2006	5
2007	6
2008	4
2009	7

The PSC requires the utility to take action to reduce UFW when it reaches 15 percent. The Waukesha Water Utility is below the action level of 15 percent, and pressure does not appear to be major contributor to water loss.

AWWA (Water Audits and Loss Control Programs – M36) recommends an approach that looks at the volume of water lost and uses an Infrastructure Leakage Index (ILI) as a benchmark to compare how well a utility is managing leakage. The lower the ILI, the better the utility is managing water loss, with 1 generally being considered the lowest that is economically obtainable. As part of Waukesha's 2006 Water Master Plan, water loss was evaluated using this methodology, an ILI of 1.3 was determined for Waukesha.

Figure 1 is a reproduction from Lambert, A.O. and Dr. R. D. McKenzie, Practical Experience in using Infrastructure Leakage Index, International Water Association Conference 'Leakage Management: A Practical Approach', Lemesos, Cyprus, November 2002. The figure illustrates the ILI of seven North American systems compared to the International Water Association (IWA) International data set.

Table 4 is a reproduction from Water Audits and Loss Control Programs, AWWA M36, 2009 summarizing guidelines for the use of the ILI as a preliminary leakage target-setting tool.

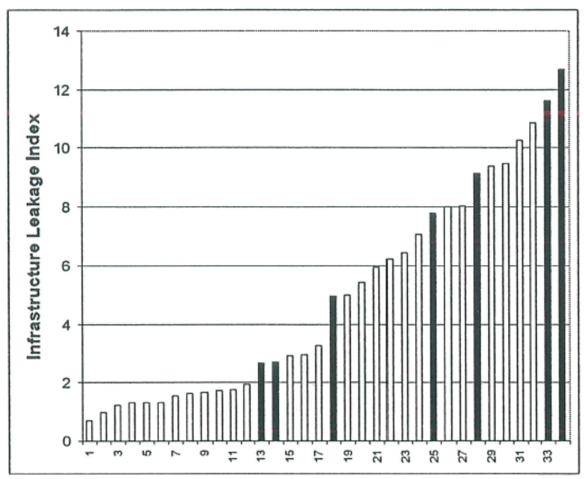


Figure 1. ILI Comparison

5.0 CONCLUSION

The Waukesha water Utility has divided the water distribution into eight pressure zones to ensure that pressure is maintained above regulatory requirements under current and projected water demand and operating conditions. Hydraulic modeling has confirmed that the current system pressure is adequate to ensure that the needed fire flows can be delivered. Historical water main breaks and leakage levels are below acceptable norms.

Table 4. Guidelines for Use of the Level Infrastructure Leakage Index as a Preliminary Leakage Target-Setting Tool (in lieu of having a determination of the system-specific economic level of leakage)

Target ILI Range	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.	Operating with system leakage above this level requires expansion of existing infrastructure and/or additional water resources to meet the demand.	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.
3.0 - 5.0	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources can be developed or purchased at reasonable expense. Periodic water rate increases can be feasibility effected and are tolerated by the customer population.
5.0 - 8.0	Water resources are plentiful, reliable, and easily extracted.	Superior reliability, capacity, and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Cost to purchase or obtain/treat water is low, as are rates charged to customers.
Greater than 8.0	While operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0-other than as an incremental goal to a smaller long-term target-is discouraged.		
Less than 1.0	In theory, an ILI value less than 1.0 is not possible. If the calculated ILI is just under 1.0, excellent leakage control is indicated. If the water utility is consistently applying comprehensive leakage management controls, this ILI value validates the program's effectiveness. However, if strict leakage management controls are not in place, the low ILI value might be attributed to error in a portion of the water audit data, which is causing the real losses to be understated. If the calculated ILI value is less than 1.0 and only cursory leakage management controls are used, the low ILI value should be considered preliminary until it is validated by field measurements via the bottom-up approach.		
Source: Water Audits and Loss Control Programs, AWWA M36, 2009.			

Appendix D
Water Use Audit

APPENDIX C
WATER BALANCE AND EVALUATION OF SYSTEM LOSSES

As part of the Water System Master Plan, an evaluation of water loss was performed. This appendix summarizes the results of the evaluation and will provide the following:

1. Establish the current level of water loss
2. Establish the economic level of leakage
3. Identify appropriate active leakage control (ALC) approach

C.1 BACKGROUND

In the United States, guidelines for preparing a water audit are provided in AWWA Manual M36, which provides a water audit worksheet for the establishment of the level of UFW and associated leakage within a water distribution system. The water loss committee that is responsible for updating and maintaining the guidelines provided in AWWA M36 are in the process of adopting international standards for water audit and loss reduction strategies (Journal AWWA, August 2003). The revised approach to the standards will be based on work performed by the International Water Association (IWA) Water Loss Task Force. This revised approach is a radical change to the current philosophy presented in AWWA M36. A number of new terms have been introduced, but the main difference is the concept of moving away from using the term UFW and expressing UFW as a percentage of water pumped into the system to discuss leakage as an overall volume loss. For the UFW program for Waukesha Water Utility, the new approach being developed by the Water Loss Committee of AWWA, based on the IWA's Public Utilities Water Loss Task Force recommendations, will be adopted.

With the adoption of AWWA's new approach for evaluating water loss within a water distribution system, it is important to provide definitions of some of the terms currently not widespread in the industry that now will be used. The end of this appendix includes definitions of terms for reference. The definitions are based on IWA's Blue Pages for Losses from Water Supply Systems Standard Terminology and Recommended Performance Measures.

C.2 WATER BALANCE

A water balance displays how quantities of water flow into and out of the distribution system and to the customer. Figure C-1 and Table C-1 illustrate the components of a water balance based on IWA recommended best practice. All data in the water balance is expressed as a volume per year. Each component of the water balance is specifically defined in the definition of terms provided at the end of this appendix.

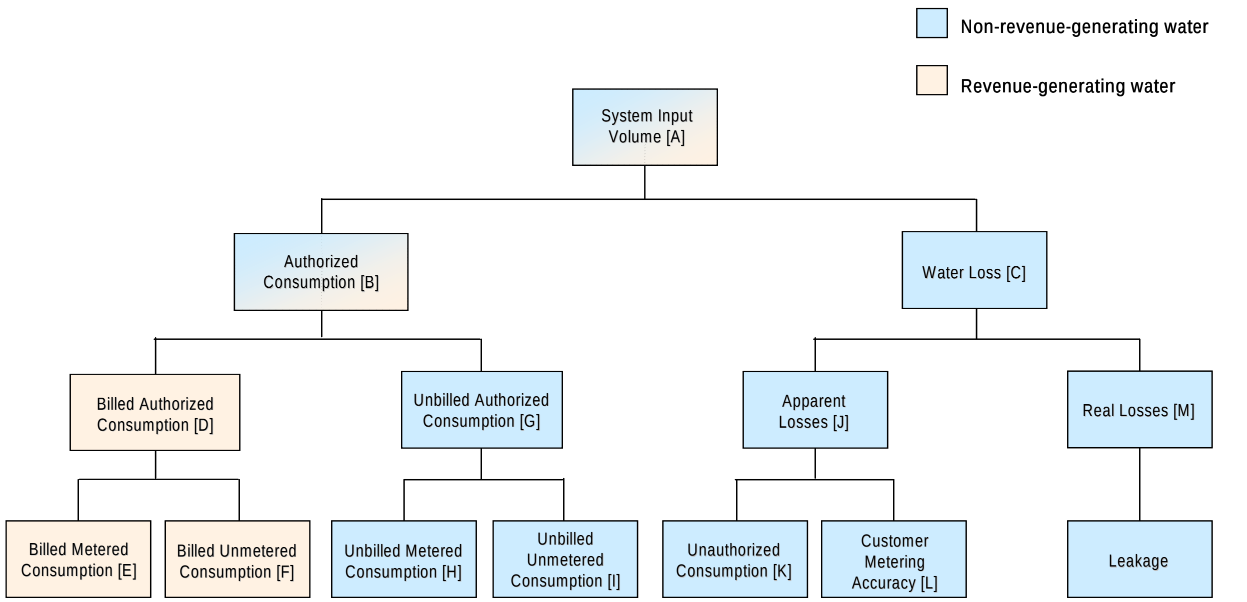


FIGURE C-1: COMPONENTS OF A WATER BALANCE

TABLE C-1
COMPONENTS OF A WATER BALANCE

System Input Volume [A]	Authorized Consumption [B]	Billed Authorized Consumption [D]	Billed Metered Consumption [E]	Revenue-Generating Water
			Billed Unmetered Consumption [F]	
		Unbilled Authorized Consumption [G]	Unbilled Metered Consumption [H]	Non-Revenue-Generating Water
			Unbilled Unmetered Consumption [I]	
	Water Losses [C]	Apparent Losses [J]	Unauthorized Consumption [K]	
			Metering Inaccuracies [L]	
		Real Losses [M]	Leakage on Transmission and/or Distribution Mains	
			Leakage and Overflows at Utility's Storage Tanks	
			Leakage on Service Connections up to Point of Customer Metering	

C.2.1 System Input Volume [A]

The system input volume (SIV) for Waukesha is the volume of water entering the distribution system. The information on the SIV was obtained from the 2004 Public Service Commission (PSC) Report.

The total SIV in 2004 was 2,699 MG.

C.2.2 Authorized Consumption [B]

Authorized consumption is any water used for all uses approved by the Utility. Most authorized consumption is metered, however, some is not. Authorized consumption is comprised of the following components:

1. Billed Authorized Consumption [D]

    a. Billed Metered Consumption [E]
    b. Billed Unmetered Consumption [F]

2. Unbilled Authorized Consumption [G]

    a. Unbilled Metered Consumption [H]
    b. Unbilled Unmetered Consumption [I]

C.2.2.1 Billed Authorized Consumption [D]

Billed authorized consumption is the annual volume of billed metered and unmetered water taken by registered customers and others who are authorized by the Utility for residential, commercial, public, and industrial purposes. Billed authorized consumption is comprised of the following two components:

1. Billed Metered Consumption [E]
2. Billed Unmetered Consumption [F]

C.2.2.2 Billed Metered Consumption [E]

Billed metered consumption is the component of billed authorized consumption that is metered. The billed metered consumption for Waukesha for the year 2004 was 2,529 MG.

C.2.2.3 Billed Unmetered Consumption [F]

No billed unmetered consumption was reported for Waukesha in 2004.

C.2.2.4 Unbilled Authorized Consumption [G]

Unbilled authorized consumption is the annual volume of unbilled metered and unmetered water taken by registered customers and others who are authorized by the Utility for residential, commercial, public, and industrial purposes.

Unbilled authorized consumption varies from community to community but generally covers the water needed to operate and maintain a water system and water used for public services such as swimming pools and irrigation. Unbilled authorized consumption is comprised of the following two components:

1. Unbilled Metered Consumption [H]
2. Unbilled Unmetered Consumption [I]

Table C-2 summarizes the Utility's unbilled water use (metered and unmetered) for public services and general operations.

TABLE C-2
UNBILLED CONSUMPTION

Description	Consumption
Unbilled Metered Consumption [H]	0 MG
Unbilled Unmetered Consumption [I]	6.2 MG
Total	6.2 MG

The unbilled metered and unmetered consumption for Waukesha for the year 2004 was 6.2 MG.

C.2.3 Water Losses [C]

Water losses are equal to the difference between the system input volume and authorized consumption. The IWA defines two categories under which all types of water loss occurrences fall:

1. Apparent Losses [J]
2. Real Losses [K]

Using the formula of "water losses = system input volume - authorized consumption" results in overall water losses of 164 MG for the year 2004 for Waukesha.

C.2.3.1 Apparent Losses [J]

Apparent losses are essentially "paper" losses and consist of water use, which is not recorded due to metering error, incorrect assumptions of unmetered use, and unauthorized consumption; therefore, the two components of apparent losses are:

1. Unauthorized Consumption [K]
2. Customer Metering Accuracy [L]

Unauthorized Consumption [K]

Unauthorized consumption includes such things as meter or meter reading tampering, illegally opened fire hydrants, unauthorized tapping into service mains, or unauthorized restoration of a water service connection after discontinuance by the Utility.

At this stage, there is no known unauthorized consumption; therefore, for 2004, the unauthorized consumption was estimated at zero.

Customer Metering Accuracy [L]

The accuracy of customer meters can have a dramatic effect on the water balance. Based on information provided by Waukesha Water Utility personnel, customer meters were assumed to have an accuracy of 99 percent; therefore, the apparent losses due to customer metering accuracy are estimated to be approximately 19 MG.

C.2.3.2 Real Losses [M]

Real losses are physical water losses in water systems up to the point of measurement of customer use. Real losses are calculated using the following equation:

Real Losses = Water Losses - Apparent Losses

Table C-3 summarizes the calculation of real losses for Waukesha for the year 2004. The estimated real losses for Waukesha for the year 2004 are 145 MG.

TABLE C-3
REAL LOSSES

Real Losses		Volume
System Input Volume	[A]	2,699 MG
Authorized Consumption	[B]=[D]+[G]=[E]+[F]+[H]+[I]	2,535 MG
Water Losses	[C]=[A]-[B]	164 MG
Apparent Losses	[J]=[K]+[L]	19 MG
Real Losses	[M]=[C]-[J]	145 MG

C.3 EVALUATION OF SYSTEM LOSSES

The previous sections described in detail the components of water balance for the Waukesha Water Utility for 2004. The water balance establishes the real losses for Waukesha. This section discusses in detail the process of evaluating leakage levels for Waukesha.

The following performance indicators are discussed:

1. Technical Indicator for Real Losses (TIRL)
2. Unavoidable Annual Real Losses (UARL)
3. Infrastructure Leakage Index (ILI)

The parameters used for the evaluation of system losses are consistent with the IWA Water Loss Task Force.

C.3.1 Water System Information

To evaluate Waukesha’s system losses using the parameters used by the IWA Water Loss Task Force, the water system parameters summarized in Table C-4 are required.

TABLE C-4
WATER SYSTEM INFORMATION

Description	Entire System
Length of Water Main	305 miles
Number of Service Connections	19,159
Distance Customer Meters are Located from Edge of Street	10 feet
Percent of Time System Pressurized	100 percent
Average System Pressure	65 psi

C.3.2 TIRL

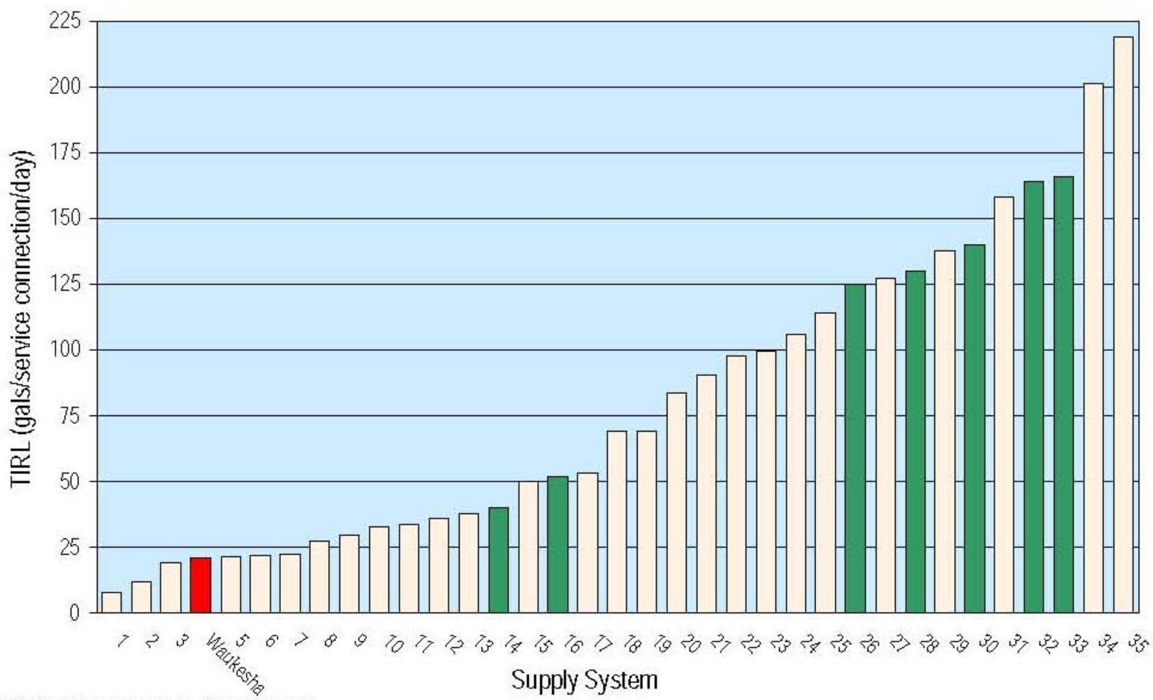
The TIRL is a performance indicator of the total volume of losses in a water distribution system. Typically, this has been defined as the percentage of the amount of water entering the distribution system. In the new approach of looking at water losses, it is recommended that TIRL be expressed in gallons per service connection per day. Table C-5 summarizes the TIRL calculation for Waukesha.

TABLE C-5
TIRL

Calculation of TIRL	Entire System
Annual Volume of Real Losses	145 MGD
Percent of Time System Pressurized	100 percent
Number of Service Connections	19,159
TIRL	21 gallons/service connection/day

Using the estimated real losses determined in the water balance of 145 MGD, the total number of service connections is estimated at 19,159, and the TIRL for Waukesha is approximately 21 gallons per service connection per day.

Figure C-2 compares the Waukesha TIRL with the TIRL of other communities throughout the world. The seven TIRLs indicated in green on the figure are North American communities. From this figure, it can be seen that the level of real losses for Waukesha is in the middle of those surveyed and on the lower end of the North American communities.



North American systems are shown in green.
Supply systems composed of 34 systems surveyed in 20 countries.
Source: Lambert, A., D. Huntington, and T.G. Brown, Water Loss Management in N.America: Just How Good Is It?, Water Loss Control Manual, 2002.

FIGURE C-2: TIRL

C.3.3 UARL

The water industry has long recognized that it is impossible to achieve zero leakage. Previous terms that have been used to describe the level of leakage that cannot be completely recovered include the following: background leakage, intrinsic leakage, and non-recoverable leakage. The term UARL has been introduced to define the level of leakage which could be achieved at the current operating pressure if there were no financial or economic constraints on the level of ALC. Similar to TIRL, UARL has the unit of gallons per service connection per day.

The UARL consists of the following main elements:

1. Background losses from undetectable leaks
2. Losses from reported leaks
3. Losses from unreported leaks

Using an approach adopted in the United Kingdom, an average UARL can be calculated for an individual water system. The parameter values used to calculate the UARL are based on published international data for minimum background loss rates, typical burst flow rates, and frequencies for infrastructure in good condition. The calculated values of the UARL for each component of infrastructure are shown in Table C-6.

The calculated UARL should be only used as a guide. Once ALC has been implemented, the background losses and reported and unreported leaks can be better defined for the Waukesha water system, and a more accurate UARL can be established.

The Table C-6 values presented as an equation in the most basic form is presented below.

$$UARL = (5.39 \times L_m + 0.15 \times N_c + 7.47 \times L_p) \times P$$

Where: *Lm* is the length of water mains in the distribution system (miles)
Nc is the number of service connections
Lp is the total length of pipe between the edge of the street and the customer meter (feet)
P is the average operating pressure (psi)
UARL is in gallons per day (gpd)

The following characteristics of the Waukesha water distribution system were used for the UARL calculation:

1. Approximately 305 miles of water main
2. Approximately 19,159 service connections
3. Average system pressure of 65 psi
4. Average length of service connection between street and water meter of 10 feet

The total UARL for Waukesha was calculated to be 16 gallons per service connection per day (312,000 gpd).

TABLE C-6
UARL

Calculation of UARL	Entire System					
Length of Water Main	305 miles					
Number of Service Connections	19,159					
Distance Customer Meters are Located from Edge of Street	10 feet					
Percent of Time System Pressurized	100 percent					
Average System Pressure	65 psi	Calculated Components of UARL				
Components of UARL	Total UARL	Background Losses	Reported Bursts	Unmetered Use	UARL Total	Units
Mains	106,792 gpd	2.87	1.75	0.77	5.39	gallons/mile of main/day/psi of pressure
Service Connections, Main to Curb-Stop	186,800 gpd	0.11	0.01	0.03	0.15	gallons/serv conn/day/psi of pressure
Service Connections, Curt-Stop to Meter	312,124 gpd	4.8	0.57	2.12	7.47	gallons/mile of main/day/psi of pressure
UARL	312,129 gpd					
UARL	16 gallons/ serv conn/day					

C.3.4 ILI

The difference between the TIRL and UARL represents the maximum potential for future savings in real losses. Also, the ratio of TIRL to UARL is in a useful, non-dimensional index of the overall condition and management of infrastructure. The ratio of TIRL to UARL is known as the ILI. Table C-7 summarizes the ILI calculation for Waukesha.

TABLE C-7
ILI

Calculation of ILI	Entire System
TIRL	21 gallons/serv conn/day
UARL	16 gallons/serv conn/day
ILI (ratio of TIRL to UARL)	1.3

Figure C-3 illustrates ILI along with the survey results of several other communities throughout the world. The seven ILIs indicated in green on the figure are North American communities. From this figure, it can be seen that Waukesha is in the low to mid range of communities surveyed.

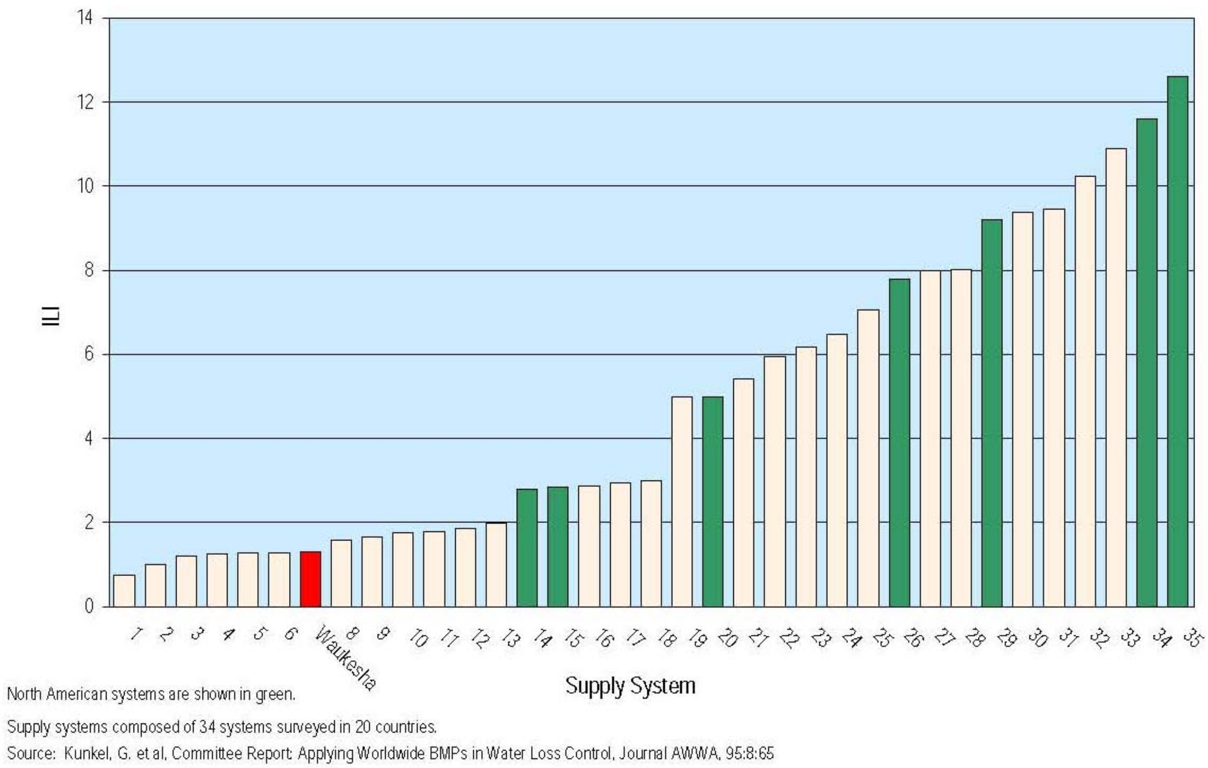


FIGURE C-3: ILI

The AWWA Water Loss Committee recently published Table C-8 as a guideline for action based on a community's ILI.

TABLE C-8
GENERAL GUIDELINES FOR SETTING A TARGET LEVEL ILI
(in lieu of having a determination of the system-specific economic level of leakage)

Target ILI Range	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.	Operating with system leakage above this level will require expansion of existing infrastructure and/or additional water resources to meet the demand.	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.
3.0 - 5.0	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.
5.0 - 8.0	Water resources are plentiful, reliable, and easily extracted.	Superior reliability, capacity, and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Cost to purchase or obtain/treat water is low, as are rates charged to customers.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Source: AWWA Water Loss Control Committee, *Applying Worldwide BMPs in Water Loss Control*, Journal AWWA, August 2003.			

The table indicates that communities with limited water sources are currently operating near the capacity of existing infrastructure or where there are financial limitations on developing additional supply sources that should set a target ILI of 1 to 3. The guidelines discourage setting a target ILI greater than 8, as such a level of leakage is not an effective utilization of water as a resource; therefore, Waukesha is much lower than the maximum target ILI recommended and is near the minimum target ILI.

C.4 SUMMARY

This summarizes the completion of the water balance and evaluation of system losses, and determination of potential actions to be taken based on the water balance. Figure C-4 summarizes the components of the 2004 water system balance.

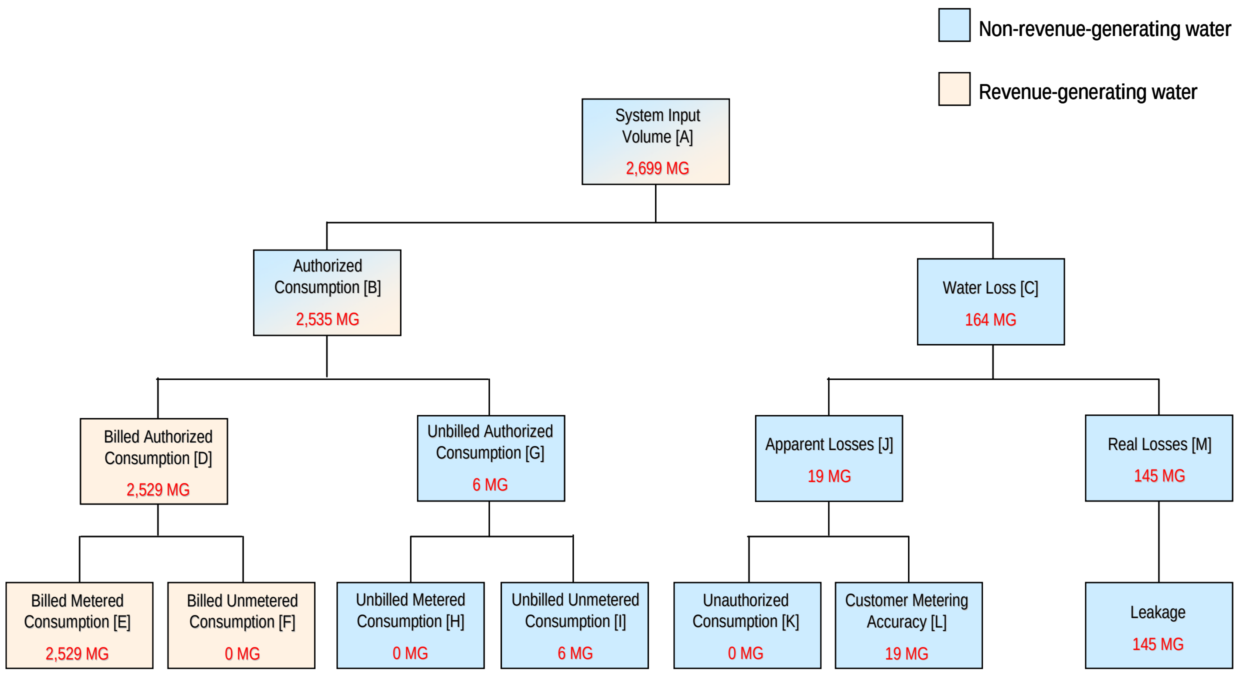


FIGURE C-4: SUMMARY OF 2004 WATER BALANCE

The following summarizes the findings from this analysis:

1. The 2004 TIRL for Waukesha is approximately 21 gallons per service connection per day. For the 34 communities surveyed throughout the world, TIRL varied from approximately 10 gallons per service connection per day to approximately 215 gallons per service connection per day, with an average of approximately 70 gallons per service connection per day; therefore, benchmarked against other communities, the TIRL for Waukesha is below average.

2. The 2004 ILI (ratio of TIRL to UARL) for Waukesha is approximately 1.3. For the 34 communities surveyed throughout the world, the ILI varied from approximately 1 to approximately 13, with an average of approximately 5; therefore, benchmarked against other communities, the ILI for Waukesha is very low.

3. It is recommended for good accounting practice that the Utility attempt to track and/or meter the current unmetered water usage such that the accuracy of the water balance can be improved.

REFERENCES

AWWA Water Loss Control Committee, *Applying Worldwide BMPs in Water Loss Control*, Journal AWWA, August 2003.

Flowmeters in Water Supply, AWWA Manual M33, Denver, Colorado, 1989.

Lambert, A., D. Huntington, and T.G. Brown, *Water Loss Management in North America: Just How Good Is It?,* Water Loss Control Manual, 2002.

Lambert, A. O., T.G. Brown, M. Tkizawa, and D. Weimers, *A Review of Performance Indicators for Real Losses from Water Supply Systems*, IWSA, J Water SRT - Aqua 48, 227-237, 1999.

Lambert, A., S. Myers, and S Trow, Managing Water Leakage, Economic and Technical Issues, Financial Times Energy, A Division of Financial Times Business Limited, London, England.

Losses from Water Supply Systems: Standard Terminology and Recommended Performance Measures, The Blue Pages, International Water Association, October 2000.

Thornton, Julian, *Water Loss Control Manual*, McGraw-Hill, 2002.

Various authors, UK Water Industry: Managing Leakage, Engineering and Operations Committee, October 1994.

Water Meters - Selection, Installation, Testing, and Maintenance, AWWA Manual M6, Denver, Colorado, 1999.

Appendix E
CEM Summary

Conservation Efficiency Measures Summary

Prepared for

City of Waukesha

Water Conservation Stakeholder Committee

December 2011

CH2MHILL®

135 South 84th Street
Suite 400
Milwaukee, WI 53214

Executive Summary

Successful water conservation programs across the country incorporate a combination of public information, incentives, and regulations to achieve efficient water use across their service area. Conservation efficiency measures (CEMs) are focused on operating a watertight water treatment and distribution system, public and school-age education, and a portfolio of measures to address water used by utility customers. To increase the effectiveness of water conservation programs, utilities generally select a small number of CEMs for implementation. CEMs for Waukesha Water Utility (WWU) will be selected with consideration given to regulatory requirements, budget and staffing constraints, detailed customer water use analysis, stakeholder/customer input, and prioritization by the Conservation Stakeholder Committee.

Required measures including a distribution system water use audit, leak detection and repair program, source management, and distribution system pressure management are part of WWU's current program and future conservation program and are, therefore, not included in the CEMs in this listing. Similarly, public information/ education and school education programs are not included in this listing, but will be included in the Conservation Plan Update. The CEMs included in this summary provide a broad selection of possible CEMs to be evaluated and prioritized for implementation over time. While many of CEMs identified in this summary may be implemented in the long term, it is anticipated that only the most effective measures will be implemented over the next 3 to 5 years.

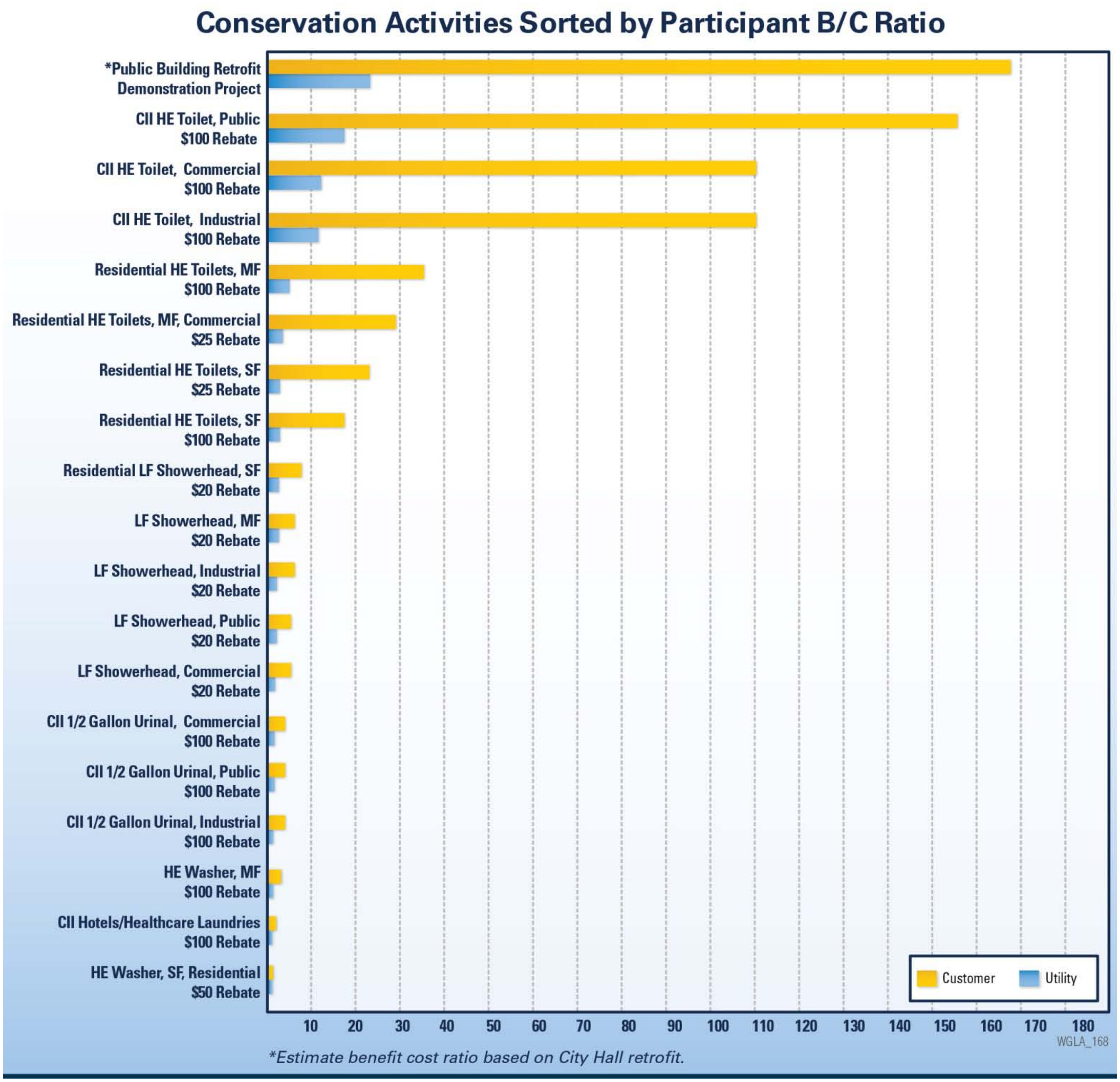
Technology and approaches to increase water efficiency are rapidly changing. The costs and savings estimates presented in this document represent data from a variety of sources including the Alliance for Water Efficiency (AWE), California Urban Water Conservation Council, the U.S. Environmental Protection Agency WaterSense Program, the American Water Works Association, and other sources. The estimates will be refined based on actual technologies selected for implementation.

In 2011, WWU analyzed a number of CEMs using the AWE tracking tool. Results from the tool include benefit-to-cost ratios as one way to prioritize measures for implementation. The benefit-to-cost ratio (B:C) for the City and its customers is presented in Exhibit 1. A conservation measure with a B:C greater than 1 is an improvement. Measures with a B:C less than one should be re-evaluated to consider changes to the program activity or to consider other non-economic benefits. For the package of CEMs evaluated, the overall B:C for the City is 4.0 and the B:C for City customers is 19.4. Exhibit 1 depicts the B:C of individual conservation activities. Not all of the CEMs summarized herein have been evaluated using the AWE tracking tool. Those measures prioritized through the planning process will be evaluated (or re-evaluated) using current information and more refined water use data.

The measures in this summary represent a menu of potential conservation measures for consideration and discussion by the City of Waukesha water conservation stakeholder committee as part of the 2012 update to the Water Conservation Plan. The description of the measures, estimated costs and savings, rebate amounts and other information should be considered draft. Measures recommended for inclusion in the plan update will be refined and further evaluated.

EXHIBIT 1

City of Waukesha Additional CEM Benefit-to-Cost Ratio Analysis Summary (2011)



Contents

Section **Page**

Exhibit

Acronyms and Abbreviations

AWE	Alliance for Water Efficiency
AWWA	American Water Works Association
B:C	benefit-to-cost ratio
CEM	conservation efficiency measure
CII	commercial, industrial, and institutional
DIR	demand-initiated regeneration
gpcd	gallons per capita per day
gpm	gallons per minute
HET	high-efficiency toilet
NAHB	National Association of Home Builders
O&M	operation and maintenance
USEPA	U.S. Environmental Protection Agency
WWU	Waukesha Water Utility

SECTION 1

Residential Demand Management: Potential Conservation Efficiency Measures

1.1 Residential Indoor CEMs

1.1.1 Water Use Surveys/Audits

Measure Description

Water use surveys, also called water audits, provide residents a way to understand how much water they use in and around their home and identify ways to save water. Surveys can be performed with online calculators, bill mail-outs, or distributed (or conducted) door-to-door surveys.

A survey will gather information about water-using fixtures inside the home such as toilets, showers, dishwashers, and washing machines, and water use outside the home for irrigation, swimming pools, hot tubs, and other water-using features. A field survey (or audit) will also provide a way to detect leaks, inefficient irrigation systems and identify other ways to save water. Potentially, audits can be performed by community members who have been trained to conduct audits. In some communities, utilities engage licensed plumbers or contracts to replace fixtures or repair minor leaks during a home water audit.

A survey can also factor in the number of residents and water-using habits to estimate the amount of water used for different purposes. The information can help residents target water-saving technologies or behaviors to reduce the amount of water they use. Additionally, a survey is a good way to teach residents how to read their meter to track water use as well as to look for leaks. The guidance can be provided through online or printed instructions, or during a field survey, and would be available for all single-family and multi-family homes served by WWU. The program would be designed to focus on providing onsite field surveys or audits to the top 10 percent of water users with an online survey or calculator or printed information available to all residential users.

Program Background, Projected Water Savings, and Costs

A water use survey or audit is primarily an education tool that fosters awareness of water-using fixtures and habits in homes. Costs include the development of the survey tool such as an online calculator or paper survey, distribution of the tool, and occasional updates. WWU currently provides information on water audits and links to conservation resources on its Web site.

Field or onsite audits, however, can lead to direct savings and can be designed to replace fixtures during the audit. Some water utilities partner with electrical providers to provide comprehensive energy and water audits at the same time. Providing field personnel or contractors to conduct the audits will increase the costs but would be expected to increase the water savings.

Potential Metrics for Evaluation during Implementation

If implemented, evaluation of the success of the implemented measure may include the following:

- Number of households participating in a water use survey/audit
- Actual savings for onsite audits using before and after tracking

1.1.2 High-efficiency Toilet Model Rebates and/or Distribution

Measure Description

The high-efficiency toilet (HET) model rebate and/or distribution conservation measure would encourage replacement of older toilets with HET models. The program provides for the limited distribution of HETs or rebates for those customers who replace old toilets with newer HET models. According to the U.S. Environmental Protection Agency (USEPA; 2011a), toilet flushing accounts for approximately 30 percent of indoor water use. The WaterSense partnership program, sponsored by USEPA, has developed a toilet certification program. The WaterSense label is used on toilets that are certified by independent laboratory testing to meet rigorous criteria for both performance and efficiency—for the models, WWU would develop a distribution program or provide rebates.

High-efficiency Toilet (HET)

The measure would affect all single- and multi-family homes served by WWU.

Program Background, Projected Water Savings, and Costs

HETs use about 20 percent less water per flush than low-flow toilets, and meet the 1.6 gallons per flush efficiency standard required of new toilets since 1992 (1.6 gallons per flush). The most common HET models use approximately 1.3 gallons per flush; however, some models use as little as 1.0 to 1.1 gallons per flush. Significant water savings can occur when pre-1992 toilets (typically 3.5 gallons per flush) are replaced with HET models. Based upon an average of 5 flushes per capita per day (American Water Works Association [AWWA] 1999), HET models would save 1.5 gallons per capita per day (gpcd) or 1,600 gallons per year for a household of 3 residents. HET models would save about 11 gpcd when compared with pre-1992 toilets (12,000 gallons per year for a household of 3 residents). It is estimated that up to 100 rebates would be issued each year.

HET model costs vary over a wide range, but the average price is approximately $200. For example, the Milwaukee Metropolitan Sewerage District recently announced distribution of 1.28 gallons per flush toilets that cost either $50 or $75 after a $100 rebate was applied. Under this proposed program, the WWU would offer a $100 rebate to homeowners replacing pre-1992 toilets. Based on preliminary cost estimates of purchasing HET models, a cost of $100 per toilet, to be borne by WWU, was assumed for this analysis, whether in the form of rebates or actual toilet distribution.

Potential Metrics for Evaluation during Implementation

If implemented, evaluation of the success of the implemented measure may include the following:

- Water savings
- Number of rebates provided/toilets distributed
- Program costs (program administration, public education, contractors, and consultants, etc.) as percent of overall cost of the measure
- Program savings
- Water and sewer costs reduced by customer
- Operation and maintenance (O&M) and/or capital costs avoided by WWU

1.1.3 High-efficiency Clothes Washer Rebates

Measure Description

The high-efficiency clothes washer rebate measure be managed similar to the toilet rebate program, but would provide a limited number of rebates for customers who replace older washing machine models with high-efficiency washing machines. The national average water use for clothes washing accounts for nearly 22 percent of water used inside residences, or approximately 15.0 gallons per person per day. The measure would affect all single-family and multi-family homes served by WWU. In many communities, water utilities and energy providers (natural gas or electricity) partner to issue rebates to their customers for both water and energy savings.

Program Background, Projected Water Savings, and Costs

A non-conserving washing machine uses approximately 40.9 gallons per load compared with an average of 24.3 gallons for high-efficiency models. (California Urban Water Conservation Council, 2011). A family of 4 could save an average of approximately 8,000 gallons per year. Additionally, they would reduce their wastewater discharges and energy consumption. High-efficiency washing machines often cost $200 or more than conventional washing machines. Rebates for similar programs vary, but for this analysis, it is anticipated that 5 to 20 rebates would be issued each year, with an assumed rebate amount of $50 for a single-family customer and $100 for multi-family customers with public use washing machines. The rebate is higher for the multi-family customer because more water is estimated to be saved each year when more than one family washes laundry with the same washing machine.

High-efficiency Washing Machine

Potential Metrics for Evaluation during Implementation

If implemented, evaluation of the success of the implemented measure may include the following:

- Water savings
- Number of rebates provided/toilets distributed
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- Operation and maintenance (O&M) and/or capital costs avoided by WWU

1.1.4 Water-efficient Showerheads

Measure Description

Modern (post-1992) low-flow showerheads use 2 gallons per minute (gpm) or less. Overall, homes with only water-efficient showerheads used an average of 21 gallons per day for showers compared to 35 gallons per day in homes with only non-low-flow showerheads.

WWU currently distributes shower timers and publicizes a water-conserving tip to limit length of showers to no more than 5 minutes. The water-efficient showerheads measure could be implemented in alternative ways. For instance, WWU could market the program and provide water-efficient showerheads to residents. Given the low cost of water-efficient showerheads (likely less than $5 per unit if purchased in bulk), WWU would more than likely provide free showerheads, rather than offer a rebate. Distribution would be most efficient in combination with public information efforts (such as during workshops or when conducting a water use audit) or during fixture retrofit programs. Another alternative is to offer a rebate in the $20 per showerhead range to encourage replacement of high-end showerheads that can range in cost from approximately $60 to $250 or more.

Program Background, Projected Savings, and Costs

Showering accounts for about 17 percent of indoor water use. Some older showerheads flow at up to 5.5 gpm as compared with the national efficiency standard for new showerheads, which requires a maximum flow rate of 2.5 gallons at a water pressure of 80 pounds per square inch. Showerheads with the WaterSense label have a maximum flow rate of 2.0 gpm. It is estimated that the average household could save 2,300 hundred gallons per year by replacing old showerheads with a WaterSense-certified showerhead. Residents would also save energy to heat water.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the number of showerheads distributed or households reached.

1.1.5 High-efficiency Water Heater Replacement

Measure Description

For this conservation measure, WWU would provide rebates to homeowners that replace traditional water heaters with high-efficiency water heating systems. In addition to saving water, replacing water heaters can also save energy used to heat and distribute the water. The high-efficiency water heater replacement measure may be a good program to implement in partnership with local power providers and Wisconsin Focus on Energy. Additional research is needed to determine which systems would be eligible for rebates based on both water and energy use.

Program Background, Projected Savings, and Costs

When an end user turns on a hot water faucet, heated water from a traditional water heater enters the in-house plumbing system, and the existing water in the lines is wasted down the drain. Installing a point of use pump can eliminate the waste as heated water moves to the faucet or shower. Some water providers throughout the country are providing rebates for such systems. Point-of-use pumps send cold water that would normally go down the drain back to the water heater through the cold water line. The pump recirculates the water until it reaches the desired temperature.

Another system, known as tankless water heaters, is placed close to the hot water place of use, such as in the kitchen or bathroom. Tankless water heaters can be electric or powered by natural gas. With a tankless water heater, the water is heated at the source rather than a remote water heater. Some systems save water but increase energy use.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure may include the following:

- Water savings
- Number of rebates provided
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

1.1.6 Leak and Minor Plumbing Repair Program

Measure Description

In this program, WWU would contract with plumbing service(s) to repair minor leaks and replace high-water-using toilets, faucet aerators, and showerheads for eligible customers, such as low-income families and seniors.

Program Background, Projected Savings, and Costs

Similar programs have been conducted in cities such as San Antonio (Plumbers to People) and Dallas (Minor Plumbing Repair Program) where they have been very successful in reducing water waste cost-effectively.

Eligibility for the program would be determined in cooperation with other agencies (for instance, the Waukesha County Health and Human Services Department).

According to the U.S. Census Bureau, approximately 5 percent of the population within the City of Waukesha is over the age of 65, and approximately 8.8 percent is living below the poverty level. Further analysis would be required to determine the potential customers and potential savings that could be achieved with a similar program in the WWU service area.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure may include the following:

- Water savings
- Number of rebates provided
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

1.1.7 Water Softener Replacement

Measure Description

The conservation program would provide a rebate for residents replacing water softeners with models that meet USEPA WaterSense standards. Because specifications are being developed by USEPA, WWU will consider more specific program guidelines after the new standards are finalized and products are available in the area.

Program Background, Projected Savings, and Costs

Some models of water softeners recharge using a time clock, recharging whether it is necessary or not, such as while a resident is away on vacation. Some providers offer rebates to replace timer-based water softeners (owned or leased) with a new demand-initiated regeneration (DIR) water softener. Modern units have a water meter or hardness sensor to control regeneration. Thus, soft water is produced only as it is needed, and regeneration is typically more infrequent than clock-controlled regeneration.

According to USEPA, some water softeners use up to 25 gallons per day to flush the system of magnesium and calcium. Such flushing can use up to 10,000 gallons per year. During 2011, USEPA published a Notice of Intent to develop specifications for water-efficient water softeners. It is expected that new standards will be published within the next few years.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure may include the following:

- Water savings
- Number of rebates provided
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

1.2 Residential Outdoor CEMs

1.2.1 Irrigation Audits

Measure Description

Detecting leaks and establishing proper sprinkler and irrigation timer settings can save a substantial amount of water for large irrigation users.

This measure would focus on residential customers with substantial landscaping areas and those in the top 10 percent of residential water users. Trained staff or contracted irrigation professionals would assess the efficiency of the existing irrigation system and make recommendations to reduce outdoor water use. Additionally, the program would include workshops for landscape designers, irrigation professionals, and landscape maintenance teams to provide information on proper design, installation, and maintenance.

Program Background, Projected Water Savings, and Costs

Irrigation landscapes are often labor-intensive, partly due to a larger number of zones used in the landscape. A Best Management Practice guide prepared by the Texas Water Development Board offers guidelines for surveys. Additional analysis is required to estimate the savings potential for the WWU service area. Audits of large landscapes may require ½ to 1 day of labor for the field audit and report development. Costs are estimated at approximately $240 for labor and an estimated $50 of other costs. If the recommendations are implemented, savings are assumed to last at least 5 years. However, conduct of an audit is voluntary, as is implementation of the recommendations. Therefore, the savings are not certain, and such programs are often considered as part of the public education and outreach program. It is likely that additional personnel or contractors) with a certified irrigation professional would be required.

Applicable Metrics for Evaluation

Actual savings are difficult to predict because audits are often accompanied by irrigation system replacement or changes to overall irrigation system. If implemented, evaluation of the success of the implemented measure could be measured by the following:

- Number of audits performed
- Number of suggestions implemented upon follow-up and associated estimated savings
- Number of auditors trained by WWU
- Size (square feet) of irrigated landscapes audited

1.2.2 Rain Gauge or Sensor

Rain Sensor

Measure Description

Outdoor water use is estimated to account for approximately 31 percent of water consumed by the average WWU residential account and about 44 percent for the top 1 percent of residential customers. Rain sensor or soil moisture sensor devices automatically shut off automatic sprinkler systems during and after rain showers and allow the systems to go back to normal cycle when the sensor dries out. Residents or businesses that use drinking water for an irrigation system and do not have a working rain/freeze sensor would be eligible for this program.

WWU would combine this measure with residential and commercial, industrial, and institutional (CII) irrigation audits or water use surveys; thus, the estimated cost of this measure would only include the cost of the sensors. WWU would provide the rain/freeze sensors to the customers for delivery during or after the audits.

Program Background, Projected Savings, and Costs

Rain/freeze sensors cost approximately $20 and are easy to install, so installation would not be included in the rebate or distribution program.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the measure could be based on the number of sensors distributed.

1.2.3 Irrigation Technology Rebate

Measure Description

The measure would be designed to allow a variety of irrigation technologies to be considered for a rebate. It could be broadly defined to require minimum savings and demonstrated actual water use reduction over time, as compared to other rebates that are developed for installation of specific technologies. The program would focus on the top 10 percent of residential users who use as much as 4.5 times the average single-family residential customer in the service area. WWU could also combine irrigation audits that assess watering behaviors as well as the irrigation technology.

Program Background, Projected Savings, and Costs

Irrigation technology continues to evolve, and irrigation-related companies will continue to offer equipment that enables irrigation systems to use less water. For example, the latest conservation-related innovation includes multi-stream rotating nozzles. This type of sprinkler is a multi-stream rotor the size of a spray nozzle. It fits any conventional spray head body or shrub adapter, and offers high uniformity and low application rates. Additional analysis is required to evaluate potential savings and costs for a program to provide rebates for water-saving irrigation technology. Any such program should also include a focus on education because outdoor water use for irrigation is significantly affected by behavior. For example, in some applications, installation of weather-based irrigation controllers has resulted in increased water use. It is likely that additional field personnel would be required to evaluate the technology as well as to conduct the associated audits and inspections.

Applicable Metrics for Evaluation

- Water savings
- Number of rebates provided
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

1.2.4 Landscape/Turf Replacement Program

Measure Description

The landscape/turf replacement measure would provide a limited number of rebates each year for residential customers that replace a minimum of 1,500 square feet of turf with native or well-adapted low-water-using plants or hardscapes such as permeable garden paths. The customer would be required to submit a landscape conversion plan as part of the eligibility process. The rebated amount would be allocated over a 5-year period as water savings are demonstrated.

Program Background, Projected Savings, and Costs

Choosing plants that are well adapted to the soil and climate conditions of your yard is most water efficient. Native plants maintain the look and feel of the local landscape and can provide habitat for birds, butterflies, and other wildlife. Well-adapted plants are generally easy to maintain and less likely to be stressed during times of low rainfall or extreme freeze. Landscape practices such as adding soil amendments and zoned irrigation and incorporating hardscapes such as paths and patios can also reduce the need for supplemental irrigation and fertilizers. Such practices can reduce the volume of offsite runoff and enhance stormwater quality.

Estimating water savings from such practices can be difficult because residents may continue to irrigate more frequently or use greater volumes of water than the landscape actually needs. Additionally, such landscape retrofits are often coupled with irrigation system upgrades, making it difficult to determine what savings are due to use of more efficient technology and what savings result from the change in landscape management practices. Furthermore, given the relatively low outdoor use and the relatively high rainfall in the area, it is unclear that landscape or turf replacement would result in significant savings in the WWU service area. This program will take additional time to evaluate and will likely require additional personnel to evaluate the proposed landscape plans and conduct field inspections.

Applicable Metrics for Evaluation

- Water savings
- Number of rebates provided/ square feet of landscapes replaced.
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

SECTION 2

Commercial, Industrial, and Institutional Demand Management: Potential Conservation Efficiency Measures

Descriptions of CEM for CII customers are presented as individual measures because a single measure could be implemented for several customer categories. It is anticipated that final program design would bundle several measures for specific categories of customers to use staff and funding resources more effectively. For example, a school makeover program may include showerhead and toilet replacement, kitchen appliance retrofits, and irrigation system upgrades for ball fields. Implementation could be phased to completely retrofit a limited number of schools each year or, alternatively, to retrofit a specific water use for a larger number of schools each year. For example, the first phase could include an irrigation system upgrade program to reduce season peak demands, which currently average about 42 percent for public facilities.

CII programs would likely be implemented to target the highest water-using categories with the greatest opportunity for water savings. Potential CII program participants include the following:

- Schools, public facilities, and parks
- Hospitals and health care facilities
- Industrial users
- Restaurants
- Hotels
- Laundromats
- Carwashes
- County correctional facilities (jail)
- Light commercial (offices and retail)

2.1 Commercial, Industrial, and Institutional Indoor CEMs—General

2.1.1 Water Use Surveys/Audits

Measure Description

The first step in an effective onsite conservation program is determining a baseline of how much water is used for what purposes in a particular business. Building on its existing online information regarding CII water use audits, WWU would expand its resource library for CII customers and provide audits upon request for commercial facilities. The audits will identify leaks that could be fixed, as well as fixtures and appliances that could be replaced, to save water. Potentially, WWU could establish a performance-based contract with a vendor to conduct audits.

Evaluation of some processes may require an industrial engineer to assess the potential for water savings with process or equipment changes. The more complicated audits may also require several days to complete, depending on the size of the facility. WWU will work with local industries to develop an appropriate program for the audits.

Program Background, Projected Savings, and Costs

Savings associated with audits are difficult to quantify given the range of CII customers in the service area. Often they are considered as part of the public education program.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure may include the following:

- Number of CII customers requesting and/or using information from the WWU resource library
- Number of audits performed
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost

High-efficiency Urinal

2.1.2 Pint or Half-gallon Urinal Rebates or Distribution

Measure Description

A high-efficiency urinal uses no more than 0.25 gallon per flush (1.9 liters per flush). The amount is a reduction from the current standard of 1.0 gallon per flush (3.8 liters per flush) as required by the Energy Policy Act of 1992. Before 1994, urinals used between 1.5 and 3.0 gallons per flush. The program would provide a rebate estimated at $100 for non-residential customers that replace both a urinal using at least 1.5 gallons per flush and the flush valve with a urinal using 0.5 gallon per flush or less.

Program Background, Projected Savings, and Costs

The WaterSense partnership program, sponsored by USEPA, has developed a water efficient flushing urinal specification and has developed a certification program for those urinals that meet rigorous criteria for both performance and efficiency. They estimate that for every 1.5-gallon urinal that is replaced with a WaterSense urinal, 4,600 hundred gallons per year would be saved (USEPA 2011b).

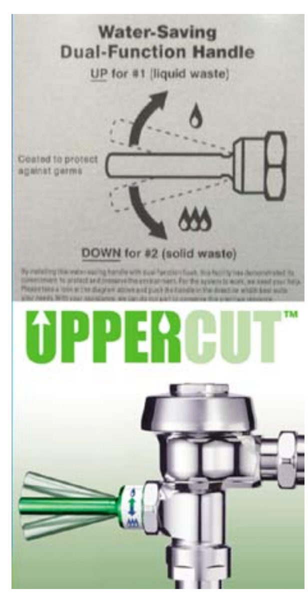
The average cost of a WaterSense urinal is $350 and the average cost of the flushing device is $250. This cost is approximately the same cost as for a 1.5-gallon per flush urinal.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure may include the following:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

HET Handle Design



2.1.3 HET Model Rebates and/or Distribution

Measure Description

High-efficiency toilets use an average volume of 1.3 gallons per flush (Toolbase Services Web site, National Association of Home Builders [NAHB] 2008), which is about 20 percent less water than the efficiency standard that has been required of new toilets since 1992 (1.6 gallons per flush) and about 63 percent less than the average volume per flush (3.5 gallons) used by pre-1992 toilets (AWWA 1999). Based on an average of 5 flushes per capita per day (AWWA 1999), HET models would save 1.5 gpcd (1,600 gallons per year) for a household of 3 residents). HET models save about 11 gpcd when compared with pre-1992 toilets (12,000 gallons per year for a household of 3 residents). Water savings in commercial or institutional facilities would likely be higher.

The measure would be available for all non-residential customers served by WWU; however, HET models may be best suited for light commercial applications, rather than high-volume or heavy-use conditions.

Program Background, Projected Savings, and Costs

The WaterSense partnership program, sponsored by USEPA, has developed a toilet certification program. The WaterSense label is used on toilets that are certified by independent laboratory testing to meet rigorous criteria for performance and efficiency. For such models, WWU would develop a distribution program or provide rebates.

Toilet costs vary over a wide range based on style, but the average cost is approximately $200. Under the proposed program, WWU would offer a $100 rebate to CII customers replacing pre-1992 toilets.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure may include the following:

- Water savings
- Number of rebates provided/toilets distributed
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.1.4 High-efficiency Showerheads

Measure Description

Shower heads with the WaterSense label use 2 gpm or less. For this conservation measure, WWU would provide, distribute, or install high-efficiency showerheads as part of the water use makeover for CII clients with shower facilities such as hotels, schools, and hospitals. Commercial grade showerheads can be more costly than residential showerheads and water-savings per showerhead are often higher for the CII customer. WWU would offer a $20 per showerhead rebate or pay a similar amount for installation if part of retrofit distribution or installation program.

Program Background, Projected Savings, and Costs

Some older showerheads flow at up to 5.5 gpm as compared with the national efficiency standard for new showerheads, which requires a maximum flow rate of 2.5 gpm at a water pressure of 80 pounds per square inch. Showerheads with the WaterSense label have a maximum flow rate of 2.0 gpm. CII customers would also save energy to heat water.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall cost
- Program savings

- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.1.5 High-efficiency Clothes Washer Rebates

Measure Description

This measure be managed similar to the toilet rebate program, but would provide a limited number of rebates for CII customers who replace older washing machine models with high-efficiency washing machines having the Energy Star label. This measure would focus on laundromats, hotels, hospitals, or other customers with resident populations. In many communities, water utilities and energy providers (natural gas or electricity) partner to issue rebates to their customers for water and energy savings.

Program Background, Projected Water Savings, and Costs

A non-conserving washing machine uses approximately 40.9 gallons per load compared with an average of 24.3 gallons for high-efficiency models. (California Urban Water Conservation Council 2011). High-efficiency washing machines often cost $200 or more than convention washing machines. The rebate for washing machine replacement is estimated at $100 per washing machine.

Potential Metrics for Evaluation during Implementation

If implemented, evaluation of the success of the implemented measure may include the following:

- Water savings
- Number of rebates provided/toilets distributed
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU
- Net program cost-effectiveness

2.1.6 High-efficiency Water Heater Rebates

Measure Description

For this conservation measure, WWU would provide rebates to CII customers that replace traditional water heaters with high-efficiency water heating systems. In addition to saving water, replacing water heaters can also save energy used to heat and distribute the water. The measure may be a good program to implement in partnership with local power providers and Wisconsin Focus on Energy.

Program Background, Projected Savings, and Costs

When an end user turns on a hot water faucet, heated water from a traditional water heater enters the facility's plumbing system, and the existing water in the lines is wasted down the drain. Installing a point-of-use pump can eliminate the waste as heated water moves to the faucet or shower. Some water providers throughout the country are providing rebates for such systems. Point–of-use pumps send cold water that would normally go down the drain back to the water heater through the cold water line. The pump recirculates the water until it reaches the desired temperature.

Another system, known as tankless water heaters are placed close to the hot water place of use, such as in the kitchen or bathroom. Units can be electric or heated by natural gas. With a tankless water heater, the water is heated at the source rather than a remote water heater. Some systems save water but increase energy use.

Water savings will depend on the travel distance and pipe capacity from the water heater to the point of use and will vary among facilities. Additional research is needed to determine which systems would be eligible for rebates based on both water and energy use.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure may include:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.2 Commercial, Industrial, and Institutional Indoor CEMs—Kitchen Water Use

2.2.1 Commercial Dishwashing Rebates

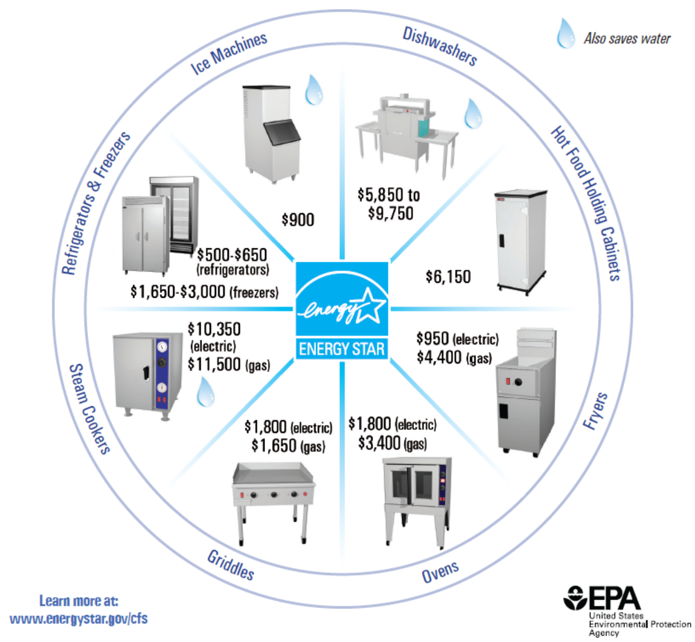
Measure Description

This measure would be available to CII customers, but would focus on restaurants, schools, hospitals, and other facilities with resident populations. Models eligible for rebate would include those that are both water-saving and with a high Energy Star rating. A list of qualifying models would be provided to those applying for rebates.

Program Background, Projected Water Savings, and Costs

Newer water- and energy-efficient commercial dishwashing equipment can save varying amounts of water depending on the type of unit as well as usage practices. The Food Service Technology Center has conducted research comparing models. Some models eliminate the need for pre-rinse stations and may achieve considerable savings. Reduced water use will have a significant effect on energy use for heating water for sanitizing dishes in commercial kitchen. Savings will vary for CII customers depending on frequency and volume of meal preparation and service and equipment currently in use. Additional onsite evaluations will be required to estimate overall savings potential for the measure.

Energy Star Appliances and Rebates



Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.2.2 Pre-rinse Spray Valve Replacement

Measure Description

A spray-rinse valve is a device used in commercial facilities to remove food from dishes prior to cleaning in a dishwasher. Older devices frequently provide a continuous water flow rather than having a squeeze level to control the flow of water.

Pre-rinse spray valve replacements can save water at restaurants, schools, hospitals and other facilities

This measure would include a rebate for the purchase and installation of a more efficient pre-rinse spray valve used by restaurants, schools, hospitals, or other non-residential customers with kitchen facilities. The efficient valves use a knife-edge spray rather than a shower-type spray to better focus the available energy and remove food particles more efficiently.

Program Background, Projected Water Savings, and Costs

A standard pre-rinse spray valve uses 2 to 6 gallons of water per minute; low-flow sprayers use 1.6 or less gallons of water per minute. The Food Service Technology Center estimates that certified pre-rinse spray models can save approximately 60 gallons of water (and wastewater) for every hour used. USEPA’s Energy Star program has developed certification requirements of pre-rinse spray valves; specifications are currently being developed under the WaterSense program.

High-efficiency sprayers cost approximately $60 each when bought in bulk.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.2.3 Ice Machine Replacement

Measure Description

Air-cooled Ice Machine

This measure would include an incentive for the purchase and installation of an air-cooled ice machine to replace a water-cooled unit and be available for restaurants, schools, hospitals, hotels, or other non-residential customers with kitchen facilities. Typically, more water is used in water-cooled ice makers to cool the system than to make the ice itself. Commercial ice machines typically use 15 to 25 gallons of water to produce 100 pounds of ice flakes or cubes, depending on the quality of the ice. Older water-cooled ice machines use as much as 90 gallons to produce the same quantity of ice. These quantities do not include the water used to cool the machine. It takes 130 to 180 gallons of cooling water per 100 pounds of ice in a typical water-cooled ice machine. Assuming a water-cooled machine using 150 gallons per 100 pounds of ice and produces 400 pounds per day, the water use for a year, in cooling water alone, would be 219,000 gallons. By installing an air-cooled ice machine, the annual water savings would be 219,000 gallons.

Program Background, Projected Water Savings, and Costs

In some communities, such as the City of Austin, water-cooled ice machines are banned. For a short period of time, the City offered rebates for replacing old water-cooled ice machines purchased after January 1, 2001. A rebate equal to 50 cents per pound of rated capacity for the old unit, up to a maximum of $500, was offered. Denver Water offers $450 per machine, and the City of Santa Fe offers a $400 rebate.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Pounds of rated capacity replaced
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.3 Commercial, Industrial, and Institutional Indoor CEMs—Industrial or Customer-specific Water Use

2.3.1 Cooling Towers Audits

Measure Description

A cooling tower audit is an onsite evaluation of cooling towers and cooling water systems. A team of experts evaluate the general condition of the cooling tower, the cooling water system, and the water treatment program. The intent of the audit is to find more efficient ways to use water for cooling. The audit team would document recommended actions based on their findings. Audits can be conducted by plant staff, grounds keepers, or through a contract managed by WWU.

Program Background, Projected Water Savings, and Costs

Cooling towers are heat removal devices used to transfer process waste heat to the atmosphere. Cooling towers may either use the evaporation of water to remove process heat and cool the working fluid or rely solely on air to cool the working fluid. Common applications include cooling the circulating water used in industrial processes and building cooling. Sometimes, water is used in once-through cooling and then discharged into the wastewater system. Increasing the number of times water runs through the cooling tower (that is, increasing the cycles of concentration) can result in significant water savings that more than offset the potentially increased cost of water treatment. CII customers would also reduce discharges into the wastewater system and lower wastewater charges.

Savings will vary from customer to customer and are difficult to estimate with accuracy. Often, audits are considered educational processes that increase awareness of water efficiency practices extending beyond just the cooling towers being audited.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Number of (or percent of eligible) CII establishments audited
- Water savings, if recommendations implemented
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.3.2 Commercial and Industrial Customer Conservation Retrofit/Rebate

Measure Description

CII customers' type and volume of water use within the WWU service area vary greatly. Similarly the water-using equipment varies for different industrial customers. Several industrial users have already installed water-saving equipment or modified their processes to achieve water savings with considerable savings on their water and wastewater bill. This program would provide a standard rebate amount based on annual savings resulting from permanent structural or technology changes to reduce water use for large industrial users or other specific customer categories such as hospitals, dentist offices or other facilities with specialized equipment or processes. The program would require customers to prepare an engineering report estimating savings from the proposed changes. The rebate would be based on actual savings and paid out over a 5- to 10-year period as water savings are demonstrated.

Program Background, Projected Water Savings, and Costs

Additional analysis is required to estimate expected savings from this measure; however, the top 10 percent of commercial customers use approximately 84 percent of the water used by industrial customers within the WWU service area. This indicates volume of water used only and not water-use efficiency. That is, a high volume user may be very efficient in how the water is used. Nonetheless, a focused effort on the top industrial users could complement the water-saving measures that industrial users are already implementing.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.3.3 Vehicle Washing/Carwashes

Measure Description

This measure would offer rebates for commercial carwashes that install water-saving technologies.

Program Background, Projected Water Savings, and Costs

Homeowners washing their vehicle at home may use as much as 140 gallons per wash compared with commercial carwashes that can use approximately 40 gallons per wash (About.com 2011). Soaps and detergents used in vehicle washing also typically runoff properties into the stormwater system, thus potentially affecting water quality in streams and rivers. Commercial car washes can implement numerous practices to use water more efficiently, and are required to capture wash and rinse water and discharge into the wastewater collection system.

Examples of possible water-saving technology and processes include regular replacement of wash nozzles as necessary to avoid leaks. Additional water savings can be achieved by installing weep management systems, either weep recovery or intermittent weep systems, to control bleed-off from nozzles during freezing weather. Other possibilities include installing a water reclamation system and replacing plastic or brass nozzles with stainless steel nozzles. WWU could provide rebates for carwash equipment that has demonstrated water savings.

Water savings, as well as implement costs, vary with the type of equipment replaced. More research is needed to develop a rebate program tied to specific technologies; however, incentives could be provided under a general incentive program for commercial customers similar to the Industrial Customer Conservation Retrofit program described in Section 2.2.5.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.3.4 Public Building Facilities Retrofit

Measure Description

This program would allocate funding for the installation of replacement fixtures and water-saving equipment in public buildings, similar to the plumbing fixture and cooling equipment retrofit at City Hall.

Program Background, Projected Water Savings, and Costs

Public buildings within the City vary with respect to type and volume of water use. When public buildings, such as schools, administrative offices, libraries, etc., install water-saving fixtures and equipment, water savings and cost savings are shared by City citizens. This program would include survey of public buildings to identify potential retrofit demonstration projects. The program would also include collaborative funding for estimating water savings, planning, and implementing improvements and auditing results.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.4 Commercial, Industrial, and Institutional Outdoor CEMs

Seasonal water use for commercial and industrial customers averages about 22 percent of total water use, which suggests that outdoor CEMs may not provide the greatest water savings for the majority of CII customers. However, for public customers, such as parks and schools, seasonal water use represents about 45 percent of total water use, which indicates that outdoor water use measures may be more effective.

2.4.1 Landscape Survey/Audit: Large Irrigation Areas

Measure Description

Detecting leaks and establishing proper sprinkler and irrigation timer settings can save a substantial amount of water for large irrigation users.

This measure would affect CII customers with substantial landscaping (such as schools, parks, golf courses, and commercial developments with summer monthly use of at least 25,000 gallons more than winter monthly use). Trained staff or contracted irrigation professionals would assess the efficiency of the existing irrigation system and make recommendations to reduce outdoor water use.

Program Background, Projected Water Savings, and Costs

CII irrigation landscapes are often labor intensive, partly due to a larger number of zones used in the landscape, often over 30. It is not uncommon for these users to use up to 100,000 gallons per month for their landscape needs. A best management practice guide prepared by the Texas Water Development Board offers guidelines for audits. The audits require 2 days of labor and an estimated $50 of other costs, for a total cost of $530 per audit. If the recommendations are implemented, savings are assumed to last at least 5 years. However, conduct of an audit is voluntary as is implementation of the recommendations. Therefore, the savings are not certain and such programs are often considered as part of the public education and outreach program.

Applicable Metrics for Evaluation

Actual savings are difficult to predict because audits are often accompanied by irrigation system replacement or changes to overall landscape design. If implemented, evaluation of the success of the implemented measure could be measured by the following:

- Number of audits performed
- Number of suggestions implemented upon follow-up and associated estimated savings
- Number of auditors trained by WWU
- Size (square feet) of irrigated landscapes audited

2.4.2 Irrigation Technology

Measure Description

The irrigation technology measure would be designed to allow a variety of irrigation technologies to be considered for a rebate. It could be broadly defined to require minimum savings and demonstrated actual water use reduction over time as compared to other rebates that are developed for installation of specific technologies.

The program would focus on CII customers with the highest seasonal outdoor water usage. For example, for some CII accounts up to 44 percent of their water use seasonally and may be used for irrigation. WWU could also combine irrigation audits that assess watering behaviors with the irrigation technology.

Program Background, Projected Savings, and Costs

Irrigation technology continues to evolve, and irrigation-related companies will continue to offer equipment that enables irrigation systems to use less water. For example, the latest conservation-related innovation includes multistream rotating nozzles, which are a type of sprinkler with a multistream rotor the size of a spray nozzle. The nozzle fits any conventional spray head body or shrub adapter and offers high uniformity and low application rates. Similar to the weather-based irrigation controller, additional analysis is required to evaluate savings and costs to develop a program to provide rebates for water-saving irrigation technology. It is likely that additional field personnel would be required to evaluate the technology as well as to conduct the audits and inspections.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.4.3 Landscape/Turf Replacement Program

Measure Description

This measure would provide a limited number of rebates each year for CII customers that replace a minimum amount of square feet of turf with native or well-adapted low water-using plants or hardscapes, such as permeable garden paths. The customer would be required to submit a landscape conversion plan as part of the eligibility process. The rebated amount would be allocated over a 5-year period as water savings are demonstrated.

Program Background, Projected Savings, and Costs

Choosing plants that are well adapted to the soil and climate conditions is most water efficient. Native plants maintain the look and feel of the local landscape and can provide habitat for birds, butterflies, and other wildlife. Well-adapted plants are generally easy to maintain and less likely to be stressed during times of low rainfall or extreme freeze. Landscape practices such as adding soil amendments or zoned irrigation and incorporating hardscapes, such as paths and patios can also reduce the need for supplemental irrigation and fertilizers. Such practices can reduce the volume of offsite runoff and enhance stormwater quality.

Estimating water savings from such practices can be difficult because customers may continue to irrigate more frequently, or use greater volumes of water than the landscape actually needs. Further, such landscape retrofits are often coupled with irrigation system upgrades, making it difficult to determine which savings are due to use of more efficient technology and which savings result from the change in landscape management practices. Given the relatively low outdoor use and the relatively high rainfall in the area, it is unclear that landscape or turf replacement would result in significant savings in the WWU service area. The program will take additional time to evaluate and will likely require additional personnel to evaluate the proposed landscape plans and conduct field inspections.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Number of rebates provided/ square feet of landscapes replaced
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.4.4 Rainwater Capture/Condensate Reuse Incentive

Measure Description

During the summer months when landscape irrigation is at its peak, production of condensate from air conditioning units is also at its peak. This measure would provide a rebate for CII customers to capture condensate and reuse it for non-potable purposes such as landscape irrigation. The steady stream of condensate during the summer months can supplement onsite rainwater capture to provide a reliable source for irrigation water. It is possible that expected water and wastewater savings would be sufficient to cover the costs of a condensate reuse system.

Program Background, Projected Water Savings, and Costs

Water savings and costs to capture and reuse rainwater and condensate will vary case-by-case. Consideration for the potential for increased energy consumption to pump water to the irrigation system would be a factor as to the effectiveness for this measure on a particular property. It is likely that additional staff would be required to develop standards to prevent cross-connections with the potable system, evaluate the potential savings, and inspect the installation of such systems. Additional time to research this program is needed prior to implementation.

Applicable Metrics for Evaluation

If implemented, evaluation of the success of the implemented measure could be based on the following:

- Water savings
- Number of rebates provided
- Number of (or percent of eligible) CII establishments participating
- Program costs (program administration, public education, contractors, and consultants, etc.) as a percentage of overall measure cost
- Program savings
- Water and sewer costs reduced by customer; energy savings
- O&M and/or capital costs avoided by WWU

2.4.5 Water Recycling (Reuse)

Measure Description

This measure would involve a longer-term exploration of the potential and costs for onsite reuse or wastewater effluent reuse within WWU’s service area. As water use efficiency improves, the opportunities, water savings, and costs associated with water recycling will change. Investigation into state regulations, plumbing codes, and other regulatory constraints are required to determine the feasibility of additional water recycling within the service area.

Program Background, Projected Water Savings, and Costs

Water recycling (or wastewater reuse) is the beneficial use of wastewater from a treatment plant or after another use. Wastewater effluent is domestic or municipal wastewater that has been treated to a quality suitable for a particular beneficial use. Potential beneficial uses of recycled water include golf course, athletic field, or park irrigation, industrial cooling and process water, and other non-potable uses. Some communities in arid or severely water-limited areas provide additional treatment and include this source for potable use as well.

Recycled water use can be achieved onsite in some industrial or public applications, or distributed throughout a utility's service area through a separate system of pipes and pump stations. When the wastewater treatment facilities are located near potential users, this can be efficient; however, if getting the recycled water to the end user requires an extensive piping system, this process can be expensive as well as energy-intensive.

WWU has evaluated the feasibility of water reuse in the operation of its water supply, treatment, and distribution facilities. There are negligible opportunities for water reuse for the following reasons:

- Plumbing fixtures in the WWU Administration Building have been retrofitted with high-efficiency units
- Landscaped areas are not irrigated
- Water used in water treatment processes cannot be recycled because of high radium concentrations

SECTION 3

Policies, Service Rule Provisions, Ordinances, and Building Codes

In addition to customer incentives and public education and information, policies or regulations are elements of a comprehensive water conservation program. The policies presented here are options for WWU to consider, and could be incorporated into WWU's service rules, or adopted into the City code through ordinances. Costs for implementation and enforcement would likely be low. The potential for water savings has not yet been determined for the policy options presented; however, savings can be evaluated for policies that achieve a favorable ranking.

3.1 Leak Inspection and Repair prior to Property Resale or Lease

3.1.1 Measure Description

This utility service rule or ordinance would provide that property would be inspected for existing and potential indoor and outdoor leaks prior to signing of property resale or lease agreements. Generally, the policy would include the following provisions:

- Leak inspection will include all indoor and outdoor water-using fixtures, appliances, equipment, irrigation systems (such as pipes and sprinkler heads), and plumbing connections as well as the water service line to the property.
- All existing leaks will be repaired, with proof of such repairs (for instance, paid plumber's invoice) documented as a condition of property sale or lease.
- Potential leaks, such as heavily worn but not broken clothes washer hoses or rusting pipe connections, will also be documented and presented to the new property owner(s) or lessee(s), but will not be required for preemptive repair.
- Public properties, including buildings and outdoor facilities such as public parks and playing fields, will be subject to the same leak inspection and repair requirements described above at least once every 3 years.

3.2 Fixture and Equipment Retrofit or Replacement upon Property Resale or Lease

3.2.1 Measure Description

This utility service rule or ordinance would require that properties with existing plumbing fixtures that have flush or flow rates that exceed the Wisconsin Administrative Code, Chapter Comm 84: Plumbing Products, and would replace those fixtures with models that comply with the more water-efficient requirements set forth in the State Code as a condition of property resale or lease of the property. Generally, the policy would include the following provisions:

- Property owners with noncompliant fixtures are encouraged, but not required,[1] to install new high-efficiency WaterSense-labeled toilets, showerheads, urinals, and bathroom faucets as appropriate. Property owners that install WaterSense-labeled fixtures at resale or lease may be eligible for rebates.
- High-volume pre-rinse spray valves (exceeding 1.6 gpm) will be replaced at property transfer or lease.

[1] The Waukesha Municipal Code incorporates by reference the State of Wisconsin Plumbing Code. The state plumbing code can disallow local authorities from creating rules that supersede or conflict with the state's code. Thus, in some cases, local plumbing code or ordinances may require state approval.

- Properties with once-through cooling systems, water-cooled ice makers, and other water-using fixtures that are inefficient, will be identified prior to property transfer or lease to determine their eligibility for replacement under existing rebate, loan, grant, or other financial assistance program.
- Public properties, including buildings and outdoor facilities such as public parks and playing fields, will be subject to the same fixture inspection and retrofit and replacement (if necessary) requirements described above at least once every 3 years.

3.3 Year-round Lawn and Landscape Sprinkling Schedule

3.3.1 Measure Description

This utility service rule or ordinance would change the existing sprinkling ordinance to reduce sprinkling to 1 day per week and limit time of day watering. Such a policy could include that the following elements:

- Automatic sprinkling systems may be operated for no longer than a prescribed duration (that is, 45 minutes) 1 day per week throughout the year.
- Handheld hoses used for lawn watering may apply water for no longer than a prescribed duration (that is, 30 minutes) 1 day per week.
- Allowable irrigation day may be set by address. For instance, residential odd number addresses may water on Saturdays, residential even number addresses may water on Sundays, nonresidential odd number addresses may water on Tuesdays, and nonresidential even number addresses may water on Thursdays. (Alternative schedule: watering is allowed on the same day as trash collection.)
- No outdoor irrigation is allowed when it is raining.
- Handheld hoses used for lawn and landscape irrigation, vehicle washing, and other tasks must be equipped with an automatic shutoff nozzle.
- Temporary exemptions granted by application and permit may be allowed for newly planted grass, sod, and other plant materials not to exceed 30 days.

  Ordinance example:

  Franklin, Massachusetts, Water Usage Restrictions,
  http://town.franklin.ma.us/Pages/FranklinMA_ATM/FranklinMA_PDQhousing/125

3.4 Decorative Water Features

3.4.1 Measure Description

This utility service rule or ordinance would establish design standards and water use limitations for outdoor decorative water features. Elements of such a policy could include the following provisions:

- All fountains, ponds, waterfalls, or other decorative water features, excluding swimming pools or spas, will have a maximum total cumulative exposed water surface area of 20 square feet.
- Allowed water features will use a water recirculation system (no once-through systems).
- All water sprayed from the water feature must remain within the water feature and will not spray or run off onto surrounding landscape or hardscape areas.
- Outdoor decorative water features may be operated for no longer than 8 hours per day and not between the hours of 12:00 a.m. and 6:00 a.m.

- Swimming pools and spas would be required to have covers to reduce evaporative losses.

  Ordinance example:

  City of Santa Monica, California, Water-Efficient Landscape and Irrigation Standards, http://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Landscape/SKMBT_C65211041317010.pdf

3.5 Annual Irrigation Inspection

3.5.1 Measure Description

This utility service rule or ordinance would establish requirements for irrigation system inspections for large properties. Generally, the policy would include the following provisions:

- Properties 5 acres or over, athletic fields and golf courses with in-ground irrigation systems must submit an annual irrigation checkup report to WWU.
- The irrigation checkup report will document results from a leak inspection and related water waste repairs and adjustments that were made, such as improvements to distribution uniformity, verification of correct rain sensor operation, and related measures.
- Properties that do not have a current irrigation system checkup on file may be fined and will lose their courtesy water waste warning if the irrigation system is reported being run outside designated irrigation hours or if water from the irrigation system is found running down the street or other impervious cover.

  Ordinance example:

  San Antonio, Texas, Water System, Irrigation Check-up Ordinance, http://www.saws.org/conservation/Ordinance/IrrigationAudit/

3.6 Conservation Standards for New Construction

3.6.1 Measure Description

Generally, implementing water-conserving elements in new buildings and construction is more cost-effective than retrofitting existing structures and landscapes. This ordinance would establish requirements for new construction to require certain water-efficiency standards for indoor and outdoor water use. Such an ordinance would be developed with input and involvement of the building and real estate community, irrigators, landscape professionals, building inspectors, city planners, and other stakeholders. This policy could include the following elements:

- Establishing or amending landscape and/or irrigation requirements in development codes to require rain/freeze sensors and other features
- Establishing standards for landscaped median width to prevent irrigation overspray, or prohibiting pop-up or rotary sprayheads for irrigating narrow areas
- Requiring irrigation plans review and approval
- Requiring submeters or separate metering for multi-family housing units
- Requiring pint or half-gallon urinals, high-efficiency water heaters, or other water-efficient fixtures and appliances

3.7 Water Waste Prevention

3.7.1 Measure Description

Water waste prevention ordinances establish general rules for water use that prevent non-beneficial use of water. Because many such practices increase water runoff, they can also benefit stormwater quality efforts. This policy could include the following elements:

- Prohibiting runoff from properties during irrigation
- Prohibiting hose washing of driveways, sidewalks, and patios
- Prohibiting voluntary carwashes in parking lots other impervious areas
- Requiring two to four cycles of concentration for new cooling towers
- Prohibiting single-pass water-cooled ice machine
- Requiring positive shutoff valves for handheld dishwashing wands

3.8 Monthly Billing

3.8.1 Measure Description

Increasing the billing frequency from a quarterly to a monthly system supports conservation efforts in several ways. More frequent billing increases customer awareness of water use and can help identify customer water leaks more quickly. The financial signal from seasonal or inverted block rates (that is, higher cost per gallon of water used as volume increases) is stronger with more frequent billing.

SECTION 4
References

About.com. 2011. “Eco-Friendly Car Washing: Is It Better to Wash Cars at Home or at the Car Wash?” Accessed on November 25, 2011, at http://environment.about.com/od/greenlivingdesign/a/car_wash.htm.

American Water Works Association (AWWA), 1999. Residential End Users Water Survey.

California Urban Water Conservation Council. 2011. “Home Tour.” Accessed on November 7, 2011, at http://www.h2ouse.org/tour/index.cfm.

Food Service Technology Center, 2011. “Pre-Rinse Spray Valves.” Accessed on December 2, 2011, at http://www.fishnick.com/equipment/sprayvalves.

National Association of Home Builders (NAHB). 2008.

New Hampshire Department of Environmental Services. 2001. “Implementing a Water Efficiency and Conservation Program for Public Water Utilities.” Accessed on December 2, 2011, at http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-26-9.pdf.

U.S. Environmental Protection Agency (USEPA). 2011a. “WaterSense Labeled Toilets.” Accessed on November 10, 2011, at http://epa.gov/watersense/pubs/toilets.html.

U.S. Environmental Protection Agency (USEPA). 2011b. “WaterSense Labeled Flushing Urinals.” Accessed on November 26, 2011, at http://www.epa.gov/watersense/docs/urinal_factsheet508.pdf.

Appendix F
Long-term CEM Implementation

TABLE F-1
NR 852 Table 1 Conservation and Efficiency Measures

2005–2009						2010–2030						2030–2050					
Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public
PWS-1, Water Use Audit																	
Perform water use audit following procedures in ch. PSC 185.	2006	X	X	X	X	Perform water use audit following procedures in ch. PSC 185.	Every 5 years	X	X	X	X	Perform water use audit following procedures in ch. PSC 185.	Every 5 years	X	X	X	X
Minimize water loss and un-accounted water with universal metering.	Continuously	X	X	X	X	Minimize water loss and un-accounted for water with universal metering.	Continuously	X	X	X	X	Minimize water loss and un-accounted for water with universal metering.	Continuously	X	X	X	X
Loop water mains to reduce water volumes needed for annual flushing.	Annually	X	X	X	X	Loop water mains to reduce water volumes needed for annual flushing.	Annually	X	X	X	X	Loop water mains to reduce water volumes needed for annual flushing.	Annually	X	X	X	X
						Develop unidirectional waterman flushing program to improve flushing efficiency.	2015					Conduct unidirectional flushing to reduce water used for routine water main maintenance.	Annually	X	X	X	X
						Implement unidirectional flushing to reduce water used for routine water main maintenance.	2017–2030	X	X	X	X						
PWS-2, Leak Detection and Repair																	
Proactively investigate aberrant flow meter readings to detect leaks.	Continuously	X	X	X	X	Proactively investigate aberrant flow meter readings to detect leaks.	Continuously	X	X	X	X	Proactively investigate aberrant flow meter readings to detect leaks.	Continuously	X	X	X	X
Replace old mains to avoid leaks.	Annually	X	X	X	X	Replace old mains to avoid leaks.	Annually	X	X	X	X	Replace old mains to avoid leaks.	Annually	X	X	X	X
						Survey and repair water main and service connection leaks at level where water savings benefits exceed program costs.	Annually	X	X	X	X	Survey and repair water main and service connection leaks at level where water savings benefits exceed program costs.	Annually	X	X	X	X
PWS-3, Information and Education Outreach																	
Planning and Monitoring																	
Implement Water Conservation and Protection Plan with near-, mid-, and long-term water efficiency goals.	2006	X	X	X	X	Update Water Conservation and Protection Plan with input from customers and City leaders.	Every 5 years	X	X	X	X	Update Water Conservation and Protection Plan with input from customers and City leaders.	Every 5 years	X	X	X	X
Prepare annual PSC Water Conservation Program summary reports.	2009–2010	X	X	X	X	Prepare annual PSC Water Conservation Program summary reports.	Annually	X	X	X	X	Prepare annual PSC Water Conservation Program summary reports.	Annually	X	X	X	X
						Prepare annual WDNR Water Conservation Program summary reports.	Annually	X	X	X	X	Prepare annual WDNR Water Conservation Program summary reports.	Annually	X	X	X	X
Collaboratively establish and maintain leadership role in regional Wisconsin Water Conservation Coalition.	2006–2009	X	X	X	X	Maintain leadership role in Wisconsin Water Conservation Coalition.	Continuously	X	X	X	X	Maintain leadership role in Wisconsin Water Conservation Coalition.	Continuously	X	X	X	X
Outdoor Water Use																	
Adopt City ordinance to restrict outdoor sprinkling.	2006	X	X	X	X	Implement "My Brown Lawn is Green" yard sign campaign.	2010	X	X	X	X	Launch sprinkler restriction public awareness campaign.	Annually	X	X	X	X

TABLE F-1
NR 852 Table 1 Conservation and Efficiency Measures

2005–2009						2010–2030						2030–2050					
Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public
Provide refrigerator magnet with sprinkler guidelines to all customers.	2008	X	X	X	X	Conduct workshop on wise outdoor water use with public parks representatives.	2010				X	Provide educational materials at Spring City Gardeners Club Event.	Annually	X	X		
Install municipal street signs with sprinkler guidelines.	2007	X	X	X	X	Launch sprinkler restriction public awareness campaign.	Annually	X	X	X	X	Conduct customer irrigation control outreach to large irrigators.	Annually		X	X	
Provide educational materials at Spring City Gardeners Club Event.	2008–2009	X	X			Provide educational materials at Spring City Gardeners Club Event.	Annually	X	X								
Educate other area water utilities on starting a rain barrel program.	2008				X	Conduct survey of outdoor water use practices by public customers.	2012				X						
						Survey landscape professionals and equipment suppliers on local irrigation control practices.	2013	X	X	X							
						Conduct customer irrigation control outreach to large irrigators.	2015–2030		X	X							
Education and Outreach																	
Water Conservation in City of Waukesha Public School Curriculum; Educate 1,000 5th graders each year on water supply and conservation.	1990–2009	X				Water Conservation in City of Waukesha Public School Curriculum.	Annually	X				Water Conservation in City of Waukesha Public School Curriculum.	Annually	X			
Water conservation training for City employees; educate staff on conservation goals, implemented measures, and public education information.	2005–2009	X	X	X	X	Water conservation training for City employees.	Annually	X	X	X	X	Water conservation training for City employees.	Annually	X	X	X	X
Residential Challenge & Award —Collaboration with Wisconsin Water Conservation Coalition.	2008	X				Residential Challenge II & III.	2018, 2028	X				Residential Challenge IV & V.	2038, 2048	X			
Restaurant Association Annual Conference Informational Booth and Table Tents.	2009		X			Restaurant Association Annual Conference Participation.	Annually		X			Restaurant Association Annual Conference Participation.	Annually		X		
Water & Energy Efficiency Expo Event Sponsorship and Information Booth.	2010	X	X	X	X	Public Building Retrofit Demonstration Project.	Every 5 years				X	Public Building Retrofit Demonstration Project.	Every 5 years				X
Waukesha Water Utility Administration Building Fixture Retrofit Demonstration Project.	2005				X	Conduct a student water conservation contest.	Every 5 years	X				Conduct a student water conservation contest.	Every 5 years	X			
City Hall Fixture Retrofit Demonstration Project: install high efficiency plumbing fixtures; WDNR support; press release.	2006				X	Conduct Fix-A-Leak Week Promotional Campaign with Informational Materials and Leak Tablet give-away.	Annually	X	X	X	X	Conduct Fix-A-Leak Week Promotional Campaign with Informational Materials and Leak Tablet give-away.	Annually	X	X	X	X
Informative Presentations, Displays Booths																	
Carroll University Water Wise Event.	2006–2009	X	X	X	X	Waukesha Public Library Displays.	Annually	X	X	X	X	Waukesha Public Library Displays.	Annually	X	X	X	X
Waukesha Public Library Displays.	2006–2009	X			X	Various Civic (e.g., Rotary Club) Meetings.	Annually	X	X	X	X	Various Civic (e.g., Rotary Club) Meetings.	Annually	X	X	X	X

TABLE F-1
NR 852 Table 1 Conservation and Efficiency Measures

2005–2009						2010–2030						2030–2050					
Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public
Waukesha County Technical Institute, Water Conservation for Commercial and Industrial Applications.	2009		X	X		Professional Society Seminars and Conferences (AWWA, NRWA, Groundwater Guardians, etc.).	Annually	X			X	Professional Society Seminars and Conferences (AWWA, NRWA, Groundwater Guardians, etc.).	Annually	X			X
Various Civic (e.g., Rotary Club) Meetings.	Annually	X	X	X	X	Various Civic (e.g., Rotary Club) Meetings.	Annually	X	X	X	X	Various Civic (e.g., Rotary Club) Meetings.	Annually	X	X	X	X
Waukesha Middle School Water Fest.	2009	X				Prairie School Health Fair.	2010	X				Waukesha County Boy Scouts.	Annually	X			
City of Waukesha Open House Forums.	2010	X	X	X	X	Waukesha County Boy Scouts.	Annually	X									
Wisconsin Section American Water Works Association Conference—water conservation and outreach planning.	2005, 2007, 2009	X			X	City of Waukesha Open House Forums.	2010–2015	X	X	X	X						
Wisconsin Section American Water Works Association Water Efficiency Seminar—Conservation Water Rates.	2009	X			X	Environmental & conservation groups meetings.	2010–2020	X	X	X	X						
Wisconsin Groundwater Guardians Festival.	2005	X			X												
Wisconsin Rural Water Association—water conservation planning.	2009	X			X												
GE Medical Energy and Water Conservation Fair.	2008–2009			X													
Promote water conservation goals of City's largest industrial users.	2007				X												
Meet with environmental groups including Clean Wisconsin, Wisconsin Environmental Action League, and Midwest Environmental Advocates.	2006–2009	X															
Other Communication Media																	
Radio Interview.	2010	X	X	X	X	WUWM Lake Effect Feature Story.	Annually	X	X	X	X	Radio station feature story.	Annually	X	X	X	X
Gus Gnorski Show.	2009	X	X	X	X	Television interview.	Annually	X	X	X	X	Television interview.	Annually	X	X	X	X
Public Access Cable TV	2006–2009	X	X	X	X	Public Access Cable TV.	Annually	X	X	X	X	Public Access Cable TV.	Annually	X	X	X	X
Water Utility Web site news, information, educational materials.	2006–2009	X	X	X	X	Water Utility Web site news, information, educational materials.	Continuously	X	X	X	X	Water Utility Website news, information, educational materials.	Continuously	X	X	X	X
Water Utility bill stuffers.	2006–2010	X	X	X	X	Water Utility bill stuffers.	Annually	X	X	X	X	Water Utility bill stuffers.	Annually	X	X	X	X
						Press releases, radio and TV interview.	Annually	X	X	X	X	Press releases, radio and TV interview.	Annually	X	X	X	X
Press releases, radio and TV interviews.	2006–2010	X	X	X	X	Social media (Facebook, Twitter).	2010–2030	X	X	X	X	Social Media (Facebook, Twitter).	Annually	X	X	X	X
PWS-4, Source Management																	
Meter all water withdrawn and report its use per ch. PSC 185.	Continuously	X	X	X	X	Meter all water withdrawn and report its use per ch. PSC 185.	Continuously	X	X	X	X	Meter all water withdrawn and report its use per ch. PSC 185.	Continuously	X	X	X	X

TABLE F-2

NR 852 Table 2 Conservation and Efficiency Measures

2005–2009						2010–2030						2030–2050					
Conservation Measure	**Date**	**Residential**	**Commercial**	**Industrial**	**Public**	**Conservation Measure**	**Date**	**Residential**	**Commercial**	**Industrial**	**Public**	**Conservation Measure**	**Date**	**Residential**	**Commercial**	**Industrial**	**Public**
PWS-R1, Distribution System Pressure Management																	
Maintain optimum system pressure to minimize volume leaked.	2006–2009	X	X	X	X	Maintain optimum system pressure to minimize volume leaked.	2010–2030	X	X	X	X	Maintain optimum system pressure to minimize volume leaked.	2030–2050	X	X	X	X
Notify customers about planned system pressure changes and importance of leak audits.	2009	X	X	X	X	Notify customers about planned system pressure changes and importance of leak audits.	2010	X	X	X	X	Notify customers about planned system pressure changes and importance of leak audits.	As Needed	X	X	X	X
PWS-R2, Residential Demand Management Program																	
Incentives Programs																	
Toilet Rebate Incentive Program.	2008–2009	X				Increase $25 toilet rebate to $100. Conduct survey of rebate recipients.	2011	X				Audit and refine active incentive programs.	Annually	X			
Initiated City Rainbarrel Incentive Program.	2008	X				Audit and refine active incentive programs.	Annually	X				Promote City Rainbarrel Incentive Program.	Continuously	X			
Conduct water use study to define customer use trends	2006–2009	X	X	X	X	Conduct water use study to define customer use trends.	Annually	X	X	X	X	Conduct water use study to define customer use trends	Annually	X	X	X	X
						Promote City Rainbarrel Incentive Program.	Continuously	X									
						Investigate low income housing fixture replacement incentive program with Wisconsin Focus on Energy.	2010	X									
						Develop clothes washer rebate incentive program.	2014	X									
						Implement clothes washer rebate incentive program.	2014–2030	X									
						Develop showerhead rebate incentive program.	2012	X									
						Implement showerhead rebate incentive program.	2012–2030	X									
Residential Demand Management Water Pricing																	
Implement first-in-state inclining rate structure to encourage water conservation.	2007	X				Evaluate inclining rate structure design.	Annually	X				Evaluate inclining rate structure design.		X			
Refine inclining rate structure design.	2009	X				Investigate converting from quarterly to monthly billing frequency.	2016	X									

TABLE F-2
NR 852 Table 2 Conservation and Efficiency Measures

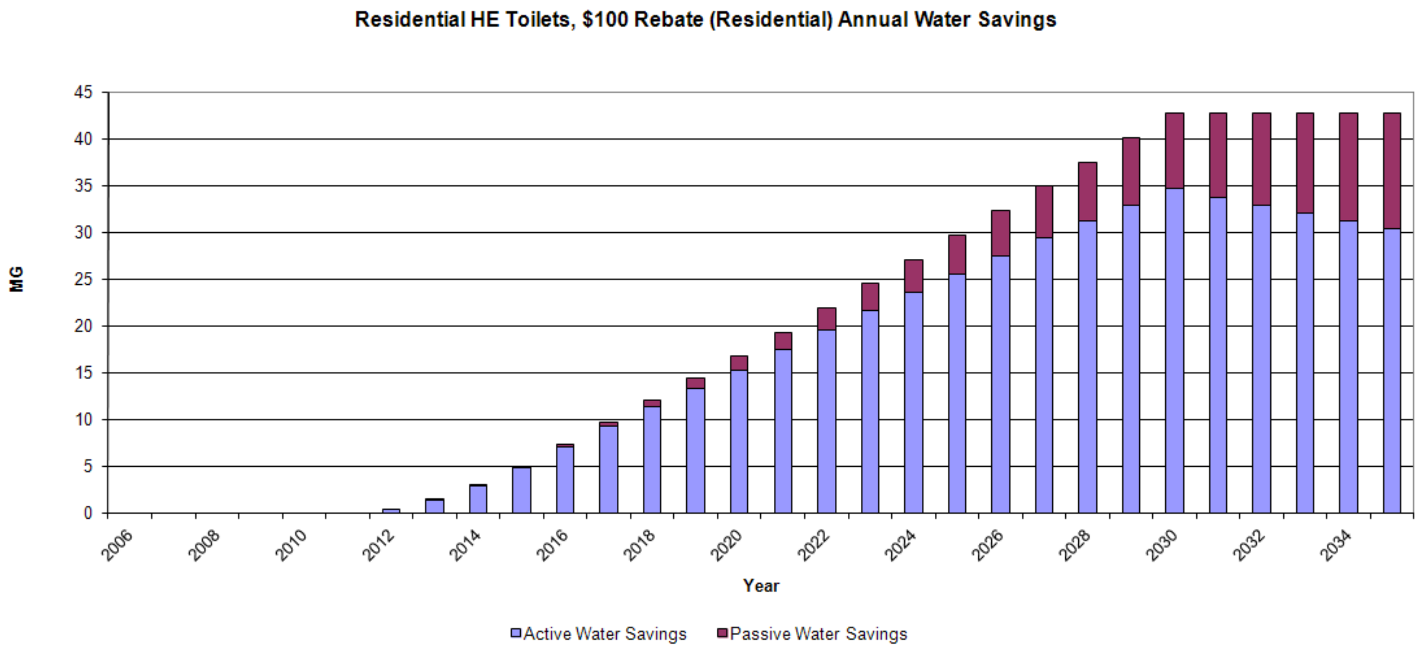
2005–2009						2010–2030						2030–2050					
Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public
PWS-R3, Commercial and Industrial Demand Management																	
Conduct Rainbarrel Demonstration Project with City Improvement Business District.	2009		X			Conduct water use survey of commercial customers to develop criteria to customize demand management and water use guidance.	2012		X			Audit and refine active incentive programs.	Annually		X	X	X
Partnered with Metropolitan Builders Association in development of "Green" Trend Home.	2007		X			Provide customized commercial demand management guidance.	2013–2020		X			Refine customized commercial, industrial, and public demand management guidance.	Every 5 years			X	
						Conduct water use survey of industrial customers to develop criteria to customize demand management and water use audit guidance.	2014			X							
						Provide customized industrial demand management guidance.	2015–2030			X							
						Conduct water use survey of public customers to develop criteria to customize public demand management and water use audit guidance.	2015				X						
						Provide customized public demand management guidance.	2016–2030				X						
						Develop urinal rebate incentive program.	2014		X	X	X						
						Implement urinal rebate incentive program.	2015–2030		X	X	X						
						Develop clothes washer rebate incentive program.	2014		X								
						Implement clothes washer rebate incentive program.	2014–2030		X								
						Develop showerhead rebate incentive program.	2012		X		X						
						Implement showerhead rebate incentive program.	2012–2030		X		X						
						Investigate spray rinse valve incentive program in collaboration with Wisconsin Focus on Energy.	2015		X	X	X						
						Implement spray rinse valve incentive program.	2015–2030		X	X	X						
						Evaluate inclining rate structure for commercial and industrial customers.			X	X							

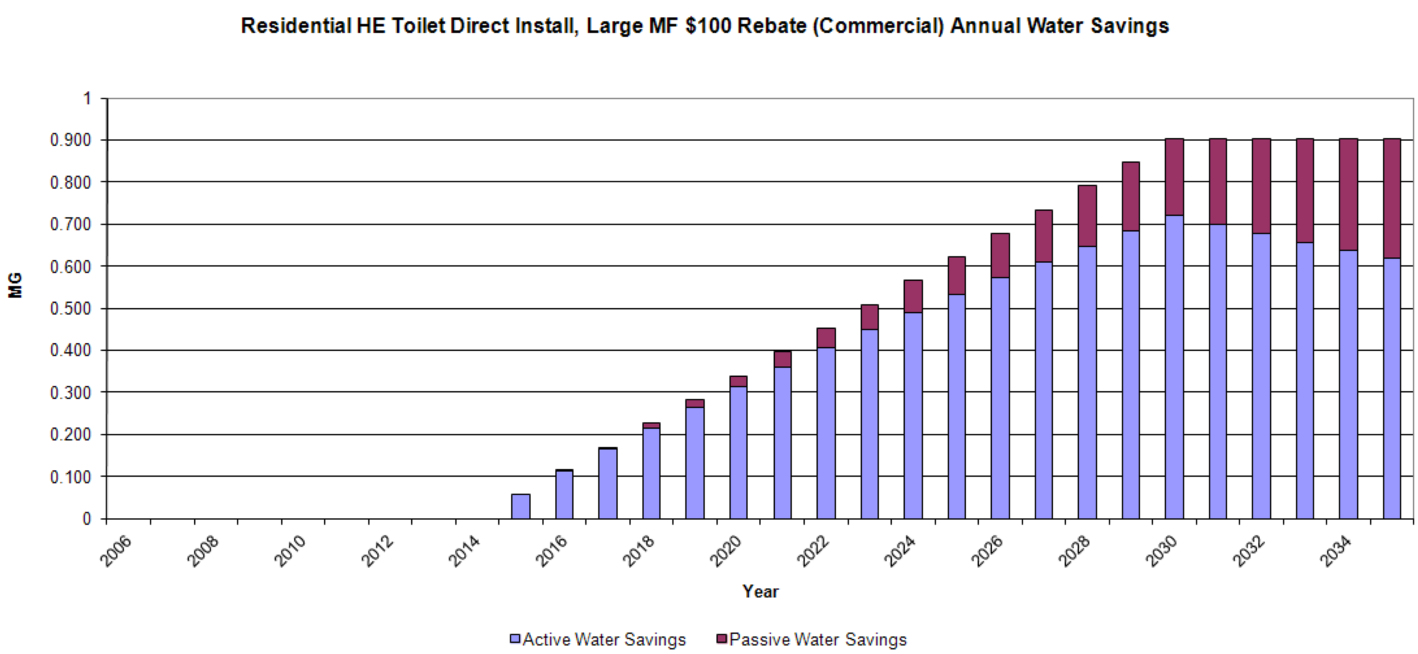
TABLE F-2
NR 852 Table 2 Conservation and Efficiency Measures

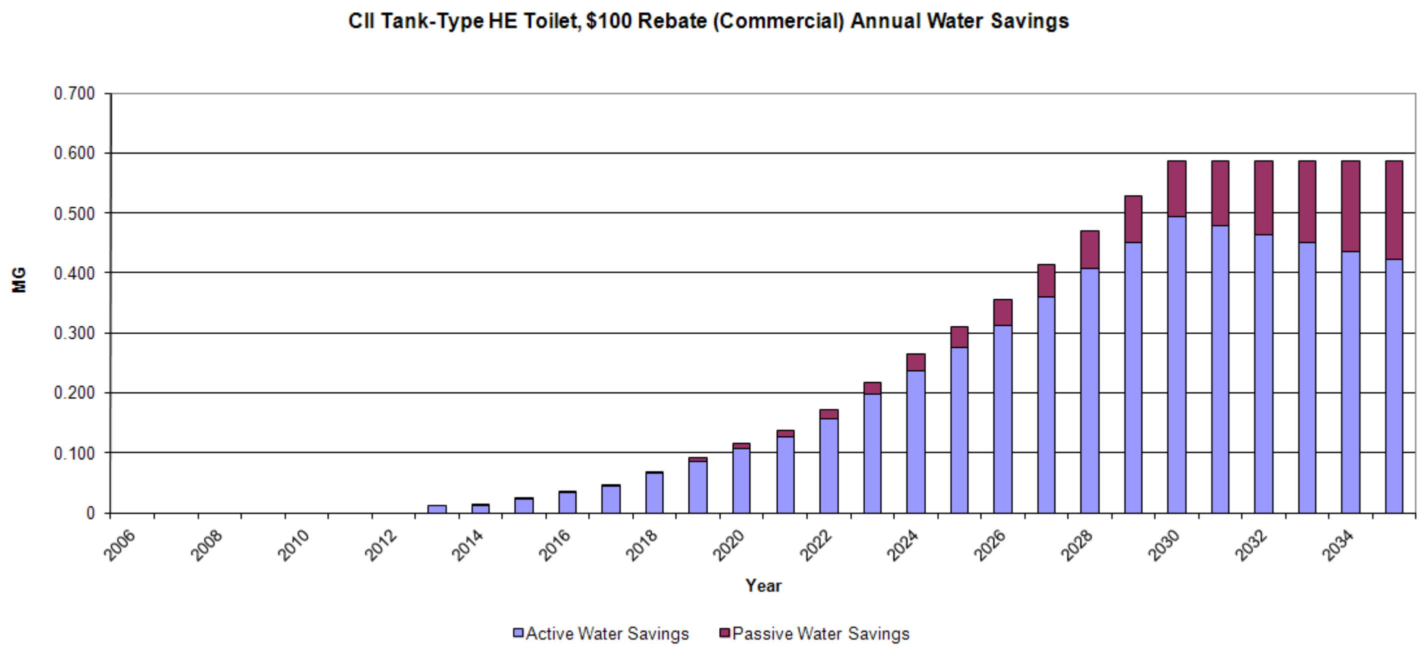
2005–2009						2010–2030						2030–2050					
Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public	Conservation Measure	Date	Residential	Commercial	Industrial	Public
PWS-R4, Water Reuse																	
Recycled filter backwash water until radium levels in water prohibited this practice.	2008–2009					Investigate potential applications for nonpotable water reuse in the City.	2020				X	Implement a water reuse demonstration project.	2040				X
Audit water utility facilities to identify water reuse applications.	2008					Implement an environmentally sound water reuse demonstration project.	2030				X						

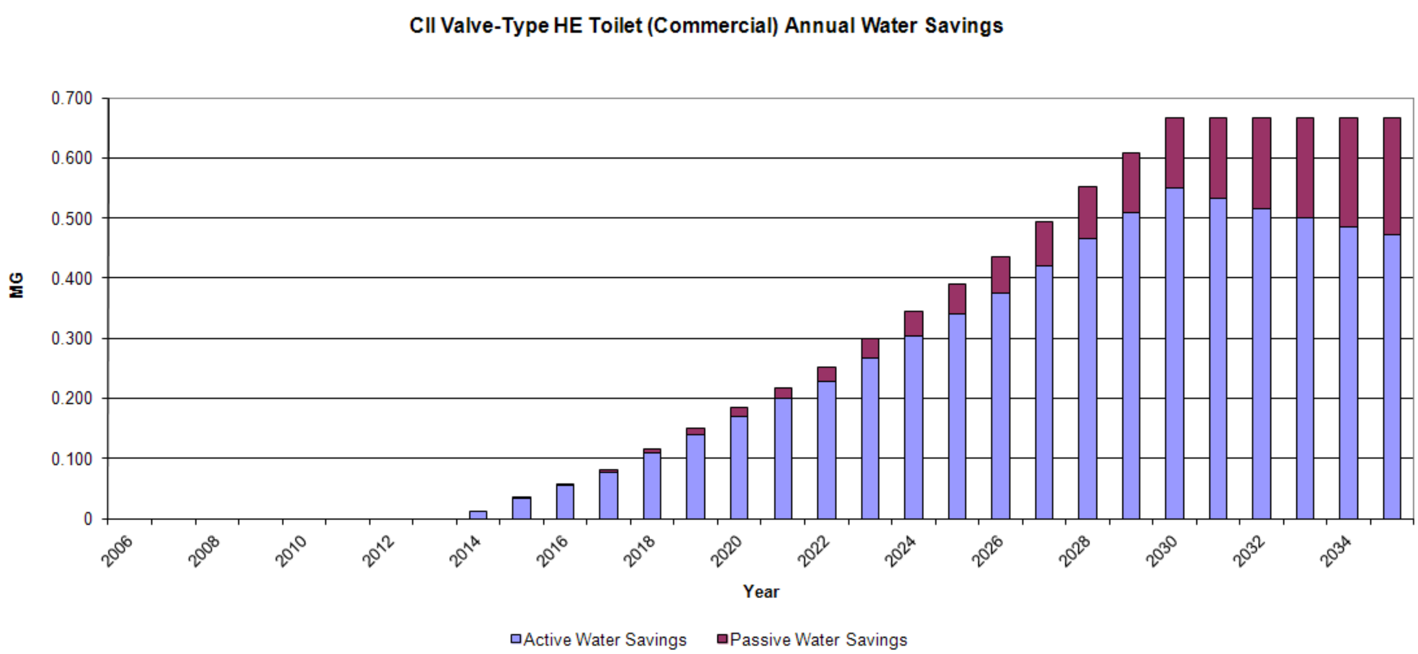
Appendix G
AWE Tool Output

APPENDIX G
AWE Tool Output

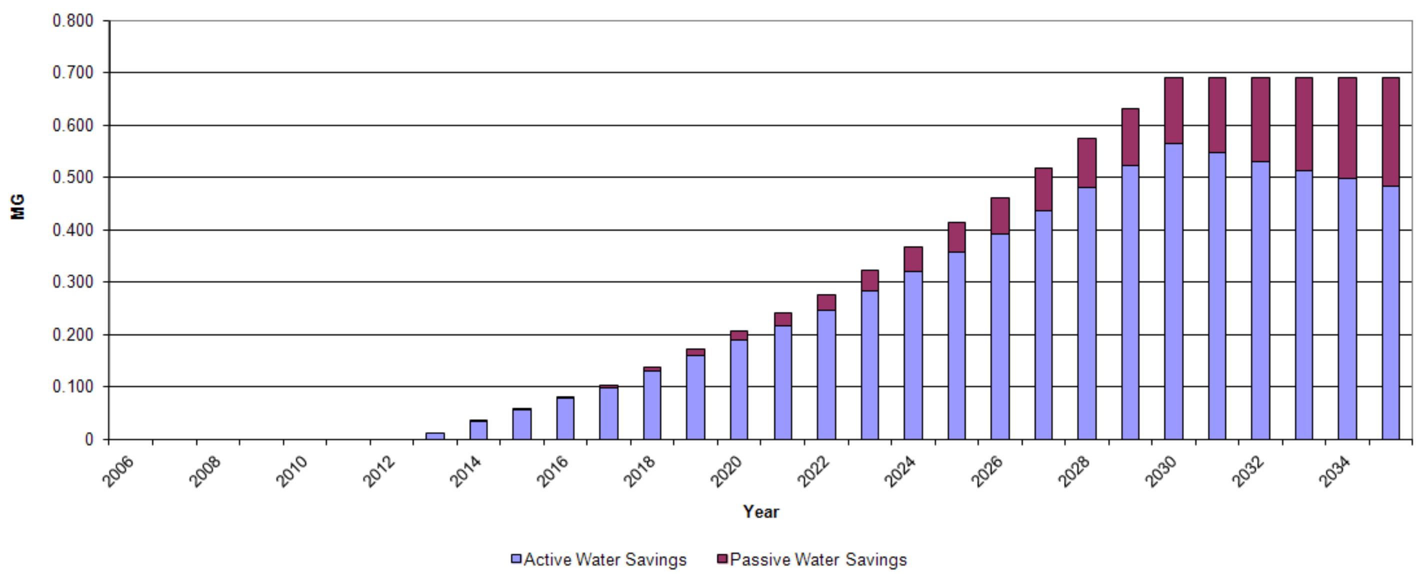




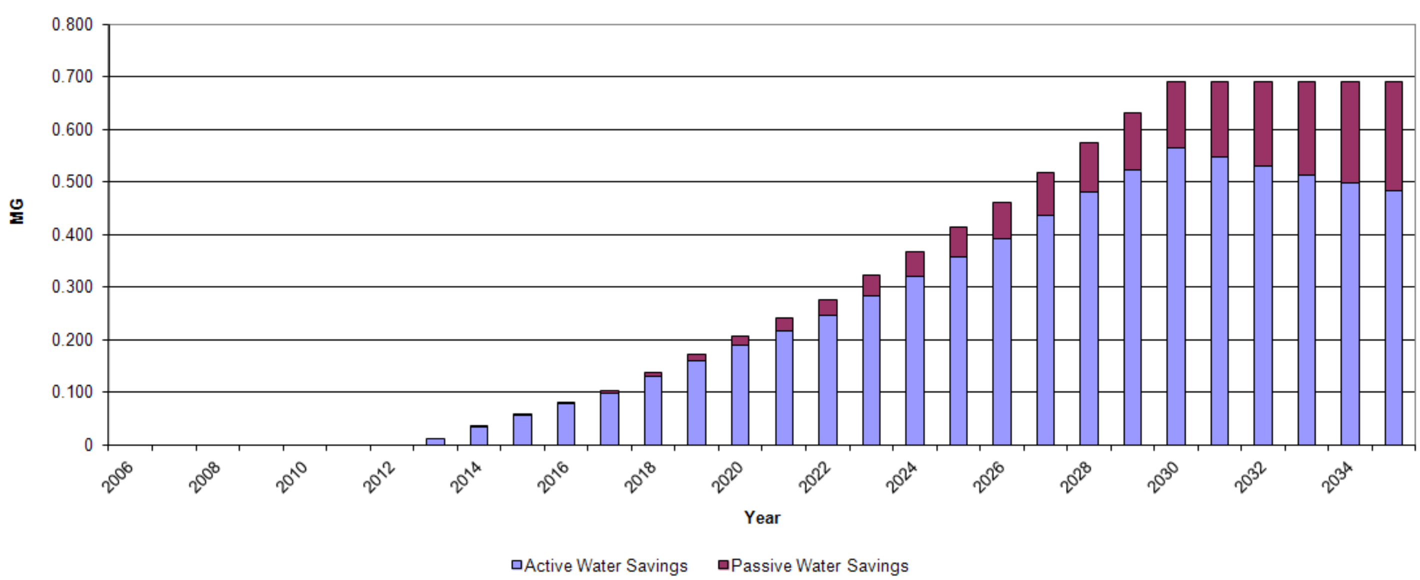

CII Tank-Type HE Toilet, $100 Rebate (Commercial) Annual Water Savings
MG
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

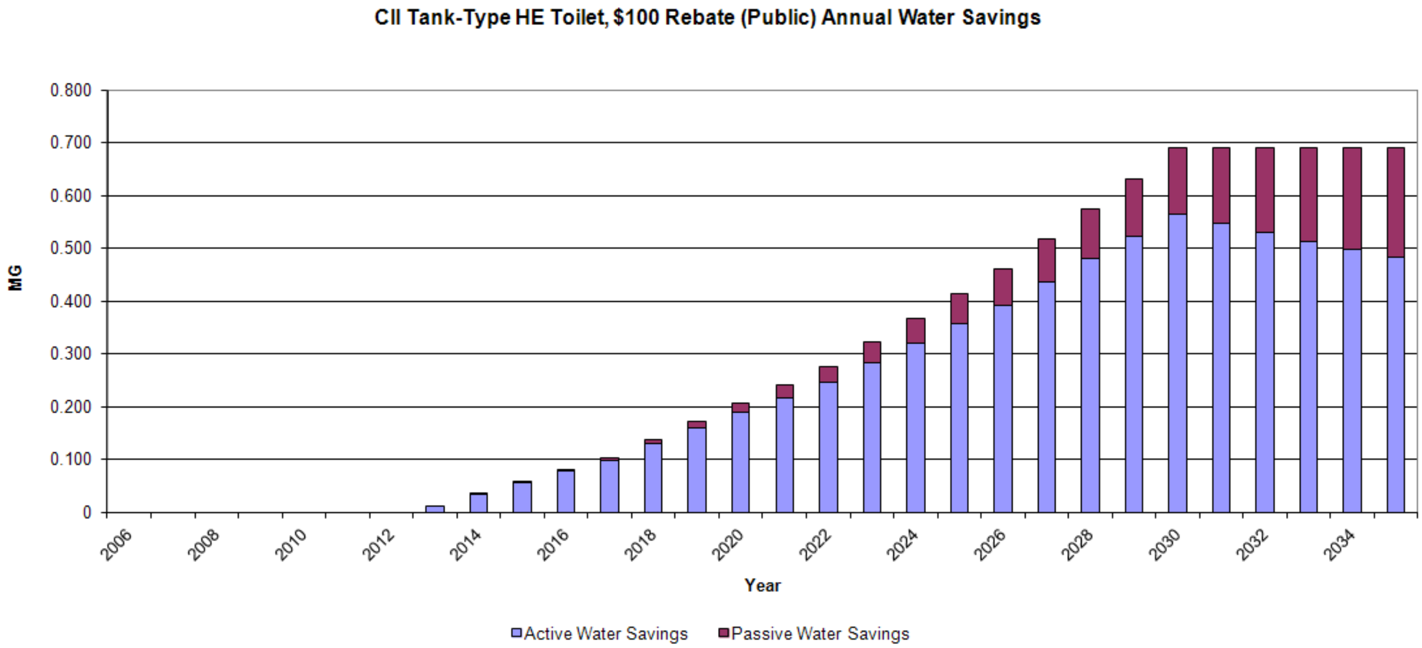

CII Valve-Type HE Toilet (Commercial) Annual Water Savings
MG
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

CII Tank-Type HE Toilet, $100 Rebate (Industrial) Annual Water Savings

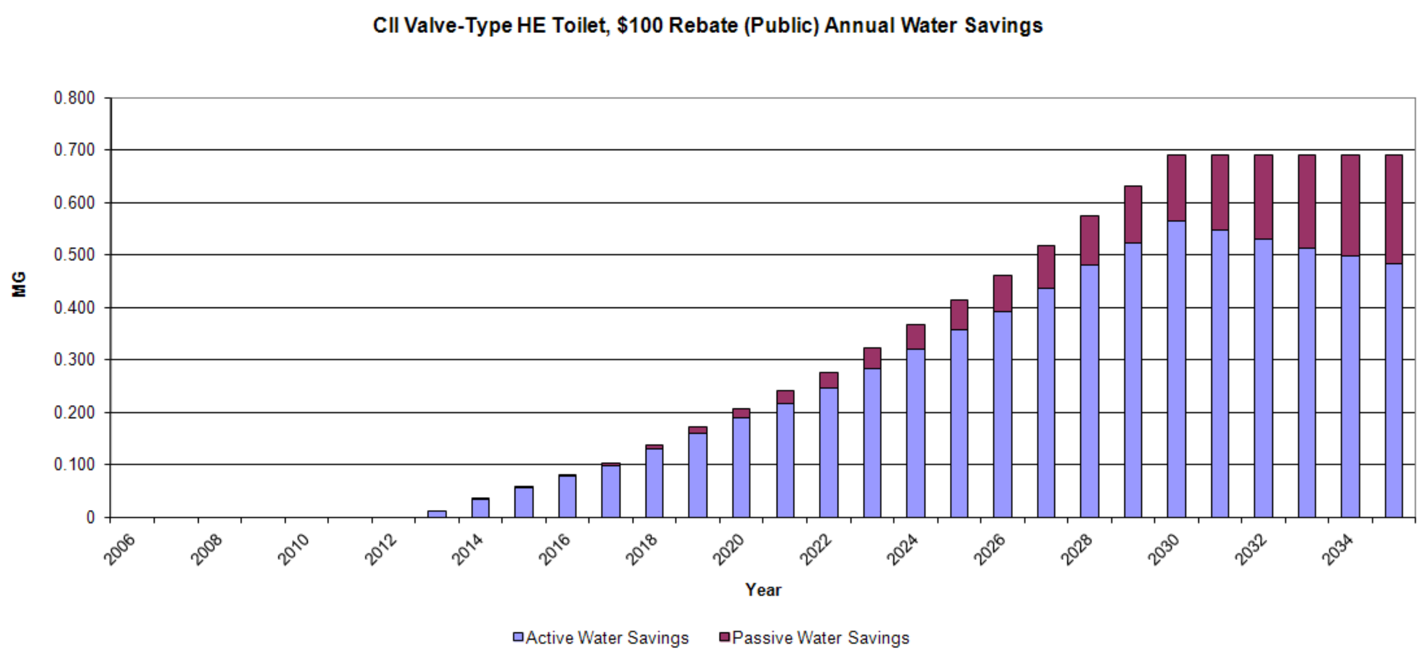


CII Valve-Type HE Toilet, $100 Rebate (Industrial) Annual Water Savings

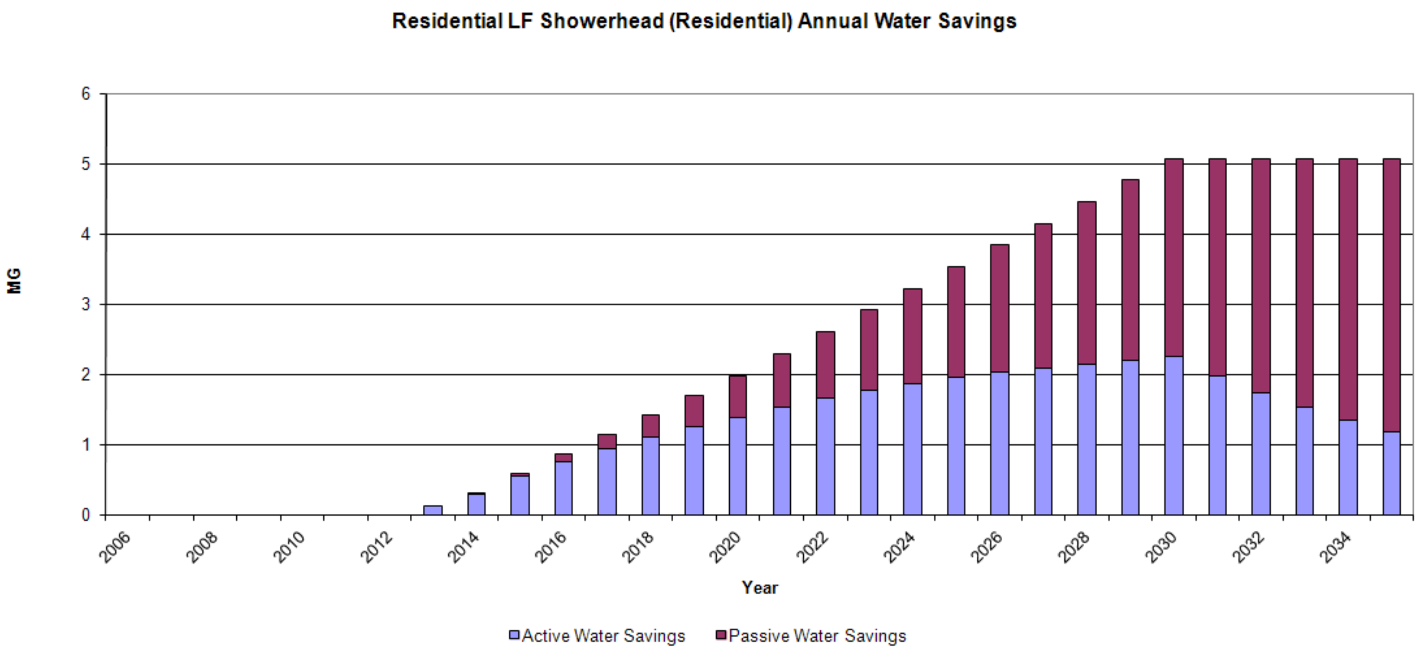


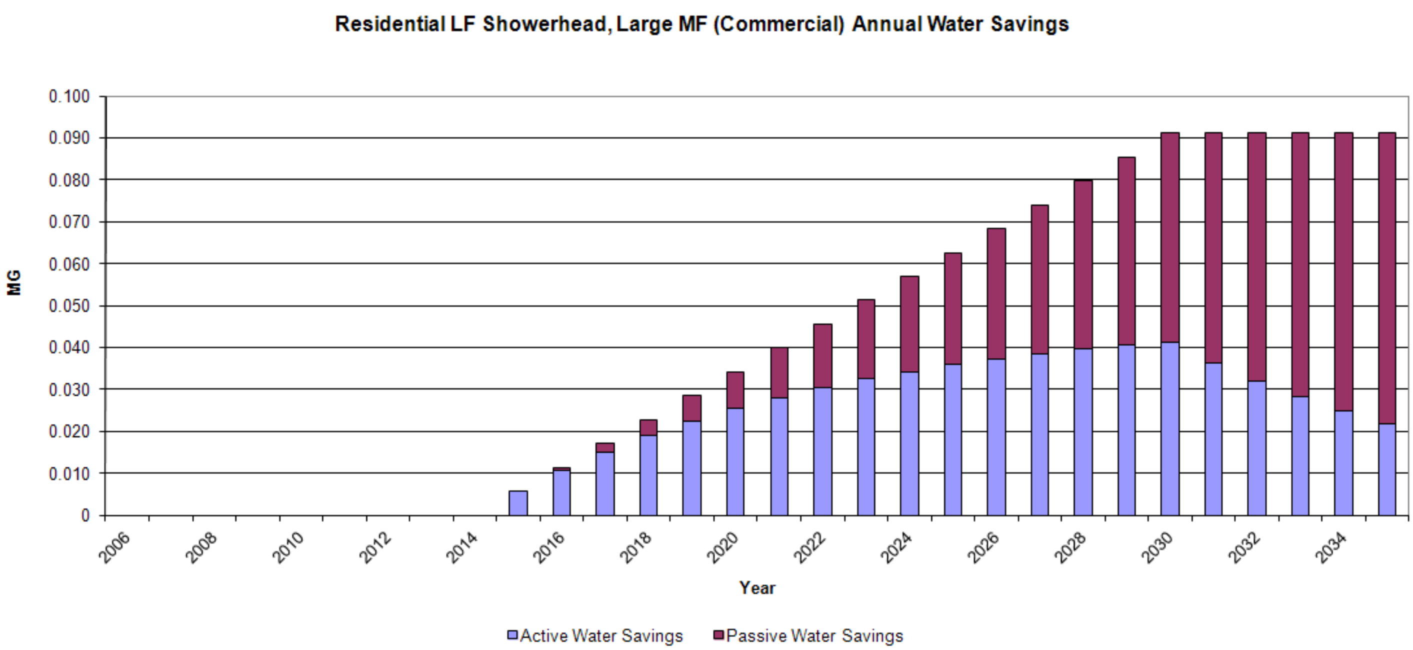


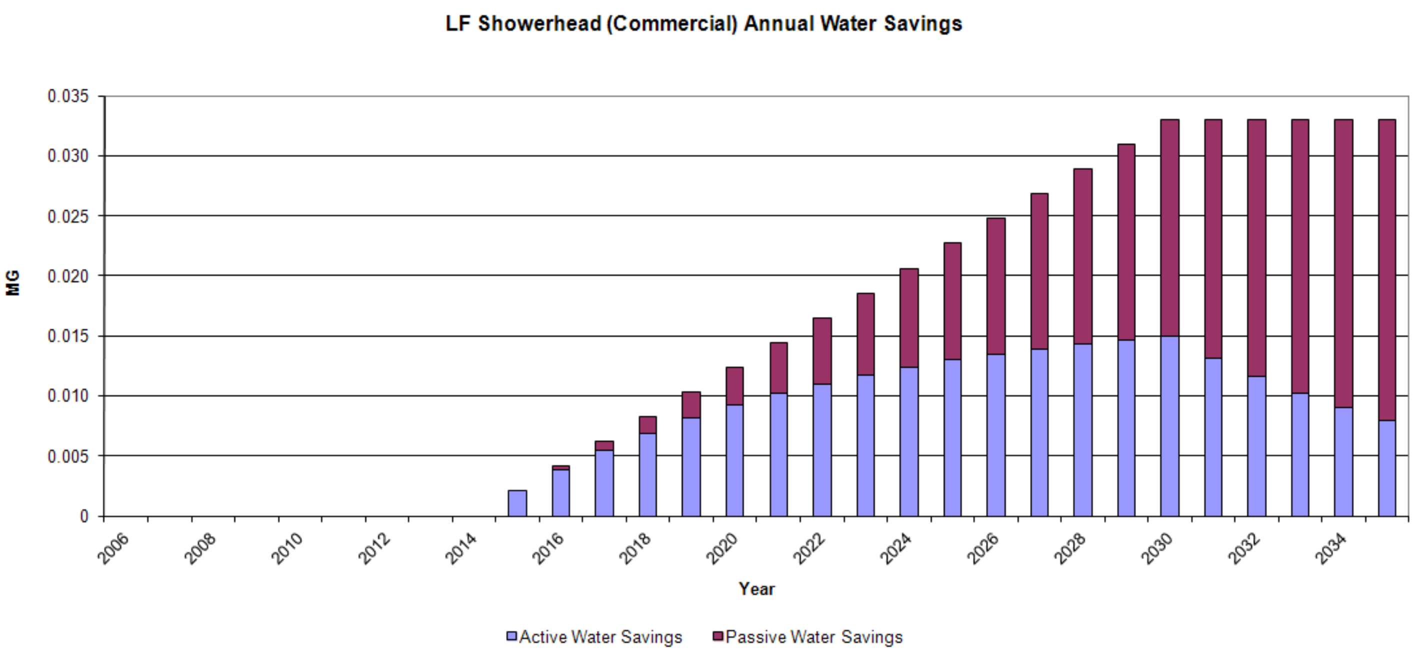
CII Tank-Type HE Toilet, $100 Rebate (Public) Annual Water Savings
MG
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

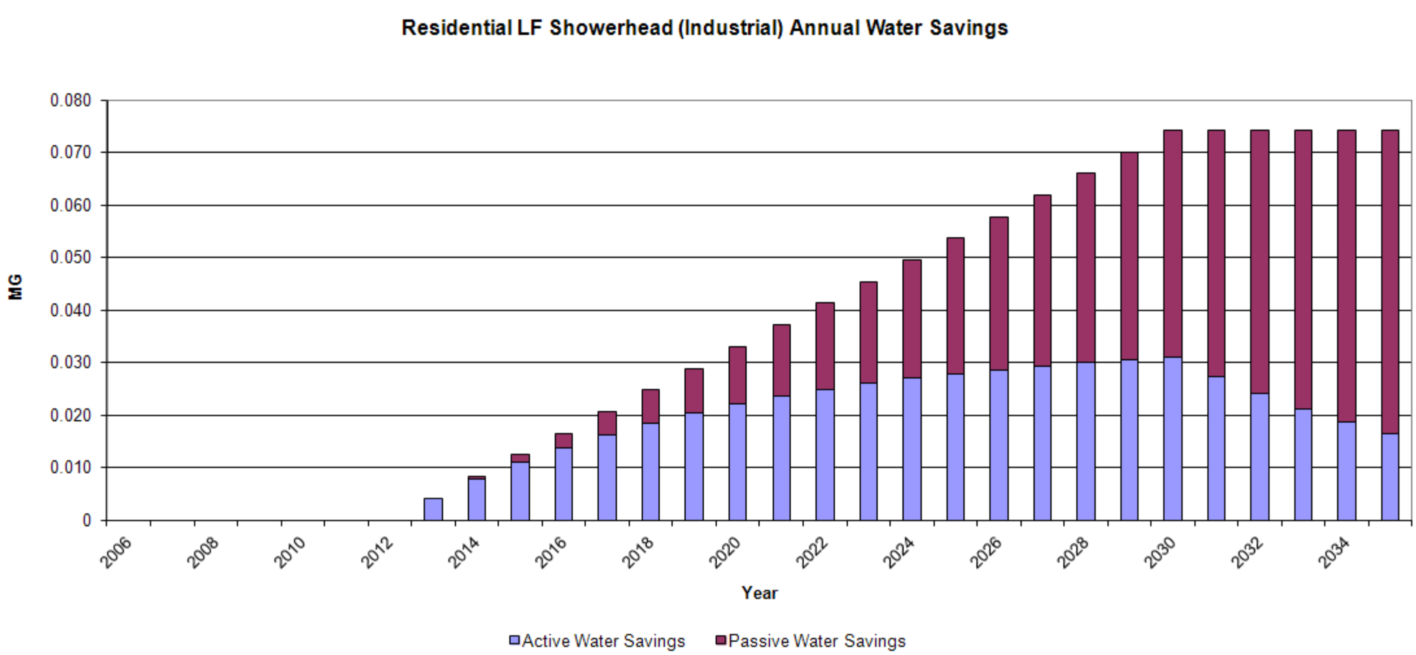


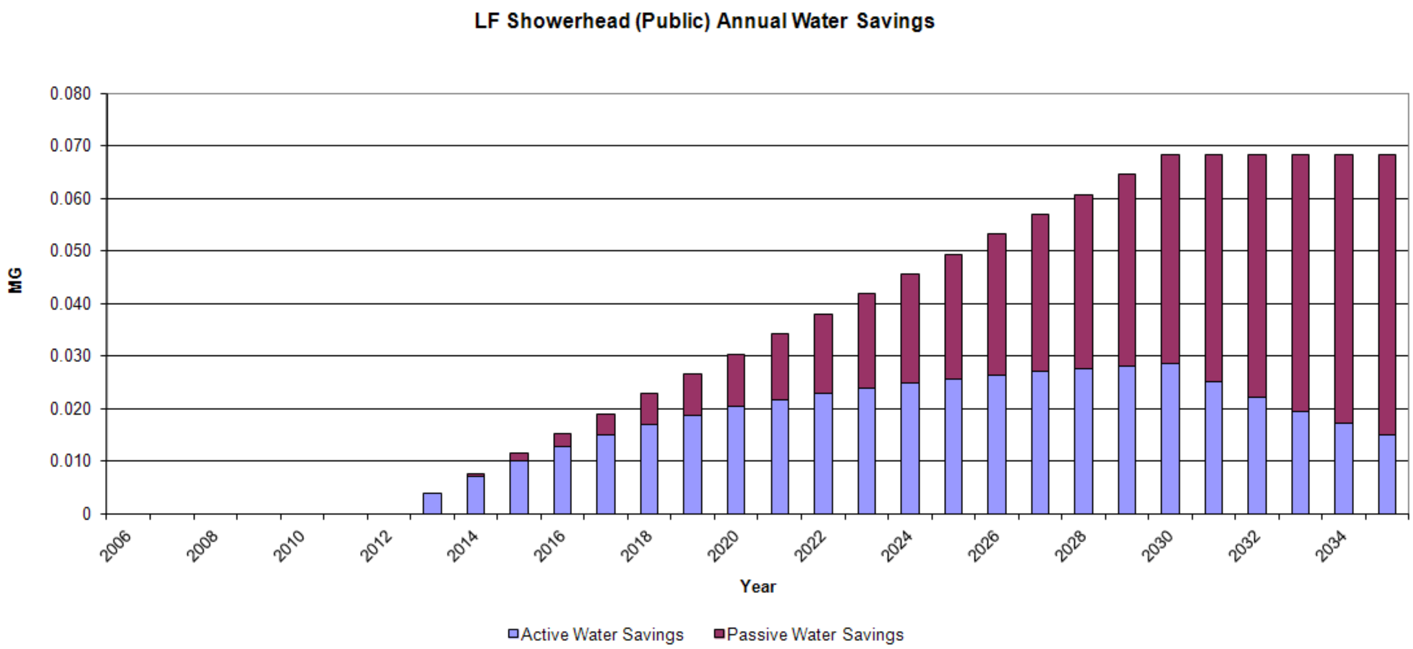
CII Valve-Type HE Toilet, $100 Rebate (Public) Annual Water Savings
MG
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

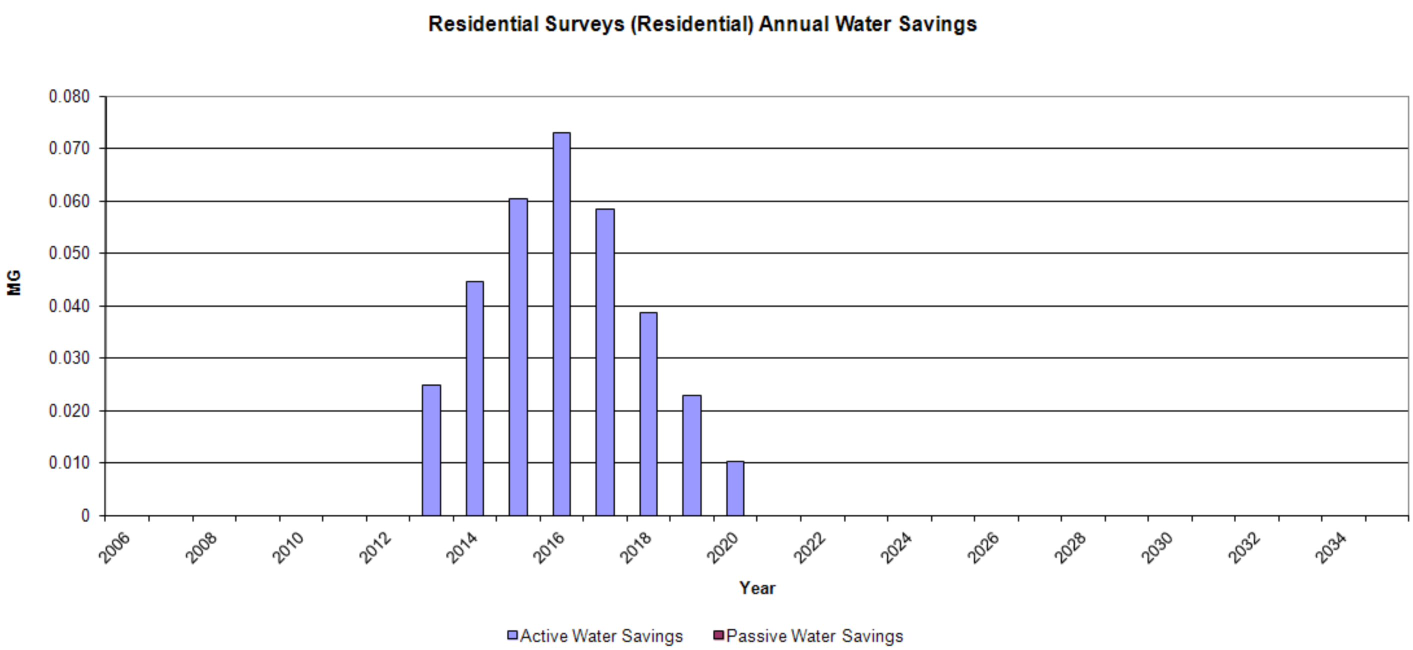

Residential LF Showerhead (Residential) Annual Water Savings
MG
0
1
2
3
4
5
6
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

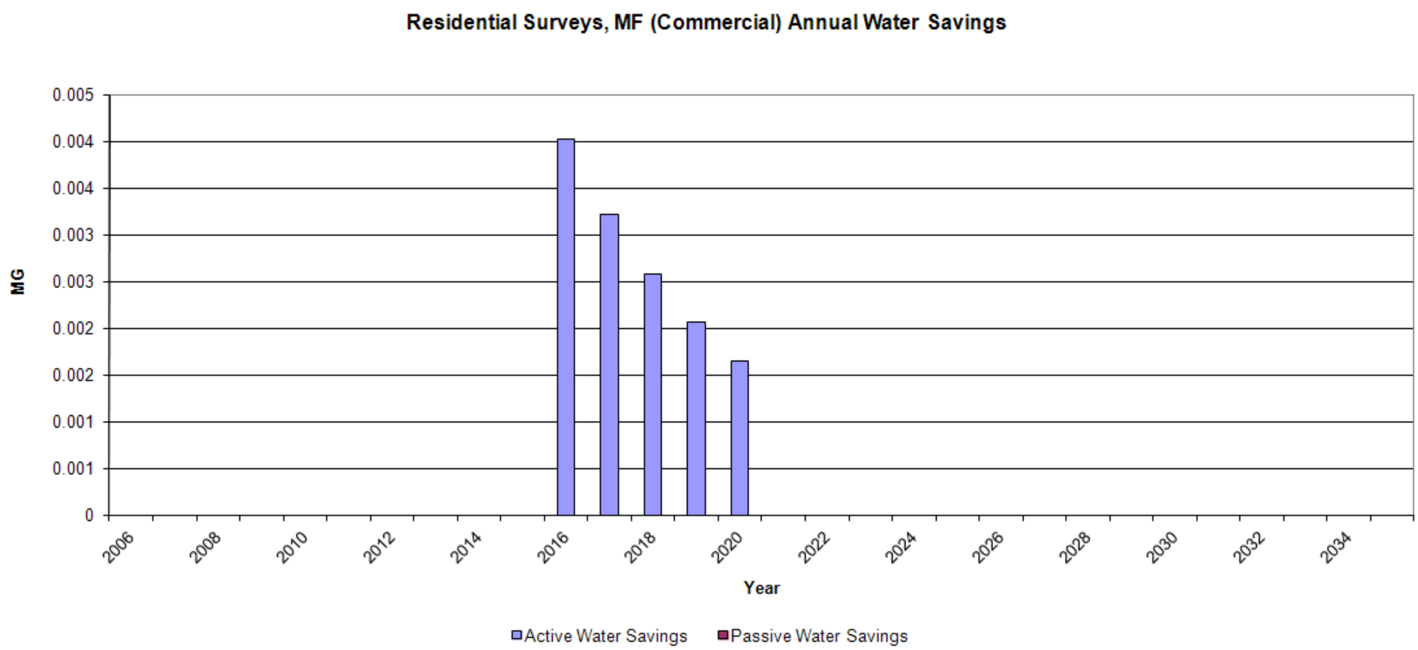

Residential LF Showerhead, Large MF (Commercial) Annual Water Savings
MG
0
0.010
0.020
0.030
0.040
0.050
0.060
0.070
0.080
0.090
0.100
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

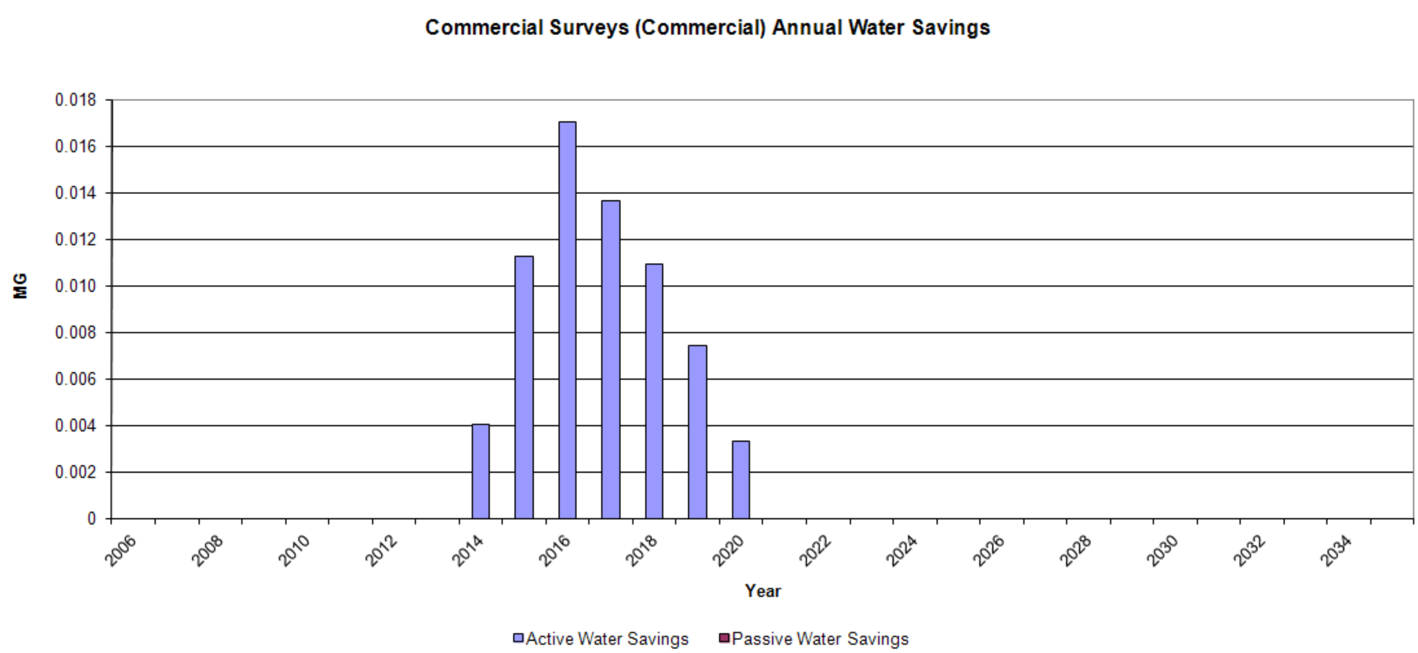

LF Showerhead (Commercial) Annual Water Savings
MG
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

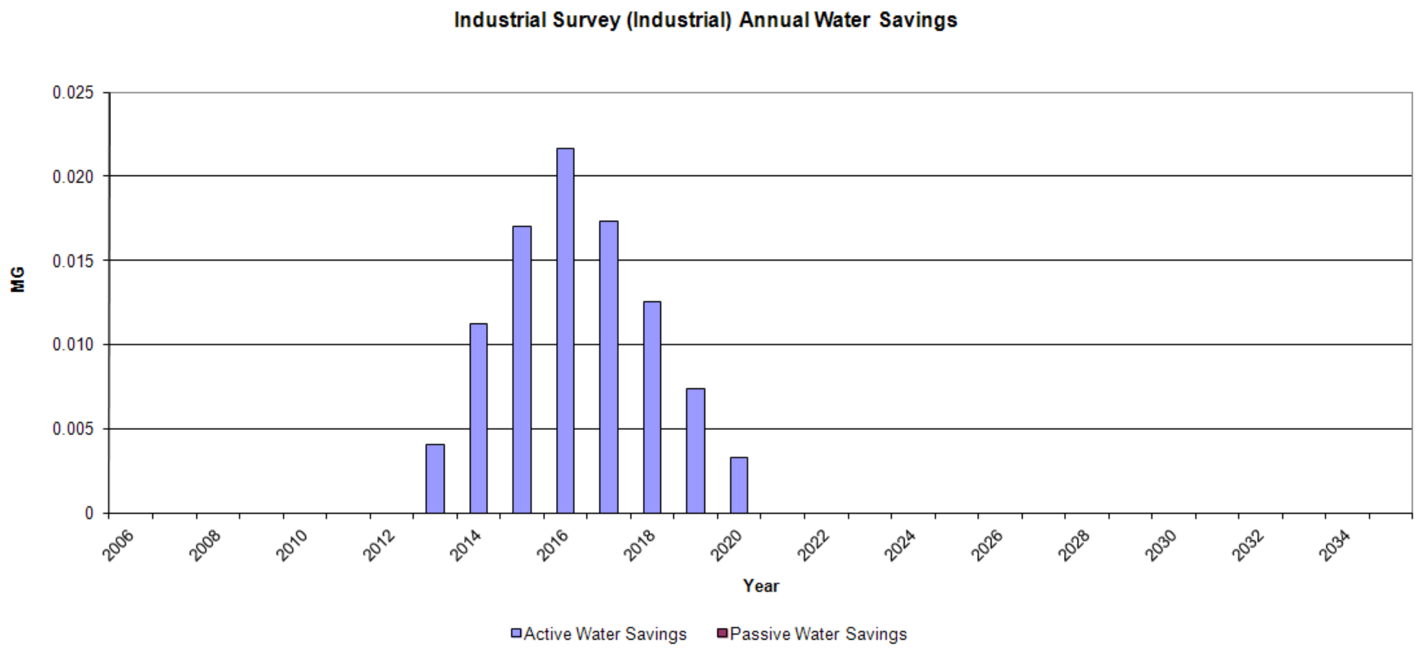

Residential LF Showerhead (Industrial) Annual Water Savings
MG
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

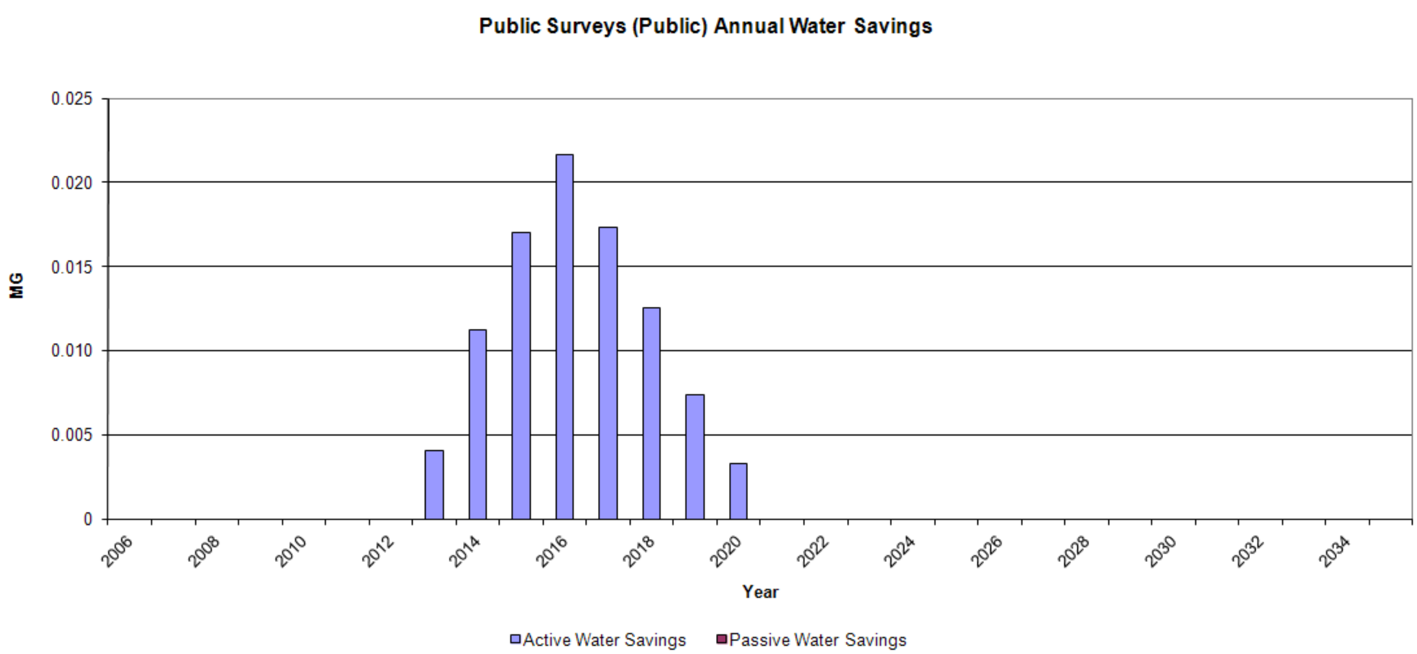

LF Showerhead (Public) Annual Water Savings
MG
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

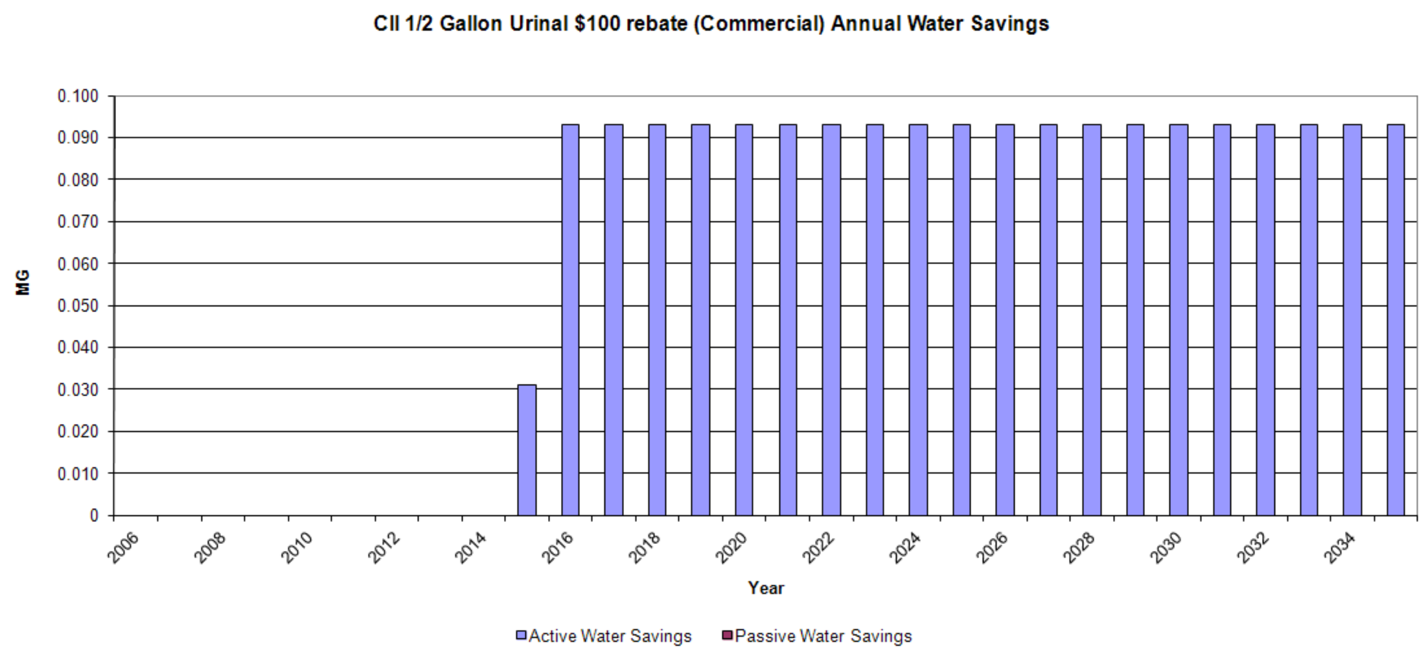

Residential Surveys (Residential) Annual Water Savings
MG
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

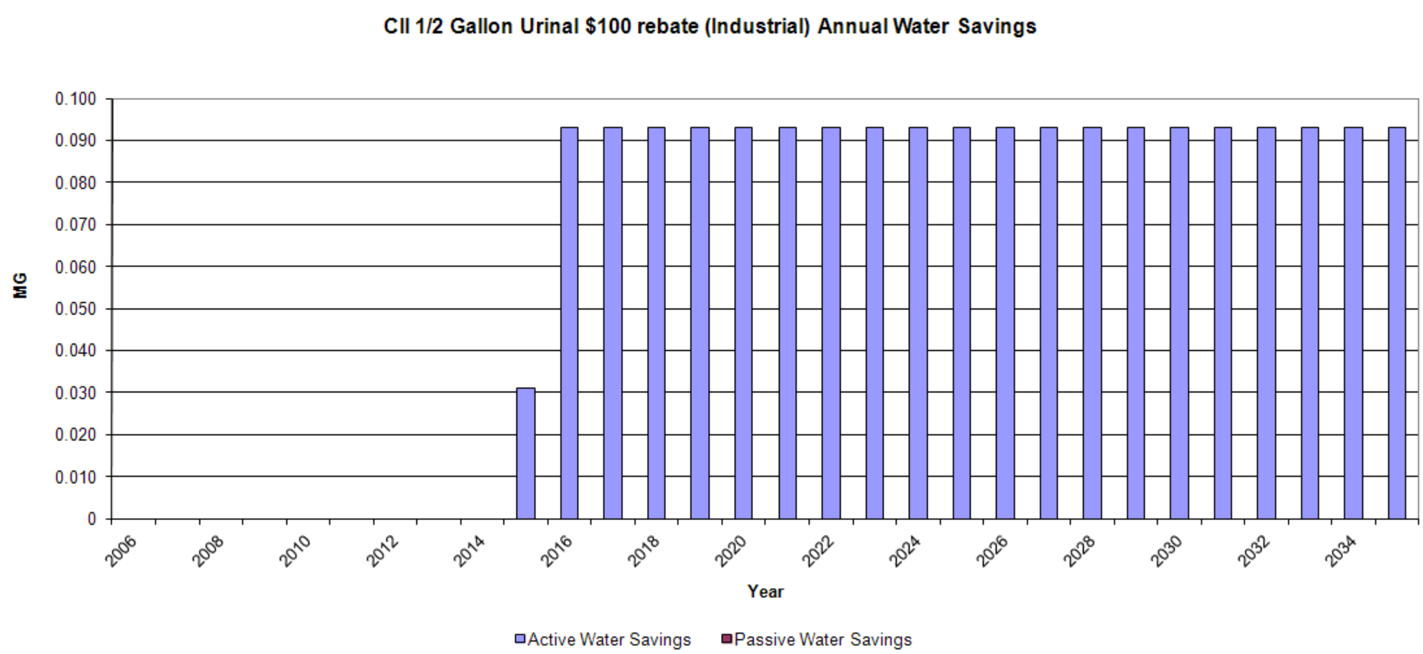

Residential Surveys, MF (Commercial) Annual Water Savings
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0
MG
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

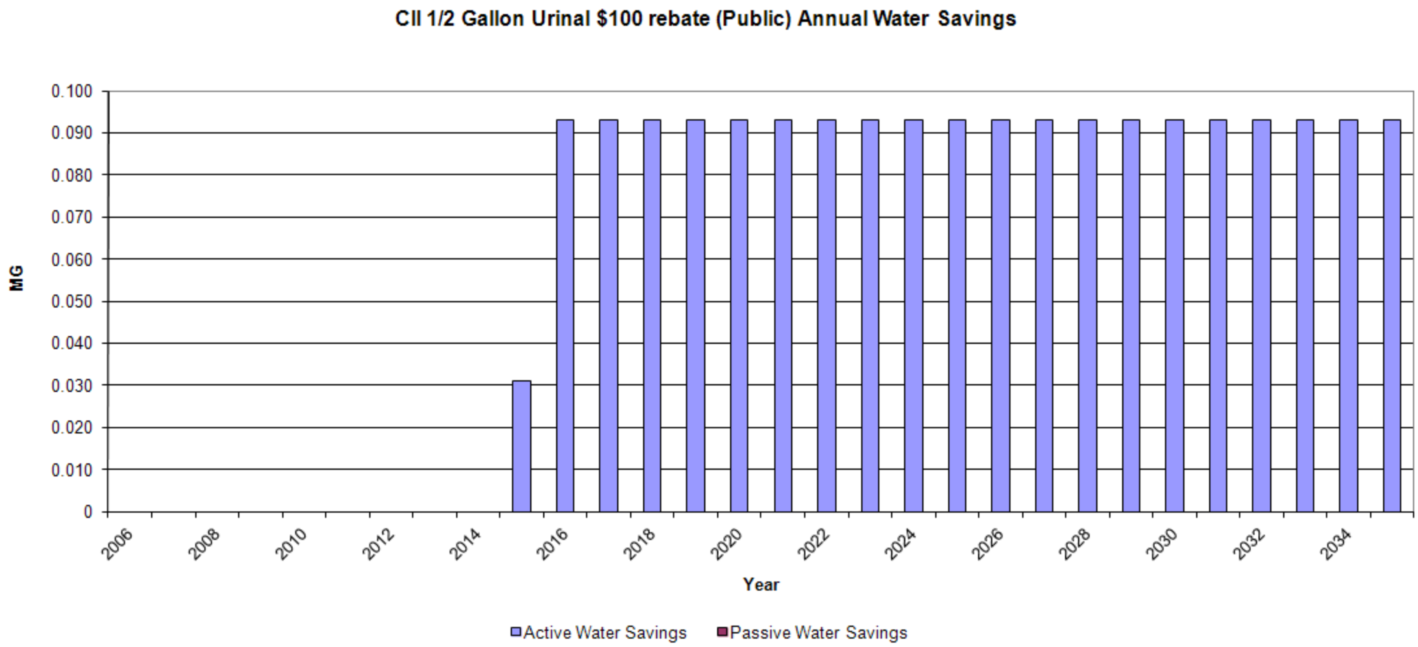

Commercial Surveys (Commercial) Annual Water Savings
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0
MG
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

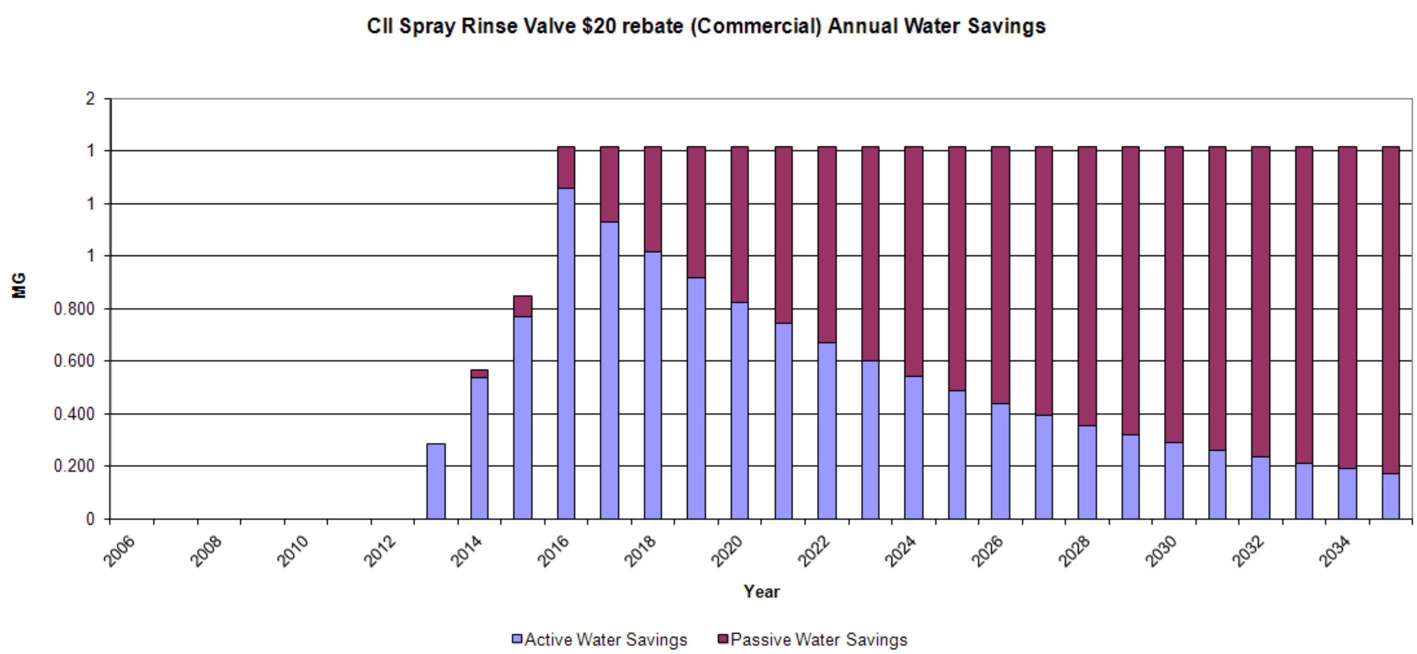

Industrial Survey (Industrial) Annual Water Savings
MG
0.025
0.020
0.015
0.010
0.005
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

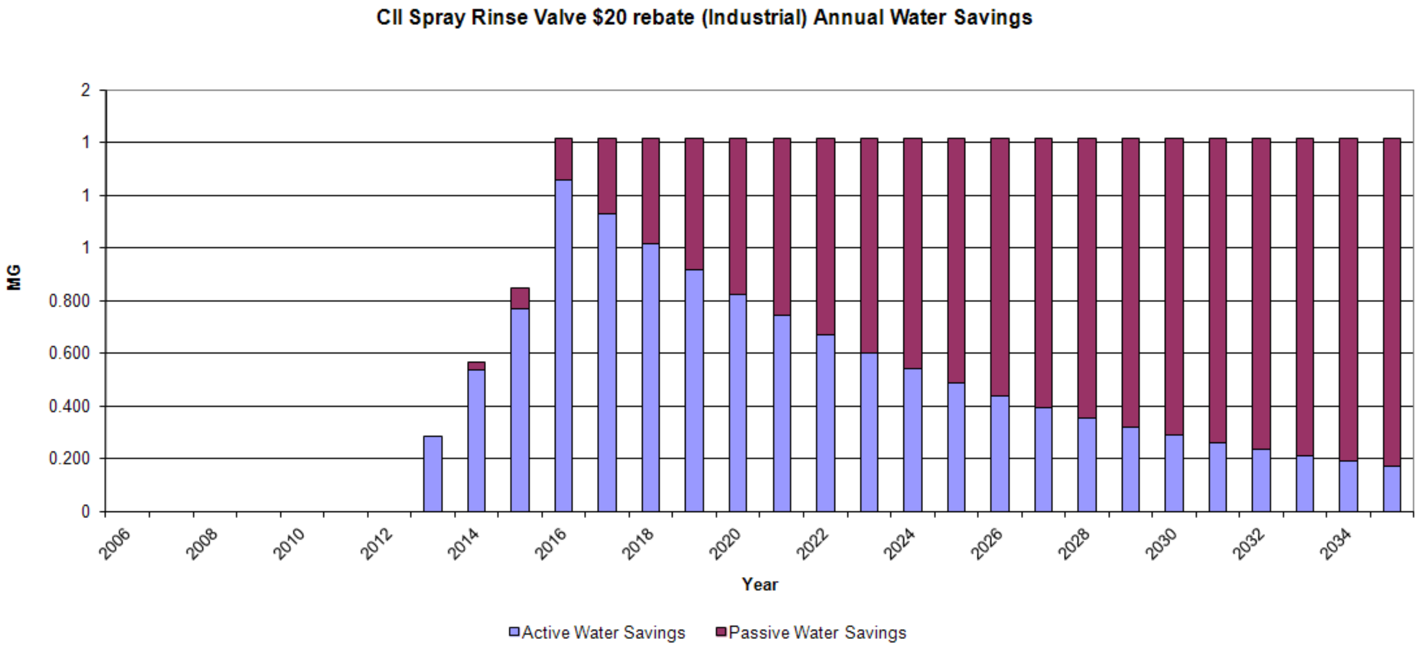

Public Surveys (Public) Annual Water Savings
MG
0.025
0.020
0.015
0.010
0.005
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings


CII 1/2 Gallon Urinal $100 rebate (Commercial) Annual Water Savings
MG
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

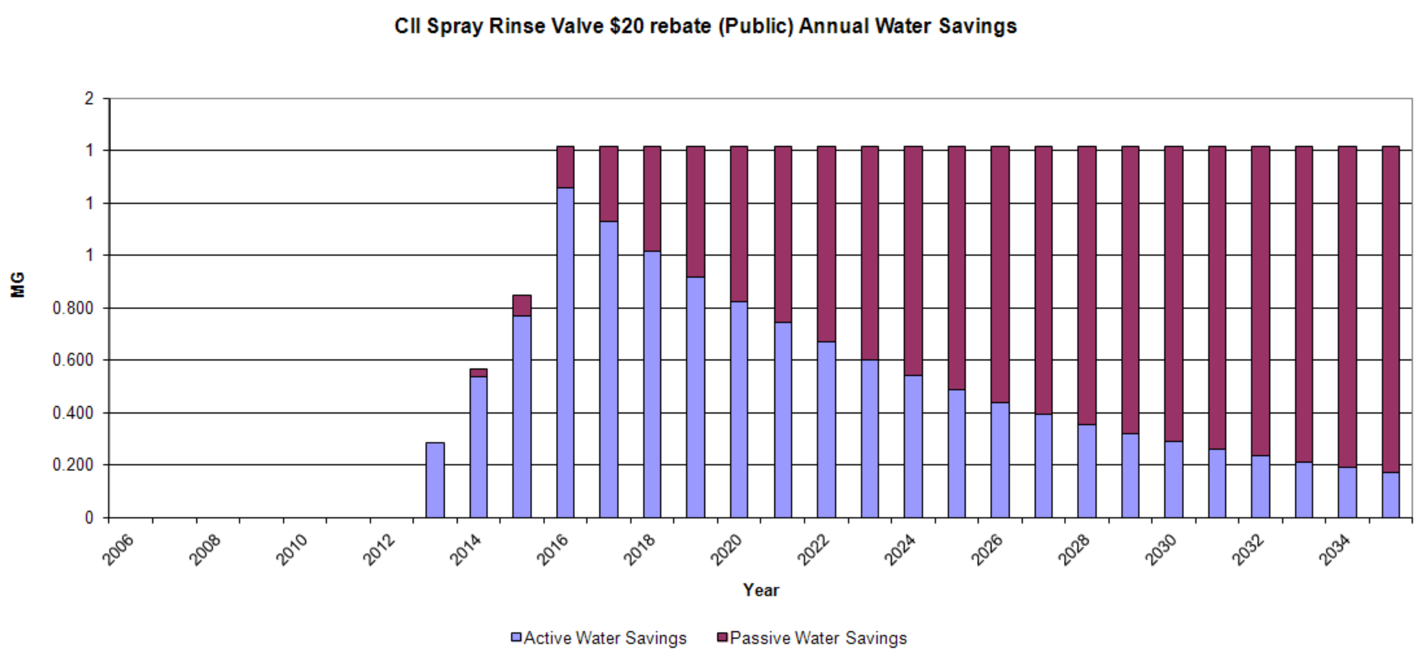

CII 1/2 Gallon Urinal $100 rebate (Industrial) Annual Water Savings
MG
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings


CII 1/2 Gallon Urinal $100 rebate (Public) Annual Water Savings
MG
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

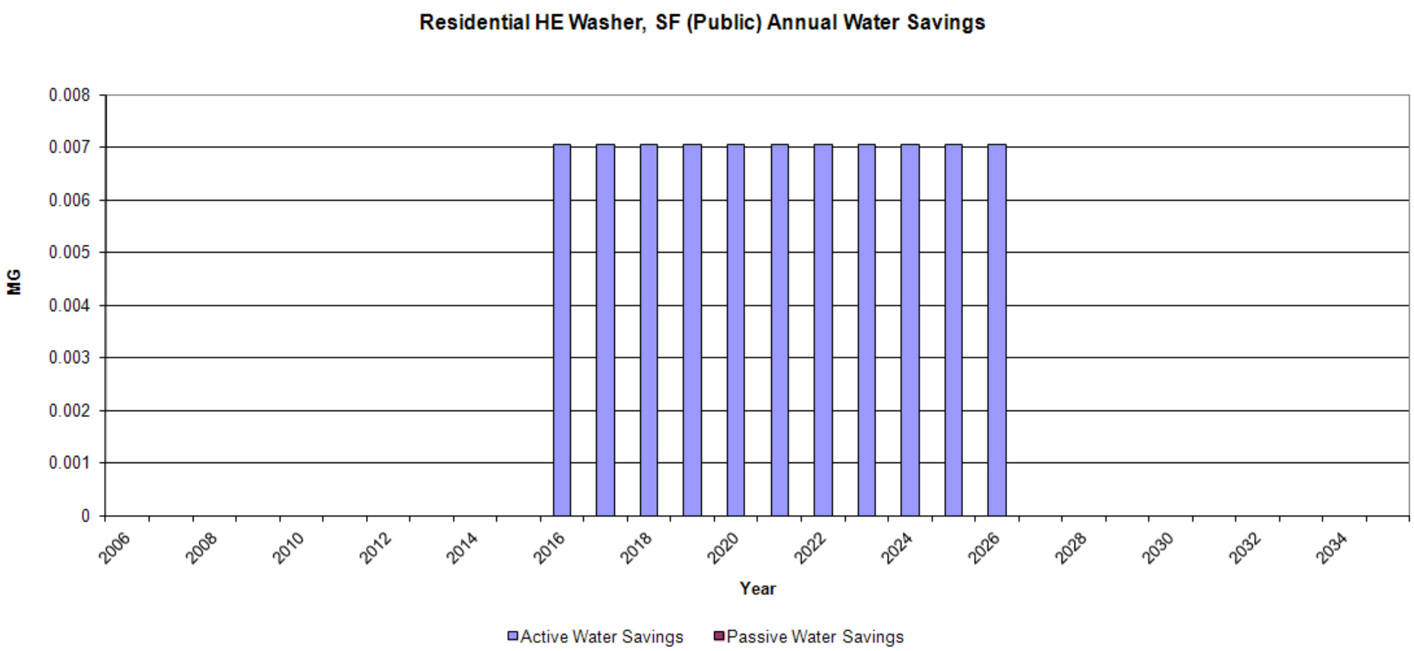

CII Spray Rinse Valve $20 rebate (Commercial) Annual Water Savings
MG
2
1
1
1
0.800
0.600
0.400
0.200
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings



CII Spray Rinse Valve $20 rebate (Industrial) Annual Water Savings
MG
2
1
1
1
0.800
0.600
0.400
0.200
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings



CII Spray Rinse Valve $20 rebate (Public) Annual Water Savings
MG
2
1
1
1
0.800
0.600
0.400
0.200
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings


Residential HE Washer, SF (Public) Annual Water Savings
MG
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Active Water Savings
Passive Water Savings

Appendix E
Cost Estimates

Summary Cost Estimates
Waukesha Supply and Return Alternatives

	2013 Costs Capital Cost(1)	O&M $/yr.(2)	20-Year Present Worth(3)	50-Year Present Worth(3)
Alternative 1 - Deep and Shallow Aquifers	$211,000,000	$7,200,000	$294,000,000	$325,000,000
Alternative 2 - Lake Michigan Supply from Oak Creek and Root River Return (corridor sharing with Root River return flow)	$206,000,000	$7,900,000	$297,000,000	$331,000,000
Alternative 3 - Shallow Aquifers and Fox River Alluvium	$217,000,000	$8,900,000	$320,000,000	$358,000,000
Alternative 4 - Lake Michigan and Shallow Aquifers	$250,000,000	$8,300,000	$346,000,000	$381,000,000
Alternative 5 - Unconfined Deep Aquifers	$234,000,000	$6,400,000	$308,000,000	$335,000,000
Alternative 6 - Multiple Sources	$323,000,000	$7,300,000	$407,000,000	$439,000,000

Notes

Some capital costs generated by scaling previous estimates to ENR Index

1 June 2013 dollars. Capital costs June 2013 construction start.

2 16.7 mgd supply capacity, 10.1 mgd average capacity, 11.7 mgd average return flow.

3 Interest rate = 6%

Alternative 1 - Deep and Shallow Wells

Captial Cost

	Quantity	Unit Cost	Total
Shallow Aquifer Wellfield			*2013 Costs*
Well houses and pumps	12	$ 334,500	$ 4,014,000
Land, acres	12	$ 178,416	$ 2,141,000
Roads, ft	30,000	$ 27.9	$ 837,000
Interconnecting pipe, 8" to 20", ft	30,000	$ 185	$ 5,535,000
Electrical (10% of well houses, pumps, land)	$ 6,155,000.00	10%	$ 616,000
Shallow Aquifer Supply Pipeline to Waukesha			
11 mi of 24" pipe, mixed rural and urban, ft	58,080	$ 357	$ 20,707,000
Shallow Aquifer Treatment Plant and Pump Station			
One groundwater treatment plant @ 16.7 mgd	16,700,000	$ 1.59	$ 26,553,000
Land	1	$ 2,230,000	$ 2,230,000
Deep Well Treatment Plant			
3 RO plants for Wells 6,8,10 @ 5.35 mgd including land built in 2020	5,350,000	$ 4.57	$ 24,460,000
Distribution System Improvements			
4.3 mi of 16", 24", and 30" pipes	22,500	$ 413	$ 9,289,000
5.1 mi of 16" pipe for blending, ft	26,928	$ 323	$ 8,698,000
Wastewater Forcemain			
5 mi of 6" forcemain, ft	26,400	$ 141	$ 3,715,000
Subtotal			**$ 108,795,000**
3% markup for Bonds & Insurance			$3,264,000
5% markup for Mob/Demob			$5,440,000
8% markup for Contractors Overhead			$9,400,000
4% markup for Contractors profit			$4,700,000
25% Contingency			$32,900,000
Subtotal Markups and Contingency			**$ 55,704,000**
Total Project Construction Costs			**$ 164,499,000**
8% allowance for engineering and design			$13,160,000
12% allowance for permitting, legal and admin.			$19,740,000
8% allowance for engr services during construction			$13,160,000
Subtotal Other Project Costs			**$46,060,000**
TOTAL PROJECT CAPITAL COST			**$ 210,560,000**

Alternative 1 - Deep and Shallow Wells

Operating and Maintenance Cost

Source of Supply	Units	Quantity	Unit Cost	$/yr	Total
Deep Well pumping/maintenance	$/1000 gal	1,642,500	$ 0.350	$ 574,875	
Shallow Well Pumping/Maintenance	$/1000 gal	2,044,000	$ 0.140	$ 286,160	
					$ 861,000
Treatment/Pumping					
Deep Wells 6,7,8 starting in 2020	$/1000 gal	821,250	$ 0.61	$ 500,963	
Shallow Wells	$/1000 gal	2,044,000	$ 1.09	$ 2,225,916	
Residuals	$/1000 gal	164,068	$ 4	$ 656,270	
					$ 3,383,000
Home Softening					
Salt/Equipment/Replacment	$/person/yr	13,683	$ 209	$ 2,859,747	
					$ 2,860,000
Transmission					
Operation and Maintenance	$/lf/yr	137,280	$ 0.52	$ 71,386	
					$ 71,386
Alternative 1 Total O&M ($/yr.)					**$ 7,200,000**

PRESENT WORTH (6%, 20 yrs)	**$ 83,000,000**
PRESENT WORTH (6%, 50 yrs)	**$ 113,000,000**
Total Present Worth (6%, 20 years)	**$ 293,560,000**
Total Present Worth (6%, 50 years)	**$ 323,560,000**

Alternative 2 - Lake Michigan Supply

From Oak Creek. Return to Root River.

Captial Cost

	Quantity	Unit Cost	Total
Lake Michigan Supply Pump Station			
one PS @ 16.7 mgd and 210 psi	1	$ 8,830,125	$ 8,831,000
Lake Michigan Supply Pipeline			
20 miles of 30"	105,600	$ 408.00	$ 43,085,000
Return Pump Station and Pipeline			
one PS @ 16.7 mgd and 210 psi	1	$ 3,700,000	$ 3,700,000
19 miles of 30"	100,320	$ 457.00	$ 45,847,000
Distribution System Improvements			
5 mi of 24" pipes	24,800	$ 206	$ 5,109,000
Subtotal			**$ 106,572,000**
3% markup for Bonds & Insurance			$3,198,000
5% markup for Mob/Demob			$5,329,000
8% markup for Contractors Overhead			$9,208,000
4% markup for Contractors profit			$4,604,000
25% Contingency			$32,228,000
Subtotal Markups and Contingency			**$ 54,567,000**
Total Project Construction Costs			**$ 161,139,000**
8% allowance for engineering and design			$12,892,000
12% allowance for permitting, legal and admin.			$19,337,000
8% allowance for engr services during construction			$12,892,000
Subtotal Other Project Costs			**$45,121,000**
TOTAL PROJECT CAPITAL COST			**$ 206,260,000**

Alternative 3 - Fox Alluvium and Shallow Aquifer

Captial Cost

	Quantity	Unit Cost	Total
Shallow Aquifer Wellfield			*2013 Costs*
Well houses and pumps	12	$ 334,500	$ 4,014,000
Land, acres	12	$ 178,416	$ 2,141,000
Roads, ft	30,000	$ 27.9	$ 837,000
Interconnecting pipe, 8" to 20", ft	30,000	$ 185	$ 5,535,000
Electrical (10% of well houses, pumps, land)	$ 6,155,000	10%	$ 616,000
Fox River Alluvium Wellfield			
Well houses and pumps	$ 4	$ 805,000	$ 3,220,000
Land, acres	$ 4	$ 276,000	$ 1,104,000
Roads, ft	4,600	$ 27.9	$ 128,340
Interconnecting pipe, 12" to 16", ft	4,600	$ 172	$ 791,200
Electrical (10% of well houses, pumps, land)	$ 4,324,000	10%	$ 432,000
Treatment Plant and Pump Station			
One lime softening surface water treatment plant @ 16.7 mgd	16,700,000	$ 4.20	$ 70,140,000
Distribution System Improvements			
7 mi of 16", 20", 24", and 30" pipes	36,800	$ 525	$ 19,320,000
Wastewater Forcemain			
5 mi of 6" forcemain, ft	26,400	$ 141	$ 3,715,000
Subtotal			**$ 111,993,540**
3% markup for Bonds & Insurance			$3,360,000
5% markup for Mob/Demob			$5,600,000
8% markup for Contractors Overhead			$9,677,000
4% markup for Contractors profit			$4,839,000
25% Contingency			$33,868,000
Subtotal Markups and Contingency			**$ 57,344,000**
Total Project Construction Costs			**$ 169,337,540**
8% allowance for engineering and design			$13,548,000
12% allowance for permitting, legal and admin.			$20,321,000
8% allowance for engr services during construction			$13,548,000
Subtotal Other Project Costs			**$47,417,000**
TOTAL PROJECT CAPITAL COST			**$ 216,750,000**

Alternative 3 - Fox Alluvium and Shallow Aquifer

Operating and Maintenance Cost

Source of Supply	Units	Quantity	Unit Cost	$/yr	Total
Wells Pumping/Maintenance	$/1000 gal	3,686,500	$ 0.140	$ 516,110	
					$ 516,000
Treatment/Pumping					
Lime Softening Water Treatment Plant	$/1000 gal	3,686,500	$ 2.17	$ 7,999,705	
Residuals	$/1000 gal	73,730	$ 4	$ 294,920	
					$ 8,295,000
Transmission					
Operation and Maintenance	$/lf/yr	108,281	$ 0.52	$ 56,306	
					$ 56,306
Alternative 1 Total O&M ($/yr.)					**$ 8,900,000**

PRESENT WORTH (6%, 20 yrs)	**$ 102,000,000**
PRESENT WORTH (6%, 50 yrs)	**$ 140,000,000**
Total Present Worth (6%, 20 years)	**$ 318,750,000**
Total Present Worth (6%, 50 years)	**$ 356,750,000**

Alternative 4 - Lake Michigan and Shallow wells

Captial Cost

	Quantity	Unit Cost	Total
Shallow Aquifer Wellfield			*2013 Costs*
Well houses and pumps	12	$ 334,500	$ 4,014,000
Land, acres	12	$ 178,416	$ 2,141,000
Roads, ft	30,000	$ 27.9	$ 837,000
Interconnecting pipe, 8" to 20", ft	30,000	$ 185	$ 5,535,000
Electrical (10% of well houses, pumps, land)	$ 6,155,000.00	10%	$ 616,000
Shallow Aquifer Supply Pipeline to Waukesha			
11 mi of 24" pipe, mixed rural and urban, ft	58,080	$ 357	$ 20,707,000
Shallow Aquifer Treatment Plant and Pump Station			
One groundwater treatment plant @ 16.7 mgd	16,700,000	$ 1.59	$ 26,553,000
Land	1	$ 2,230,000	$ 2,230,000
Lake Michigan Supply Pump Station			
one @ 7.6 mgd and 100 psi	1	$ 5,870,000	$ 5,870,000
Lake Michigan Supply Pipeline			
14 miles of 24", ft	73,920	$ 387.00	$ 28,608,000
Return Pump Station and Pipeline			
one @ 7.6 mgd and 100 psi	1	$ 3,200,000	$ 3,200,000
11 miles of 24", ft	58,080	$ 271.00	$ 15,740,000
Distribution System Improvements			
4.3 mi of 16", 24", and 30" pipes	22,500	$ 413	$ 9,289,000
Wastewater Forcemain			
5 mi of 6" forcemain, ft	26,400	$ 141	$ 3,715,000
Subtotal			**$ 129,055,000**
3% markup for Bonds & Insurance			$3,872,000
5% markup for Mob/Demob			$6,453,000
8% markup for Contractors Overhead			$11,151,000
4% markup for Contractors profit			$5,576,000
25% Contingency			$39,027,000
Subtotal Markups and Contingency			**$ 66,079,000**
Total Project Construction Costs			**$ 195,134,000**
8% allowance for engineering and design			$15,611,000
12% allowance for permitting, legal and admin.			$23,417,000
8% allowance for engr services during construction			$15,611,000
Subtotal Other Project Costs			**$54,639,000**
TOTAL PROJECT CAPITAL COST			**$ 249,770,000**

Alternative 4 - Lake Michigan and Shallow wells

Operating and Maintenance Cost

Source of Supply	Units	Quantity	Unit Cost	Ext. Cost	Total
Purchased water	$/1000 gal	3,686,500	$ 1.830	$ 6,746,295	
					$ 6,746,000
Treatment/Pumping					
Lake Michigan Pumping Energy	$/kWh	6,176,619	$ 0.06	$ 370,597	
Lake Michigan Pump Station O&M	%	$ 8,831,000	2%	$ 176,620	
Return Flow Pumping Energy	$/kWh	7,280,875	$ 0.06	$ 436,852	
Return Flow Pump Station O&M	%	$ 3,700,000	2%	$ 74,000	
					$ 1,058,000
Transmission					
Operation and Maintenance	$/lf/yr	142,560	$ 0.52	$ 74,131	
					$ 74,131
Alternative 1 Total O&M ($/yr.)					**$ 7,900,000**

PRESENT WORTH (6%, 20 yrs)	**$ 91,000,000**
PRESENT WORTH (6%, 50 yrs)	**$ 125,000,000**
Total Present Worth (6%, 20 years)	**$ 297,260,000**
Total Present Worth (6%, 50 years)	**$ 331,260,000**

Alternative 4 - Lake Michigan and Shallow wells

Operating and Maintenance Cost

Source of Supply	Units	Quantity	Unit Cost	Ext. Cost	Total
Purchased water	$/1000 gal	1,642,500	$ 1.830	$ 3,005,775	
Shallow Well Pumping/Maintenance	$/1000 gal	2,044,000	$ 0.140	$ 286,160	
					$ 3,292,000
Treatment/Pumping					
Lake Michigan Pumping Energy	$/kWh	1,536,853	$ 0.06	$ 92,211	
Shallow Wells Pumping Energy	$/1000 gal	2,044,000	$ 1.09	$ 2,225,916	
Residuals	$/1000 gal	186,150	$ 4.00	$ 744,600	
Return Flow Pumping Energy	$/kWh	947,652	$ 0.06	$ 56,859	
Lake Michigan Pump Station O&M	%	$ 5,870,000	2%	$ 117,400	
Return Flow Pump Station O&M	%	$ 3,200,000	2%	$ 64,000	
					$ 3,301,000
Home Softening					
Salt/Equipment/Replacment	$/person/yr	13,683	$ 116	$ 1,585,602	
					$ 1,586,000
Transmission					
Operation and Maintenance	$/lf/yr	137,280	$ 0.52	$ 71,386	
					$ 71,386
Alternative 1 Total O&M ($/yr.)					**$ 8,300,000**

PRESENT WORTH (6%, 20 yrs)	**$ 95,000,000**
PRESENT WORTH (6%, 50 yrs)	**$ 131,000,000**
Total Present Worth (6%, 20 years)	**$ 344,770,000**
Total Present Worth (6%, 50 years)	**$ 380,770,000**

Alternative 5 - Unconfined Deep Aquifer

Captial Cost

	Quantity	Unit Cost	Total
Unconfined Deep Aquifer Wellfield			*2013 Costs*
New wells @ 1.5 mgd each	12	$ 557,500	$ 6,690,000
Well houses and pumps	12	$ 334,500	$ 4,014,000
Land	12	$ 334,500	$ 4,014,000
Roads, ft	47,520	$ 27.9	$ 1,324,620
Interconnecting pipe, 12" to 24", ft	47,520	$ 167	$ 7,947,720
Electrical (10% of well houses, pumps, and land)	14,718,000	10%	$ 1,471,800
Unconfined Deep Aquifer Supply Pipeline to Waukesha			
15 miles 36", rural	79,200	$ 390	$ 30,907,800
5 miles 36", urban	26,400	$ 669	$ 17,661,600
Unconfined Deep Aquifer Treatment Plant and Pump Station			
One @ 16.7 mgd	16,700,000	$ 1.95	$ 32,585,875
Land	1	$ 1,115,000	$ 1,115,000
Distribution System Improvements			
4.3 mi of 16", 24", and 30" pipes	22,500	$ 413	$ 9,289,000
Wastewater Forcemain			
5 mi of 6" forcemain, ft	26,400	$ 141	$ 3,715,000
Subtotal			**$ 120,736,415**
3% markup for Bonds & Insurance			$3,623,000
5% markup for Mob/Demob			$6,037,000
8% markup for Contractors Overhead			$10,432,000
4% markup for Contractors profit			$5,216,000
25% Contingency			$36,512,000
Subtotal Markups and Contingency			**$ 61,820,000**
Total Project Construction Costs			**$ 182,556,415**
8% allowance for engineering and design			$14,605,000
12% allowance for permitting, legal and admin.			$21,907,000
8% allowance for engr services during construction			$14,605,000
Subtotal Other Project Costs			**$51,117,000**
TOTAL PROJECT CAPITAL COST			**$ 233,670,000**

Alternative 5 - Unconfined Deep Aquifer

Operating and Maintenance Cost

Source of Supply	Units	Quantity	Unit Cost	$/yr	Total
Wells Pumping/Maintenance	$/1000 gal	3,686,500	$ 0.350	$ 1,290,275	
					$ 1,290,000
Treatment/Pumping					
Groundwater Water Treatment Plant	$/1000 gal	3,686,500	$ 0.50	$ 1,843,250	
Residuals	$/1000 gal	73,730	$ 4	$ 294,920	
					$ 2,138,000
Home Softening					
Salt/Equipment/Replacment	$/person/yr	13,683	$ 209	$ 2,859,747	
					$ 2,860,000
Transmission					
Operation and Maintenance	$/lf/yr	137,280	$ 0.52	$ 71,386	
					$ 71,386
Alternative 1 Total O&M ($/yr.)					**$ 6,400,000**

PRESENT WORTH (6%, 20 yrs)	**$ 73,000,000**
PRESENT WORTH (6%, 50 yrs)	**$ 101,000,000**
Total Present Worth (6%, 20 years)	**$ 306,670,000**
Total Present Worth (6%, 50 years)	**$ 334,670,000**

Alternative 6 - Multiple Sources

Captial Cost

	Quantity	Unit Cost	Total
Deep Well Treatment Plant			
3 RO plants for Wells 6,8,10 @ 5.35 mgd including land built in 2020	5,350,000	$ 4.57	$ 24,460,000
Shallow Aquifer Water Treatment Plant			
One @ 2.5 mgd	2,500,000	$ 4.46	$ 11,150,000
5 mi of 6" forcemain, ft	26,400	$ 141	$ 3,715,000
Land	1	$ 2,230,000	$ 2,230,000
Shallow Aquifer Wellfield			
new wells and wellhouses @ 1.5 mgd each	3	$ 780,500	$ 2,341,500
Land	3	$ 278,750	$ 836,250
Roads, ft	7,000	$ 27.9	$ 195,125
Interconnecting pipe, 12", ft	10,000	$ 161	$ 1,605,600
Electrical (10% of well houses, pumps, and land)	3,177,750	10%	$ 317,775
Shallow Aquifer Supply Pipeline to Waukesha			
10 miles of 16 " for 4 mgd	52,800	$ 262	$ 13,834,920
Unconfined Deep Aquifer Treatment Plant			$ -
One @ 3.2 mgd	3,200,000	$ 2	$ 7,136,000
Land	1	$ 557,500	$ 557,500
Unconfined Deep Aquifer Wellfield			
3 new wells and wellhouses @ 1.5 mgd each	3	$ 1,338,000	$ 4,014,000
Land	3	$ 334,500	$ 1,003,500
Roads, ft	10,560	$ 28	$ 294,360
Interconnecting pipe, 12", ft	10,560	$ 161	$ 1,695,514
Electrical (10% of well houses, pumps, and land)	5,017,500	10%	$ 501,750
Unconfined Deep Aquifer Supply Pipeline to Waukesha			
12 miles 20", rural	63,360	$ 201	$ 12,716,352
5 miles 20 ", urban	26,400	$ 368	$ 9,713,880
Quarry Water Treatment Plant			$ -
intakes @ 2 mgd each	4	$ 1,672,500	$ 6,690,000
Intake pump stations	2	$ 557,500	$ 1,115,000
Land	1	$ 557,500	$ 557,500
One water plant @ 5 mgd	5,000,000	$ 4	$ 22,300,000
4" Sludge pipeline	21,120	$ 85	$ 1,789,709
Quarry Supply Pipeline to Waukesha			
7 miles 16", rural	36,960	$ 158	$ 5,851,877
Silurian Dolomite Aquifer Treatment Plant			
One @ 2 mgd	2,000,000	$ 2.23	$ 4,460,000
Land	1	$ 557,500	$ 557,500
Silurian Dolomite Aquifer Wellfield			$ -
5 new wells and wellhouses @ .5 mgd each	5	$ 780,500	$ 3,902,500
Land	5	$ 334,500	$ 1,672,500
Roads, ft	10,560	$ 27.9	$ 294,360
Interconnecting pipe, 6", ft	21,120	$ 80.3	$ 1,695,514
Interconnecting pipe, 12", ft	10,560	$ 81.4	$ 859,531
Electrical (10% of well houses, pumps, and land)	5,575,000	10%	$ 557,500
Silurian Dolomite Aquifer Supply Pipeline to Waukesha			
2 mile 12 ", urban	10,560	$ 191	$ 2,013,422
Distribution System Improvements			
4.3 mi of 16", 24", and 30" pipes	22,704	$ 413	$ 9,373,000
2.7 mi of 16" pipe for blending, ft	14,256	$ 323	$ 4,605,000

Subtotal			**$ 166,613,938**
3% markup for Bonds & Insurance			$4,999,000
5% markup for Mob/Demob			$8,331,000
8% markup for Contractors Overhead			$14,396,000
4% markup for Contractors profit			$7,198,000
25% Contingency			$50,385,000
Subtotal Markups and Contingency			**$ 85,309,000**
Total Project Construction Costs			**$ 251,922,938**
8% allowance for engineering and design			$20,154,000
12% allowance for permitting, legal and admin.			$30,231,000
8% allowance for engr services during construction			$20,154,000
Subtotal Other Project Costs			**$70,539,000**
TOTAL PROJECT CAPITAL COST			**$ 322,460,000**

Alternative 6 - Multiple Sources

Operating and Maintenance Cost

Source of Supply	Units	Quantity	Unit Cost	$/yr	Total
Deep Well pumping/maintenance	$/1000 gal	1496500	$ 0.35	$ 523,775	
Shallow Well Pumping/Maintenance	$/1000 gal	876000	$ 0.14	$ 122,640	
Quarry pumping/Maintenance	$/1000 gal	876000	$ 0.14	$ 122,640	
Dolomite well pumping/Maintenance	$/1000 gal	438000	$ 0.14	$ 61,320	
					$ 830,000
Treatment/Pumping					
Deep Wells 6,7,8 starting in 2020	$/1000 gal	821,250	$ 0.61	$ 500,963	
Shallow Wells and Quarry	$/1000 gal	1,752,000	$ 1.11	$ 1,944,720	
Unconfined Wells	$/1000 gal	730,000	$ 0.50	$ 365,000	
Residuals	$/1000 gal	103842.5	$ 4	$ 415,370	
Dolomite Wells	$/1000 gal	438,000	$ 0.50	$ 219,000	
					$ 3,445,000
Home Softening					
Salt/Equipment/Replacment	$/person/yr	13,683	$ 209	$ 2,859,747	
					$ 2,860,000
Transmission					
Operation and Maintenance	$/lf/yr	290,400	$ 0.52	$ 151,008	
					$ 151,008
Alternative 1 Total O&M ($/yr.)					**$ 7,300,000**

PRESENT WORTH (6%, 20 yrs)	**$ 84,000,000**
PRESENT WORTH (6%, 50 yrs)	**$ 115,000,000**
Total Present Worth (6%, 20 years)	**$ 406,460,000**
Total Present Worth (6%, 50 years)	**$ 437,460,000**

Appendix F
Intergovernmental Approvals

Waukesha Water Utility
SERVING WAUKESHA SINCE 1886

115 DELAFIELD STREET
WAUKESHA, WI 53188-3615

Telephone: (262) 521-5272 • Fax: (262) 521-5265 • E-mail: contactus@waukesha-water.com

September 29, 2011

Paul Kanter, Chairman
Town of Delafield
N14 W30782 Golf Road
Delafield, WI 53018

Subjec Request for Approval by the Town of Delafield of the City of Waukesha Water Supply Service Area Plan

Dear Mr. Kanter:

At your September 13, 2010 Town Board meeting, the Town Board unanimously approved the Town of Delafield's inclusion in the Waukesha Water Utility Service Area. At that meeting, I made a commitment to provide a letter clarifying several issues raised by members of the Town Board regarding inclusion in the service area.

One issue was the cost to the Town for inclusion in the service area or for the Application for Great Lakes Water. There is no cost to the Town of Delafield to be included in the service area or for the Application for Great Lakes Water. Inclusion of the area in the Town in the service area would simply make that area eligible to receive water service from the Waukesha Water Utility if requested by the property owner.

Other issues were related to questions about how the water service would be extended to the residents within the service area. Annexation is not required as a precondition of water service for the residents within the service area in the Town of Delafield. Health and safety needs of the property owner will be considered when service is requested. Also, if a property owner does request annexation, inclusion in the service area does not guarantee that annexation would be granted. Annexation will be considered by the City on a case-by-case basis.

Finally, if water service were requested and approved, appropriate conservation measures similar to those implemented by the City of Waukesha would be required if water is provided. Examples of those measures include sprinkling restrictions, conservation water rates, wise water use promotions, and similar activities.

Once again, I appreciate the Town of Delafield's quick response to our request and look forward to working with you in the future should water service be requested.

If you have any questions or would like any further information, feel free to contact me at (262) 521-5272 ext. 518.

Sincerely,

Waukesha Water Utility

Daniel S. Duchniak, P.E.
General Manager

Waukesha Water Utility
SERVING WAUKESHA SINCE 1886

115 DELAFIELD STREET
WAUKESHA, WI 53188-3615

Telephone: (262) 521-5272 • Fax: (262) 521-5265 • E-mail: contactus@waukesha-water.com

July 7, 2011

Paul Kanter, Chairman
Town of Delafield
N14 W30782 Golf Road
Delafield, WI 53018

Subject: Request for Approval by the Town of Delafield of the City of Waukesha Water Supply Service Area Plan

Dear Mr. Kanter:

The purpose of this letter is to request review and approval by the Town of Delafield of the City of Waukesha Water Supply Service Area Plan as discussed below.

Background and Regulatory Requirement

In December 2008, the Southeast Regional Planning Commission (SEWRPC), in conjunction with the Wisconsin Department of Natural Resources, delineated the water supply service area for the City of Waukesha which included an area of the Town of Delafield. (Refer to Attachment 1.) This planning guidance was prepared in a manner consistent with the Waukesha County comprehensive plan, the *Regional Water Supply Plan for Southeastern Wisconsin,* and state planning requirements. The proposed water supply service area and population projections are a basis for the *Draft City of Waukesha Water Supply Service Area Plan, April 2010*. (Refer to Attachment 2.) This proposed water supply service area is consistent with the current sewer system services area that has been approved by the Town of Delafield.

The City of Waukesha is making application for a diversion of Great Lakes water pursuant to Sections 281.346 and 281.348 Wis. Stats. The Great Lakes-Water Resources Compact and the Wisconsin Statutes adopted pursuant to the Compact require that the City document the public participation process conducted for the proposed Water Supply Area Plan, including evidence that the governing body of the Town of Delafield addressed by the plan have approved the Water Supply Service Area Plan, hence this request to the Town of Delafield.

The Town of Delafield water supply is currently provided by private wells. The future decision of whether to develop a Town municipal water supply system is up to the Town of Delafield. Municipal Great Lakes water supply would only be provided if needed and requested by the Town of Delafield. The Town was included by SEWRPC in the City of Waukesha's future water supply service area because it may be served by municipal water service during the planning horizon that extends to year 2035. Approval of the City's Water Supply Service Area Plan does not financially or legally commit the Town to actual Great Lakes water supply but rather acknowledges the potential for Great Lakes Water supply of the designated area of the Town by the City sometime in the future. The Town will remain on its supply of private wells unless there is a water supply need and an initiative by the Town requesting Great Lakes water supply by the City for the designated service area. At that time, the Town would be required to implement conservation measures consistent with those implemented by the City of Waukesha. Non-approval by the Town of the City's Great Lakes water supply for the area of the Town designated by SEWRPC will result in this area being deleted from Great Lakes Water Supply Service by the City of Waukesha and revision of the Water Supply Service Area Plan. Approval of the City of Waukesha Water Supply Service Area Plan provides the Town with a contingency plan (Attachment 3) for water supply in the future if the Town ever decides to replace its private wells with a municipal supply.

Because our application for a Great Lakes water supply (Attachment 4) is currently pending before the DNR, we would appreciate a response by September 2, 2011. I would be happy to discuss this matter with you at your convenience. Thank you for your consideration.

Sincerely,

Waukesha Water Utility

Daniel S. Duchniak, P.E.
General Manager

cc: Mike Hahn, Southeastern Wisconsin Regional Planning Commission
Dale Shaver, Waukesha County
Dino Tsoris, Wisconsin Department of Natural Resources

Attachments

1- Southeastern Wisconsin Regional Planning Commission Letter, December 23, 2008
2- Southeaster Wisconsin Regional Planning Commission Letter, March 17, 2009
3- Draft City of Waukesha Water Supply Service Area Plan, April 2010
4- Application for Great Lakes Water Supply, May 2010

Waukesha Water Utility
SERVING WAUKESHA SINCE 1886
115 DELAFIELD STREET
WAUKESHA, WI 53188-3615
Telephone: (262) 521-5272 • Fax: (262) 521-5265 • E-mail: contactus@waukesha-water.com

July 7, 2011

Jeff Weigel
City of Pewaukee
N240 N3065 Pewaukee Road
Pewaukee, WI 53072

Subject: Request for Approval by the City of Pewaukee of the City of Waukesha Water Supply Service Area Plan

Dear Mr. Weigel:

The purpose of this letter is to request review and approval by the City of Pewaukee of the City of Waukesha Water Supply Service Area Plan as discussed below.

Background and Regulatory Requirement

In December 2008, the Southeast Regional Planning Commission (SEWRPC), in conjunction with the Wisconsin Department of Natural Resources, delineated the water supply service area for the City of Waukesha which included an area of the City of Pewaukee. (Refer to Attachment 1.) This planning guidance was prepared in a manner consistent with the Waukesha County comprehensive plan, the *Regional Water Supply Plan for Southeastern Wisconsin*, and state planning requirements. The proposed water supply service area and population projections are a basis for the *Draft City of Waukesha Water Supply Service Area Plan, April 2010*. (Refer to Attachment 2.) This proposed water supply service area is consistent with the current sewer system services area that has been approved by the City of Pewaukee.

The City of Waukesha is making application for a diversion of Great Lakes water pursuant to Sections 281.346 and 281.348 Wis. Stats. The Great Lakes-Water Resources Compact and the Wisconsin Statutes adopted pursuant to the Compact require that the City document the public participation process conducted for the proposed Water Supply Area Plan, including evidence that the governing body of the City of Pewaukee addressed by the plan have approved the Water Supply Service Area Plan, hence this request to the City of Pewaukee.

The City of Pewaukee water supply in the designated area is currently provided by private wells. The future decision of whether to develop a municipal water supply system for this area is up to the City of Pewaukee. Municipal Great Lakes water supply would only be provided if needed and requested by the City of Pewaukee. The area within the City was included by SEWRPC in the City of Waukesha's future water supply service area because it may be served by municipal water service during the planning horizon that extends to year 2035. Approval of the City's Water Supply Service Area Plan does not financially or legally commit the City to actual Great Lakes water supply but rather acknowledges the potential for Great Lakes Water supply of the designated area of the City by the City sometime in the future. The area within the City will remain on its supply of private wells unless there is a water supply need and an initiative by the City requesting Great Lakes water supply by the City for the designated service area. At that time, the City would be required to implement conservation measures consistent with those implemented by the City of Waukesha for the designated area. Non-approval by the City of the City's Great Lakes water supply for the area of the City designated by SEWRPC will result in this area being deleted from Great Lakes Water Supply Service by the City of Waukesha and revision of the Water Supply Service Area Plan. Approval of the City of Waukesha Water Supply Service Area Plan provides the City with a contingency plan (Attachment 3) for water supply in the future if the City ever decides to replace its private wells with a municipal supply.

Because our application for a Great Lakes water supply (Attachment 4) is currently pending before the DNR, we would appreciate a response by September 2, 2011. I would be happy to discuss this matter with you at your convenience. Thank you for your consideration.

Sincerely,

Waukesha Water Utility

Daniel S. Duchniak, P.E.
General Manager

cc: Mike Hahn, Southeastern Wisconsin Regional Planning Commission
Dale Shaver, Waukesha County
Dino Tsoris, Wisconsin Department of Natural Resources

Attachments

1- Southeastern Wisconsin Regional Planning Commission Letter, December 23, 2008
2- Southeaster Wisconsin Regional Planning Commission Letter, March 17, 2009
3- Draft City of Waukesha Water Supply Service Area Plan, April 2010
4- Application for Great Lakes Water Supply, May 2010

COMMON COUNCIL MEETING NOTICE & AGENDA

Monday, July 18th, 2011

IMMEDIATELY FOLLOWING THE PUBLIC HEARINGS

Common Council Chambers
City of Pewaukee
W240 N3065 Pewaukee Road ~ Pewaukee, WI

1.0 Call to Order [Mayor Klein]

2.0 Public Comment - *Please limit your comments to 2 minutes, if further time for discussion is needed please contact your local Alderperson prior to the meeting.*

3.0 Consent Agenda – Action

- 3.1 Approval of Common Council Meeting Minutes dated June 20, 2011
- 3.2 Accounts Payable Summaries
- 3.3 Bartender Licenses (Renewals)

3.3.1	Evan Weickardt	3.3.2	Antonia Wankowski
3.3.3	Steve Youngbauer	3.3.4	Pamela Duane
3.3.5	Chris Hill	3.3.6	Darren Wolf
3.3.7	Hasan Incili	3.3.8	Kaitlin Brierton
3.3.9	Jason Jaworski	3.3.10	Doug Kunde
3.3.11	Randy Strumberger	3.3.12	Michelle A. Garrigan-Kronschnabl
3.3.13	Steven Straub	3.3.14	Jessie Petre
3.3.15	Nicole Boehnen	3.3.16	Ann Penisten
3.3.17	Jeff Calimlim	3.3.18	Joshua Green
3.3.19	Lucy Stich	3.3.20	Sarah Johnson
3.3.21	Sonya Eichler	3.3.22	Sarah Toth-Lisowicz
3.3.23	Abby Swift	3.3.24	Kristina Mouzakis

- 3.4 Bartender Licenses (New)

3.4.1	Kayla Hine	3.4.2	Sara Blackburn
3.4.3	Nikolas Radi	3.4.4	Sheila Gard
3.4.5	Ryan Wargolet	3.4.6	Kim Kubena
3.4.7	Christine Albrecht	3.4.8	Diane Stommel
3.4.9	Sherry DeGodt	3.4.10	James Brand

- 3.5 Transfer Money from the Build America Bond Account into the General Checking Account in the amount of $42,348.52 for capital equipment purchases and paving project expenses

4.0 Update on Police Services [Lt. Dussault]

5.0 Public Hearing and Possible Approval Pertaining to the Wholesale Beer License of Purple Feet Wines, LLC located at N29 W2381 Woodgate Court West, Naming Mark H. Bausch Agent [Kiser]

6.0 Discussion and Possible Action to Approve a Large Gathering Permit and Allow for a Temporary Change of Liquor License Premise Description at the Request of Craig Werner of Mug Shots to Hold His Second Annual Music Event on July 22nd and July 23rd, 2011 [Kiser]

7.0 Discussion and Possible Action Regarding the Remaining Appointments to Various Committees, Boards and Commissions [Mayor Klein]

8.0 Discussion and Possible Action Regarding Joint Meeting with Village of Pewaukee on Consolidation

9.0 Discussion and Possible Action Regarding the Potential Cancellation of a Meeting in August [Mayor Klein]

10.0 Discussion and Possible Action Regarding Redistricting of the City of Pewaukee [Tarczewski]

11.0 Further Discussion and Possible Action Regarding the Proposed Victoria Station I Cash Escrow Agreement (June 20, 2011 Public Works Committee meeting)

12.0 Further Discussion and Possible Action Regarding the Request from the City of Waukesha to have the City of Pewaukee Replace and Restore the Clay Dam in the Sanitary Sewer Trench in South Park (May 16, 2011 Public Works Committee meeting)

13.0 Discussion and Possible Action to Authorize Expenditures in 2011 for the Engineering Design of the Reconstruction of Weyer Road [Weigel]

14.0 Discussion and Possible Action to Authorize Staff to Draw on the Letter of Credit for the Glacier Ridge Development Final Paving [Weigel]

15.0 Discussion and Action on the Request from the City of Waukesha to approve the Waukesha Water Supply Service Plan [Weigel]

16.0 Public Comment - *Please limit your comments to 2 minutes, if further time for discussion is needed please contact your local Alderperson prior to the meeting.*

17.0 Adjournment

Kelly Tarczewski
Clerk/Treasurer (7/13/2011)

NOTICE

It is also possible that members of other governmental bodies of the municipality may be in attendance to gather information that may form a quorum. At the above stated meeting, no action will be taken by any governmental body other than the governmental body specifically referred to above in this notice.

Any person who has a qualifying disability under the Americans with Disabilities Act that requires the meeting or materials at the meeting to be in an accessible format must contact the Clerk/Treasurer, Kelly Tarczewski, at (262) 691-0770 by 12:00 p.m. the day of the meeting so that arrangements may be made to accommodate your request.

In attendance: Mayor S. Klein, Alderpersons S. Bierce, C. Brown, C. Enters, M. Hasslinger, D. Kiser and K. Novack. Also present were Attorney S. Riffle, City Administrator T. LaBorde, DPW Director/City Engineer J. Weigel, Assistant Engineer M. Wagner, Lieutenant N. Dussault and City Clerk/Treasurer K. Tarczewski.

1.0 **Call to Order** – Following the public hearing for College Avenue and Bluemound Road water transmission main and the Sunnyridge Lane road reconstruction, municipal water and sanitary sewer public hearing, Mayor Klein called the regular Common Council meeting to order at 9:33 p.m.

2.0 **Public Comment** – Bob Steker (N27 W27018 Woodland Drive) began to speak about Mug Shotz's request for a large gathering permit (Item #6.0). Mayor Klein stated he may want to wait to give his opinion until after the Council discusses Mr. Werner's plan, and Mr. Steker agreed to do so.

3.0 **Consent Agenda – Action**

- **3.1 Approval of Common Council Meeting Minutes dated June 20, 2011**
- **3.2 Accounts Payable Summaries**
- **3.3 Bartender Licenses (Renewals)**
  - **3.3.1 Evan Weickardt** — **3.3.2 Antonia Wankowski**
  - **3.3.3 Steve Youngbauer** — **3.3.4 Pamela Duane**
  - **3.3.5 Chris Hill** — **3.3.6 Darren Wolf**
  - **3.3.7 Hasan Incili** — **3.3.8 Kaitlin Brierton**
  - **3.3.9 Jason Jaworski** — **3.3.10 Doug Kunde**
  - **3.3.11 Randy Strumberger** — **3.3.12 Michelle A. Garrigan-Kronschnabl**
  - **3.3.13 Steven Straub** — **3.3.14 Jessie Petre**
  - **3.3.15 Nicole Boehnen** — **3.3.16 Ann Penisten**
  - **3.3.17 Jeff Calimlim** — **3.3.18 Joshua Green**
  - **3.3.19 Lucy Stich** — **3.3.20 Sarah Johnson**
  - **3.3.21 Sonya Eichler** — **3.3.22 Sarah Toth-Lisowicz**
  - **3.3.23 Abby Swift** — **3.3.24 Kristina Mouzakis**
- **3.4 Bartender Licenses (New)**
  - **3.4.1 Kayla Hine** — **3.4.2 Sara Blackburn**
  - **3.4.3 Nikolas Radi** — **3.4.4 Sheila Gard**
  - **3.4.5 Ryan Wargolet** — **3.4.6 Kim Kubena**
  - **3.4.7 Christine Albrecht** — **3.4.8 Diane Stommel**
  - **3.4.9 Sherry DeGodt** — **3.4.10 James Brand**
- **3.5 Transfer Money from the Build America Bond Account into the General Checking Account in the amount of $42,348.52 for capital equipment purchases and paving project expenses**

A motion was made and seconded (D. Kiser, C. Brown) to approve consent agenda items 3.1, 3.2, 3.3, 3.4, and 3.5. There was no discussion regarding this item and the motion passed unanimously.

4.0 **Update on Police Services** – Lieutenant Dussault submitted a copy of the statistics with the updated numbers through June of this year. Ms. Brown referred to the citation area of the report regarding written and verbal warnings. She felt the numbers were the lowest on record and she questioned if that was typical for the summer. Lieutenant Dussault stated there is a speed grant, which is picking up a lot of the space for that, so the squads out on regular patrol are spending more time following up on cases, because there are a lot of investigations going on. That does play into the numbers. The speed grant totals are not included in the report, and it is just the squads that the City has through the contract. Lieutenant Dussault noted that the speed grant is funded by the state. Therefore, the numbers are lower because the squads on contract are spending more time in subdivisions and business districts where the quantity might not be as many.

Ms. Enters questioned where the revenue for the speed grants was going. Lieutenant Dussualt stated the revenue comes to the City of Pewaukee's municipal citations. Ms. LaBorde added that it also gets split between the state and county as well, as normal citations do.

Lieutenant Dussault stated the Cops and Bobbers season is half way through, and there are five weeks left. He mentioned that National Night Out is coming up on August 4th at Wagner Park and they are working with the Park and Recreation Department and the Fire Department. In addition, sign up for the fall and winter Gutter Busters program and the Badges and Bullseyes program are coming up at the end of August.

5.0 **Public Hearing and Possible Approval Pertaining to the Wholesale Beer License of Purple Feet Wines, LLC located at N29 W2381 Woodgate Court West, Naming Mark H. Bausch Agent** – Mr. Kiser stated this is a current establishment that sells wholesale for hard liquor, and they now want to sell beer.

Mayor Klein opened the public hearing at 9:41 p.m. and asked if there was anyone in the audience that wished to speak on the issue. After hearing no requests from the audience to speak, Mayor Klein closed the public hearing.

A motion was made and seconded (D. Kiser, C. Brown) to approve the wholesale beer license of Purple Feet Wines, LLC. There was no discussion regarding this item and the motion passed unanimously.

6.0 **Discussion and Possible Action to Approve a Large Gathering Permit and Allow for a Temporary Change of Liquor License Premise Description at the Request of Craig Werner of Mug Shots to Hold His Second Annual Music Event on July 22nd and July 23rd, 2011** – Mr. Kiser stated last year's attendance was affected by rain. He stated there were issues at this location in previous years when it was the Firehouse. Mr. Kiser felt the live music hours are shorter this year, but Ms. Novack disagreed and stated the hours went until 11:00 p.m. last year. The event went three days last year, but this year's event is on Friday and Saturday.

Ms. Brown noted that last year there was a big issue with parking and there was a shuttle from the park and ride. She stated she did not see anything about that on this year's permit.

Craig Werner, liquor agent for Mugshotz, stated he did plan on doing the shuttle again, but he forgot to put it on the application. He stated he also needs to figure out what is going to be done about the temporary no parking signs.

Ms. Novack referred to last year's meeting minutes and stated the signs were supposed to say that there was a shuttle available. She has a photo of the sign that was above the door, and there was no mention whatsoever of the shuttle. Mr. Werner stated he only had that banner up to get the word out.

Mr. Kiser noted that if there is an outside tent, the Building Inspector, Fire Chief, and the Sheriff's Department must all do inspections on the tent before anything starts. He felt the biggest discussion should be the hours.

Ms. Novack felt general neighborhood impact should be an issue. The idea of having the event for two days is too much. She stated she has already received several emails and phone calls. Last year, per the minutes, Mr. Werner indicated that he had spoken to some of the area residents about the event and that they agreed to it. However, within a couple days, she received 25 signatures of neighbors that were totally opposed to it. Ms. Novack felt that two days is too much for the location and she was opposed to even one day. There are houses literally 20 feet from where the outside gathering area is and it is not like any other bar in the City. She questioned if it is the same owner as when the building was the Firehouse, because that owner assured that he would never come back for another outside event. It was noted that it is not the same owner.

Mayor Klein stated he monitored the event fairly closely last year and went there several times. He felt that Mr. Werner delivered on what he said he was going to do last year. There was tight security and parking did not seem to be an issue, but it was crowded.

Ms. Novack noted that last year there was a bus that came with a pub tour that blocked the street for about ten minutes.

Mayor Klein felt three days was a lot to ask residents of the area to put up with. The sound was actually greater some distances away. He stated he received complaints from a mile and a half away, but he did believe the noise was controlled. The problem is what is fair to a business person versus what is fair to the neighbors that are around it.

Ms. Enters stated the hours of the music have been lowered from 11:00 p.m. to 10:00 p.m. The size of the fencing is slightly smaller than last year, but not much. She believed there was one incident on file from last year. Ms. Enters did not believe it was fair to hang the previous owner's problems on the current owner. She personally did not have any objection to the event, and she has not heard from anyone.

Mr. Bierce noted that Rick Hanan's name is on the permit as the property owner, and that is the same owner as the Firehouse. Mr. Werner noted that Rick Hanan owns the property. Ms. Novack stated she specifically asked if the owner was the same as the Firehouse, and she stated Mr. Werner answered that it was not the same person, and she acknowledged that Mr. Werner was the leaser of the business.

Mr. Bierce stated the owner of the business property has not changed, the owner of the business has not changed, and there were no noticeable problems reported to the police last year. He felt the residents live in a neighborhood with a bar in it, and once a year the owner wants to make some money. Mr. Bierce stated he was all for it and Mr. Werner did not do anything last year to send up any red flags so he saw no reason to not allow it this year.

Ms. Novack noted that there was a squad car stationed in the street that had been there all night, and she questioned if the City paid for that squad car to be there to monitor the event or if Mugshotz paid for it. Lieutenant Dussault stated there was an extra squad car put out to monitor the situation. He noted that is not done for every event, and Ms. Novack had a problem with that from a taxpayer's perspective.

Mr. Kiser compared the hours of music for this event to the Taste of Lake Country.

<u>A motion was made and seconded (D. Kiser, S. Bierce) to approve the large gathering permit for Mugshotz with the condition that the Building Inspector, Fire Department, and Sheriff's Department need to sign off once the apparatuses are set up to make sure they are compliant.</u>

Ms. Novack requested the motion also be contingent on Mugshotz paying for the cost of the police car that is present for the event. Lieutenant Dussault stated there will be a 6 to 2 car working that night, and he would have to check the schedule.

Ms. Enters wanted to make sure there are temporary no parking signs, and that a shuttle is available.

Mayor Klein was under the impression that there was a provision last year that if things went bad the first night, the event could be cancelled. Mr. Riffle stated if the Council wants that to be the case, then they need to include that and cannot put it on the Sheriff's Department. It must be part of the permit. Mr. Kiser agreed to make that a part of the permit.

Bob Steker stated he lives four houses down the road from Mugshotz, and he did not believe a lot of people where aware that this issue was going before the Council because the agenda was just posted last Thursday. Mr. Steker thought there had to be 30 days between turning in the permit and the event. He questioned if Mr. Werner would be able to get the Sheriff's Department and the Fire Department in line by Friday night. Mr. Steker reminded the Council that the event is not in their neighborhood and he stated he does not want a music festival in his neighborhood. He recommended it being a one day event.

Mayor Klein stated the 30 days was discussed last year and that people should be given a little more time to get to know about these situations. Mr. Steker pointed out that the Council discussed having the owner collect signatures from the neighbors stating they do not object to the permit.

Ms. Novack noted that she spoke to a woman named Sue that lives right across the street, and she told Ms. Novack that Mr. Werner indicated the reason his permit is on the agenda this late is based on the City. Ms. Novack stated there were discussions to get the issue on the agenda with much more advanced time, but it was actually Mr. Werner that was delayed in getting the information in. She questioned why this permit did not come to the

Council in June, and she noted that last year she went to Mugshotz to speak with Mr. Werner, but he never contacted her back.

Ms. Enters called the question.

There was no further discussion regarding this item and the motion was approved 4-aye, 2-nay (Hasslinger, Novack).

Jim Jaeschke (W276 N2666 Lily Court West) stated the City ordinance specifically requires a 30 day notice to the Clerk.

Mr. Werner then discussed the various neighbors he made contact with last year. He also mentioned that he blocked off certain yards so no one would walk on the neighbor's properties, and he cleaned up every morning.

Ms. LaBorde stated last year after the discussion, City staff was charged with looking at large gatherings and revamping the process, but that has not been completed yet.

Mr. Riffle confirmed that the ordinance states the application must be made 30 days in advance. The ordinance was passed in 2007. If the permit is allowed to go forward, someone could go to court tomorrow and seek a restraining order because the Council issued the permit contrary to the ordinance.

A motion was made and seconded (D. Kiser, S. Bierce) to rescind the previous motion.

The Council pointed out that the event could be any time after July 28th, as the permit was received on June 28th. Mr. Werner stated the event was too big to move inside.

Ms. Novack felt there was more than an opportunity to have met the 30 days, and she suspected the bands were booked even more than 30 days before the event.

There was no further discussion regarding this item and the motion passed unanimously.

A motion was made and seconded (S. Bierce, D. Kiser) to allow the large gathering request anytime 30 days after the 28th of June, within this calendar year.

Mr. Kiser stated all of the inspections need to take place, after all of the tents are set up.

Mayor Klein requested the City be notified two weeks in advance of when the new event will be held so that there is prior notice.

There was no further discussion regarding this item and the motion was approved 4-aye, 2-nay (Hasslinger, Novack).

7.0 **Discussion and Possible Action Regarding the Remaining Appointments to Various Committees, Boards and Commissions** – Mayor Klein reappointed Christine Wunder to the Plan Commission and appointed Tom Koepp to replace Dennis Briley on the Zoning Board of Appeals. He appointed Tom Matt to the Board of Review and Bob Goff to the Fire Commission.

A motion was made and seconded (D. Kiser, M. Hasslinger) to reappoint Christine Wunder to the Plan Commission, appoint Tom Koepp to the Zoning Board of Appeals, appoint Tom Matt to the Board of Review, and appoint Bob Goff to the Fire Commission. There was no discussion regarding this item and the motion passed unanimously.

8.0 Discussion and Possible Action Regarding Joint Meeting with Village of Pewaukee on Consolidation – Mayor Klein stated there was nothing to report at this time.

Mr. Kiser stated he wanted to meet, and he felt the issue needed to get together and move forward.

Mayor Klein felt the window of opportunity was closing with the approval of the east-west transmission main that will cost the City $1.5 million. That money was potential savings that would have not happened at that level, had the City continued with merger discussions.

Ms. Enters noted that at the last Council meeting when a joint meeting was discussed, the Council had agreed that they would all have to agree on a date and set it, but if anyone cancelled at the last minute, the meeting would still go forward. She was under the impression that the first joint meeting would have to have all Council members present. In the memo to the Village, it says the future meeting date was to be approved with the intent to not delay the action any further if all members cannot be present. Ms. Enters wanted to make it clear that if the Council were to set a meeting, which she was not in favor of, all members would have to be available in order for the date to be approved. She referred to the most recent Village Board meeting and stated the Board members were all over the board, asking to go back to the numbers, use the same assumptions, update the numbers, and possibly have a non-binding referendum in April. There was no thought of a meeting.

<u>A motion was made and seconded (C. Enters, C. Brown) to not plan a joint meeting with the Village at this time and get on with City business.</u>

Mr. Kiser felt there had to be a meeting. Mayor Klein felt the City should show that this is still a viable option.

Mr. Bierce felt the City should have an open door policy to anyone that wants to discuss potential savings.

There was no further discussion regarding this item and the motion failed 2-aye, 4-nay (Bierce, Hasslinger, Kiser, Novack).

9.0 Discussion and Possible Action Regarding the Potential Cancellation of a Meeting in August – Ms. Enters questioned why a meeting was being cancelled. Mayor Klein stated it was a request by an Alderman.

Ms. Brown pointed out that a lot of communities around the City cut down during the summer if there is not a lot on the agenda. She noted that she would be gone August 1st no matter what.

Ms. Novack suggested cancelling the meeting when it comes closer if there is not a lot on the agenda, but keeping the door open if there should be issues that need to be discussed.

It was determined that if there are enough items for the August 1st meeting, then that meeting will be scheduled. If not, the next meeting will be August 15th.

10.0 Discussion and Possible Action Regarding Redistricting of the City of Pewaukee – Ms. Tarczewski stated after every ten year census, communities have the ability to change the ward boundaries. Plan 1 would make "old" ward 4, of which Alderman

Novack is a resident, a part of the "new" district 2. This would potentially give three aldermen to that district, and leave district 1 with only one alderman.

Plan 2 was envisioned by the City Planner. Ms. Tarczewski stated she did not like the flow of Plan 2 and felt it looked too blocky and was cut into angles.

Ms. Tarczewski noted there were changes in the County Supervisor districts, which helped the City out a bit, because the districts are now more of a straight line versus choppy in the past. In addition, the City lost Assembly District 33, which was originally in ward 7, and the entire City is now in Assembly District 98.

A motion was made and seconded (D. Kiser, C. Enters) to approve Plan 1.

Ms. Novack did not understand why the number of aldermen per district was coming up if the Council was not discussing redistricting. In regards to where the different wards will fall, she did not care whether it was option 1 or 2. Ms. Tarczewski stated she wanted the Council to see the bigger picture of what she was envisioning, and she was charged with presenting a plan that would make sense. Ms. Novack felt if the Council decides that ward 4 is going to look like Plan 1, then a bigger decision is actually being made.

Ms. Brown felt Plan 1 seemed to clean things up.

Mr. Bierce referred to Plan 1 and felt the number of people in each ward was much more disproportionate. The plan goes from a low of 672 to a high of almost 2,000. In Plan 2, the numbers seem to be a little more evened out. Ms. Tarczewski pointed out that there is potential for the larger growth that is happening.

Ms. Enters stated her concern in Plan 1 was that in wards 4, 5, and 6, the voting population was 5,150. Ms. Tarczewski felt the polling location would be okay with that.

Ms. Novack stated the concern she heard about Plan 2 was that there would be too many people voting at Wagner Park, although it would be the same amount of people voting at Wagner Park then as there is now. Ms. Tarczewski stated she was concerned with the residents in Springdale Estates and Steeplechase going into one polling location. In the past, the Wagner Park poll workers have specified that they are at their max.

Mr. Bierce did not understand the concern about the growth in the northeast quadrant of the City, since that is the area that has been increased the most. Ms. Tarczewski stated wards 1, 2, and 3 combined have roughly 3,900 residents. The big portion of the population is going to be in wards 4, 5, and 6, but that is what is currently voting at New Visions Church anyway.

Ms. Enters referred to the green shaded area of Plan 1 and noted that area was mostly industrial, even though the rectangle area looks bigger.

Ms. Novack referred to Plan 1 and questioned what wards would be in district 1. It was noted that it would be wards 1, 2, and 3. District 2 would be 4, 5, and 6. She felt district 1 was a huge section. Ms. Tarczewski pointed out that a lot of the area is industrial. Ms. Enters noted that it actually cuts the population of district 1 down in order to accommodate for the anticipated growth.

Ms. Novack stated under Plan 2, there would be three districts that would have two aldermen in each district. The only real change is that a few more people would have to change a polling location. Ms. Novack felt Plan 2 falls out easily with what people are relatively comfortable with in the current structure. The only real difference between Plan 1 and Plan 2 is that in Plan 1 there are three aldermen in one district until 2013 and only one in the other. Mr. Riffle noted that an alderman would be added. Ms. Novack felt $10,000 would have to be added to the budget for an extra alderman, and the only real difference between the two is the number of people switching polling places.

Ms. Brown did not believe Plan 2 sounded like a bad plan.

Ms. Enters stated she wrote down the voting population of each of the wards, and under Plan 2, district 1 would have 4600, which would be the highest voting population. That does not account for the growth and the growth is big. She was concerned how big district 1 would get out of proportion with the other two districts.

Ms. Tarczewski stated the current ward structure could be left the way it is and the Council can decide how they can redistrict.

Ms. Novack stated in the past, she thought the voting location change of ward 4 should wait until the census comes out before a change is made. She stated this would be the best time and she would not fight having ward 4 vote with the rest of district 1.

Ms. Brown felt the current ward plan looks spread out and even, and she questioned if it was a big deal to keep it the way it is, even with the census change. Ms. Tarczewski stated all of the numbers would be in the proper range that they need to be per ward, so that would be perfectly fine. By keeping the current ward structure, all of the aldermen would still be in the same districts. Ms. Brown did not have any complaints about the way the map looks right now.

There was no further discussion regarding this item and the motion failed 0-aye, 6-nay.

<u>A motion was made and seconded (C. Brown, M. Hasslinger) to keep in place the current wards and authorizing the Mayor to sign a resolution to that effect.</u>

Ms. Enters thanked Ms. Tarczewski for all of her work.

There was no discussion regarding this item and the motion was approved 5-aye, 1-nay (Bierce).

11.0 Further Discussion and Possible Action Regarding the Proposed Victoria Station I Cash Escrow Agreement – Mr. Weigel stated the Council previously approved the agreement adopted by the City Attorney's office, but since that time, the applicant has suggested changes. If the Council is to accept the blue line version, the City's ability to fund any work out of this cash escrow is limited to the cash in the escrow. Under the development agreement, there are rights to increase the amount of assurity if necessary. The development has gone from ownership of the developer back to the bank. The developer has given City staff a copy of the contract with a contractor for the paving that shows work can be done for approximately $142,000, and there is $163,000 in the letter-of-credit, which would be transferred to the cash escrow. If the Council turns down the agreement, the City would have to draw on the letter-of-credit and bid it out. The City would basically be subject to the same risk, but more of the money would be spent in the effort to bid it. Mr. Weigel recommended adopting and approving the amended cash escrow agreement. The bank's liability is limited to the amount of the letter of credit, and no more.

A motion was made and seconded (M. Hasslinger, C. Enters) to approve the Victoria Station I cash escrow agreement. There was no discussion regarding this item and the motion passed unanimously.

12.0 Further Discussion and Possible Action Regarding the Request from the City of Waukesha to have the City of Pewaukee Replace and Restore the Clay Dam in the Sanitary Sewer Trench in South Park – Mr. Weigel requested no action be taken on this issue. He noted that he and the Mayor are meeting with the City of Waukesha on Friday in response to the past action.

13.0 Discussion and Possible Action to Authorize Expenditures in 2011 for the Engineering Design of the Reconstruction of Weyer Road – Mr. Weigel stated this is being brought forth in an effort to conceptually get the Council's approval to look at forwarding some of the engineering costs for the Weyer Road reconstruction. He felt it would be a good move to get some engineering going now, because the City would have to work with the Town of Lisbon. If the Council approves the action, the intended budget resolution would be brought forward at the next meeting to approve the funds. The estimate from RA Smith for the engineering is $76,100.

A motion was made and seconded (M. Hasslinger, K. Novack) to approve the 2011 expenditures for engineering design of the reconstruction of Weyer Road.

There was no discussion regarding this item and the motion passed unanimously.

14.0 Discussion and Possible Action to Authorize Staff to Draw on the Letter of Credit for the Glacier Ridge Development Final Paving – Mr. Weigel stated the City sent a letter to the Glacier Ridge developers requesting their written response to the City's demand that they agree to put the final coats of paving down this year, otherwise the City will draw on their letter-of-credit. If the developers do not respond or respond that they are not willing to go forward, Mr. Weigel requested authorization to draw on the letter of credit so the project can still be moved on this year.

A motion was made and seconded (C. Enters, M. Hasslinger) to authorize staff to draw on the letter-of-credit for the Glacier Ridge development final paving. There was no discussion regarding this item and the motion passed unanimously.

15.0 Discussion and Action on the Request from the City of Waukesha to approve the Waukesha Water Supply Service Plan – Mr. Weigel stated the SEWRPC plan does include a portion of the City of Pewaukee in the Waukesha service area for their Great Lakes Water application. He noted that the City has not formally adopted that part of the service plan. There is a portion of the City south of I-94 that is left out because that portion is currently in the water quality plan for sewer service with the Brookfield treatment plant and not the Waukesha treatment plan. It would be a violation of the Great Lakes Treaty to send those lands over to Waukesha without an amendment to the plan.

A motion was made and seconded (S. Bierce, K. Novack) to approve the Waukesha water supply service plan.

Ms. Brown questioned if it was up to Waukesha if she wanted to have water in her area. Mr. Weigel stated it would be up to the City of Pewaukee to request the City of Waukesha extend service.

Mr. Hasslinger questioned if Waukesha's negotiating for great lakes water had any effect on this and these areas. Mr. Weigel stated this is a small, nearly developed area.

Ms. Brown felt the residents were then not being given a choice. Mr. Weigel stated the only source of water south of I-94 would be from the City of Waukesha. If the City of Pewaukee would be obligated to bring water there, the City would have to spend $4 million to $5 million more, and that cost would have to be passed on to the residents in that area. It is cheaper, and more efficient, and makes sense.

There was no further discussion regarding this item and the motion passed unanimously.

16.0 **Public Comment** – No public comment was made.

17.0 **Adjournment** – A motion was made and seconded (K. Novack, S. Bierce) to adjourn the meeting at 11:01 pm. There was no discussion regarding this item and the motion passed unanimously.

Respectfully Submitted,

Kelly Tarczewski
Clerk/Treasurer

OAK CREEK/WAUKESHA
LETTER OF INTENT

This Letter of Intent ("LOI") is dated as of November 30, 2012 (the "Effective Date"), by and between the City of Waukesha, by and through its Waukesha Water Utility ("Waukesha") and the City of Oak Creek and its Water and Sewer Utility (collectively, "Oak Creek")

WHEREAS, Waukesha and Oak Creek desire to enter into a Letter of Intent ("LOI") for the provision of Lake Michigan water (the "Water") pursuant to a Water Supply Agreement (the "Agreement") and in accordance with provisions and restrictions of the Great Lakes Compact (the "Compact") and an approved water service area (the "Water Service Area") as delineated by the Southeastern Wisconsin Regional Planning Commission ("SEWRPC").

NOW THEREFORE, Waukesha and Oak Creek (collectively, the "Parties") agree as follows:

1. This LOI provides a basis and an outline of provisions that the Parties intend to include in an Agreement between Oak Creek and Waukesha pursuant to which Oak Creek will supply Water wholesale to Waukesha and Waukesha will purchase Water wholesale from Oak Creek.

2. Waukesha will construct any infrastructure necessary to distribute the Water to Waukesha's water service area, as identified and included herein by exhibit and reference. The alignment and route of any Water transmission mains infrastructure, which includes pumps stations and other improvements, that may need to be constructed to effectuate the Agreement will be the sole responsibility of Waukesha, provided, however, that Waukesha shall consult with Oak Creek regarding the location and construction of water transmission mains infrastructure within the boundaries that are currently under the jurisdiction of Oak Creek. Once such water transmission mains infrastructure is placed into service, it will become the property of Oak Creek and shall be operated and maintained as part of Oak Creek's system. Alternatively, Oak Creek may choose to construct required water transmission mains infrastructure within Oak Creek and incorporate the appropriate costs into the water rates charged to Waukesha and shall give written notice to Waukesha of its intentions. If Oak Creek chooses to construct the water transmission mains infrastructure, then Oak Creek shall determine the alignment and route of any water transmission mains infrastructure.

3. This LOI is also for the purpose of advancing Waukesha's Water application to the Wisconsin Department of Natural Resources (the "WDNR") and the Great Lakes Regional Body and that specific details regarding day to day operational issues will be addressed in the Agreement at a later date and time.

4. By executing this LOI, Waukesha agrees to negotiate exclusively with Oak Creek for the provision of Water, provided, however, that Waukesha shall be allowed to negotiate with other Water suppliers if Oak Creek provides written notice that it requires substantial modifications to the provisions of this LOI. Both Waukesha and Oak Creek shall negotiate in good faith.

5. The Parties agree in concept to the following provisions of Water service:

A. **Water Quality, Quantity and Service Pressure**: Oak Creek shall provide, at its municipal border, Water to Waukesha which is safe for human consumption and which meets all primary drinking water quality standards from time to time established by State and Federal governmental entities. The Water shall be of the same purity and quality as the Water provided by Oak Creek to its individual retail and other wholesale customers and shall be at a pressure sufficient to satisfy all applicable requirements of the WDNR and the Public Service Commission of Wisconsin (the "PSC").

The minimum hge ("hydraulic grade elevation") shall be 870 (USGS datum) at the metering station measured at the downstream side of the meter based on a single pipe dedicated to Waukesha. This hge may change if the City of Franklin's distribution system is utilized for transferring water to Waukesha. The supply of water for the current areas served in Waukesha, are set forth in Exhibit A (the "Initial Service Area") attached hereto and incorporated herein, shall be at the rate needed by Waukesha but not to exceed eleven million gallons er day ("gpd") (11,000,000 gpd) measured at any point in time at the meter near the Oak Creek municipal border, as set forth above. During the term of this Agreement Oak Creek's supply of Water to Waukesha to serve the Water Service Area shall not exceed eighteen million five hundred thousand gallons per day (18,500,000 gpd) measured at any point in time, except with Oak Creek's consent to such exceedance. In the event Oak Creek is unable to satisfy Waukesha's request to supply more than 18,500,000 gpd (or such higher demand figure as agreed to by Oak Creek), Waukesha may obtain Water service from any other source without violating the terms of this LOI.

Improvements to Oak Creek's water supplies (the "Improvements") will be required to enable Oak Creek to supply the Waukesha's Water demands. The Improvements will be installed based upon pre-described system demands as outlined in Table 1, attached as Exhibit B hereto and incorporated herein. To enable Oak Creek to meet future Water service demands, Waukesha shall develop a five (5) year water projection for both average day demand and maximum day demand, to be reviewed by Oak Creek on an annual basis. By April 1 of each calendar year, commencing in the year following the date of final approval of the Application for Great Lakes Water, Waukesha shall notify Oak Creek of its updated five (5) year water projections. Oak Creek shall meet Waukesha's updated demands, provided that Waukesha's demand increases in any one year will not exceed one hundred fifty thousand (150,000) gpd measured at any point in time, unless both Parties agree to such exceedance. If Waukesha does not provide an update of its five (5) year projections by April 1st, Year 1 of the prior year's plan will become Year 1 of the updated plan. For planning purposes, Waukesha's 2012 average day demand is seven million (7,000,000) gpd and Waukesha's maximum day demand is eleven million (11,000,000) gpd.

B. **Service Area**: Oak Creek shall provide Water at wholesale Water rates for the Initial Service Area. The Initial Service Area may be expanded to provide Water to the Water Service Area provided the average day demand does not exceed 150,000 gpd per year measured annually on a cumulative basis. Such expansions may occur without the consent of both parties.

C. **Allocation of Shared System Costs (Source of Supply, Pumping, Water Treatment and Transmission Mains)**: Shared system costs will be allocated per the following Two Step Method:

The allocation of Oak Creek's shared costs to wholesale customers will be determined in the first step of a Two-Step Cost of Service Study (COSS) prepared by Oak Creek. The second step will be developed by each Party for retail rates for each community. Under this Two-Step method, revenue requirements will be allocated between Oak Creek's wholesale and retail customers using a base-extra capacity methodology. Base shared costs will be allocated pro rata based on water consumption. Extra capacity maximum day (MD) shared costs will be allocated by applying relative system maximum day ratios to base flows. Customer costs will be allocated based on the number of equivalent-meters using standard PSC ratios.

1. Revenue requirements will be developed under the current method approved by the PSC. If Oak Creek or its treatment plant is no longer regulated by the PSC, then revenue requirements

will be developed using guidance from the American Water Works Association's Manual of Water Supply Practices M1.

2. The base-extra capacity method used in step one of Oak Creek's Two-Step Method does not allocate any base or extra capacity costs to fire protection. All fire hydrant costs are allocated to Oak Creek retail customers.
3. Transmission mains are considered to be all mains fourteen inches and larger plus fifty percent of twelve inch mains.
4. Total system MD ratios are determined by using an average of the annual MD ratio for the previous four years.
5. Actual individual wholesale customer metered data will be used to determine each wholesale customer's MD ratio. Oak Creek's MD flow will be determined by subtracting wholesale MD flow from total system flows. The allocation of base shared costs and extra capacity maximum day shared costs between Oak Creek and each of the wholesale customers will use the average of the annual MD ratio for the previous four years.

D. **Rates**:

1. Sufficiency of Rates

The Agreement shall provide for a wholesale water rate, approved by the PSC, to allow Oak Creek, at its discretion, to fully recover its total cost (not marginal cost) to provide wholesale water to its wholesale customers.

2. Estimated Rates

Waukesha shall be a wholesale customer of Oak Creek. The wholesale rate with Waukesha as a customer is estimated to be $1.90 per 1000 gallons of water based on 2012 dollars with Waukesha purchasing an average of 7 million gallons per day (MGD) and a maximum day purchase of 11 MGD with Oak Creek installing the improvements identified in Exhibit B. Waukesha will be responsible for providing adequate water from its system storage to meet its maximum hour demand plus fire flows. Both Parties acknowledge that this rate is based on assumptions that may change between 2012 and 2018. This rate will not be guaranteed until the date on which Waukesha actually purchases the Water, which is estimated to occur in 2018.

Waukesha shall be solely responsible for billing and collection of all fees or charges from its retail and/or wholesale Water service customers. Subject to 1. above, the initial rate of charges for wholesale Water services supplied to Waukesha by Oak Creek shall be the current rates authorized by the PSC, which rates shall cover all commodity and fixed excess demand related charges inclusive of public fire protection charges. The schedule of water rates shall be subject to modification during the term of the Agreement based on the Two Step Method described above. Such changes shall be approved, as required, by the PSC. Oak Creek shall submit invoices to Waukesha on a monthly basis. A reasonable rental fee for the operation, maintenance and repair of metering and demand measuring devices will be charged to Waukesha and incorporated in the monthly service fee as approved by the PSC. All such invoices shall be payable to Oak Creek within twenty (20) days. If payments are not received within twenty (20) days a penalty of 1% per month on any delinquency shall be due and payable by Waukesha.

E. **Reliance on PSC**: The Parties acknowledge that in entering into this LOI they are mutually relying on the current regulatory role of the PSC, as of the date of this LOI with respect to matters relating to Water service rates, rules and practices. If the responsibilities of the PSC or any successor agency with respect to such matters change materially, or if the level of involvement of the PSC or any successor agency in such matters changes materially or if the PSC ceases to exist or exercise regulatory authority regarding water service rates and practices and such authority has not been transferred to a successor agency, the provisions and procedures of Dispute Resolution outlining a binding arbitration process set forth in the Agreement will be invoked.

F. **Regional Water Authority**: Both Parties agree to engage in discussions related to the creation of a Regional Water Authority ("RWA"), the purpose of which would be to own and operate a treatment facility and the facility's related infrastructure. Such discussions would investigate the potential for the RWA to serve Oak Creek and its wholesale customers and the ownership and governing structure of the potential RWA. If such RWA purchases Oak Creek's existing Water treatment facility and the facility's related infrastructure, Oak Creek will receive fair and equitable monetary compensation for the sale.

G. **Operation and Maintenance**: Oak Creek and Waukesha may agree to enter into a separate agreement governing Oak Creek staff's proper operation and maintenance of Waukesha facilities located outside Oak Creek at a cost outlined in such agreement. In the event such an agreement cannot be reached, Waukesha would be solely responsible for operating and maintaining such facilities.

Facilities in Oak Creek shall be owned and maintained by Oak Creek and the cost of those facilities shall be incorporated into the Water rates as set forth in the Allocation of Costs described above.

H. **Agreement Term**: It is intended that the Agreement shall be for an initial term of forty (40) years then automatically renew for four (4) ten (10) year terms unless both Parties agree otherwise. The Agreement shall terminate eighty (80) years from the date upon which it takes effect, which shall occur upon the Agreement being duly approved and signed by each of the Parties and approved by the WDNR as required by law.

6. **No Obligation:** Except as expressly set forth herein, neither Party shall have any obligation to the other. No reliance, performance, change or loss of position or other action or expectation now or hereafter made based on this LOI shall be deemed to create any obligation or agreement of any type. There are no agreements or understandings between the Parties regarding supplying Water except as expressly set forth in this LOI.

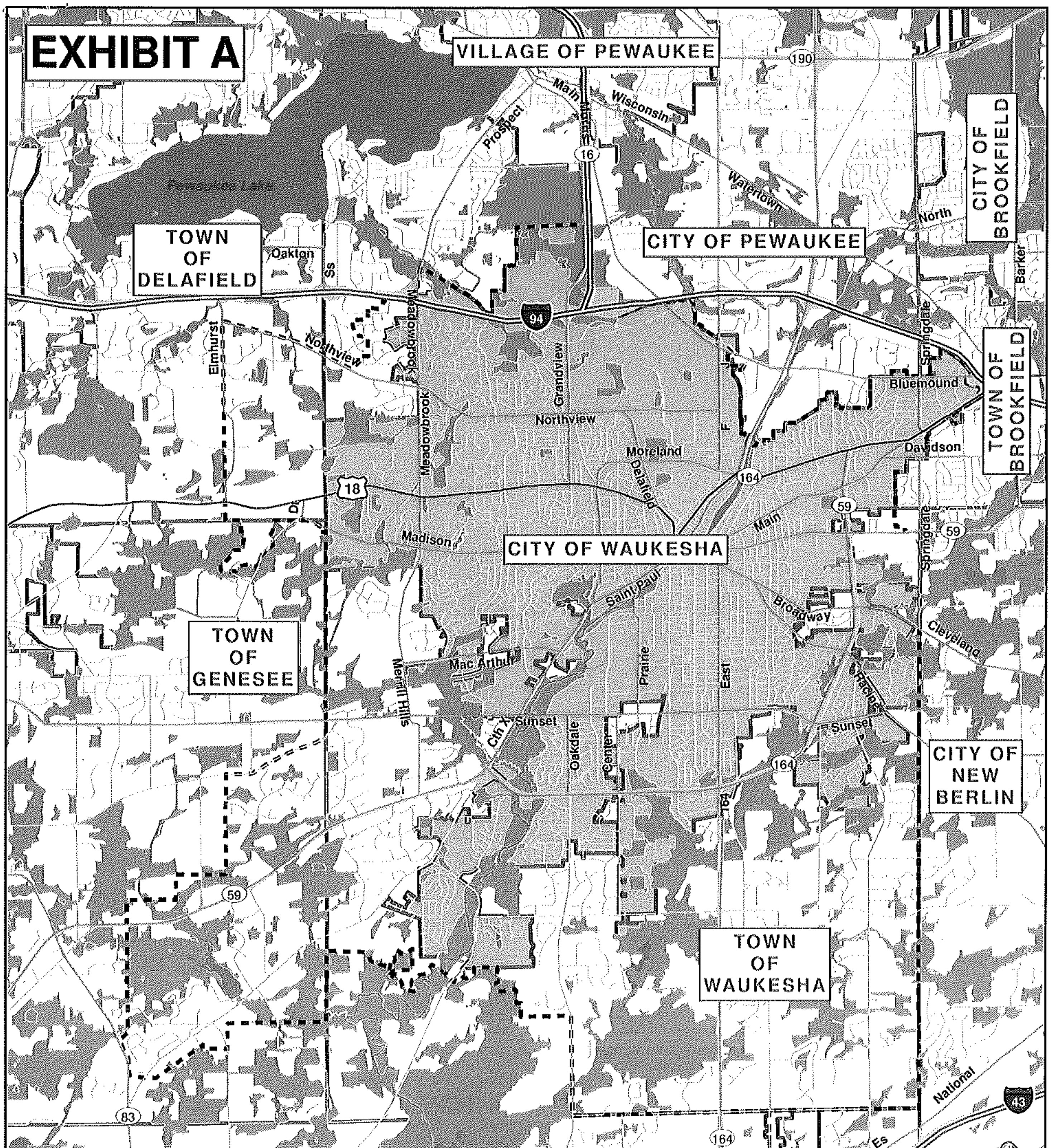
7. **LOI Term:** This LOI shall remain in effect for a period of forty-eight (48) months from its Effective Date.

For:

Oak Creek Water and Sewer Utility:	City of Waukesha:
Gerald H Wille	Jeff Scrima
Gerald H. Wille, Chairman	Jeff ~~S~~. Scrima, Mayor R
Fredrick R. Siepert	Thomas E. Neill
Fredrick R. Siepert, Secretary	Thomas E. Neill, City Clerk/Treasurer

8925987

City Attorney's Office 11-6-2012



LEGEND

City of Waukesha - Water Service Area

City of Waukesha - Initial Service Area

Civil Divisions

Wetlands and Environmental Corridors

Water

Freeway

Highway

Major Road

Streets

N

Map Date: September 2012

0 4,000 8,000 16,000 Feet

DATA SOURCES: Data source for Planned Water Service Area, Wetlands and Environmental Corridors is SEWRPC. All other data is from the City of Waukesha.

Waukesha Water Utility
SERVING WAUKESHA SINCE 1886
115 DELAFIELD STREET
WAUKESHA, WI 53188-3615
Telephone: (262) 521-5272 • Fax: (262) 521-5265 • E-mail: contactus@waukesha-water.com

December 6, 2012

Mr. Eric K. Ebersberger
Chief, Water Use Section
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707

Subject: City of Waukesha, Wisconsin
Water Supplier Letter of Intent

Dear Mr. Ebersberger:

Attached please find a copy of the Letter of Intent between the City of Waukesha and the City of Oak Creek to enter into an agreement for Waukesha to purchase water from Oak Creek submitted in support of the City of Waukesha's application for a Great Lakes water supply.

Please contact me at (262) 521-5272 ext. 518 or dduchniak@waukesha-water.com if additional information is required by the Wisconsin Department of Natural Resources.

Sincerely,

WAUKESHA WATER UTILITY

Daniel S. Duchniak, P.E.
General Manager

EXHIBIT B

Year	Maximum Day Demand (mgd)	Improvement	Total Cost	
2014	23.65	Construct 48-inch transmission main improvements (Phase 1).	$2,670,000	
2014	22.50	Add one 9 mgd high service pump at existing high service pumping station with piping upgrades. (Total High Service Pumping Firm Capacity - 31.5 mgd)	$300,000	
2015	23.65	Construct 48-inch transmission main improvements (Phase 2).	$2,670,000	
2016	25.50	Add one 9 mgd raw water pump at existing raw water pumping station. (Total Raw Water Pumping Firm Capacity - 34.5 mgd)	$180,000	
2016	18.50*	Construct new 7.0 mgd firm capacity high zone Puetz Road Booster Station. (Total High Zone Booster Station Firm Capacity - 25.5 mgd)	$1,500,000	
2016	23.65	Construct 48-inch transmission main improvements (Phase 3).	$2,670,000	
2017	22.50	Construct 3.0 mgd of additional standby power generation for the high service pumping station.	$150,000	
2017	23.65	Construct 48-inch transmission main improvements (Phase 4).	$2,670,000	
2017	34.50	Add one 9 mgd raw water pump at existing raw water pumping station. (Total Raw Water Pumping Firm Capacity - 43.5 mgd)	$180,000	
2017	31.50	Add two 9 mgd high service pump at existing high service pumping station with piping upgrades. (Total High Service Pumping Firm Capacity - 49.5 mgd)	$600,000	$18,346,500
2018	35.00	Expand Water Treatment Plant to 55 mgd.	$32,000,000	
2019	43.50	Construct additional 12 mgd raw water pumping station expansion. (Total Raw Water Pumping Firm Capacity - 55.5 mgd)	$2,200,000	
2019	45.00	Construct 36-inch transmission main improvements (Phase 1).	$3,125,000	
2020	45.00	Construct 36-inch transmission main improvements (Phase 2).	$3,125,000	
2021	25.50*	Expand the high zone Puetz Road Booster Station by 6.5 mgd. (Total High Zone Booster Station Firm Capacity - 32.0 mgd)	$1,500,000	
2021	25.50*	Construct 30-inch transmission main improvements (Puetz Booster Station to Connection Point - Phase 1)	$820,000	
2022	25.50*	Construct 30-inch transmission main improvements (Puetz Booster Station to Connection Point - Phase 2)	$820,000	
2023	49.50	Construct additional 16 mgd high service pumping station expansion. (Total High Service Pumping Firm Capacity - 64.5 mgd)	$2,800,000	
2023	49.50	Construct 5.5 mgd of additional standby power generation for the high service pumps.	$200,000	
2026	32.00*	Construct 16-inch distribution improvements on the discharge side of the Rawson Avenue and Ryan Road Booster Stations.	$620,000	
2026	32.00*	Replace existing 900 gpm booster pumps with two new 1,800 gpm booster pumps at Rawson Avenue Booster Station. (Total High Zone Booster Station Firm Capacity - 34.6 mgd)	$300,000	
2027	54.00	Construct 30-inch transmission main improvements (WTP Discharge - Phase 1)	$1,270,000	
2028	34.60*	Expand Ryan Road Booster Station by 4.5 mgd. (Total High Zone Booster Station Firm Capacity - 39.1 mgd)	$1,200,000	
2028	54.00	Construct 30-inch transmission main improvements (WTP Discharge - Phase 2)	$1,270,000	
2028	54.00	Construct 2.0 mgd of additional standby power generation for the high service pumps.	$100,000	
2028	54.00	Construct 5.0 mgd of additional standby power generation for the raw water pumps.	$150,000	
2029	55.50	Expand the raw water pumping station capacity by 10 mgd. (Total Raw Water Pumping Firm Capacity - 65.5 mgd)	$2,000,000	
2029	36.00*	Construct 16-inch distribution improvements along 27th Street (Phase 1)	$1,230,000	
2030	55.00	Expand Water Treatment Plant to 65 mgd.	$16,000,000	
2030	36.00*	Construct 16-inch distribution improvements along 27th Street (Phase 2)	$1,230,000	
2031	36.00*	Construct 16-inch distribution improvements along 27th Street (Phase 3)	$1,230,000	
		Subtotal	$86,780,000	
		35% Contingency and Professional Services	$30,373,000	
		Total	**$117,153,000**	

*High Zone Demand

All costs are in 2012 dollars

indicates Phase 1 improvements

TOWN OF DELAFIELD BOARD OF SUPERVISORS MEETING
TUESDAY, AUGUST 23, 2011 – 7:00 P.M.
DELAFIELD TOWN HALL

AGENDA

1. Closed Session. Upon motion duly made, seconded, and adopted by roll call vote, the Board will convene into closed session pursuant to Wisconsin Statutes Section 19.85(1)(c) to consider employment, promotion, compensation or performance evaluation data of any public employee over which the governmental body has jurisdiction or exercises responsibility, more specifically the Town Attorney.

2. Call to Order

3. Pledge of Allegiance

4. Citizen Comments – During the Public Comment period of the agenda, the Town Board welcomes comment from any member of the public, other than an elected Town Board member, on any matter not on the agenda. Please be advised that pursuant to state law, the Board cannot engage in a discussion with you but may ask questions. The Board may decide to place the issue on a future agenda for discussion and possible action. Each person wishing to address the Board will have up to five (5) minutes to speak. Speakers are asked to submit to the Town Clerk, a card providing their name, address, and topic for discussion.

   The Board will also take comment from the public on agenda items as called by the Chair, but not during the Public Comment. Please note that once the Board begins its discussion of an agenda item, no further comment will be allowed from the public on that issue.

5. Approval of Minutes of August 9, 2011

6. Action on vouchers submitted for payment:
   A. Report on budget sub-accounts and action to amend 2011 budget
   B. 1) Accounts payable; 2) Payroll

7. Communications (*for discussion and possible action)*
   A. None

8. Unfinished Business
   A. Daniel S. Duchniak, (7/7/11), Re: Request for Approval by the Town of Delafield of the City of Waukesha Water Supply Service Area Plan.

9. New Business
   A. Consideration and possible action on an Ordinance to Repeal and Re-create Section 1.15 of the Town of Delafield Municipal Code Related to the Composition of the Board of Review, and to Require Confidentiality of Income and Expense Assessment Data.

10. Announcements and Planning Items
    A. Next Plan Commission Meeting – September 6
    B. Next Park and Recreation Commission Meeting – September 12 – 6:30 p.m.
    C. Next Town Board Meeting – September 13
    D. Budget Workshop – Monday, September 19 – 6:30 p.m.
    E. Budget Workshop – Monday, September 26 – 6:30 p.m.

11. Adjournment

____

Mary T. Elsner, CMC, WCMC
Town Clerk/Treasurer

Notification of this meeting has been posted in accordance with the Open Meeting Laws of the State of Wisconsin. The Town Board may take action on any item on the agenda. It is possible that members of and possibly a quorum of members of other governmental bodies of the municipality may be in attendance at the above-stated meeting to gather information; no action will be taken by any governmental body at the above-stated meeting other than the Town Board of Supervisors. Please note that, upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals through appropriate aids and services. For additional information or to request this service, contact Mary Elsner, Town Clerk, at N14 W30782 Golf Road, Delafield, WI 53018-2117. This agenda is for informational purposes only. Posted – 8/18/2011

TOWN OF DELAFIELD BOARD OF SUPERVISORS MEETING
August 23, 2011

Members Present: P. Kanter, P. Van Horn, C. Dundon, L. Krause and R. Ackley
Others Present: E. Larson, *Town Attorney,* T. Barbeau, *Town Engineer,* J. Stevens, *Lake Country Reporter, 5 citizens*

<u>First order of business</u>: Closed Session
MOTION MADE BY MR. ACKLEY, SECONDED BY MS. DUNDON TO GO INTO CLOSED SESSION. MR. ACKLEY – AYE, MS. DUNDON – AYE, CHAIRMAN KANTER- AYE, MR. KRAUSE – AYE, MR. VAN HORN – AYE. MOTION CARRIED.

MOTION MADE BY MR. KRAUSE, SECONDED BY MS. DUNDON TO COME OUT OF CLOSED SESSION. MR. ACKLEY – AYE, MS. DUNDON – AYE, CHAIRMAN KANTER-AYE, MR. KRAUSE – AYE, MR. VAN HORN – AYE. MOTION CARRIED

<u>Second order of business</u>: Call to Order
Chairman Kanter called the meeting to order at 7:55 p.m.

<u>Third order of business</u>: Pledge of Allegiance

<u>Fourth order of business</u>: Citizen Comments
Lewaune Hanson, W311N299 Paradise Valley Ct., stated that she is trying to sell Lot 2 on Paradise Valley Court and has been unsuccessful. The approval of the subdivision required installation of an underground water tank or the contribution of $20,000 to ward the town's acquisition of a fire tanker truck. Ms. Hanson is requesting the Town Board confirm that any subsequent owner who would otherwise be allowed to divide the property by CSM, be allowed to do so without having to contribute $20,000. Chairman Kanter stated that this item will be placed on the September 13 Town Board Agenda.

<u>Fifth order of business</u>: Approval of Minutes of August 9, 2011
The minutes will be filed as prepared by the Town Clerk.

<u>Sixth order of business</u>: Action on vouchers submitted for payment:
A. Report on budget sub-accounts and action to amend 2011 budget

B. 1) Accounts payable; 2) Payroll

Accounts Payable
MOVED TO APPROVE PAYMENT OF CHECKS #50070 – 50107 IN THE AMOUNT OF $129,185.26

MOVED TO APPROVE PAYMENT OF #50031 IN THE AMOUNT OF $3,535.00
CHAIRMAN KANTER/MR. ACKLEY

Payroll
MOVED TO APPROVE PAYMENT IN THE AMOUNT OF $35,283.56
MS. DUNDON/MR. KRAUSE **MOTION CARRIED.**

<u>Seventh order of business</u>: Communications (*for discussion and possible action)*
A. None

<u>Eighth order of business</u>: Unfinished Business
A. Daniel S. Duchniak, (7/7/11), Re: Request for Approval by the Town of Delafield of the City of Waukesha Water Supply Service Area Plan.

Daniel Duchniak stated that as part of the City of Waukesha's application to tap into Lake Michigan, SEWRPC established the boundaries of a portion of the town south of Northview Road, east of High G and south of Highway 18. If the town agrees to be included in the service area, it will be the town's decision as to when this area would receive water either by creating its own water utility or contracting with the City of Waukesha. If the town declines to be in the city's service area, it would not affect the city's application except they would have to go back to SEWRPC to redraw the service area boundary. Mr. Duchniak stated that the final decision is up to the DNR.

MOTION MADE BY MR. VAN HORN, SECONDED BY MR. KRAUSE TO APPROVE AND SUPPORT THIS WATER SUPPLY AREA PLAN IN ITS BASIC APPLICATION FORM.

Discussion followed on the risk of future annexation to the City of Waukesha.

MOTION MADE BY MS. DUNDON, SECONDED BY MR. KRAUSE TO TABLE. MOTION CARRIED.

Ninth order of business: New Business

A. Consideration and possible action on an Ordinance to Repeal and Re-create Section 1.15 of the Town of Delafield Municipal Code Related to the Composition of the Board of Review, and to Require Confidentiality of Income and Expense Assessment Data.

MOTION MADE BY MR. KRAUSE, SECONDED BY MS. DUNDON TO APPROVE AN ORDINANCE TO REPEAL AND RE-CREATE SECTION 1.15 OF THE TOWN OF DELAFIELD MUNICIPAL CODE RELATED TO THE COMPOSITION OF THE BOARD OF REVIEW, AND TO REQUIRE CONFIDENTIALITY OF INCOME AND EXPENSE ASSESSMENT DATA. MOTION CARRIED.

Tenth order of business: Announcements and Planning Items

A. Next Plan Commission Meeting – September 6
B. Next Park and Recreation Commission Meeting – September 12 – 6:30 p.m.
C. Next Town Board Meeting – September 13
D. Budget Workshop – Monday, September 19 – 6:30 p.m.
E. Budget Workshop – Monday, September 26 – 6:30 p.m.

Eleventh order of business: Adjournment

MOTION MADE BY MR. KRAUSE, SECONDED BY MR. VAN HORN TO ADJOURN AT 8:35 P.M. MOTION CARRIED.

Respectfully submitted,

Mary T. Elsner, CMC, WCMC
Town Clerk/Treasurer

Minutes approved on September 13, 2011

TOWN OF DELAFIELD BOARD OF SUPERVISORS MEETING
TUESDAY, JULY 12, 2011 – 7:00 P.M.
DELAFIELD TOWN HALL

AGENDA

1. Call to Order

2. Pledge of Allegiance

3. Citizen Comments – During the Public Comment period of the agenda, the Town Board welcomes comment from any member of the public, other than an elected Town Board member, on any matter not on the agenda. Please be advised that pursuant to state law, the Board cannot engage in a discussion with you but may ask questions. The Board may decide to place the issue on a future agenda for discussion and possible action. Each person wishing to address the Board will have up to five (5) minutes to speak. Speakers are asked to submit to the Town Clerk, a card providing their name, address, and topic for discussion.

   The Board will also take comment from the public on agenda items as called by the Chair, but not during the Public Comment. Please note that once the Board begins its discussion of an agenda item, no further comment will be allowed from the public on that issue.

4. Approval of Minutes of June 28, 2011

5. Action on vouchers submitted for payment:
   A. Report on budget sub-accounts and action to amend 2011 budget
   B. 1) Accounts payable; 2) Payroll

6. Communications *(for discussion and possible action)*
   A. Daniel S. Duchniak, (7/7/11), Re: Request for Approval by the Town of Delafield of the City of Waukesha Water Supply Service Area Plan

7. Unfinished Business
   A. Discussion on letter of notification from Department of Agriculture, Trade and Consumer Protection concerning Town of Delafield Chemical Weed Treatment Ordinance (tabled 6/14/11)

8. New Business
   A. Consideration and possible action on proposals to prepare a plat of survey for Fire Station #1 located at W304 N2455 Maple Avenue
   B. Consideration and possible action on Resolution dividing the Town into 11 wards according to the final published results of the most recent federal census
   C. Discussion and possible action on request from Sunvest Solar Inc. for a special use permit to install a solar energy conversion system

D. Consideration and possible action on Plan Commission's request for input on whether or not to allow chickens in residential areas
E. Consideration and possible action on Operator's License for the period of 7/1/10 to 6/30/12:
   - Matthew A. Tesch for Kim's Lakeside
   - Stephanie M. Williams for Kim's Lakeside
   - Rena M. Manriquez for Kim's Lakeside

9. Announcements and Planning Items
   A. Board of Review – Thursday, July 21 – 7:00 p.m.
   B. Next Town Board Meeting – July 26
   C. Next Plan Commission Meeting – August 2

10. Adjournment

____

Mary T. Elsner, CMC, WCMC
Town Clerk/Treasurer

Notification of this meeting has been posted in accordance with the Open Meeting Laws of the State of Wisconsin. The Town Board may take action on any item on the agenda. It is possible that members of and possibly a quorum of members of other governmental bodies of the municipality may be in attendance at the above-stated meeting to gather information; no action will be taken by any governmental body at the above-stated meeting other than the Town Board of Supervisors. Please note that, upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals through appropriate aids and services. For additional information or to request this service, contact Mary Elsner, Town Clerk, at N14 W30782 Golf Road, Delafield, WI 53018-2117. This agenda is for informational purposes only. Posted – 7/8/2011

TOWN OF DELAFIELD BOARD OF SUPERVISORS MEETING
July 12, 2011

Members Present: P. Kanter, C. Dundon, P. Van Horn, L. Krause and R. Ackley
Others Present: T. Barbeau, *Town Engineer, 6 citizens*

First order of business: Call to Order
Chairman Kanter called the meeting to order at 7:00 p.m.

Second order of business: Pledge of Allegiance

Third order of business: Citizen Comments
There was no citizen comment.

Fourth order of business: Approval Town Board Minutes of June 28, 2011
MOTION MADE BY MR. VAN HORN, SECONDED BY MR. KRAUSE TO APPROVE. MOTION CARRIED.

Fifth order of business: Action on vouchers submitted for payment:
A. Report on budget sub-accounts and action to amend 2011 budget

B. 1) Accounts payable; 2) Payroll

Accounts Payable
MOVED TO APPROVE PAYMENT OF CHECKS #48507 - 48549 IN THE AMOUNT OF $29,809.06.

Payroll
MOVED TO APPROVE PAYMENT OF CHECKS #22704 – 22724 IN THE AMOUNT OF $25,148.78.
MS. DUNDON/MR. ACKLEY MOTION CARRIED.

Sixth order of business: Communications
A. Daniel S. Duchniak, (7/7/11), Re: Request for Approval by the Town of Delafield of the City of Waukesha Water Supply Service Area Plan

Chairman Kanter stated that he directed Engineer Barbeau to contact the City of Waukesha and SEWRPC to request that a representative attend this evening's meeting for additional information on the subject water supply service area plan. As Engineer Barbeau was unsuccessful in his attempt, this item will be placed on the July 26 agenda. He will invite a representative from SEWRPC and City of Waukesha to attend.

Seventh order of business: Unfinished Business
A. Discussion on letter of notification from Department of Agriculture, Trade and Consumer Protection concerning Town of Delafield Chemical Weed Treatment Ordinance (tabled 6/14/11)

MOTION MADE BY MS. DUNDON, SECONDED BY MR. ACKLEY TO REMOVE FROM THE TABLE. MOTION CARRIED.

Mr. Krause stated that he contacted Lori Bowman of DATCP. Attorney Larson submitted requested information to DATCP, but they have not yet acted on it.

Chairman Kanter directed attention to recent charges submitted by Attorney Larson for services performed on the chemical weed treatment ordinance. He requested that Mr. Krause contact the law firm to question whether or not the City of Pewaukee and Village of Pewaukee also received these charges. This matter will be placed on the July 26 agenda.

MOTION MADE BY MR. VAN HORN, SECONDED BY MR. ACKLEY TO TABLE FOR TWO WEEKS. MOTION CARRIED.

Eighth order of business: New Business

A. Consideration and possible action on proposals to prepare a plat of survey for Fire Station #1 located at W304 N2455 Maple Avenue

Engineer Barbeau stated that he requested four proposals for the subject project and the following three were submitted: Jahnke & Jahnke - $2075.00; RA Smith National - $1975.00; and, Yaggy Colby - $1740.00.

MOTION MADE BY MR. KRAUSE, SECONDED BY MR. VAN HORN TO ACCEPT THE PROPOSAL SUBMITTED BY YAGGY COLBY IN THE AMOUNT OF $1740.00 TO PREPARE A PLAT OF SURVEY FOR FIRE STATION #1 LOCATED AT W304 N2455 MAPLE AVENUE. MR. ACKLEY – YES, MS. DUNDON – YES, MR. KRAUSE – YES, MR. VAN HORN – YES, CHAIRMAN KANTER – NO. MOTION PASSED 4-1.

B. Consideration and possible action on Resolution dividing the Town into 11 wards according to the final published results of the most recent federal census

MOTION MADE BY MR. VAN HORN, SECONDED BY MR. ACKLEY TO APPROVE THE RESOLUTION DIVIDING THE TOWN INTO 11 WARDS ACCORDING TO THE FINAL PUBLISHED RESULTS OF THE MOST RECENT FEDERAL CENSUS. MOTION CARRIED.

C. Discussion and possible action on request from Sunvest Solar Inc. for a special use permit to install a solar energy conversion system

Richard Mortimer, Sunvest Solar Inc., stated the request to install a roof-top type solar electric system at Church of the Resurrection, W287 N 3700 North Shore Drive, Pewaukee. Engineer Barbeau stated that this is the first time a special use permit has been required. He directed attention to Section 17.06 of the Town Code stating, "A separate special use permit from the Town Board shall be required for each system".

MOTION MADE BY MR. VAN HORN, SECONDED BY MR. ACKLEY TO APPROVE A SPECIAL USE PERMIT TO INSTALL A SOLAR ENERGY CONVERSION SYSTEM AT CHURCH OF THE RESURRECTION, W287 N3700 NORTH SHORE DRIVE. MOTION CARRIED.

D. Consideration and possible action on Plan Commission's request for input on whether or not to allow chickens in residential areas

The general consensus of the Town Board is to send this matter back to the Plan Commission and request that an ordinance be drafted to allow chickens in residential areas.

E. Consideration and possible action on Operator's License for the period of 7/1/10 to 6/30/12:
- Matthew A. Tesch for Kim's Lakeside

MOTION MADE BY MR. VAN HORN, SECONDED BY MR. ACKLEY TO APPROVE. MOTION CARRIED.

- Stephanie M. Williams for Kim's Lakeside

MOTION MADE BY MS. DUNDON, SECONDED BY MR. ACKLEY TO APPROVE. MOTION CARRIED.

- Rena M. Manriquez for Kim's Lakeside

MOTION MADE BY MS. DUNDON, SECONDED BY MR. KRAUSE TO APPROVE. MOTION CARRIED.

Ninth order of business: Announcements and Planning Items

A. Plan Commission workshop – July 19
B. Board of Review – Thursday, July 21 – 7:00 p.m.
C. Next Town Board Meeting – July 26
D. Next Plan Commission Meeting – August 2

Tenth order of business: Adjournment
MOTION MADE BY MR. KRAUSE, SECONDED BY MS. DUNDON, TO ADJOURN AT 7:55 P.M. MOTION CARRIED.

Respectfully submitted,

Mary T. Elsner, CMC, WCMC
Town Clerk/Treasurer

Minutes approved on July 26, 2011

Waukesha Water Utility
SERVING WAUKESHA SINCE 1886

115 DELAFIELD STREET
WAUKESHA, WI 53188-3615

Telephone: (262) 521-5272 • Fax: (262) 521-5265 • E-mail: contactus@waukesha-water.com

January 12, 2011

Sharon L. Leair, Chairman
Town of Genesee
S42 W31258 North Street
Genesee Depot, WI 53127

Subject: Request for Approval by the Town of Genesee of the City of Waukesha Water Supply Service Area Plan

Dear Ms Leair:

The purpose of this letter is to request review and approval by the Town of Genesee of the City of Waukesha Water Supply Service Area Plan as discussed below.

Background and Regulatory Requirement

In December 2008, the Southeast Regional Planning Commission (SEWRPC), in conjunction with the Wisconsin Department of Natural Resources, delineated the water supply service area for the City of Waukesha which included an area of the Town of Genesee. (Refer to Attachment 1.) This planning guidance was prepared in a manner consistent with the Waukesha County comprehensive plan, the *Regional Water Supply Plan for Southeastern Wisconsin,* and state planning requirements. The proposed water supply service area and population projections are a basis for the *Draft City of Waukesha Water Supply Service Area Plan, April 2010.* (Refer to Attachment 2.) This proposed water supply service area is consistent with the current sewer system services area that has been approved by the Town of Genesee.

The City of Waukesha is making application for a diversion of Great Lakes water pursuant to Sections 281.346 and 281.348 Wis. Stats. The Great Lakes-Water Resources Compact and the Wisconsin Statutes adopted pursuant to the Compact require that the City document the public participation process conducted for the proposed Water Supply Area Plan, including evidence that the governing body of the Town of Genesee addressed by the plan have approved the Water Supply Service Area Plan, hence this request to the Town of Genesee.

The Town of Genesee water supply is currently provided by private wells. The future decision of whether to develop a Town municipal water supply system is up to the Town of Genesee. Municipal Great Lakes water supply would only be provided if needed and requested by the Town of Genesee. The Town was included by SEWRPC in the City of Waukesha's future water supply service area because it may be served by municipal water service during the planning horizon that extends to year 2035. Approval of the City's Water Supply Service Area Plan does not financially or legally commit the Town to actual Great Lakes water supply but rather acknowledges the potential for Great Lakes Water supply of the designated area of the Town by the City sometime in the future. The Town will remain on its supply of private wells unless there is a water supply need and an initiative by the Town requesting Great Lakes water supply by the City for the designated service area. Non-approval by the Town of the City's Great Lakes water supply for the area of the Town designated by SEWRPC will result in this area being deleted from Great Lakes Water Supply Service by the City of Waukesha and revision of the Water Supply Service Area Plan. Approval of the City of Waukesha Water Supply Service Area Plan provides the Town with a contingency plan (Attachment 3) for water supply in the future if the Town ever decides to replace its private wells with a municipal supply.

Because our application for a Great Lakes water supply (Attachment 4) is currently pending before the DNR, we would appreciate a response by March 14, 2011. I would be happy to discuss this matter with you at your convenience. Thank you for your consideration.

Sincerely,

Waukesha Water Utility

Daniel S. Duchniak, P.E.
General Manager

Cc: Mike Hahn, Southeastern Wisconsin Regional Planning Commission
Dale Shaver, Waukesha County
Dino Tsoris, Wisconsin Department of Natural Resources
Jeff Scrima, City of Waukesha Mayor
Curt Meitz, City of Waukesha Attorney

Attachments
1- Southeastern Wisconsin Regional Planning Commission Letter, December 23, 2008
2- Southeaster Wisconsin Regional Planning Commission Letter, March 17, 2009
3- Draft City of Waukesha Water Supply Service Area Plan, April 2010
4- Application for Great Lakes Water Supply, May 2010 (3 copies)

NEWS ITEM

TOWN OF GENESEE
S43 W31391 HIGHWAY 83
PO BOX 242
GENESEE DEPOT, WI 53127
262-968-3656

REGULAR TOWN BOARD MEETING
FEBRUARY 14, 2011
7:00 P.M.
AGENDA

1. Discussion/action – Minutes to be approved – Regular Town Board Meeting of 1-10-11; Special Town Board Meeting of 1-17-11
2. Monthly report from Wales-Genesee Fire Chief Greg Jezak
3. Discussion/action – Funding for Computerized Aided Dispatch (CAD) – Waukesha County Emergency Preparedness Department
4. Discussion/action – Contribution of one half of 5% matching 2010 Assistance to Firefighters Grant for the purchase of defibrillator
5. Discussion/action – Request for approval of the City of Waukesha Water Supply Service Area Plan
6. Discussion/action - Approval of Agreement/contract for computerizing building footprint information – Schultz Appraisal Agency
7. Discussion/action – Request for parking on town road and outside amplified music for wedding/reception at W330 S3388 Bryn Mawr Road – Wayne & Kathy Grandy
8. Discussion/action – Request for second access – Dan Kopshinsky, W289 S4685 Rockwood Trail
9. Discussion/action – Snow removal complaint – Jim Stresing - Jenkins Court
10. Discussion/action – Appointment as Recycling Coordinator – Marcia Bufton
11. Discussion/action – Approval of Resolution Authorizing the Recycling Coordinator with the DNR
12. Discussion/action – Request for final payment (Holiday Road project) – Mann Bros., Inc.
13. Discussion of financial guarantee for ditch and driveway bond (repeal of Ord. 03-1)
14. Discussion/action – Ordinance 11-1 to Repeal prior ordinances regarding culvert installation and fees , and to establish regulations regarding Town of Genesee public right-of-ways, including culvert regulations and driveway regulations
15. Reports –
    A. Treasurer – Carol McCormick
        a. 2010 tax collection
    B. Public Works Supervisors – Tom Earle
        a. Snow & Ice control update
        b. Update on underground tank removal on Old Village Road
16. Discussion/action – Bills to be presented
17. Discussion/action –Approval of Resolution Designating Public Depository & Authorizing Withdrawal of County, City, Village Town or School District Moneys – Citizens Bank of Mukwonago
18. Discussion/action – Garbage/recycling billing for non-residents on Billings Court
19. Discussion/action – Upgrading of computer
20. Discussion/action – Request for Operator Permit
21. Reports –
    A. Chairman – Sharon Leair
        a. Update from WTA – Waukesha County Unit meeting of 1-26-11
        b. Update regarding the Zurawski matter
        c. Update on Town Zoning Code Meetings
    B. Supervisor – Drake Reid
        a. Update from Waukesha County Cooperation Council Meeting – 2-7-11

22. Correspondence
23. Adjourn

Barbara A. Whitmore, WCMC
Town Clerk/Designated Representative
February 10, 2011

Notice - It is possible that members of and possibly a quorum of members of other governmental bodies of the municipality may be in attendance at the above stated meeting to gather information; no action will be taken by any governmental body at the above stated meeting other than the governmental body specifically referred to above in this notice.

Please note that upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals through appropriate aids and services. For additional information or to request this service, contact the Town Office at 968-3656.

REGULAR TOWN BOARD MEETING
FEBRUARY 14, 2011

Chairman Leair called the meeting to order at 7:02 p.m. Present were Supervisors Reid, Ross, Morris and Schmittinger. Also present were Planner Herrmann and Clerk Whitmore.

Discussion/action – Minutes to be approved –
Regular Town Board Meeting of 1-10-11 Morris made motion to approve the minutes of 1-10-11, Reid seconded, motion carried with Ross abstaining; **Special Town Board Meeting of 1-17-11** Reid made motion to approve, Schmittinger seconded, motion carried with Morris and Ross abstaining.

Monthly report from Wales-Genesee Fire Chief Greg Jezak
Board members will be copied with the monthly report. There were a total of 18 calls in January.

Discussion/action – Funding for Computerized Aided Dispatch (CAD) – Waukesha County Emergency Preparedness Department
Leair reported the Village of Wales has approved splitting this cost, discussion. Reid made motion to approve the town pay 1/2 of the $1,175.00 for the Wales-Genesee Fire Department share of the CAD through the Waukesha County Department of Emergency Preparedness, Morris seconded, motion carried unanimously. The check is to be made to the Wales-Genesee Fire Dept.

Discussion/action – Contribution of one half of 5% matching 2010 Assistance to Firefighters Grant for the purchase of defibrillator
Jezak wrote a grant application in 2010 to replace two defibrillators for $56,000; the federal government awarded the grant but only enough for one defibrillator, after pleading his case and they did award $42,000 for both with a 95/5 percent split, the 5 percent for the fire department came to $2,100, Genesee's portion will be $1,050.00. The next grant he will work on will be towards radios. Morris made motion to approve the towns portion for the defibrillators, Ross seconded. Morris thanked the Chief for his diligence to get the grant. Motion carried unanimously.

Jezak reported the ad for engine 3761 has had several inquiries and bids; the bids close at 10 am tomorrow and hopefully the joint fire board will award to highest bidder tomorrow evening at the monthly board meeting. There have been inquires from Wisconsin, Wyoming and Texas.

Discussion/action – Request for approval of the City of Waukesha Water Supply Service Area Plan
Daniel Duchniak, general manager of the City of Waukesha Water Utility appeared to go over the city's request for approval of the City of Waukesha Water Supply Service Area Plan. SEWRPC had put about four square miles of the Town of Genesee on the map of possible future service area at the request of the DNR. The DNR had asked to include 17 areas in Waukesha County in the request service area looking at the information they have. They requested those areas be put in the requested service area in the event service may someday be needed. If the town signs on now they would only need to make a request to the City of Waukesha for service. If they do not sign on now they would have to work through the eight great lake states if service was requested later. Schmittinger asked if we would help pay for the city's request. Mr. Duchniak stated only if and when the town requested service. Schmittinger asked if we could get that in writing. Mr. Duchniak said he would send something to the town.

If the town does request to become part of the service plan it does not preclude the town from drilling their own well and starting their own utility district.

Mr. Duchniak told the Board he needs to hear from them by March 14th, since the next meeting is on the 14th, the morning of the 15th would be alright. This item was tabled to March.

Discussion/action - Approval of Agreement/contract for computerizing building footprint information – Schultz Appraisal Agency
Discussion, Schmittinger made motion to table, Morris seconded, motion carried unanimously.

Discussion/action – Request for parking on town road and outside amplified music for wedding/reception at W330 S3388 Bryn Mawr Road – Wayne & Kathy Grandy
This request is for Saturday August 27th. The Grandys and their nephew Brian were present to discuss the request. They will have the wedding, dinner and reception with amplified music in a large tent in their yard which is surrounded by trees. They expect 125 guests, parking would be allowed on one side of the road, leaving the driveway clear for emergency vehicles. They will be renting portable toilet facilities. The dinner will be from 5 to 7 pm and 8 to midnight a music reception; they have already spoken to several neighbors.

The Board suggested the contact the sheriff department, fire department and neighbors. Morris made motion to approve with music no later than midnight, Ross seconded, motion carried unanimously.

Discussion/action – Request for second access – Dan Kopshinsky, W289 S4685 Rockwood Trail
The Kosphinskys asked this be tabled to next month. Leair asked the Board to go and look at the Kopshinsky property; they will mark with a stake where they would like the second access to be. Schmittinger made motion to table, Reid seconded, motion carried unanimously.

Discussion/action – Snow removal complaint – Jim Stresing - Jenkins Court
Mr. Stresing was unable to make tonight's meeting and asked this be tabled to next month. Ross made motion to table, Schmittinger seconded, motion carried unanimously.

Discussion/action – Appointment as Recycling Coordinator – Marcia Bufton
Leair recommended appointing Marcia Bufton as our Recycling Coordinator, replacing Russ Evans who resigned as of December 31st. Ross made motion to appoint Marcia Bufton as the town's Recycling Coordinator, Schmittinger seconded, motion carried unanimously.

Discussion/action – Approval of Resolution Authorizing the Recycling Coordinator with the DNR
Discussion, Morris made motion to approve the Resolution Authorizing the Recycling Coordinator with the DNR, Schmittinger seconded, and motion carried unanimously.

Discussion/action – Request for final payment (Holiday Road project) – Mann Bros., Inc.
Discussion of the request for payment, and issue Tom has with the drainage of one driveway. We will not know if the ponding of water will be corrected until after the snow melts.

Morris made motion not to pay this bill per Tom's report one driveway does not met with standards, to check with Yaggy Colby to clarify the amount of the request and if there is proof the drainage will function. Schmittinger seconded, motion carried unanimously.

Discussion of financial guarantee for ditch and driveway bond (repeal of Ord. 03-1)
Herrmann discussed this with Attorney Macy this afternoon and felt we should leave this ordinance as is, we can handle the dollar amount of the bond through the fee schedule resolution.

Discussion/action – Ordinance 11-1 to Repeal prior ordinances regarding culvert installation and fees, and to establish regulations regarding Town of Genesee public right-of-ways, including culvert regulations and driveway regulations

The main change on this ordinance was the restriction of anything placed or planted in the right of way is prohibited; the other changes were basically removing the Town Engineer inspecting and changing it to the Public Works Supervisor; also the addition of section IV, mailbox regulations.

Ross made motion to approve Ordinance 11-1, Morris seconded, motion carried unanimously.

Discussion of policy for culvert inspections and fee.

Reports –

Treasurer – Carol McCormick

2010 tax collection

McCormick stated she has finalized tax collections, residents also asked when the house signs will be installed.

Bills to be presented

Schmittinger made motion to approve the bills as presented and to also approve two checks to the Wales-Genesee Fire Department for $587.50 and $1050.00. Morris seconded, motion carried unanimously.

Public Works Supervisors – Tom Earle

Snow & Ice control update

The blizzard plowing went well, drifting was a big issue; we did need to bring in a front end loaded to clear some of the cul-de-sac's. All roads were open Wednesday before noon, widening and clean up took place Wednesday afternoon and Thursday. Eleven cars were abandoned on the town roads.

Discussion of Tom taking the town truck home to save him time coming back to the town and trouble getting to the garage at the park when large snow storms are predicted.

Update on underground tank removal on Old Village Road

The material is ready to be removed as soon as it thaws; the barrels should be picked up this week.

Update regarding the Zurawski matter

The building is gone, Mr. Zurawski hired a company to remove the building, some additional fill will be needed, there is a slight depression where the house was. They had requested to grade material from the property and were advised not to as this could change the drainage pattern of the property.

Leair added the attorney may be going back to court to try and re-coup some of our costs.

Discussion/action –Approval of Resolution Designating Public Depository & Authorizing Withdrawal of County, City, Village Town or School District Moneys – Citizens Bank of Mukwonago

Whitmore stated this is a request of the bank to have the form updated; it has to do with homeland security. Morris made motion to approve, Ross seconded, motion carried unanimously.

Discussion/action – Garbage/recycling billing for non-residents on Billings Court

It was discovered four residents on Billings Court are not being billed for garbage pickup, however Johns has them on the list they provided the town of addresses they pick up at. After further research it was found the properties are in both the town of Genesee and Ottawa. The residence is in Ottawa with the access in Genesee.

Discussion. Ross made motion a letter should be sent to the four home owners that the John's will be notified to stop pick up this week and to call John's to cancel the pickup. Schmittinger seconded, motion carried unanimously.

<u>Discussion/action – Upgrading of computer</u>
Herrmann explained the scanner for the new copier will not work with the current server we have, the company will not hook it up as they are afraid it will cause the server to crash. After discussion with Mike Rotroff it was felt the best way to solve this would be to replace a current computer and use the old one for the scanner only. We had not planned on replacing any computers until next year, but did budget funds this year in case there were any problems. This was discussed with the representative from the copier company prior to our signing the contract and they assured us there would be no problems. Discussion, it was agreed to replace Carol's computer, that no action was needed since there were budgeted funds.

<u>Discussion/action – Request for Operator Permit</u>
Ross made motion to approve the new application for Emma Rose Starzewski at Ten Chimneys Foundation subject to proof of schooling, Schmittinger seconded, motion carried unanimously.

<u>Reports –</u>
Chairman – Sharon Leair
<u>Update from WTA – Waukesha County Unit meeting of 1-26-11</u>
Chris Kapenga was present at the meeting and went over some of the budget issues being discussed. The wind turbine was also discussed.

<u>Update on Town Zoning Code Meetings</u>
The meetings are moving along, the Town of Vernon is planning on their public hearing the end of February.

Supervisor – Drake Reid
<u>Update from Waukesha County Cooperation Council Meeting – 2-7-11</u>
Reid said the minutes pretty much summarize what happened at the meeting.

There was also discussion on a new prescription drug discount card being offered to anyone in the county.

<u>Correspondence</u>
Board members were copied with correspondence.

There will be a public information meeting at the Mukwonago Village Hall on Tuesday February 22 from 5 to 7 pm regarding the highway 83 reconstruction from CTH "NN" to STH "59".

Schmittinger made motion to adjourn, Ross seconded, motion carried unanimously. Meeting adjourned at 8:50 p.m.

Respectfully submitted,

Barbara A. Whitmore, WCMC
Town Clerk

Waukesha Water Utility
SERVING WAUKESHA SINCE 1886

115 DELAFIELD STREET
WAUKESHA, WI 53188-3615

Telephone: (262) 521-5272 • Fax: (262) 521-5265 • E-mail: contactus@waukesha-water.com

February 16, 2011

Sharon L. Leair, Chairman
Town of Genesee
S42 W31258 North Street
Genesee Depot, WI 53127

Subject: Request for Approval by the Town of Genesee of the City of Waukesha Water Supply Service Area Plan

Dear Ms Leair:

Thank you and the Town Board for their time in taking up the Approval of the Water Supply Service Area Plan at your meeting on Monday, February 14, 2011. I appreciate the board's thorough review of the request.

At the meeting, a question was asked related to the financial impact to the Town of Genesee if it was to approve the plan. This letter is to inform you that there are no costs associated with the inclusion of the proposed area within the Town of Genesee into the Water Supply Service Area plan and there are no costs associated with the application for Great Lakes water. The only costs that would be borne by the Town of Genesee would be those costs associated with the development of a water utility by the Town and the construction of facilities necessary to transfer the water from the Waukesha Water utility to the residents within the service area if the Town would choose to provide water service to its residents. Approval of the plan simply gives the Town the option to provide Great Lakes water in the future, not any obligation. Service would only be developed at the request of the Town of Genesee.

I trust this answers the questions raised at the meeting. Feel free to contact me at (262) 521-5272 ext. 518 if you have any further questions.

Thank you in advance for your attention to this matter.

Sincerely,

Waukesha Water Utility

Daniel S. Duchniak, P.E.
General Manager

NEWS ITEM

TOWN OF GENESEE
S43 W31391 HIGHWAY 83
P.O. BOX 242
GENESEE DEPOT, WI 53127
262-968-3656

REGULAR TOWN BOARD MEETING
MARCH 14, 2011
7:00 P.M.
AGENDA

1. Discussion/action – Awarding of Roadside Weed Cutting bid
2. Discussion/action – Minutes to be approved – Special Town Board Meeting of 2-11-11; Regular Town Board Meeting of 2-14-11; Executive Session of 2-18-11
3. Monthly report from Wales-Genesee Fire Chief Greg Jezak
4. Discussion/action – Request for approval of the City of Waukesha Water Supply Service Area Plan
5. Discussion/action – Approval of Agreement/contract for computerizing building footprint information – Schultz Appraisal Agency
6. Discussion/action – Request for second access – Dan Kopshinsky, W289 S4685 Rockwood Trail
7. Discussion/action – Snow removal complaint – Jim Stressing, Jenkins Ct.
8. Discussion/action – Request for Temporary Class "B"/"Class B" Retailers License – Genesee Rebels
9. Reports –
   - A. Treasurer – Carol McCormick
     - a. Update on 2010 tax collection
     - b. Update on 2009 & 2010 unpaid personal property taxes
   - B. Public Works Supervisor – Tom Earle
     - a. Update on snow and ice control
     - b. Update on road work
10. Discussion/action – Bills to be presented
11. Discussion/action – 2009 personal property taxes for Arnolds Environmental
12. Discussion/action – Ordinance 11-2, Ordinance to amend ordinance 11-1 culvert installation and fees, public right-of-ways, culvert regulations, driveway regulations and mailboxes
13. Discussion/action – Resolution 11-3R, Fee Schedule
14. Discussion/action – 2010 Budget Amendments
15. Discussion/action – Codification contract
16. Discussion – set date for 2011/12 Liquor License Hearing
17. Discussion/action – Operators' Permit applications
18. Reports –
   - A. Chairman – Sharon Leair
     - a. Proposed State Budget
     - b. Update on Zoning Code
     - c. Update on Zurwaski property
   - B. Clerk – Barb Whitmore
     - a. Update on garbage billing on Billings Ct.
19. Correspondence
20. Adjourn

Barbara A. Whitmore, WCMC
Town Clerk/Designated Representative
March 10, 2011

Notice - It is possible that members of and possibly a quorum of members of other governmental bodies of the municipality may be in attendance at the above stated meeting to gather information; no action will be taken by any governmental body at the above stated meeting other than the governmental body specifically referred to above in this notice.

Please note that upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals through appropriate aids and services. For additional information or to request this service, contact the Town Office at 968-3656.

TOWN OF GENESEE
MARCH 14, 2011

Chairman Leair called the meeting to order at 7:02 p.m. Present were Supervisors Reid, Schmittinger and Ross; Morris was absent. Also present were Public Works Supervisor Earl and Clerk Whitmore.

<u>Discussion/action – Awarding of Roadside Weed Cutting bid</u>
Earle went over the two bids received and opened on March 11th at 3 pm. The two bids received were:
Watertown Evergreen - $48.00 per hour, base bid
Butterfield Trucking - $46.00 per hour, base bid

Earle taking the base bid and the additional three pieces of equipment listed on each bid figured the rate per hour per foot mowed which came to $4.00 per foot per hour for the Butterfield bid and $3.94 per foot per hour for the Watertown Evergreen bid.

Earle explained this was not an easy recommendation to make, Watertown was awarded the bid last year and did a good job, with no major complaints. Earle recommended Watertown Evergreen based on the numbers.

Discussion of the way the bid was written and equipment on each bid.

Ross made motion to go with the bid from Mr. Butterfield, his bid is the lower rate per hour based on the bid specs.

Paul Dishneau of Watertown Evergreen stated he uses a mower that is made specifically for hillside mowing, discussion.

Ross stated the base bid requested an hourly rate that is what we have to look at. Leair stated the bid specs will be reviewed and possibly changed before next year.

Schmittinger seconded the motion, motion carried unanimously.

<u>Discussion/action – Minutes to be approved –</u>
Special Town Board Meeting of 2-11-11 Ross made motion to approve, Schmittinger seconded, motion carried unanimously **Regular Town Board Meeting of 2-14-11** Ross made motion to approve, Schmittinger seconded, motion carried unanimously. **Executive Session of 2-18-11** Ross made motion to adjourn, Schmittinger seconded, motion carried unanimously.

<u>Monthly report from Wales-Genesee Fire Chief Greg Jezak</u>
Board members were copied with the monthly report; there were 23 calls in the month of February with a total of 53 calls as of this evening.

Engine 3761 was sold to the department in Couderay for $15,000. There are currently three people in fire school, one in EMT and 1 in EMT IV tech.

<u>Discussion/action – Request for approval of the City of Waukesha Water Supply Service Area Plan</u>
A letter was received from Daniel Duchniak of the Waukesha Water Utility as requested at the February meeting stating there would be no cost to the town by approving the service area; the only cost to the town would be if the town decided to request service at a later date, by this approval the town would not have to work through the eight Great Lakes states if they did request service, discussion. Ross made motion to approve the request for participation in the City of Waukesha Supply Service Area Plan, Schmittinger seconded, motion carried unanimously.

Discussion/action – Approval of Agreement/contract for computerizing building footprint information – Schultz Appraisal Agency

Ross stated according to the minutes of the December 2010 meeting the Board already told the Schultz agency to start the project in 2011. He contacted the Town of Delafield which uses Schultz and they were charged the $5 and $10 fee; Town of Merton pays $31,000 to maintain their records and is starting a reval at over $200,000 which will include the additional drawings. The Town of Vernon has not been approached and he is waiting for a call back from the Town of Mukwonago. Barb contact the Town of Ottawa, theirs was done last year as part of their revaluation; Wales is doing a revaluation this year and this is part of the total package there was no break down; North Prairie has heard nothing about this. Discussion. Ross made motion to approve the agreement as provided, Schmittinger seconded, motion carried unanimously.

Discussion/action – Request for second access – Dan Kopshinsky, W289 S4685 Rockwood Trail

Discussion of the proposal, Leair was concerned about the drop off and utilities. Mr. Kopshinsky felt this was the best area, there would be few trees to remove, they will have to purchase some land from their neighbor to make the access. Ideally they would like them to come in one side and go out the other, backing out is the real danger. There was also a discussion on the purchase of land from the neighbor and if they will be creating a non-conforming lot. Ross made motion to approve the second access subject to their not creating a non-conforming lot and subject to the Mr. Kopshinsky acquiring the land. Schmittinger seconded, motion carried unanimously. Per Tom Earle a culvert will not be required.

Discussion/action – Snow removal complaint – Jim Stressing, Jenkins Ct.

A letter of complaint and pictures were received by the town on February 7th from Jim Stessing on Jenkins Ct.

Mr. Stressing stated the town has a policy, why is it not followed. The entrance into his subdivision was barely 12 feet across 24 hours after the snow storm and the policy reads it will be 15 feet, regardless of the storm, that needs to be done.

Earle stated the main objective is to get the roads open, then do the clean up and widening of the roadway.

Discussion on how the cul-de-sac is plowed and how Mr. Stressing felt it should be done.

Leair told Mr. Stressing the Board had heard his complaints. Mr. Stressing asked if the town was going to follow your policy, as the policy needs to be followed. Schmittinger felt this was exceptional storm, with a large volume of snow and blizzard winds, if there is a problem call and we will respond accordingly. The town's first responsibility is to make the roads accessible for emergency equipment.

Discussion/action – Request for Temporary Class "B"/"Class B" Retailers License – Genesee Rebels

Discussion. Ross made motion to approve the license for the Genesee Rebels, the area is immediately surrounding the 3 ball diamonds, and the entire park is not under this license or reserved for the Rebels sales. 2011 regular season games, rain dates and post season games, also the Gibson Memorial Tournament. Schmittinger seconded, motion carried unanimously.

Reports –

Public Works Supervisor – Tom Earle

Update on snow and ice control

The billing covered the blizzard in February; major equipment was used on many of the cul-de-sac to remove the large drifts, also the clear the parking lanes on highway 83. It was agreed Butterfield did a good job opening the roads.

Update on road work

Earle reported he attended a seminar by the DOT, the prevailing wage law may go away, if so it would be a substantial savings to the town, discussion.

Treasurer – Carol McCormick

Update on 2010 tax collection

McCormick explained there error with the December 17th property bills caused by the payments for that date not being forwarded to the county; in February the county sent delinquent bills to those residents. A letter from McCormick was sent to the property owners explaining the error.

Update on 2009 & 2010 unpaid personal property taxes

The 2008 and 2009 unpaid personal property tax bills will be sent to the county for collection and charged back.

Discussion/action – 2009 personal property taxes for Arnolds Environmental

McCormick received a letter from Arnolds Environmental from August 2006 stating they file their personal property taxes in the Town of Saukville; she had sent them a letter that the bill for 2009 would be turned over to the county for collection; she was asking the Board to approve writing this off and charging it back, discussion. Schmittinger made motion to table this item that we need clarification what constitutes a business, Ross seconded, motion carried unanimously.

Discussion/action – Bills to be presented

Ross made motion to approve the bills as presented, including the invoice for $62,513.75 from Butterfield, Reid seconded, motion carried unanimously.

Discussion/action – Ordinance 11-2, Ordinance to amend ordinance 11-1 culvert installation and fees, public right-of-ways, culvert regulations, driveway regulations and mailboxes

Discussion, Board members agreed to add "or cash equivalent of a standard post and box or as determined by the town" to section IV Mailbox Regulations. Ross made motion to approve Ordinance 11-2 subject to the change discussed, Schmittinger seconded, motion carried unanimously.

STATE OF WISCONSIN TOWN OF GENESEE WAUKESHA COUNTY

ORDINANCE NO. 11-2

AN ORDINANCE TO AMEND ORDINANCE NO. 11-1
CULVERT INSTALLATION AND FEES, PUBLIC RIGHT-OF-WAYS, CULVERT REGULATIONS, DRIVEWAY REGULATIONS AND MAILBOXES

WHEREAS, the Town Board of the Town of Genesee adopted an Ordinance to regulate culvert installation and fees, public right-of-ways, culvert regulations, driveway regulations and mailboxes in the Town of Genesee; and

WHEREAS, the Town Board of the Town of Genesee finds that it is reasonable to amend the Ordinance to better serve the taxpayers of the Town,

NOW, THEREFORE, the Town Board of the Town of Genesee, Waukesha County, Wisconsin, DOES ORDAIN AS FOLLOWS:

SECTION 1: Town of Genesee Ordinance No. 11-1 entitled an ordinance to repeal prior ordinances regarding culvert installation and fees, and to establish regulations regarding Town of Genesee public right-of-ways, including culvert regulations and driveway regulations, Section IV Mailbox Regulations, Subsection C, is hereby repealed and recreated to read as follows:

IV. MAILBOX REGULATIONS

C. The Town shall not replace any mailbox in kind. Should an investigation determine that a mailbox was damaged by Town or Contractor equipment, the property owner shall receive a standard (4 in. x 4 in.) post and box unit or the cash equivalent of a standard (4 in. x 4 in.) post and box unit as determined by the town. The post shall consist of either a treated or cedar material, depending on what was found in the investigation.

SECTION 2: SERVERABILITY.

The several sections of this ordinance are declared to be severable. If any section or portion thereof shall be declared by a court of competent jurisdiction to be invalid, unlawful or unenforceable, such decision shall apply only to the specific section or portion thereof directly specified in the decision, and shall not affect the validity of any other provisions, sections or portions thereof of the ordinance. The remainder of the ordinance shall remain in full force and effect. Any other ordinances whose terms are in conflict with the provisions of this ordinance are hereby repealed as to those terms that conflict.

SECTION 3: EFFECTIVE DATE

This ordinance shall take effect immediately upon passage and posting or publication as provided by law.

Dated this ____ day of __________________, 2011.

TOWN OF GENESEE

____

ATTEST: Sharon L. Leair, Town Chair

____

Barbara A. Whitmore, Town Clerk

Published and/or posted this _____ day of ____________________, 2011

Discussion/action – Resolution 11-3R, Fee Schedule
Whitmore went over the proposed changes – Planner from $84.00 to $87.50; Public Site Fees were changed as follows – single family unit $844.00 to $860.00, multi-family unit -$553.00 to $563.50 and studio/one bedroom $421.00 to $429.00. Occupancy Bond from $1,900.00 to $2,000.00. Voter Registration List and Satellite dish public hearing were both removed. Schmittinger made motion to approve Resolution 11-3R, Ross seconded, motion carried unanimously.

WAUKESHA COUNTY TOWN OF GENESEE STATE OF WISCONSIN

RESOLUTION 11-3R

**A RESOLUTION
TO ADOPT THE CHARGES AND FEE SCHEDULE
FOR THE TOWN OF GENESEE**

BE IT RESOLVED BY THE Town Board of the Town of Genesee, Waukesha County, Wisconsin
That certain fees described by ordinances of the Town of Genesee are hereby established in the amounts described herein:

	Charges & Fees	
Town Hall		
Hall rental	100.00	
Security deposit	50.00	
Dogs		
Dog license	10.00	spayed/neutered
	15.00	male/female
	5.00	late fee-after March 31st
Hobby kennel	25.00	plus license fees PUBLIC HEARING Required
Commercial kennel	35.00	
Liquor Licenses		
Operator's permits	25.00	1 year permit
Cigarette license	30.00	
Class "A" Beer	25.00	
Class "A" Liquor	325.00	
Class "B" Beer	100.00	
Class "B" Liquor	325.00	
"Class C" Wine	100.00	
Picnic & Wine	10.00	per day
Publication fee	25.00	must be paid at submittal

Certified Surveys/ Subdivisions

Clerical Fees	100.00	CSM
	200.00	Plat
Professional Fees		
Planner	85.70	per hour
Attorney	Time & Expense	
Engineer	Time & Expense	
Final Submittals - plats		
Public Site Fee	860.00	per single family unit
	563.50	per multi-family unit
	429.00	studio/1 bedroom
Clerical fee	75.00	
Professional fees	as above	
Re-submittals (plats & CSM)	75.00	per submittal
Occupancy Bond	2,000.00	
Culvert Application	110.00	
Cul de sac length	75.00	special exception

Holding Tank Permits

Residential	150.00	
Business - Holding tank	0.06	per gal
Grease tank	0.15	per gal

Solicitor/Peddlers Permit	35.00	

Miscellaneous

Copies - black/white	0.25	a copy
color	1.00	a copy
Special Assessment Letters	20.00	
	25.00	walk-in & Faxed
Town road map	2.00	plus tax .10
Land Division & Development	19.00	plus tax .97
Waukesha County zoning code	27.00	plus tax 1.38
Waukesha County Shoreland/Floodland	10.50	plus tax .54
Faxed copies	2.00	1st Page
	1.00	add'l pages
Returned checks	30.00	

Park & Recreation Fees

Shelter House			
Resident		125.00	plus tax 6.38
Non-resident		300.00	plus tax 15.30
Youth Sports			
Soccer/Ball		33.00	Child
		50.00	Late sign-up
Adult Leagues		50.00	a team
Field Rentals			
Practice time - town		15.00	per hour
non-town		20.00	per hour
Game's - town		15.00	per hour plus field prep.
non-town		20.00	per hours plus field prep.
Field Preparation		20.00	soccer
		30.00	ball
		50.00	hardball
<u>Tournaments</u>			
Town Leagues			
1 staff person		120.00	a day
additional staff		15.00	per hour
Diamond/Field use		10.00	per hour
Bond		350.00	
Dumpster Fee		280.00	
Shelter House Fees			
Town Park	per day	125.00	plus tax 6.38; 2 fields & 1 kitchen
Sunset Park	per day	250.00	plus tax 12.75; 4 fields & 2 kitchens
Non-Town Leagues			
1 staff person		150.00	a day
additional person		20.00	per hour
Diamond/Field use		15.00	per hour
Bond		500.00	
Dumpster fee		280.00	
Shelter House Fees			
Town Park	per day	300.00	plus tax 15.30; 2 fields & 1 kitchen
Sunset Park	per day	600.00	plus tax 30.60; 4 fields & 2 kitchens

This resolution shall take effect immediately upon passage and posting as provided by law.
Dated this __________ day of March 2011.

TOWN OF GENESEE

____

Sharon L. Leair, Chairman

ATTEST:

____

Discussion/action – 2010 Budget Amendments
Discussion of the changes, Whitmore said there will be an addition of $293,000.00 to the general fund balance from the 2010 budget.

Schmittinger made motion to approve the 2010 Budget Amendments, Ross seconded – roll call vote – Ross, aye; Schmittinger, aye; Reid – aye; Leair- aye; motion carried unanimously.

TOWN OF GENESEE
2010 Budget Amendment

PLEASE TAKE NOTICE THAT the Town of Genesee Board at a Regular Town Board Meeting of March 14, 2011, amended the 2010 Budget. Said amendments were approved unanimously by a roll call vote.

General Fund	Budget Current	Budget Amended	Proposed Amendment
Expenditures			
General government:			
Town Board	46,850	47,800	950
Elections	16,293	15,554	(739)
Outside services	53,875	56,338	2,463
Public Safety			
Fire and rescue	334,584	643,910	309,326
Increase in expenditures			312,000
Other financing sources			
Proceeds of long term debt	-	312,000	312,000

Barbara A. Whitmore, WCMC
Town of Genesee Clerk

Discussion/action – Codification contract
Whitmore asked this be tabled; the bids have to be reviewed to be sure we are looking at the same costs from each vendor. Schmittinger made motion to table the Codification contract, Ross seconded, motion carried unanimously.

Discussion – set date for 2011/12 Liquor License Hearing
Discussion, the Liquor License Hearing will be held on June 13th at 6:30 p.m. before the Board Meeting.

Discussion/action – Operators' Permit applications
Ross made motion to approve the new application for James Kenneth Beier at Saxe's and a new application for Roberta R. Vande Leest for the Lions Club, Reid seconded, motion carried unanimously.

Reports –
Chairman – Sharon Leair
Proposed State Budget
Leair went over the proposed cuts the town may face from shared revenue, general transportation and the recycling grant. Discussion.

Update on Zoning Code
The Chairman from the three towns will each contact several County Board representative to discuss our zoning issues and will invite them all to a meeting here on March 31st.

Update on Zurwaski property
We may need a closed session regarding this; our attorney is working on a compromise to recover the costs and fees the town is legally entitled to.

Clerk – Barb Whitmore
Update on garbage billing on Billings Ct.
Whitmore explained to the Board the garbage billing on Billings Court has been taken care of, the residents in the town of Ottawa that are receiving service from John's pay John's Disposal directly, a letter has been sent to those Ottawa residents with an apology. When John's was contacted about the addresses on the garbage list, they did not tell Whitmore that they contracted with John's directly.

Correspondence
Whitmore reported we received a thank you letter from the Mediation & Restorative Center for the $250.00 donation. The final quarterly franchise fee from Time Warner was received February 22nd in the amount of $12,923.43.

Schmittinger made motion to adjourn

Paul Dishneau of Watertown Evergreen came to the table to talk to the Board about the bid awarded this evening. Mr. Dishneau questioned the bidding by the hour this year and per the foot last year; also he owns the equipment listed on his bid, he said the spec sheet reads machinery you currently own. Discussion, Schmittinger stated this will be checked, we can revisit this after Tom checks out if Butterfield has the 3 pieces of equipment.

Ross seconded the motion to adjourn, Motion carried unanimously. Meeting adjourned at 8:50 p.m.

Respectfully submitted,

Barbara A. Whitmore, WCMC
Town Clerk

Town of Genesee *est. 1843*

S43 W31391 Hwy 83
PO Box 242
Genesee Depot, WI 53127-0242
Phone: 262-968-3656
www.towngenesee.org

March 15, 2011

RECEIVED

MAR 16 2011

Waukesha
Water Utility

Daniel Duchniak, P.E.
Waukesha Water Utility
115 Delafield Street
Waukesha, WI 53186-3615

Re: Request for Approval by the Town of Genesee on the City of Waukesha Water Supply Service Area Plan

Dear Mr. Duchniak,

Please be advised the Genesee Town Board at their Regular Town Board Meeting of March 14, 2011, by a motion duly made and seconded, unanimously approved the request by the Waukesha Water Utility for participation in the City of Waukesha Water Supply Service Area Plan. This motion was made pursuant to your letter of February 16, 2011 stating there would be no financial impact on the Town of Genesee associated with the city's application for Great Lakes water. The only costs that would be borne by the town would be those costs associated with the development of a water utility by the Town and the facilities necessary to transfer the water from the Waukesha Water utility to the residents within the service area if the town would choose to provide a water service area to its residents. This approval does not obligate the town in the future unless the Town requested service in the future.

Sincerely,

TOWN OF GENESEE

Barbara A. Whitmore

Barbara A. Whitmore, WCMC
Town Clerk

Town of WAUKESHA
established 1842
"A Great Place to Live"

May 23, 2013

Mayor, City Administrator and Common Council
City of Waukesha
201 Delafield Street
Waukesha, WI 53188

Dear Mayor, City Administrator and Common Council of the City of Waukesha,

At the May 23, 2013 Town Board Meeting the Town Board of Supervisors made a motion to accept the letter of April 25, 2013 (attached) from the City of Waukesha with the following amendments;

- All high capacity shallow aquifer wells in the Town operated by the City of Waukesha including the Lathers wells are to be abandoned upon a successful application for Great Lakes Water Diversion

- Conditional inclusion in the City of Waukesha's Water Service Area only if the City of Waukesha is successful in obtaining a Great Lakes Diversion

- The Town of Waukesha retains the right to enter into negotiations with the Village of Big Bend for treatment services for town property

- Annexation of Town Property into the City of Waukesha is not always "required" to receive water and/or sanitary sewer service from the City of Waukesha, and requests will be considered pursuant to the policy of the Common Council on a case by case basis

Please contact the Town Clerk by email at clerk-treasurer@townofwaukesha.us with any questions.

Sincerely,

John Marek, Chairman

W250 S3567 Center Rd · Waukesha, WI 53189 · (262) 542-5030 · Fax (262) 542-7870
Website: www.townofwaukesha.us · Email: info@townofwaukesha.us

City of Waukesha

CITY ADMINISTRATOR

201 DELAFIELD STREET
WAUKESHA, WISCONSIN 53188-3633
TELEPHONE 262/524-3701 FAX 262/524-3899

Edmund M. Henschel
ehenschel@ci.waukesha.wi.us

April 25, 2013

Town Chairman and Supervisors
Town of Waukesha
W250 S3567 Center Road
Waukesha WI 53189

Dear Town Chairman and Town Supervisors:

On October 16th the City of Waukesha ("City") submitted a formal response to your September 18, 2012 proposal concerning the Waukesha Water Service Planning Area. Subsequent to receiving the City's October 16th letter, a meeting with then Town Chairman Van Scyoc and Town Supervisor Banske was held to discuss the City's response. Through the discussion, we understand the concerns of the Town are related to the Town's potential loss of revenue as a result of annexations and the desire to preserve the water and water related resources to its residents.

This letter is a follow up to our meeting with Town representatives on April 13, 2013 and supersedes and replaces any of the City's previous letters, which are now null and void. The terms set forth in this document are only valid if the Town of Waukesha approval of the Water Supply Service Area Plan is consistent with the "Planning area" as defined by SEWRPC in their letter dated December 23, 2008; and once the City of Waukesha receives all necessary approvals for a supply of Great Lakes water. In addition, this offer requires action by the Town Board no later than April 30, 2013. If the offer is not accepted by April 30, 2013, the City will move forward with the area previously approved by the Town Board at its January 24, 2013 meeting and reaffirmed at its February 8, 2013 meeting. If the City is not successful with its Application, the Town's approval of the Water Supply Service Area Plan and the conditions outlined in this letter are null and void.

1. With regard to the joint consideration of petitions for annexations from territory within the Town of Waukesha to the City of Waukesha, the City will follow Wisconsin State law. The law provides a formal process by which property owners and electors may petition the City for annexation. The City agrees that the Town of Waukesha may represent its position to the City for consideration. This position will be considered by the Common Council when a request is made.

2. With regard to annexations, the City of Waukesha will agree to compensate the Town of Waukesha for twenty (20) years at the Town's mil rate for the value of the property at the time the annexation is approved by the City. This would be effective once the City receives all of the necessary approvals for its Application for Great Lakes Water and begins receiving Great Lakes Water.

3. The City of Waukesha is in agreement that neither the Town of Waukesha, nor any of the property owners of the Town of Waukesha who are in the "Water Service Planning Area", and who are not presently "customers" of the Waukesha Water Utility, will be assessed any charge(s)/cost(s) until and unless they are "connected" to the municipal water system which will provide water from Lake Michigan by their request and upon approval by the City.

4. The City of Waukesha is in agreement that the Town of Waukesha may review the Letter of Intent and the contract between the City of Waukesha and the Lake Michigan Water Supplier, to be provided to the Town of Waukesha, as soon as available (which has already been done).

5. The City of Waukesha is in agreement that the Town of Waukesha will not be encumbered or bound by any economic/social, development requirements of the Lake Michigan Water Supplier.

6. The City of Waukesha is in agreement that the Town of Waukesha will be able to choose between purchasing Great Lakes Water from the City of Waukesha either on a wholesale or retail basis or combination of both. However, individual properties that receive water service will be provided water service on a retail basis. The purchase of water by the Town or owners of individual properties will require the approval of the Common Council when a specific request for water is made.

7. The City of Waukesha is in agreement that the City of Waukesha shall confirm, in writing, the amount of water that will be allocated to the residents of the Town of Waukesha (as it is presently constituted). The amount of water so allocated shall be reserved strictly for use by the residents of the Town of Waukesha (as it is presently constituted) with the approval of the Common Council. Water allocation will be proportionately reduced if the boundaries of the Town of Waukesha are modified.

The Town's support of the City's application for water will protect residents in the Water Supply Service Area from problems such as the groundwater contamination that has contaminated private wells in the Town with molybdenum near the intersection of Highways 59 and 164; spills similar to the one that occurred in the Town of Jackson; or failing septic systems resulting in groundwater contamination. Without this support, the Town would be precluded from obtaining water from the City to resolve future potential groundwater contamination issues

We appreciate the spirit of intergovernmental cooperation the Town of Waukesha has exhibited through this process. The City understands the Town's concern about its ability to continue to provide effective services to its residents in light of lost assessed value resulting from annexations. In addition to the twenty year revenue sharing offered above, the City would also propose entering into negotiations with the Town to provide certain services to the Town on a cost effective basis. Such services may include, but are not necessarily limited to: snow plowing, fire.EMS service, inspection service and other mutually beneficial services.

Sincerely,

Edmunc M. Henschel
City Administrator

cc: Common Council
Water Commission
City Attorney
Steve Crandell, Community Development Director
Danield Duchniak, General Manager
Ken Yonker
Dale Shaver
Eric Ebbersberger

REGULAR MEETING OF THE COMMON COUNCIL OF THE CITY OF WAUKESHA HELD IN THE COUNCIL CHAMBERS TUESDAY, JUNE 4, 2013

Mayor: Jeff Scrima presiding.

Present: Ald. Cummings, Francoeur, Hernandez, Jankowski, Johnson, Kalblinger, Patton, C. Payne, E. Payne, Perry, Pieper, Reiland, Skinner, Thieme, and Ybarra

Absent: None

1. Roll Call and Pledge of Allegiance

2. Public Comment – City Residents and Taxpayers Only – Limited to three minutes/speaker, ending 8:00 p.m.

   Paul Furrer, 727 Hamilton Ave., spoke in favor of keeping the Town within the SEWRPC borders, with the return of water back to Lake Michigan.

   Duane Paulson, 1121 Summit Ave., spoke in favor of getting water issue settled.

   Steve Edlund, 426 Prospect Ave., spoke against including the Town in the water service area. He said their time has come and gone, and he has concerns about any additional delays.

3. Approval of Minutes

   Motion – Ald. Thieme moved, second of Ald. Patton and unanimous vote to approve the Common Council minutes of May 21, 2013.

4. Public Hearings – Format – Introduction by Professional Staff/Hearing/Comments by Council/Official Action
   None

5. New Business

   A. Approval of Resolution Authorizing the Issuance of $3,540,000 General Obligation Promissory Notes and the Issuance and Sale of $3,540,000 Note Anticipation Notes, Series 2013D

      Motion - Ald. Pieper moved, second of Ald. Reiland that the Common Council Approve a Resolution Authorizing the Issuance of $3,540,000 General Obligation Promissory Notes and the Issuance and Sale of $3,540,000 Note Anticipation Notes, Series 2013D.

      Brad Viegut, Baird, said funds will be available on June 25th and it's scheduled to mature on July 1st, 2014. There is a first interest payment on January 1st, 2014 and a final payment on July 1st, 2014. He said the note is callable February 3, 2014 or any date thereafter. He said the structure provides the City the opportunity to lock in a long term financing sometime between January and middle of June next year. The interest rate that is available is at 1.04%. He said the purpose of the note anticipation note is to fund sewer system projects and it's anticipated the long-term borrowing will be put in place next year and instead of using general obligation bonds for the long-term financing, the City would look at sewer system revenue bonds.

      Voting on motion carried by unanimous vote (Resolution 46-13 adopted).

   B. Approve the inclusion of the Town of Waukesha in the City's Water and Sewer Service

Ald. Thieme read the following resolution:

WHEREAS, in its letter of April 25, 2013 by City Administrator Henschel, the City of Waukesha set forth certain conditions in which it would agree to include areas within the Town of Waukesha as delineated by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) as part of the City's Water/Sewer Service Planning Area; and

WHEREAS, in its response dated May 23, 2013, the Town of Waukesha approved the City of Waukesha's Water/Sewer Service Plan with said conditions, as set forth in the City of Waukesha's April 25, 2013 letter; and

WHEREAS, the City of Waukesha agrees to the four points set forth in the Town of Waukesha's response dated May 23, 2013.

NOW, THEREFORE BE IT RESOLVED that the City of Waukesha Water/Sewer Service Planning Area as delineated by SEWRPC and set forth in the City's Application for Great Lakes Water be the planned service area as required by sec. 281.346(4)(bg)2. and 281.348(3)(b)2. Wis. Stats. respectively; and

BE IT FURTHER RESOLVED that the area of the Town of Waukesha included in the City of Waukesha Water/Sewer Service Planning area, including the agreed upon conditions of said inclusion, are subject to the City of Waukesha's Application for Great Lakes Water obtaining all required approvals.

Ald. Skinner, seconder of the motion, accepted.

Ald. Ybarra said he was glad to be moving forward.

Ald. Payne said he had the letter from the Town, but he didn't have the City's response to the conditions they are asking for.

Dan Duchniak, General Manager of Water Utility, said the resolution accepts the four conditions that are in the letter.

Ald. Payne said if they were in the future to receive water from us, (from Lake Michigan through us to them), and if they were to go through the Village of Big Bend for other services, that return flow would not be going back to Lake Michigan, but it would be going elsewhere. He asked what that would do to their requirement to return "x" percentage back?

Mr. Duchniak said they told the Town that if they had any areas along the southern portion of the Town that would get service from the Village of Big Bend, that they would automatically be removed from our water service area – therefore, that would preclude them from being able to access Great Lakes Water through the Waukesha Water Utility. He said immediately upon them modifying the sanitary sewer service area, they would also modify the water service area in that area - that area that would go to the Village of Big Bend would be out of the water service area.

Ald. Payne said he had a question regarding the Lathers property and the wells that may be there some day. He asked if it was listed in the application as part of a backup water supply for the City.

Mr. Duchniak said in regards to this negotiation, the discussion included the

City Administrator, Ed Henschel, said during the discussions between the City and the Town, the issue of annexation continually came up and the Town's concern over loss of tax base. He said the letter says that the City understands the concern of the Town. He said as an alternative, they suggested that if there were opportunities where the City could provide services to the Town on a cost effective basis, whatever those services may be, we'd be happy to sit down with the Town and talk about those. He said to this point, they haven't had any such discussions about any particular service. He said that was something that was included in the letter as a consideration for future opportunities between the City and the Town.

Curt Meitz, City Attorney, said to clarify, the City presented in it's application areas (Town of Genesee, Delafield, and Waukesha). He said this is required by the contract language when you prepare your water service area plan. The law also requires the approval of all the political subdivisions, all the municipalities that are served with a water supply system. He said in the letter, it states if you are going to be included in our water service area as we set forth in our application – we will consider these other services. He said this is all conditioned upon, as the resolution says, all approvals being met (the DNR, State of Wisconsin, all the states and the provinces).

Ald. Pieper said this is a positive step for both the City and the Town. He encouraged the Council to support. He said the agreement is just about water – no other services have been agreed upon.

Voting on motion carried by unanimous vote **(Resolution 47-13 adopted)**.

Motion – Ald. Johnson moved, second of Ald. C. Payne and unanimous roll call vote to approve the Consent Agenda as amended:

Removed from Ordinance & License:
License applications for Club 400
Bartender applications for Michelle Herbner, Leeann Leonard, and Kenneth Rath

Consent Agenda (Items under the Consent Agenda have passed unanimously out of committee. Unless a member of the Common Council specifically requests that an item on the Consent Agenda be removed and considered separately, items on the Consent Agenda are considered under one motion, second and a roll call vote. Any item removed from Consent Agenda will be discussed under the appropriate committee, board or commission on the Regular Agenda.)

1. **Other Boards and Commissions**

   A. **Transit Commission Report**

      1. **Recommend Approval of Purchase of Surveillance Camera Systems**
         The Transit Commission recommends approval of the purchase of Surveillance Camera Systems for Transit Buses (13 Buses) from Angeltrax at a total cost of $38,552.64. This will be funded 100% by USDOT ARRA (stimulus) funds.

      2. **Recommend Changes to Route 2 (Arcadian)**
         The Transit Commission recommends approval of the resolution modifying Route 2 (Arcadian). This change will add service to the new Woodman's Food Market on E. Main St. and eliminate service to Swenson Dr. and Goerkes Corners Park and Ride Lot. This change would be effective July 1, 2013.

2. **Plan Commission – May 22, 2013**

   A. **Letter to Council**

      1. **Extraterritorial CSM – German – Glendale Rd. – At its May 22, 2013 meeting the Plan Commission heard a request from David & Everett German to consider approving an Extraterritorial CSM for one lot and one outlot along Glendale RD. west of HWY 164. The Plan Commission recommends in favor of the CSM.**

      2. **Certified Survey Map – Miro Tool – 201 Sentry Dr. - At its May 22, 2013 meeting the Plan Commission heard a request from Miro Tool and Manufacturing Inc. and Anderson Ashton Inc. to consider approving a single lot CSM for 4.25 acres at the southeast corner of Sentry Dr. and Philip Dr. The Plan Commission recommends in favor of the CSM.**

      3. **Driveway Variance – Gaco Western - At its May 22, 2013 meeting the Plan Commission heard a request from Gaco Western to consider granting a variance to allow driveway openings in excess of 90 feet at 1245 Chapman Dr. The Plan Commission recommends in favor of the CSM.**

3. **Standing Committees**

   A. **Building & Grounds Committee – May 20, 2013**

      1. **Close Lot 5 for the Les Paul exhibit opening on June 8, 2013**

      2. **Allow Clarke Hotel to use 2 parking stalls on Broadway as temporary valet parking for all Friday Night Live events.**

      4. **Establish a No Parking zone on the west side of Manhattan Drive from Main Street to Niagara Street.**
         <u>Resolution 48-13 adopted</u>

      5. **Rescind all 2 hour parking restrictions on Martin St. from Main St. to South St. Establish a 4 hour parking restriction on Martin St. from Main St. to South St. Unanimous contingent on the Waukesha County Museum paying for the installation of new signing.**
         <u>Resolution 48-13 adopted</u>

   B. **Ordinance & License Committee – June 3, 2013**

      1. **Licenses**

         <u>(See Committee Report for Items removed from Consent Agenda)</u>

         a. **Bartender/Server**
         b. **Sidewalk Café Permit**
         c. **Extension of Premises**
         d. **Taxi Driver**
         e. **Secondhand Article/Jewelry Dealer**
         f. **Class "A" Alcohol**

q. **Taxi Cab**
r. **Special Class B Retail License**
s. **Private Alarm System**
t. **Indoor Skating Rink**

2. **Ordinances**

   a. **Third Reading – an ordinance to rezone certain property and to amend the Zoning Map of the City of Waukesha, Wisconsin (Mapleway North & South Subdivisions)**
   Ordinance 20-13 adopted

   b. **Third Reading – an ordinance to rezone certain property and to amend the Zoning Map of the City of Waukesha, Wisconsin (Northview Road)(Properties east of University Dr. and west of Pebble Valley Road)**
   Ordinance 21-13 adopted

C. **Board of Public Works – May 23, 2013**

1. **Approve Storm Water Agreement**

   The Board of Public Works recommends the Common Council approve the Storm Water Management Practice Maintenance Agreement with Boucher Buick GMC, 1907 E. Moreland Blvd.

2. **Approve Charges for Miscellaneous Hauled Wastes**

   The Board of Public Works recommends the Common Council approve the following fees:

   a. **No charge for recreational vehicle waste discharge.**

   b. **$35.00 for acceptance of small volumes of contaminated groundwater at the plant.**

   c. **$11.43 per 1000 gallons for contaminated excavation water plus $100 administrative fee.**

   d. **$25.00 for acceptance of outdoor vehicle, equipment, and pavement wash water.**

---

6. Other Boards and Commissions

   A. Transit Commission Report
   No report

   B. Water Utility Commission Report

   1. Update on Great Lakes Application Process

   Dan Duchniak, General Manager of Water Utility, said the Water Utility Commission has had over eighty meetings discussing this issue. Public comment has been welcome at meetings. Four open houses have also been held as well as neighborhood meetings in every aldermanic district.

   He explained that they know that deep aquifer groundwater levels are declining.- they are down 600 feet and the capacity is decreasing. He said they know that they utilize shallow wells. He said they also know that pumping is going to adversely impact the wetlands. He said conservation alone will not resolve their issue, especially if they continue to utilize the deep aquifer and they have to pump 20% more water. He said they analyzed fourteen different alternatives and screened it down to five alternatives. He said they ended up with six alternatives based on their discussions with the DNR that they did an in-depth anaylsis. He said the source they want to choose is the Great Lakes alternative. He said with groundwater, it's a once through alternative and with surface water, they are able to recycle and re-use the water, therefore, they will have no impact on the levels of the Great Lakes. He said their goal is to return 100% of that water.

Mr. Duchniak said today the water supply service area will be submitted to SEWRPC and it will be approved. By July 8th, they will finalize the application and it will be submitted to the DNR. He said it will take them about ninety days to finalize the EIS. Once they finalize the EIS, (about October 11th), they will go through a forty-five day public comment period on that environmental impact statement. They will have public hearings and receive public comments. That will take them to November 25th. After that there is thirty days of additional public comment, but the DNR does not have to respond to those comments. The initial forty-five day period, the DNR is required to respond. Shortly after the first of the year, they will issue the final environmental impact statement. By January 31st of next year, they will hopefully have that application submitted to the other states for approval for their consideration. He said they've worked with the DNR and the Council of Great Lakes Governors and they've come up with a schedule for them to consider. It will take approximately 5.5 months for them to get through that process. On or about August 1st, the regional body will take action. In September, they will begin designing and engineering the project, and hopefully start construction in March of 2015.

He said they started the process already of looking at their routing studies. They've received federal grant money from the Army Corps of Engineers and they are helping them do the routing studies for the mains within the City of Waukesha. He said they've also begun the routing studies to look from going to Waukesha to Oak Creek into the discharge point. He said they are also looking at hiring a construction manager in the first quarter of next year at the Water Utility to get them on board and up to speed, so they can hit the ground running once they receive the approval. He said they feel they will be able to construct this within the three years.

Ald. Cummings said this is related to the previous action, but it's also part of the process. She said she was concerned earlier in the month in regards to the City's negotiation with the Town. She said she is glad that they were statesmen and reached out and did their due diligence. She said they got the job done and this is a much better product moving forward. She said it's to the betterment for all the citizens who are neighbors.

Ald. Francoeur said she has received no residential calls with concerns of things that haven't been addressed. She said the questions have been answered, the education has been had, and the access to the people and the information has been provided. She said they were able to take action and the public is well served.

C. Information Technology Advisory Committee Report

Ald. Kalblinger gave a brief report.

D. Landmarks Commission Report

Ald. Cummings gave a brief report.

F. Parks, Recreation, & Forestry Board Report

Ald. Ybarra gave a brief report.

G. Public Library Report
No report

H. Cemetery Commission Report
No report

I. Waukesha Housing Authority Report
No report

J. Community Development Block Grant Committee Report

1. The request of the CDBG committee to adopt the 2014 CDBG funding allocation resolution

Motion – Ald. Hernandez moved to adopt the 2014 CDBG funding allocation resolution, second of Ald. Thieme and unanimous vote.

K. Public Art Committee Report
No report

L. Guitar Town Report

Ald. Reiland said the Guitar Town Project is important because: it is a fundraiser, a tribute to Les Paul and it also allows them to showcase their talented regional artists and student future artists with over forty participating.

7. Plan Commission – May 22, 2013

A. Annexation – Klotz – Saylesville Rd. - At its May 22, 2013 meeting the Plan Commission heard a request from Todd & Patricia Klotz to consider annexing 12.90 acres of land at W274 S4640 Saylesville Rd. to the City of Waukesha. The Plan Commission recommends in favor of the annexation.

Jennifer Andrews, City Planner, said the Klotz own a large piece of property, but they are only annexing a portion of the property. The property is naturally divided by a stream on the northwest side of the piece of property they are annexing. Some roads are already stubbed in from the existing Rivers Crossing Subdivision into the property, so it's a natural extension of that subdivision down the road. The request is for annexation because the owners would like to develop it in the future on sewer and water. The Land Use Plan calls for the property to be residential in the future. This would help satisfy the future residential and open space needs for the City. The staff and the Plan Commission both felt that there was a reasonable need by the City for the property and the Department of Administration ruled that the annexation is in the public interest. Both of the properties have an eight to nine minute response time for fire and emergency services. With those comments, the Plan Commission recommends in favor of the annexation with the T-1 zoning. There are a couple of conditions that must be met (one being revisions needed for the legal description).

Motion – Ald. Johnson moved to approve the annexations for Items A and B (below), second of Ald. Patton and unanimous vote.

B. Annexation – Engler – Saylesville Rd. - At its May 22, 2013 meeting the Plan

1. Review and Act on: Request to adopt the Resolution Authorizing the Issuance of $3,540,000 General Obligation Promissory Notes and the Issuance and Sale of $3,540,000 Note Anticipation Notes, Series 2013D, in anticipation thereof.
   Resolution 46-13 adopted - See pages 1 and 2

2. Review and Act on: Request to increase the Park, Rec & Forestry expense account 53945 (Sponsor Program – Parks/Forestry) from $2,500 to $6,500 and increase the Park, Rec & Forestry revenue account 48415 (Sponsorships Parks/Forestry) from $2,500 to $6,500.

   Motion – Ald. Pieper moved, second of Ald. Reiland to increase the Park, Rec & Forestry expense account 53945 from $2,500 to $6,500 and increase the Park, Rec & Forestry revenue account 48415 from $2,500 to $6,500.

   Ald. Pieper said this is a procedural matter. He said there was some additional revenue received from Park Rec through some of their programming. The budget needs to be amended accordingly. There is no impact on the budget; it is not increasing or decreasing tax dollars.

   Voting on motion carried by unanimous vote.

B. Building & Grounds Committee Report – May 20, 2013
   No report

C. Ordinance & License Committee Report – June 3, 2013

   Items removed from Consent Agenda:

   All License applications for Club 400 were held due to clerical issues.

   *****

   Motion – Ald. Johnson moved, second of Ald. Ybarra and unanimous vote to approve bartender license of Michelle Herbner. The license was approved at Committee by a three to one vote.

   ****

   Bartender applicant Leann Leonard is on hold until the next Committee meeting
   Bartender applicants Kenneth Rath & Traci Staehler were asked to appear before the Committee one last time.

D. Human Resources Committee Report – June 19, 2013
   No report

9. Board of Public Works Report – May 23, 2013

   A. Approve Bids Received
   The Board of Public Works recommends the Common Council approve Bids Received: Friday, May 17, 2013 at 11:00 a.m.

   1. Scott Ave. Area Sanitary Sewer and Water Main Relay
      The Board of Public Works recommends the contract be awarded to D.F. Tomasini Contractors, Inc. on their low bid of $1,794,776.00.

      Motion – Ald. Pieper moved, second of Ald. E. Payne and unanimous vote to approve the Board of Public Works recommendation.

12. City Administrator's Report

Ed Henschel, City Administrator, reported:

- The interviews for the Finance Director position have begun.

- The Waukesha Public Library received a $16,000 grant (Big Read Grant). The Library is one of seventy-seven non-profit organizations and libraries in the country to receive such grants for its 2013 Reading Program.

13. Mayor's Report & Referrals

Mayor Scrima went over meetings recently attended.

14. Referrals

Building & Grounds

That a crosswalk over East Ave. from East Terrace Apartments to South St. be approved (Patton)

That the request of the Key Westconsin Restaurant be granted so that the handicap parking place which faces north be moved to the south side of the drive facing east where the loading zone now is and that the 3 hour parking sign be removed from that space. (Patton)

Ordinance & License

That ordinance 7.04(6)(a) be amended to establish the first four parking places on the west side of Broadway north of the 5 Points be reserved from 5 PM to 7 AM for Clarke Hotel guests only at no charge. (Patton)

Motion – Ald. Ybarra moved, second of E. Payne and unanimous vote to adjourn.

Council adjourned 8:35 p.m.
Gina Kozlik, Clerk Treasurer

Appendix G
Public Participation Process Documentation

SUMMARY

Question	Answer
1. Need for Water	
What is surface water features?	***Dan -*** Wetlands, rivers, streams, lakes are considered surface water features
Provided you are getting approvals for Great Lakes water, when does Engineering start to get the water here and return the water?	***Dan –*** We've also had meetings with the other communities that we'd be potentially returning the water and we have made them aware of potentially what our intent is. With regards to the engineering, it is a long drawn out process no matter which way we go, and once we receive approval for a Great Lakes application, then there's going to be PSC/WDNR in our review of the project. Once we get the approval and once we know we're going to move forward, the engineering will start.
Explain why some of the water is 98° at the bottom of the deep aquifer and why it can't be used.	***Dan –***Within the aquifer, there's a number of different strata that you draw the water from and some of the water that we pulled from that aquifer was as high as 98° F and as a result of that, we had to abandon those portions of the aquifer. Before I came to Waukesha, there were some wells that had higher dissolved solids in the well, so what you have to do is fill the bottom of the well and abandon that portion of the well so you're not using that portion of the well to reduce the total dissolved solids. At 98° it would be aesthetically non-pleasing to the customers so you have to abandon that portion of the aquifer that's putting out that water. That also reduces the volume of water that you could pull from that well because the volume of water you can pull from that well depends on the number of feet that you have available to pull water from.
There's a map of the water service area as defined by SEWRPC and I'm assuming that this is made up of the 20/20 land use plan for the city? Does it extend beyond what that was?	***Dan -*** What SEWRPC did is they defined our service area. Then we asked SEWRPC to tell us what the ultimate population will be of this service area at build out. They looked at the service area and on the map they identify what's already developed, which is in blue and they look at the environmental corridors which are green and the grey areas which is the land that is available for development. The service area that we have is 85% developed. There's only 15% of land available to be developed in the future. So SEWRPC defined the available land for development and projected a population based on the ultimate land use of that area as how it sits today and I believe it was based off of the 20/20 plan.
2018 – seems like a long way out, but if there are any delays in the approval process or any kind of legal challenges to accessing or getting	***Dan –*** Correct. If you remember the timeline that I had there was about an 18 month buffer that would be available for any legal or construction issues that came up. It's important that we move this process now and start moving forward so we

Question	Answer
approval for utilizing Lake Michigan water, that's going to delay any contracting for design and construction purposes, so none of that is going to take place until this is already to go. Correct?	can get to that point where we can select the new water supply. ***Mayor*** – We are estimating just the process for this application to take one year. We're estimating 5 years even if we were successful to design, build and implement.
Have the scientists been able to tell us how long it would take to regenerate the deep aquifer, if we were to do the Great Lakes supply and give the deep aquifer a rest.	***Dan*** – The scientists have indicated and the only statistics I can give you is that everyone gets off the aquifer it would recover 50 or 70% in 7 years and 90% in 9 years. ***Tony*** – that would be the best case on exactly how many years it would take.
Do we know all this as it applies to the City of Waukesha?	***Dan*** **–** We know if we get off the aquifer it will start to recover.
I'm concerned about the baseline of the assumption regarding the population growth and the continued expanding of the city boundaries. You sited that you have 31% reduction in the water use with 18% growth. I think you would have had 47% reduction without the growth. I really wonder if you considered how you meet the radium problem with a baseline of the current population, because I don't see a reason to keep expanding and the real need for growth. I don't believe the SEWRPC numbers for growth.	***Dan*** **–** State law requires us to determine what our water service area is going to be. It also requires us to accommodate growth – that's the state law that was within the implementation legislation for the Great Lakes Compact. We looked to SEWRPC as the regional body which is given the authority under the state statutes and we looked at the regional body to determine what our service area would be. SEWRPC went and determined what that service area is and did projections of what the population will be within that service area. That service area is intended to grow from the current of ~70,000 people to ~97,000. Over the length of this project period, that's less than 1% of growth. It's a reasonable growth and the compact and legislation requires us to accommodate growth. So that's what we did within our projections and that's what we looked at in terms of our future water supply in terms of how much volume of water we're going to need. Under all the alternatives, we're looking at the same volume of water which is 18.5 million/day. Under all the alternatives we looked at, previously we were requesting between 22 and 24 million gallons/day because of what our projections were terms of water use. That was prior to us implementing a conservation and protection plan. Now that we've implemented that plan, we've had success over the last years. We've seen that success. We're comfortable in asking for a lower volume 18.5 mgd and we'd be able to accommodate that growth within 18.5 mgd. That conservation program will play a role in servicing our customers in the future.
The introduction your application says the City	

Question	Answer
of Waukesha is applying for Great Lakes water to secure a sustainable reliable water supply that is protected of public health and provides regional environmental benefits. I think that's a good statement, but strike the word sustainable.	
Waukesha is going to increase the daily maximum use of water which is ~9.9 mgd to 18 mgd. We're essentially almost increasing by 100% that water that's asked for. When the population is only expected to increase 25% based on what I read on the report from about 68,000 to 85,800 people between now and 2028. I'm trying to wrap my head around 25% increase in population, 100% asked for increase in water and why that should be the case especially since Waukesha's doing a lot of work – especially in water conservation as well.	
I'd like to know how we came up with a doubling of our water consumption if our population is growing ~10% over that time period.	
Our second major concern is whether the quantity of water Waukesha's requesting is reasonable.	
I think a lot of the language in the application pertaining to conservation in particular seems to be pretty weak and without any numeric or hard goals that have to be met by a certain time.	
How much of the water is needed for growth,	

Question	Answer
how much to sustain the folks, the businesses, the uses that are already here? I think you need to lay that out and why you need the numbers you're seeking for each of those components.	
Environmentally sound and economically feasible water conservation – just saying you're going to have and going to continue the programs you have – I don't think is going to cut it. I think the other governors are going to be looking for a lot more than that. What are the goals? What are the enforcement methods?	
2. Water Supply Alternatives	
How big is the water pipe for inflow/outflow - redundancy?	***Dan*** **-** Size of the pipe to supply the water has yet to be determined. Intent with regards to redundancy, is to continue to develop the shallow well fields we have and maintain the shallow wells that we have in our system, that would be as redundant back-up in peaking supplies so that would be available in the event of a catastrophic failure on the pipeline itself, that we would be able to turn on those wells, provide more water supply and fire protection to the residents of the City of Waukesha while that is being repaired. As far as the return flow pipeline, again that has not been sized as of yet.
Will there be a redundancy on return flow?	***Dan*** **-** There will not be a redundancy on the return flow. The back-up to that would be in the event of a catastrophic failure or something happening on that line, the discharge would be to the Fox River until the point in time that we repaired that pipeline and could send the water back.
What would happen if there was a pipe breakdown? Would we be able to use our current wells as back-up?	***Dan*** **-** The intent would be to maintain the shallow aquifer wells (abandon the deep aquifer wells) and have those in operation for emergency and back-up redundancy.
Will WWU treat the water that comes from Lake Michigan?	There will have to be some type of touch up treatment – mainly chlorine will be added to maintain the chlorine residual throughout our distribution system. No other treatment that would be necessary other than the wastewater treatment at the end of the process.
Will we have a chlorine taste in the water?	Taste of chlorine means the chlorine is actually reacting with something that's in

Question	Answer
	the pipes. As long as we flush and maintain our system, we shouldn't have that problem within the City of Waukesha. Well water retains a lower residual than on surface water.
WWU regarding Milwaukee concerns on cryptosporidium	Since the outbreak ~10 years ago, it made an awareness of the water and provided the incentive for everyone to treat water to the fullest extent as possible. Milwaukee has installed an ozone system that does take care of the cryptosporidium issue and treats the water to a much higher level where they've been recognized on the world level of the high quality water they put out in their system. Relocated their intake out of the zone of influence where the discharges were that provided the contaminants into their influence stream. They addressed the problem from the influence standpoint and from a treatment standpoint.
Are you trying to identify existing corridors on getting the water here and returning it? A lot of potential for going over private property to get the water and get it back	***Dan* -** From a preliminary design perspective, we have done some preliminary investigations in regards to corridors that are available for installing a pipe, as is SEWRPC involved from their preliminary design water supply plan and there are corridors available for us to potentially take a pipeline down. We have talked to some people that are responsible for those corridors and there is interest there.
What is "old" water? Using deep wells now, are we running the risk of tapping into old water today?	***Jeff* -** Water that has been in the aquifer for hundreds if not thousands of years. Different from a shallow aquifer where it's much more recent water that's entered the system. Old water is just a term that it's been in the ground for a long time. Only health concerns are if you go deeper into the ground. ***Dan*** - As we pull down further and further, the water gets older and that's where you run into the salinity issues and the more brackish water issues.
Annual O/M budget being that the Utility is going to be relying on existing systems for redundancy, will there be cost savings to the Utility if we go with Plan A or B or will the Utility simply have to maintain their existing systems at the same level as they are today in the event of an emergency?	***Dan* –** There is going to be cost savings when we abandon our deep aquifer wells and that's because we'll be abandoning the treatment for those wells, as well. When you're pumping from 2,000 feet deep it's a lot different than from pumping from 140 feet deep. We'd put the shallow wells on a regular maintenance schedule like we do now with our wells that are not compliant with the radium standard. We do have the ability to turn them on in the event of a catastrophic failure/emergency. With regards to the treatment process, the reason you don't maintain that treatment process is because you can't turn that on/off. We can't store chemicals for a long period of time because they'll degrade to point where you can't use them.
Is there any consideration or talks about	***Dan* –** With regards to New Berlin, the return flow is connected to MMSD, so we

Question	Answer
combining with what New Berlin is doing to possibly piggyback/combine engineering to eliminate the impact on the flow both ways?	wouldn't combine with them. We did have conversations with them on the water supply with regards to their route, however, the path that they went through to get the volume of water that they needed is different than the path that we would need to go through to get the volume of water that we need. They take about ¼ of the water that we need so we'll need a much larger pipeline than they needed for the entire city of New Berlin.
With regards to our service area – how locked in would we be to a service area and how easy would it be to amend our service area in the future?	The water service area would be locked in when we applied for the Great Lakes. We would not be able to supply water outside of that area without going for an amendment and that amendment would include getting permission from all the other Great Lakes governors. That's why we asked SEWRPC to define the "ultimate" service area for our water service area similar to what they did for our sanitary sewer area.
What are the total capital costs? What is inclusive? Alternatives for return flow – Is it based off of a specific supplier? What is the variability in the supply line cost if we went with another supplier? Order of magnitude – are we talking more or less? Is it fair to say regardless of the community that would supply the water, that the overall recommendation regarding all of the alternatives we've evaluated the fundamental conclusion that most cost-effective alternative, being Great Lakes Water, would remain intact regardless of the supplier?	***Dan –*** Capital Costs were $116 million included the O & M for 20 years. That included the present value of the O & M. The capital costs associated were $56 million. The modifications to the wastewater are included in the return flow – the $22 million. Total capital dollars are $56 million plus $22 million for the return flow pipeline = $78 million. The $22 million capital is based off of Underwood Creek. It would increase from there to the Root River or MMSD. The return flow would be done independent of what community provided us with the water. The specific supplier is based off the City of Milwaukee. I believe it's $15 million, but I'm not sure. I wouldn't say regardless of the supplier, because there are a number of different factors that come in to play with that. It would depend on the contract negotiated and what the cost of the water is and what the hook-up location is in terms of where we get the water from. In terms of who the supplier is, there are a number of variables that come in to play with that that would then fall into what we negotiate the contract is. To whether the Great Lakes supply or the western well supply would be the most cost-effective.
Do you see anywhere in the future a possibility of using well water with pumped water from Lake Michigan and supplementing it so we don't have to take as much water from Lake Michigan?	***Dan*** – This would fall more into our Operating Plan. It's very difficult to mix water chemistries of well water and surface water. Only potential would be for peaking capacity. A lot of times there will be limits on the volume of water that you can take at a specific time, so when you are getting to that threshold, you would turn on the wells with a knowledge that most of that water is going to end up

Question	Answer
	on the lawns. In the event of a catastrophic failure of the line bringing the water to Waukesha, you would be able to provide your residents with a water supply and fire protection.
If the Lake Michigan diversion is $116 million and the shallow wells are $145 million, isn't the true cost $261 million if you are using the shallow wells for redundancy?	***Dan –*** No. The shallow wells we are referring to would be a new shallow well field that we'd develop outside of what we have and outside of what we're currently planning to have.
What is the planned pipeline routing to and from Waukesha? Has there been discussion, preliminary negotiation with jurisdiction with path of the plan - possible return flow routes?	***Jeff –*** It would come from the west side of Milwaukee using existing rights of way. It would be approximately 10 miles in length and come in from the north – around 92nd and Howard. ***Dan –*** There is an east west corridor we have identified and that's been identified in the SEWRPC Plans also and as far as the details of getting the pipe to and from that corridor – those routes have not been identified at this point. ***Mayor*** – We have not had any negotiations with any jurisdictions. We have had informational discussions with the Mayor of Milwaukee and some of the members of the Milwaukee Council. We've had discussions with the Mayor and some of their staff for Wauwatosa, West Allis, Racine, Oak Creek, and the Village of Elm Grove. Our plan is once the application is made public we would have more meetings. ***Dan –*** I believe there is a second alternative that would be around the Zoo, but I'm not exactly sure where that is. The finalization of any route will have to be approved by the WDNR.
Is there actual data documentation and actual reports showing how WWU Commission studied the alternatives to diversion?	***Dan*** -The following reports are on our website "Our Future Water Supply Study", S E H Study at www.ci.waukesha.wi.us/water utility. Volumes of information are also available at the SEWRPC website with regards to the analysis that was done.
With alternative #1, the treated water pipeline that would go from the proposed well field in the south all the way up to the Hillcrest Reservoir & Booster in the NE part of the City – explain why that pipeline is needed.	***Dan –*** These numbers include distribution system improvements that will be necessary within our system to distribute water throughout our system. Right now, by putting that water to the south and the need to transfer it throughout our system, our system isn't built like that now, we need to install the improvements to move that water throughout the system. All 3 options include those numbers to make it equal (apples to apples).
Alternative #1 would need system	***Dan -*** The Hillcrest Reservoir is one of the main distribution points in our system.

Question	Answer
improvements to get the vast majority of the newly treated water up to the north and east part of the city to let it flow through the existing distribution system. Correct?	It's at a high point and it provides the water that moves throughout our central zone and then it gets distributed from that point to the northwest and southeast.
Another question in regards to the alternatives – in terms of Alternative #3, which would be Lake Michigan, we've put out letters of intent from Racine, Oak Creek and Milwaukee for potential purchasing of water. Where on this diagram – which municipality does this represent?	***Dan –*** This particular diagram represents the City of Milwaukee.
If Great Lakes is the ultimate option that's chosen by this council, if another municipality besides Milwaukee were chosen, would this diagram change? Would the route of the pipelines be different than what's articulated on this alternative?	***Dan*** – The east/west pipeline remains approximately the same and it breaks off from there where it would go towards Oak Creek and towards Racine. It would basically run the same in Waukesha County until it hit the Milwaukee County line and then it would move to the south and to the east.
You had mentioned that Alternative #1 and Alternative #2 are not sustainable. Your concern is 20-30 years we would have to do this all over again. Can you expand on that point and explain why you feel that way or what would happen in 20-30 years that would cause these	***Dan*** – There have been a number of studies that have been done. In fact, SEWRPC has done about a 2 year study with regards to the water supply for the region and they came up with the same conclusion that the City of Waukesha should go to Great Lakes for water and there was a panel of 37 water experts that sat on that review committee and came to the same conclusion, but under that scenario, what was developed was a look at the shallow aquifer and there was a model that was created and an index that looked at the shallow aquifer to the south of the City and what would happen if you took 3 – 4 million gallons/day from that aquifer. There was a base flow reduction index that was created – you would reduce that by about 50 percent. We're not talking about ultimately talking about taking 3 – 4 million, we're talking about ultimately taking half of our water and so we have to model that and it would be above that 50 percent mark, so you would be having severe environmental impacts adjacent to that area where you would be drawing down that aquifer for long-term. The other thing, during a serious drought condition, the groundwater goes down as a result of that drought condition as does the flow in the

Question	Answer
	Fox River. So under either scenario during that drought condition, you are going to additionally stress and already stressed resource. ***Tony*** **-** There are other people on these aquifers, too, not just Waukesha. So as they grow in the future, it's more water coming out of the same water source.
We purchase water either from Racine, Oak Creek, Milwaukee will we be at their mercy? Can you explain the process as far as the regulation that it's simply about the water.	***Dan*** **-** In the State of Wisconsin, the utilities are regulated by the Public Service Commission and the way they set rates is they do a cost of service study. They look at your utility and what it costs to provide service to the customer class. We would be considered as part of a customer's class from any supplier and that customer class would be the wholesale customer. For instance in Waukesha, there's the industrial class, residential class. They break those out and look at what it costs to provide that service and they allow for a certain rate of return on that so the utility can invest back into their infrastructure and the PSC will not let you set rates higher than what that cost of service study dictates and the rate of return you will allow. While a water supplier might say, we want to double your rates, but not their rates; they wouldn't be able to do that. The PSC would not allow that and if a customer wanted certain payments or whatever, the public service commission has ruled that they will not allow that to be as part of it. As part of the regulatory process, we'd have to go in front of the regular PSC and they would have to approve the rates as a regulatory body.
Whatever option we decide and if it is Lake Michigan water, no matter what municipality we would seek it from, they can't impose any type of fees just simply to make up their budget so their budget balances. Correct?	***Dan*** **–** Correct. If they had a deficit one year and they wanted to make it up through the water rates, they would not be able to do that. Like any other Utility does, they'd have to go through the rate process and justify those rates in front of the PSC. ***Mayor*** **–** The negotiations for any agreement would be lead by Dan and Lori Luther. They would be entering into negotiations on behalf of this Common Council. Any type of agreement would come to this Common Council for a public discussion and would not go into affect unless this body ultimately agreed that the negotiated conditions were acceptable.
Could we conceivably run out of water in this aquifer in 30 – 40 years?	***Dan*** **–** No, we would probably not run out of water, but the water would have more contaminants and we'd have more treatments that would be necessary. The study we went through looked at treating the deep aquifer water, treating the shallow aquifer water and those are the other numbers that identified as the other alternatives in here providing that treatment. The more and more we utilize this

Question	Answer
	aquifer the more and more the drawn down gets and the more environmental damage that will be caused. We are west of sub continental divide, but we're within a straddling county.
Our population isn't exploding and we are using conservation more and more – we use less water now than we did 10 years ago per capita. Is there a possibility where we don't have to go with Great Lakes water? This is going to be a terribly expensive proposition because a lot of people don't realize is what water we take out we have to send back.	***Dan -*** The other alternatives we looked at are just as expensive as or more expensive than the Lake Michigan option in terms of treatment costs and environmental impacts. Those costs are identified. Any route, I agree, we're looking at spending a lot of money, but any route we go, if we're going to be spending money and we have this court order by June 2018 and under that scenario the recommendation is to develop a new water supply. There will continue to be environmental damage and if we start moving to the shallow aquifer, there's going to be the drawdown in the shallow aquifer and those draw downs and environmental impacts are closer to where you are pulling from so they would be in the land directly adjacent to those wells. We have the iron, manganese and arsenic that we have to treat for with regards to the shallow wells.
With the long-term goal of Lake Michigan water supply for the city, is the city still pursuing an additional water supply via additional wells and, if that's happening, what is the status and cost of that?	***Dan –*** As you are aware, we are looking at purchasing the Lathers Parcel where there's potential to install as many as 3 – 5 wells on that parcel and we're in the process of identifying other lands to the south to the east that would be in another well field that would be adjacent to potentially develop that additional shallow well field to supplement that.
Is there a 3rd possibility – east/west replenishing the aquifer and a multi-faceted solution over the next 50 years – has anyone looked at that piece?	***Dan -*** That's a good question with regards to Lake Michigan and well option. The issue is you would have double the expense because you would have to build the treatment facility for the shallow wells and all the infrastructure to distribute the water, but you'd also have to build all the infrastructure from the Lake Michigan and the return flow. So, you'd have a higher expense if you looked at a combination. From the construction standpoint you would have an issue and from the water quality standpoint you'd have an issue because they are two different chemistries of water. I can tell you they don't blend very well, so we look at utilizing potentially our shallow wells in case something catastrophic happened.
Where would the water be treated that would be extracted from Lake Michigan?	***Dan –*** All 3 of the communities have water treatment plants that exist along the lake. Oak Creek and Racine each have one and Milwaukee has two. They would treat it at their facilities. The wastewater facility that we have currently in the City of Waukesha would continue to treat the wastewater to the standards that it has

Question	Answer
	already existing in its permit and where we discharge to the Fox River. We would be looking at changing our discharge permit and location from the Fox River to Underwood Creek. Great Lakes water would be treated at an existing facility along the lake that has the available capacity to provide the city of Waukesha with their water and then the wastewater facility would continue to treat the wastewater and we'd change the discharge location.
Would Oak Creek have the capacity to treat the quantity of water this city would require?	***Dan –*** Both Racine and Milwaukee have ample available capacity to provide the City of Waukesha with the water on its max day the 18.5 million gallons that we are looking at requesting. Oak Creek has enough capacity to handle the request we would put in right now, and they have enough available capacity within their infrastructure at their treatment plant. They'd have to add on some treatment processes to allow us to provide water on our maximum day when we reach that 18.5 million gallon threshold.
There is a perception amongst some people in this community that are a little queasy about getting Lake Michigan water from the City of Milwaukee due to their cryptosporidium situation about 10 years ago. I did speak to you about it about 6-9 months ago, but the perception is still out there. That's why I asked where the water would be treated (double treated) to make sure we don't get this cryptosporidium. I know you've explained to me that they've improved their water purification system, but the perception is still out there and I'm concerned about that. Please elaborate this improved system that they have.	***Dan –*** Since that event that took place in the City of Milwaukee they've installed an Ozination System that provides as a barrier to the cryptosporidium virus and also provides a barrier for another of other things that are out there. The City of Racine also had an incident and they had since installed a membrane treatment that polishes off the water. Basically, they treat their water and put it through a membrane system as another barrier. One thing I'd say about the City of Milwaukee since that outbreak, they have improved their system dramatically and they were recently recognized as having the 19th best water amongst large communities throughout the country. They have very high quality water and they're run by a very qualified manager.
It seems to me the greatest cost is going to be the return water. A lot of people aren't aware in this community that water we take in we have to bring back. That would include, I assume, everything that our sewage treatment	***Dan –*** The compact calls for you to return the water minus a consumptive use. We would be looking to meet the requirements of the compact on an annual basis and looking on a 5 year rolling average of having a goal of returning 100% of the water to the Great Lakes basin so it is more sustainable for the long-term. That's what makes this more environmentally sustainable for long-term is that you are recycling

Question	Answer
plant treats, correct?	and reusing the water that you utilize for your citizens rather than having it sent down to the Fox River and it's lost forever.
Do you have any idea of what costs we're talking about as far as all this pipe that would be required?	***Dan -*** The cost for the return flow and the supply are included in the numbers that were provided for you, so the return flow is also included in those numbers and the Great Lakes option is the cheaper option. ***Tony –*** For the Lake Michigan, the total capital cost was $164 million, about 30 percent of that is for the return flow. There's a little bit larger portion for the supply from a Lake Michigan utility and there's also some of those distribution system improvements we talked about to move water around town.
In regards to the legislation issues, if there is no legislation, why can we not return water to the aquifer?	
If we're pulling it out, why can't we return water to that as far as the sustainability goes?	
If we're concerned about sustainability with Lake Michigan requiring us to recycle it, why can't we use that same process with the aquifer?	
I have a question on the analysis for the maintenance – did anybody include costs that are going to be associated with that Milwaukee resolution in the maintenance budget? The way I look at it, it cost up to $2 million a year if they go by the one Cleveland has in their report - $200,000 for 2.5 million gallons p/year. If we're going to take 20 out of there, that's 8 times the amount.	
What is the challenge in regard to SEWRPC's findings concerning sustainability for the shallow aquifer?	
The water reuse from the affluent instead of using the renewable source. To what depth did	

Question	Answer
you look into this?	
Alternates all look really good – one thing with Oak Creek and Racine, they use a filtration – membranes. Did we look at that here in Waukesha?	
If the only problem with our water is the radium, you can install a filter in your home to take this out. Why doesn't the Water Utility filter that out?	
What is the cost and can this assistance be applied to this?	
You do it in your house, so why is it not being filtered out before it comes to our house?	
If it can be, will the cost that you have here on this sheet be applied to this?	
Why are new shallow water wells required and the financial impact that they will occur to the residents of the City of Waukesha and what will the City do to ensure that the new shallow water wells on the Lathers property – what will the City do to ensure that those wells will not negatively impact the Vernon Marsh and its aquifer?	
The request is if you would be able to put on a line a more specific breakdown of the cost estimates of each of the alternatives, so we know what's in those numbers – we'd have a better idea of what the cost breakdown is for each of those. My questions is – I'm still trying to get my head around the daily demand calculations and how those were determined.	
Why can't we filter the radium out of the water	

SUMMARY

Question	Answer
as the water is now?	
Why can't that be done rather than applying for water from Lake Michigan?	
What steps would you need to take to make the water usable?	
Can you tell us what steps have been or will be put into place to make sure we wouldn't have this type of problem again if we were to get water from Lake Michigan?	
If we continue to draw down on the shallow wells – for example, the wells south of the city, what would be the affect on the Vernon Marsh as well as septic systems and wells of homes in that area?	
And likewise, what would be environmental impact of drawing down on the Fox River?	
What would it take to make that water usable?	
How do you respond when someone says the majority of homes in Waukesha already have water softeners to take care of the radium?	
How many municipalities currently get their water from Milwaukee and are they having any sovereignty issues at all?	
Have there been any studies to show what the cost of removing these pharmaceuticals - should that come down the line as being required to be removed as well and what costs will be passed on to the residents of Waukesha regarding the removal of those items?	
If you're adding in that cost as something that's going to save these people all this money and reduce the cost per person per household,	

Question	Answer
and you come to find out later that we will be dealing with chloride rejection, how is that going to affect the cost/person in the end on that?	
We believe that several valid alternatives that were discounted were probably discounted prematurely and a combination of some of the approaches from the 2002 study really could be combined and looked at and that could have some merit including looking at the unconfined deep aquifer to the west, re-injection options, groundwater inducement, enhanced conservation, etc.	
One of the bigger questions we have is the application states that the deep unconfined aquifer west of Waukesha wasn't really looked at because SEWRPC made an assumption that the groundwater source had to be within one mile of Waukesha's Utility service area. I think there were also concerns over public nuisance that's mentioned in the application and that seems to not make a lot of sense given that we're now pursuing a Great Lakes diversion which is 7 miles away and also has its own suite of regulatory and legal issues.	
In all fairness, when a suggestion is made to explore an alternative, that should be given a full public airing with – it's going to cost $32 million more, but what of it is going to cost $32 million and how did you come up with $32 million. In fact, how did you come up with $174 million? About 4 weeks ago it was	

Question	Answer
$164 million and somehow it crept up to $174 million last week.	
3. Return Flow	
Return Flow Options Costs – Difference between Underwood Creek and the Root River O/M costs.	***Dan -*** Major difference is the distance it's going to have to move.
Regardless of the community that would supply the water, is it safe to say that the amount of water that can go down the river (--i.e.—Underwood Creek) even in the most extreme cases, the ultimate dry weather we would still have some water going down a return flow alternative rather than everything going back to the Fox River or vice versa. Would there always be return flow? There would be certain conditions where some would be going in both directions?	***Dan –*** In that situation we would most likely have our average day demand minus our consumptive use going back which is what's allowed under the compact, and the remainder going to the Fox River. What we look for is to work out that final operations plan is going to be with the DNR and how exactly they would want to handle those extreme scenarios. There would always be return flow. The other condition would be the wet weather condition where we have a 100 year rain event where our wastewater facility is treating more water than we would see on that average day. We would scale back the volume of water that we send back to the average day minus the allowance of consumptive use to minimize the perceived impacts that there would be to the Underwood Creek or the Menomonee River. At that point, you would be sending 7 or 8 cubic feet per second when the stream has 1500 cubic feet per second, so it would a small fraction of the amount. (I'm just using those numbers as an example.) There would always be return flow that would meet the requirements of the compact going back to the Great Lakes Basin.
Clarify the analysis that has been done pertaining to the environmental benefits to Underwood Creek, as an example; share with us an analysis which we may have done on the other side with regards to Fox River/Vernon Marsh relative to less water coming into there from our wastewater plant pertaining to normal daily flow.	***Dan –*** There has been analysis done, we've monitored and we've worked with the wastewater utility with regard to what their flows have been throughout going back 15 – 20 years with regards to wastewater discharge and wastewater flows and looked at some of the gauges within the Fox River and what that impact would be to the Fox River and downstream to the Vernon Marsh. We are still working on that analysis and SEWRPC has also looked at that analysis. This is something we would bring back at the December or January meeting. ***Jeff –*** The Vernon Marsh is fed by the Fox River primarily during the flooding events. Those are still going to occur and the utility's treated wastewater doesn't really impact that. In terms of the streams that are feeding to the Vernon Marsh, those would be directly affected by pumping from a well over a long period of time.
Is it possible to have 100% of return flow to	***Dan –*** We have done a lot of analysis on the volume of water that is available for

Question	Answer
Underwood Creek?	return flow and I believe it's about 20% more than what we utilize on average treated by the wastewater facility. There's been mixed signals from a lot of different groups, as to what that amount should be. The compact says you need to have return flow minus an allowance for consumptive use. It doesn't mean we wouldn't have a goal for reaching 100% return flow, but what is the law is return flow minus an allowance for consumptive use. ***Jeff* –** The compact actually says you need to maximize the amount of water returned back to the source water shed and you have to minimize the amount of groundwater from this basin to Lake Michigan. You want to create a water balance. The improvement isn't so much in the quantity, but the levels and the flows and quality that would go back. We're providing additional level in the stream for fish passage and also for potential water quality improvements. On the wastewater side, infiltration and inflow is a bad thing. We've met with our Director of Public Works, Fred Abadi, who made us aware that they're entering into programs to minimize the amount of infiltration and inflow that they have.
Would the return flow still go to Underwood Creek or would it go back towards one of the municipalities it chose?	***Dan* –** We are proposing that the return flow would go back to Underwood Creek under any of the 3 scenarios.
Nobody has addressed – if you're talking about dumping into Underwood Creek, which means we're going to have to get permits from MMSD. Is that going to drag us into MMSD?	
Looking to return the flow in a 5 year rolling average and what that means?	
I'm concerned about the Underwood Creek as the discharge point for the wastewater. Maybe we'll resolve this later. Underwood Creek has just been listed -are on the drafted list of 303 D list. That's EPA's fancy term of saying an impaired waterway. We have many impaired waterways in Wisconsin; this one is just about to be listed. When it's listed, then there's	

Question	Answer
developed a TMDL or a plan to improve the water quality in that creek. I think we need to wait to find out what that TMDL plan is going to say so we know that our additional discharge to Underwood Creek wouldn't require more treatment of your wastewater.	
We continue to be concerned about lack of return flow alternatives, although several alternatives were looked at in the application in the general sense, it's clear that the City's only conducted really a meaningful analysis of one being Underwood Creek. We would expect that the EIS would have more information as far as looking at a thorough analysis of return flow alternatives and the environmental and economic impacts of each one of those.	
Given basically the possible impacts on both the water quality and the quantity of Underwood Creek in Menomonee River, we feel that an impact statement should ensure that there are no other reasonable alternatives and that any return flow scenario is protective of the physical, chemical, and biological quality of the streams that are potentially impacted.	
I think by the appendices we continue to have concerns in particular about the bacteria loading that would be coming back into the creek.	
Every engineer, every DNR person will tell you that that is a bad thing to have a lot of inflow and infiltration going into your sanitary system.	

Question	Answer
Return flow – the compact calls for all used water to be returned back to the Great Lakes basin less the allowance for consumptive use at a place as close to the place at which the water is withdrawn. I've not seen an explanation for why Underwood Creek is as close a place as one could be from where the water is coming out of the lake.	
It appears, at least upon first look at what you're proposing that this is going to be a new discharge to Underwood Creek. Underwood Creek is an impaired waterway for bacteria. There are a number of recent court cases under the clean water act that make it extremely problematic at the best, for an additional loading of a particular pollutant that's the reason a water way is declared to be impaired.	
4. Compact Compliance	
Timing of application coming from the City and when is the ideal time with regards to rules and regulations that individual states are drawing up?	***Mayor*** - The compact, when it passed the WI Legislature, had about 175 pages of implementing language. Our application will follow all of those details that are there. In our discussions with the DNR they've said that at some point they will be writing rules, but we do not need to wait to move forward with an application for those rules to be written. ***Dan –*** I participate on the Groundwater Advisory Committee and we recommended groundwater quantity legislation and as part of that – laws were passed and implemented and rules were not made, but that did not mean that people stopped applying for well permits throughout the state. The DNR, while we were in the process of developing rules, they still processed applications and approved high-capacity well permits for people that did apply. ***Mayor*** - Bottom line is we do not have the luxury of waiting because of the settlement with the Dept. of Justice on the radium compliance because we either have to be successful with the Great Lakes water application by the middle of 2018 or we have to move forward with our alternative. The first example of a

Question	Answer
	community getting Great Lakes water, which is different than what our application is going to be, is New Berlin. They are a straddling community where half the community is in the basin and half is out. They had to get approval from WDNR, but did not have to go through the other 7 states. Their application had been approved even though the rules had not yet been written. ***Dan –*** The DNR is estimating about 4,000 hours that it would be required with regards to developing the rules. The first presentation I gave to this Council was in 2004 when we talked about a future water supply and the implementation of that water supply on the original timeline I had 2010 as the goal. 2010 is in a few months and we still haven't even started construction. As we move to implement this, it's going to take a number of years. We estimate about 5 years from starting to acquire the land through the easement acquisition process to actually constructing it and putting the infrastructure in place and then turning it on.
Agreements for seeking water from municipalities – are there anticipated problems with return flow politically with communities? How is that being addressed?	***Mayor –***In terms of the process from other communities, the first step will be at the October 20th Council meeting to ask the Council to make the official request. If we're successful in getting 3 letters of intent, we've been upfront that Milwaukee is our 1st choice both for financial, as well as regional cooperation reasons. There will have to be negotiations similar to what New Berlin did, which is an amount of money we would pay any community on an annual basis, as well as a possible sum to complete an application. Negotiating with any community has political issues. I don't know if there are any political issues in terms of return flow, we've been working hard and that will be part of the application to detail explain how the return flow will occur.
Regarding the Compact – do you see anything in the compact that would allow the selling municipality to dictate other things in the municipality other than water? (--.i.e.—housing/transit, etc.) making us change other things we do in the City other than to do with water?	***Dan –*** There is nothing in the compact that requires that.
You had mentioned that any other annexation beyond this border would have to go back	***Dan –*** Correct. Just like the sewer service area of the plan, like when the city looked to provide service to the City of Wales, they had to amend their sanitary

Question	Answer
through the whole process again for water service which would be outside of the service area that we're applying for. Correct?	sewer service plan, and they had to go to SEWRPC to amend it, we would have to go through that same criteria on the water side.
So it would be just a basic looking at the agreement and doing an amendment? Even if we weren't going beyond the volume that we planned because we had set borders?	***Dan*** **–** In terms of water supply, with regards to Great Lakes water supply. If we wanted to take and square off this area and add a bunch of acreage to this, in order to supply that area with water from the Great Lakes, we'd have to go back to the DNR and ask for approval and they would have to go to the other Great Lakes governors and ask for approval or an amendment to our service area. We would have to go through the whole process again. That's part of the legislation that you have to identify your water service area and that's what we did when we went through this process with SEWRPC.
If and when we apply for the Great Lakes water and our application is accepted, but we decide not to move in that direction right now, does the application expire if we don't begin construction in x amount of time?	***Dan*** **–** I do not know the answer to that question, I'd have to look into it and get back to you.
Is there any legislation requiring the return of water to a particular watershed like Underwood Creek? Is it required by State Statute or legislative requirement?	
Depending on how the Great Lakes compact is written, is there any type of language in it should Lake Michigan's water level reach a particular stage that the water supply is shut off?	
What happens if the Great Lakes Governors council turns down the application?	
Does your timeline incorporate that type of delay that's already been predicted by an expert speaker?	
How will this application reconcile the SEWRPC preliminary findings in that regard	

SUMMARY

Question	Answer
with that requirement under the compact that will be evaluated at the regional level?	
Is the requirement that there will be no adverse environmental impact to the quality or quantity of the waters of the Great Lakes basin?	
Again, with the DNR's requirement of a comprehensive environmental impact statement, how will that be addressed and how can that information be brought before the public and before yourself to assure that that component of the compact is met sufficiently so others around the region will follow suit when they make diversion applications that the bar is appropriately set?	
This application also needs to address the precedence issue.	
At the last open house someone made the statement that the draft application appeared to contain a lot of window dressing. Please comment on how you came up with the format and especially the content of the application.	
According to compact provisions, Waukesha needs to show that they have no reasonable alternative water supply and I don't quite feel they've quite fully made this case yet.	
Given that we really don't know which community is going to sell water to Waukesha, we still have a lot of questions about whether or not the application will meet compact provisions in terms of the closeness.	
Looking at the compact language and what's required in the diversion is I don't see	

Question	Answer
anywhere that you need to talk about cost. What things cost. I don't think what the alternatives cost need to be in your application. Unless I'm not finding it somewhere in the compact, it says reasonable – based on public health, but it doesn't say anything you choose the least cost method.	
The question of unavoidable need. The compact is clear that the need for any proposed diversion cannot be reasonably avoided through efficient use and conservation of existing water supplies.	
It's not at all clear that Waukesha's application has considered all reasonable alternative water supply sources which is necessary. It is evaluated how much of the required diversion could be supplied by another combination of other sources.	
5. Other	
Will Waukesha be at the mercy of Milwaukee as far as pricing and costs?	***Dan*** **-** The pricing and cost of water comes from the PSC and they do water cost studies that they have to approve. PSC does a cost of service analysis and they determine the water rates, the rate of return, and what they can charge you. PSC process will be on both the Milwaukee and Waukesha sides.
Preliminary cost projection – how will it affect each household in the City?	***Dan*** **-** We're in the process of projecting out what the costs may or may not be. The Mayor, Water Utility Commission, and I are working heavily with the representatives in Washington to identify federal dollars that would be available to help assist us in our efforts to maintain the water and return it back to the Great Lakes. So far we've received just short of $4 million from the federal gov't with regards to radium compliance. Now we're identifying other means that would bring in larger dollars to help offset those costs. ***Mayor*** **–** We're hoping we might know something about federal dollars in February. ***Dan*** **-** Meeting with our consultants in Washington and in Wisconsin with regards to the funding effort and

Question	Answer
	we're identifying some programs. We'll be meeting later this month to look at those programs and discuss with our representatives and we're looking to go out to Washington in January to further those talks and, hopefully, get into some of those programs. We hope to have some of those answers prior to an application being made.
Keep CC informed of costs.	
How do you pay for this? At the very end of the day once we have received any funding, the ultimate cost of this (Plan A or B) will be left to the City of Waukesha. Correct? The City/Common Council will be the ones approving the borrowing for these funds. Correct?	***Dan -*** As with any borrowing, it comes to this Common Council,
How much has the Green Bay cone area recovered over the last 30 years?	***Dan*** - In the 1950's all the suburbs decided they were going to go with Green Bay, but then they decided to stay on the aquifer thinking there would be plenty of water. The aquifer did recover, but I don't know the exact percentage. 50 years later that aquifer was drawn down and they had the water quality issues that we're seeing today and what they did was switch to a Great Lakes supply. They were unable to come to an agreement with Green Bay during negotiations, so the surrounding cities of Green Bay went to Manitowoc.
The City of Milwaukee is trying to hit some of the outlying communities for certain costs that were never discussed in the past and the infrastructure.	***Dan -*** That was called the Ad Valorem Tax. The PSC plays a very large role in what they can and can't charge for water. There has been a move recently, which is what I believe you are referring to, with regards to city's being able to obtain more dollars from the utility's because of the fiscal crisis that is being realized by a lot of the cities. So some of the City's are trying to get more revenue from their water utilities. The City of Milwaukee has asked for in addition to their PILOT payment $3 million from the Water Utility. They'd have to get it from somewhere, so they'd get it from their customers. Similar issues are being realized in other cities throughout the state and the PSC has not decided how they're going to deal with that issue. They are really frowning upon that issue. They don't want to see the water utilities become the cash engine for cities to operate. ***Mayor -*** Dan, isn't it true that any agreement that the City of Waukesha would reach with the City of

Question	Answer
	Milwaukee, Oak Creek, or Racine come back to the Common Council before it would become an official agreement? ***Dan –*** Correct. Any agreement that we would enter into would be negotiated by the water utility commission and would then be presented to the Common Council with ultimate approval by the Common Council. ***Mayor*** **-** We purposely are being upfront about we're looking at 3 possible communities and depending on the letters of intent and depending on our meetings with those communities over the next couple of months, that will depend on who we ultimately end up reaching an agreement with and any agreement will come back to this body for an approval prior to taking affect.
Has anything been verbally agreed to by the City of Waukesha?	***Dan –*** Not that I'm aware of, no.
Will there be an opportunity for an open session process by the Mayor for the media, public, etc., to make comments, express their opinions?	***Mayor – This*** meeting tonight we had set a goal to end around 9:00 because we felt with this presentation, until we're ready to present the Draft Application that are a lot of details that still need to be worked out. Our plans for the December/January meeting will have a starting time, but we won't have a definitive ending time, so depending on how many members of the public show up, we will come up with a process for people to make comments and express opinions. In December we plan to unveil the draft and have questions on the first draft depending on how that meeting goes will determine if we need additional meetings for questions. When the Water Commission has a special meeting to determine whether they're not going to recommend moving forward, we'll allow for discussion at that time, and as part of our regular Common Council meetings we always invite public comment.
Will costs of whatever route to a better water supply chosen be entirely on water rates or will any of it be on the City tax levy?	***Dan*** **-** The bonding for water supply would be bonded by the water rates. The bond itself would have to be issued by the City of Waukesha and it would not be anticipated that any of the dollars for paying those bonds back would come from the City of Waukesha.
How much will property taxes go up as a result of getting Lake Michigan water?	***Lori*** –The intent is for any or all expenses to be paid directly by the Water Utility through its rates, so there would be no impact on the property taxes.
Common Council decisions points slide – approval of supply by Great Lakes states. What is the indication that we have that it's a	***Dan –*** The goal for approval by the DNR is to have it reviewed and approved within 90 days for a permit and also a goal in the Great Lakes compact to have it reviewed and approved within 90 days. That's once they view it as complete, so we

Question	Answer
reasonable timeframe given all the complexity and even the lead up to getting the compact signed by the Great Lakes governors?	need to work with them to provide them with the information so they can do that as complete. We look at the 90 days for each of those and then some extra time in terms of providing them that information.
Is the first application that will be seen by the members of the compact?	***Dan*** **–** This is the first application that will be seen under the Great Lakes compact. There have been other applications for Great Lakes water that have approved and also that have been denied.
We don't have a water problem, we have a political problem. The EPA could change things for us with a stroke of a pen by upping the radium allowance. Tell us why a political thrash down and delaying tactics isn't an option.	***Dan*** **–** When you look at the process we need to go to implement a new water supply it would take about 5 years from when we get approval to when we start the process to implementing that process. That takes us out 5 years within that timeline. We did look at the water softeners, the issue is a lot of times the cold water that goes to your kitchen sink is not plumbed through the water softener, therefore, the radium is not removed from that stream. We would also be taking on the liability to be guaranteeing that those water softeners worked and removing the radium throughout someone's household. I don't believe the City Attorney would allow us to take on that liability. Therefore, it is not an option. Our City Attorney, the Water Utility, and the City spent a lot of time fighting the standard with regards to radium because the standard is different in different countries. ***Curt*** **–** An interim standard that went back longer than I've been City Attorney, the process we had been involved trying to negotiated with EPA, probably since the late 80's. Originally, the DNR did sue the City back in 1990 to comply with an interim standard – we felt it was not appropriate because the EPA had made its intentions known that it was interim and was going to change the standard and that it did not make any sense for a municipality to comply with a standard that was ultimately going to change. As it turned out, we went back in the early 90's and argued our case before the Court of Appeals procedural issue before the State Supreme Court, we were successful. Call it a delay tactic, but it was for the purposes mentioned – positive and good reasons to do so, because at the time we were looking for an expenditure to comply with the radium standard upwards of $70 million. The operating and maintenance cost was something that may have been in addition to that, I don't think it included just the billing plan to comply. The DNR, after they lost that case, commenced another action against us in the mid-90's again to comply. They were going to change the standard – possibly a 20/20 standard for

Question	Answer
	each radionuclide that was in question 226 and 228. The DNR continued to proceed ahead and we were able to come to an agreement with the Attorney General's office in 1996 (Jim Doyle), not to proceed they wouldn't do any enforcement action against the City. When the action taken against the City would apply to the other municipalities and water supply systems throughout the State that exceeded the radium standard, until such time as the EPA declared its new standard. That process ultimately came about and in 2002 they went through the whole public process – adopted the regulation – we submitted information (as well as a number of other communities) most effected by radium (Illinois, Nebraska, Texas, but Waukesha was the biggest), with scientific evidence that standard of 10 or 20 supporting that was better than the proposed 5 standard that ultimately that EPA relied upon. We did challenge that along with several other groups and the EPA determination and where you challenge an EPA regulation is in the Court of Appeals in the DC in Washington DC. It was clearly an uphill battle every time you challenge an administrative rule of the federal government; the courts are not going don chemist robes or make an independent determination. They look at the standard on what basis or scientific data was relied upon by the EPA in making their determination. You might have other data that is equally acceptable, viable. We did have a number of studies – 1 by UW-Wisconsin and one by an expert from Oregon laboratory, as well as a Canadian group, but the courts are not going to decide between whether the EPA's was more scientific vs. the parties challenge it, the standard is whether the EPA's standard information they relied upon, which happened to be a cancer in radium dial painters that were prevalent in the 1920's in the rate of cancer and Hiroshima, as long as what their basis for concluding with a standard is reasonable. Very difficult standard to overcome. They relied on no scientific data or was totally unreasonable. The decision came down that the EPA standard was reasonable that promulgated in 2002. It's a long process and highly unlikely that they would change it. Highly unrealistic to think they would change the standards. 2018 to comply with the radium standard – I can't stress enough though, as Dan and the people here say, radium is piggy backing. The main reason again for looking for Lake Michigan and other alternatives is because of the declining aquifer not because of the radium. There could be compliance by itself,

Question	Answer
	but it wouldn't make much sense if you are looking at long-term and as we continue using our existing water, as the engineers can tell you, the potential for other contaminants is getting greater and greater as they have to go deeper and deeper into the aquifer.
I want to make it perfect clear that I would not support purchasing water from anybody that wanted to make purchasing water more about than just purchasing water. If there's a supplier that wants to put things in this contract or any type of perspective contract, that don't have anything to do with water, I won't support it. I think it's important for us to understand that if we entered into an agreement with an municipality, we're buying water from you and that's it.	
We should not be buying water from any community on the Great Lakes that will have political demands or conditions for sale of their water. How many other communities are obtaining their water from the deep aquifer besides the city of Waukesha that's in that plain?	***Dan –*** I don't know that number off the top of my head. ***Tony –*** I don't know the exact number of communities, there are several.
I understand New Berlin currently gets water from the city of Milwaukee. Has the City of Waukesha reviewed that contract to see what kind of conditions are involved with that particular contract?	***Dan*** – We have looked at the contract. I cannot recite it off the top of my head though.
Is it purely a water contract or are there other conditions attached to New Berlin accessing Milwaukee water?	***Dan*** – There are not all kinds of conditions attached. The only thing that was unique about that contract was that there was a one time payment that was required as a result of the contract.
I would like to know how much money we've spent as Utility and City, on indirect or direct	***Dan –*** In 2002, when we implemented the future water supply study. We looked at all the different options and what's available to us – whether it was damning up the

Question	Answer
	but it wouldn't make much sense if you are looking at long-term and as we continue using our existing water, as the engineers can tell you, the potential for other contaminants is getting greater and greater as they have to go deeper and deeper into the aquifer.
I want to make it perfect clear that I would not support purchasing water from anybody that wanted to make purchasing water more about than just purchasing water. If there's a supplier that wants to put things in this contract or any type of perspective contract, that don't have anything to do with water, I won't support it. I think it's important for us to understand that if we entered into an agreement with an municipality, we're buying water from you and that's it.	
We should not be buying water from any community on the Great Lakes that will have political demands or conditions for sale of their water. How many other communities are obtaining their water from the deep aquifer besides the city of Waukesha that's in that plain?	***Dan* –** I don't know that number off the top of my head. ***Tony* –** I don't know the exact number of communities, there are several.
I understand New Berlin currently gets water from the city of Milwaukee. Has the City of Waukesha reviewed that contract to see what kind of conditions are involved with that particular contract?	***Dan*** – We have looked at the contract. I cannot recite it off the top of my head though.
Is it purely a water contract or are there other conditions attached to New Berlin accessing Milwaukee water?	***Dan*** – There are not all kinds of conditions attached. The only thing that was unique about that contract was that there was a one time payment that was required as a result of the contract.
I would like to know how much money we've spent as Utility and City, on indirect or direct	***Dan* –** In 2002, when we implemented the future water supply study. We looked at all the different options and what's available to us – whether it was damning up the

Question	Answer
water issues going east/west. I want to make sure we're equally looking at everything fairly.	Fox River, utilizing the quarry water, water re-use, we looked at all the options. There was nothing in that study that was pointing towards one option as the option that was our preferred option. That study said the Great Lakes and shallow aquifers were the two preferred options. SEWRPC spent 2 years studying this issue and came up with the same conclusions the future water supply study did. I don't know how much has been spent from the water utility standpoint, I know that throughout the region millions of dollars have been spent looking at water supply options. SEWRPC alone was an enormous task and burden taken on. The Great Lakes is an option for us and one we should be pursuing as an option.
How would this affect the water rates over the years?	***Dan*** – We've done some preliminary studies, but it's really an unknown, because we are, as this common council and the Water Utility Commission, is aware, they've challenged the staff to look into federal dollars and help assist in the construction costs, so we've been working with our congress and legislator and even at the state level to try and identify federal or state dollars that would be available to help offset some of these costs. Without knowing or being able to predict how much federal or state dollars we've be able to obtain. It's hard to try and figure out what those rates are ultimately going to end up being.
The rates you are talking about would be condition upon the amount of state dollars we would receive?	***Dan –*** As with our radium compliance, we received around $3.5 million to offset some of radium costs. We'd anticipate federal dollars and we're even looking at the state revolving loan fund as a potential source for money to offset some of the costs that are being associated with the future water supply. It's really difficult until we know what that final supply is going to be and until we finalize the process for the federal dollars and state dollars, we won't know exactly what the impact to rates for customers are going to be, however, the one thing I can tell you, is there is going to be an impact to rates no matter what we do, because every option that we have, there's going to be a cost associated with it.
I can expect the rates are going to be astronomical because Wisconsin is almost broke; the federal government is almost broke. I'm a little concerned about that – you make it sound like we'll be able to get state and federal dollars at the snap of our fingers. That's not	***Mayor -*** Dan and I were just in Washington DC and we met with the staff of Senator Kohl, Senator Feingold and Congressman Sensenbrenner and we did get confirmation towards the end of last year we are going to be receiving an additional $400,000 in federal funds to help with our radium compliance which brings our total to about $3.6 million in federal funds that we've received through this process. So we already have been successful, because if we didn't have that $3.6 million in

Question	Answer
going to work – they don't even have money to fix bridges in Milwaukee.	federal funds, our current rates would be even higher than they are. Part of our conversations is looking at other opportunities for federal funds that would help us deal with the long-term costs, so that is something we're working on and will continue to work on.
I appreciate that, I know you've worked hard doing this and your efforts are greatly appreciated, but you're talking $5/$6 million dollars and we're talking how many millions? $164 million? So that $3 or $4 million is chicken feed at this point in time. It's helped our radium process, but I'm concerned about what's going to happen 8/9 years from now.	***Dan*** **–** In relation to the radium compliance, we've received about 25 percent of the money towards that radium compliance. The other thing I will tell you is with regards to the Water Utility Commission and the way they've guided us in terms of financial planning, is that when we have bonded for money and we looked at how we're paying off that money and we have a 5 year financial plan that we project off of and as part of that 5 year financial plan we looked out to 2012 and 2013 and we looked at our bond and our payment terms for those bonds and have a decline in those years knowing that something big is coming and that's the advantage of our 5 year financial plan is that we're looking at it out in the future and when we're going to be bonding for money so we can project how we want to pay for things now so we can set ourselves up for that larger borrow in the future. The Water Utility itself would not be a bond for the total dollars we're talking about here, so we'd have to look to the City for assistance in terms of finding that money, but payback of those dollars would come from the rate payers.
What I'd like to see between now and the next meeting, is an example of what a water bill would be if we didn't receive any assistance – federal or state. You can use my house as an example of what my water bill would be now and what it would be if we didn't receive any assistance for any of the alternatives from the state or federal government.	
How large is that 2002 study?	***Dan*** – I'm not sure of the exact size, but it is available on line at the website under the future water supply tab that's on the front page of the city's website.
Does it have an Executive Summary? I would request that a copy of the Executive Summary be put in our packets on Saturday.	***Dan*** – Yes, it does.
My fear is that because Lake Michigan has	

Question	Answer
over the past decade actually lost water because of various factors such as the Army Corps of Engineers and the Illinois River that it's allowed water to flow at a higher rate into the Mississippi River, my concern is that there might come a time that we might be left high and dry if Lake Michigan reaches a particular water level, should we go that route. I understand that the City of Waukesha wants to be a model city in the Great lakes water usage – my concern is that if we're allowed, how many other municipalities will want to follow suite and how does that impact the drawdown on the water from Lake Michigan.	
Also, as was mentioned, what happens if the Lake Michigan water level drops?	
Where does the EIS fit into that?	
Do you have to pay back grant funding?	
I applaud the Utility for its detailed studies that they've done on the water supply issue and I believe they're pursuing the best long-term solution. One question that I have – is the debt that has to be taken down for these future capital projects, is that proposed be paid back by the general city tax or is that going to be part of the rate structure of the Utility, because those two are separate items.	
If this is possible to remove this, this money that's going to be handed down to us from federal or county, could that be applied to removing the radium?	
I want it to go on the record from you that	

SUMMARY

Question	Answer
indeed, if this application is approved; the shallow aquifer wells would only be a back-up well and wouldn't be used on a routine basis.	
What is the plan for moving forward from here with the application?	
We have a March 8th public comment meeting scheduled and then what's happening after that? When will this be brought forward to the Common Council for a vote and what steps will you take to incorporate public comment into either a vision or a new plan after the public comment period is over?	
I asked that question last week and you said your answer that your water softeners at home – they do not filter it, but there are filters and we have filters working right now that filter the radium out. Why can't we do that?	
How would utilizing quarry water affect septic and well systems for people in that area and what do you think the DNR's response might be to doing this?	
Do we even know that the owners of the quarry are willing to sell?	
Do you have any idea how much the City might be fined per day if we are not in compliance with the mandate set by the DNR?	
How much have we already paid in fines if we have paid any?	
Lastly, there have been a number of articles lately written by people fearing that if we get water through Milwaukee that we would be at their mercy and lose our sovereignty.	

Question	Answer
Do you know exactly what Milwaukee will charge per gallon per water? 2. Do you know exactly how many millions of dollars we'll have to pay Milwaukee in economic compensation? 3. Do you know the exact amount of federal grant money we might receive? 4. Do you know the exact price of the pipeline? 5. Do you know that over time having to go through periodic renegotiations with Milwaukee that Waukesha will really end up saving money?	

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Wednesday, May 8, 2013
Oak Hill Terrace
Provided an update on the City of Waukesha water supply and the Application for Great Lakes water.

Wednesday, May 1, 2013
Regulatory Affairs
Provided an update on the City of Waukesha water supply and the Application for Great Lakes water.

Thursday, April 25, 2013
Milwaukee Press Club - Behind the Headlines
Provided an update on the City of Waukesha water supply and the Application for Great Lakes water.

Tuesday, March 20, 2013
M7 Water Council Meeting
Panel discussion with Milwaukee Mayor Barrett regarding the Application for Great Lakes water.

Monday, February 18, 2013
Honadel - Stone Polish Community Center
Provided an update on the City of Waukesha water supply and the Application for Great Lakes Water.

Thursday, February 14, 2013
Golden K Meeting
Provided an update on the City of Waukesha water supply and the Application for Great Lakes Water.

Monday, February 4, 2013
City of Waukesha Rotary Club
Provided an update on the City of Waukesha water supply and the Application for Great Lakes Water.

Thursday, January 17, 2013
Waukesha Water Commission
Agenda Item #7 – Approve New Federal Funding Assistance Contracts – Approve a contract with Donald F. Roecker for time and expenses. Agenda Item #8 – Approve New Water Supply Contract – Approve a 12-month contract extension with Martin Schreiber and Associates for 2013. Agenda Item #12 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Wednesday, January 9, 2013
American Society of Mechanical Engineers
Provided a presentation on the City of Waukesha water supply and the Application for Great Lakes Water.

Thursday, January 3, 2013
Greater Milwaukee Area Sports Fisherman Groups
Provided a presentation on the City of Waukesha water supply and the Application for Great Lakes Water and the return flow of water to the root river discussing the potential impacts and answering questions related to the return of water.

Friday, December 21, 2012
City of Waukesha Southside Business Council
Provided an update on the City of Waukesha water supply and the Application for Great Lakes Water.

Thursday, December 20, 2012
Waukesha Water Commission
Agenda Item #13 – Motion to go into closed session pursuant to Sec. 19.85 (1)(e), Wisconsin Statutes, discuss the acquisition of real estate related to the Application for Great Lakes Water.
Agenda Item #14 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, November 29, 2012
Waukesha Water Commission
Agenda Item #8 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Wednesday, November 14, 2012
American Water Summit, Chicago, IL
Provided a presentation on the City of Waukesha water supply and the Application for Great Lakes Water.

Thursday, October 25, 2012
Waukesha Water Commission
Agenda Item #10 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Wednesday, October 17, 2012
Great Lakes Summit, Erie, PN
Provided a presentation on the City of Waukesha water supply and the Application for Great Lakes Water.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Tuesday, October 9, 2012
Milwaukee 7 Water Summit
Participated in a panel discussion on water conservation and the water supply for the City of Waukesha and its Application for Great Lakes Water.

Wednesday, October 3, 2012
UW Milwaukee Alumni Planning Department Presentation
Participated in a panel discussion on the water supply for the City of Waukesha and the Application for Great Lakes Water.

Tuesday, September 18, 2012
Waukesha Common Council and Waukesha Water Commission
Motion to go into closed session pursuant to Sec. 19.85 (1)(e), Wisconsin Statutes, discuss the Application for Great Lakes Water and Negotiations with Potential Water Suppliers.
Thursday, September 27, 2012
Waukesha Water Commission
<u>Agenda Item #10 -</u> Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, August 22, 2012
WWRS – TV Interview
Participated in an interview with WWRS – TV regarding the City of Waukesha water supply and the Application for Great Lakes Water.

Thursday, August 16, 2012
Town of Waukesha
Meet with Town of Waukesha officials to discuss the water supply service area.
Waukesha Water Commission
<u>Agenda Item #15 -</u> Motion to go into closed session pursuant to Sec. 19.85 (1)(e), Wisconsin Statutes, discuss the Application for Great Lakes Water and Negotiations with Potential Water Suppliers. <u>Agenda Item #17 -</u> Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, August 2, 2012
Community Meeting
Meet with Caledonia Officials to discuss the Root River and potential return flow.

Thursday, August 2, 2012
Community Meeting
Meet with Racine Officials to discuss the Root River Studies and potential return flow to the Root River.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Thursday, July 19, 2012
Waukesha Water Commission
Agenda Item #7 – Approve CH2M Hill Change Order – Move to approve the amendment with CH2M Hill for a time and expense contract. Agenda Item #9 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, June 21, 2012
Waukesha Water Commission
Agenda Item # 6 – Approve CH2M Hill Change Order – Move to approve the amendment with CH2M Hill for a time and expense contract. Agenda Item #7 – Approve Memorandum of Understanding with City of Waukesha to Secure Funds for Future Water Supply.
Agenda Item #11 – Motion to go into closed session to discuss the following: 11a – Pursuant to Sec. 19.85 (1)(e), Wisconsin Statutes, discuss the Application for the Great Lakes Water and Negotiations with Potential Water Suppliers. Agenda Item #12 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Wednesday, June 20, 2012
Community Meeting
City of Milwaukee – Public Works Committee 9:00-11:30am

Wednesday, June 6, 2012
Community Meeting
Caledonia Water Commission Presentation – Erie and 4 1/2

Thursday, May 17, 2012
Waukesha Water Commission
Agenda Item #10 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Tuesday, May 15, 2012
Community Meeting
Oak Creek Common Council Meeting 5:00-9:30pm

Thursday, April 19, 2012
Waukesha Water Commission
Agenda Item #9 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, April 12, 2012
Community Meeting
Meeting with Alderman Payne 6:00-8:30pm

Monday, April 2, 2012
Community Meeting
Alderman Ybarra Neighborhood Meeting 6:00-8:30pm

Thursday, March 29, 2012
Community Meeting
Meeting with Alderman White – Saratoga 6:30-8:30pm

Tuesday, March 27, 2012
Community Meeting
Meeting with Alderman Hernandez and Patton Neighborhood 6:00-9:00pm

Thursday, March 22, 2012
Community Meeting
Meeting with Alderman Francoeur 6:00-8:00pm.

Wednesday, March 21, 2012
Community Meeting
Meeting with Alderman Johnson at South High School 6:00-9:00pm

Monday, March 19, 2012
Community Meeting
Alderman Skinner Neighborhood Meeting 6:00-8:30pm

Thursday, March 15, 2012
Community Meeting
Meeting with Alderman Hastings 6:30-8:30pm

Thursday, March 13, 2012
Waukesha Water Commission
Agenda Item #10 – Approve Reinhart Boerner Professional Services Agreement – Move to approve a contract with the Reinhart Law Firm for a time and materials agreement.
Agenda Item #11 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, March 8, 2012
Community Meeting
Meeting with Alderman Pieper 6:00-7:30pm

Wednesday, March 7, 2012
Community Meeting
Meeting with Alderman Reiland 6:00-8:30pm

Thursday, March 1, 2012
Community Meeting
Alderman Cummings Neighborhood Meeting 6:00-9:00pm

Wednesday, February 29, 2012
Community Meeting
Meeting with Alderman Paulson 6:00-8:00pm

Thursday, February 16, 2012
Waukesha Water Commission
Agenda Item #11 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Wednesday, February 15, 2012
Community Meeting
Terry Thieme Community Meeting – 6:00-9:00pm

Thursday, January 19, 2012
Waukesha Water Commission
Agenda Item #8 – Approve New Water Supply Contract – Approve a 12-month contract extension with Martin Schreiber and Associates for 2012.
Agenda Item #9 – Approve New Federal Funding Assistance Contracts – Approve a contract with Donald F. Roecker for time and expenses.
Agenda Item #13 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, December 15, 2011
Waukesha Water Commission
Agenda Item #10 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, November 28, 2011
Waukesha Water Commission
Agenda Item #9- Approve CH2M Hill Contract Amendment
Agenda Item #12 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, October 20, 2011
Waukesha Water Commission
Agenda Item #6 – Approve Reinhart Boerner Professional Services Agreement
Agenda Item #9 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Wednesday, *September 28, 2011*
City of Milwaukee
Meeting with Milwaukee Board of Public Works 8:00-12:30pm

Thursday, September 15, 2011
Waukesha Water Commission
Agenda Item #11 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Thursday, August 18, 2011
Waukesha Water Commission
Agenda Item #7 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.
Agenda Item #8 – Review Great Lakes Application Financial Planning

Thursday, July 21, 2011
Waukesha Water Commission
Agenda Item #8 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, June 16, 2011
Waukesha Water Commission
Agenda Item #9 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, May 19, 2011
Waukesha Water Commission
Agenda Item #11 – Discuss/Recommend Water Negotiation Team.
Agenda Item #14 - Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Thursday, May 12, 2011
Town of Waukesha Board Meeting
Agenda Item #6 – Waukesha Water Utility – Agenda Item # 6a City of Waukesha Water Supply Area Plan Agenda Item #6b – Public Hearing – To invite public input on the request of City of Waukesha to the Town of Waukesha, to support expansion of the City water service area, to include the majority of the Town.

Thursday, April 21, 2011
Waukesha Water Commission
Agenda Item #4 – Approve Selection of Springsted as the Financial Advisor for our Future Water Supply.

Thursday, February 24, 2011
Waukesha Water Commission
Agenda Item #8 – Approve New Water Supply Development Contract – discuss and approve a contract with Martin Schreiber and Associates to move the application forward. Agenda Item #11 – Update on the Great Lakes Application – discussion on the status/progress of the Great Lakes Application.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Thursday, January 20, 2011
Waukesha Water Commission
Agenda Item #3 – Approve Reinhart Boerner Amendment – Approve amendment to contract with Reinhart Boerner Law Firm for 2011. Agenda Item #7 – Approve CH2M HILL Contract Amendment – Approve amendment with CH2M Hill for time and materials in working with WWU in response to the DNR. Agenda Item #17 – Review the History of Water Rates of Potential Water Suppliers – A "draft" of the Water Rate Comparison was presented for rate increases per year for Milwaukee, Oak Creek, Racine, and Waukesha, including PSC information as of July 2010 for current Wisconsin volume wholesale rates. Agenda Item #18 – Update on the Great Lakes Application - discussed the current status of the Great Lakes Application and communication with the DNR staff related to the WDNR December 2, 2010 letter.

Thursday, December 15, 2010
Waukesha Water Commission
Agenda Item #9 – Update on the Great Lakes Application – discussion on working with our consultants on the DNR response.

Thursday, November 18, 2010
Waukesha Water Commission
Agenda Item #7 - Approve 2011 Operating Budget, 2011 CIP, and 5-Year Financial Plan - discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Thursday, October 21, 2010
Waukesha Water Commission
Agenda Item #12 - Discuss 2011 Budget, Capital Improvement Plan, Operational Budget, and Financial Plan - discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Tuesday, September 21, 2010
Waukesha Water Commission
Agenda Item #7 - Discuss Capital Improvement Budget – discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Tuesday, July 27, 2010
Common Council/Waukesha Water Commission
Consideration and approval of Council communication with Department of Natural Resources regarding Great Lakes Water Application and technical report by CH2M Hill of water supply alternatives - After receiving public comment, the Common Council moved to approve a communication with the Department of Natural Resources regarding the Great Lakes Water application and technical report by CH2M Hill of water supply alternatives and authorize Common Council President Paul Ybarra to sign such letter.

Thursday, July 15, 2010
Waukesha Water Commission

Agenda Item #9 – Discuss Great Lakes Application Process – discussion regarding the recent communication between the mayor and the DNR and that it did not reflect the views and the direction provided by the water commission and the majority of the commission agrees with the policy/direction provided to staff which is the official position; common council concurrence/approval of that position; Cost estimate; Well permitting issues related to development of wells on the Lathers site; water rates and PSC regulations.

Thursday, June 24, 2010
Waukesha Water Commission
Agenda Item #3 - Approve/Ratify Future Water Supply Contracts – Discuss Great Lakes Application Process - discussion on the Reinhart law Firm contract for legal services and the work they were completing for the Utility related to the Great Lakes Water Application. There was also discussion on a change order to the CH2M Hill contract for work related to the Application for Great lakes Water. This included the areas of water supply alternative analysis, return flow analysis, environmental/habitat analysis and public education campaign.

Agenda Item #12 – Discuss Great Lakes Application Process - discussion on the process of the Great Lakes application including the topics: Alternative plans if the application is denied; recent correspondence between the mayor and DNR, the mayor and the general manager and the city attorney and mayor; the direction the utility commission provided to staff; and the application process between the Water Utility/City and DNR.

Thursday, May 20, 2010
Waukesha Water Commission
Agenda Item #3 - Ratify Boardman Law Firm Change Order – Agenda Item #15 - Discuss Water Supply Status Report - discussion on the status of the existing wells and water supply facilities and the need for a new water supply updating the status of the search. Agenda Item #16 - Discuss Great Lakes Application Process - discussion on the Boardman Law firm contract as it related to the application for Great Lakes Water and the compact compliance chapter in the application.

Thursday, April 8, 2010
Common Council/Waukesha Water Commission
Consideration and possible action on Great Lakes Water Application - After receiving public comment and a lengthy discussion which included all aspects of the Great lakes Application, the Common Council passed the motion to approve submission of the draft Great Lakes Water Application to the State of Wisconsin Department of Natural Resources, as provided under 2007 Act 227 of the Great Lakes Compact Implementation Law, subject to non-substantive or organizational changes, with the understanding that modification or additional information may also be required an anticipated part of the application process.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Thursday, March 22, 2010
Wauwatosa
Open House on the Great Lakes Application- Utility staff and consultants participated in an Open House on the Application for Great lakes Water at the Wauwatosa City Hall. All aspects of the application were presented at stations with staff present to answer any questions from the public and Wauwatosa residents in attendance.

Thursday, March 18, 2010
Waukesha Water Commission
Agenda Item #4 - Discuss/Approve Great Lakes Water Application - discussion on the background information on the Great Lakes Water Application and a recommendation to continue the application process to ensure this alternative is available for the City of Waukesha residents. Also discussed were the history of actions taken with the Water Commission, the timeline of dual alternatives – Plan B, the amount of water being requested and written comments regarding the application. Agenda Item #7 - Approve Change Order No. 2 to CH2M Hill Water Supply Contract - discussion on the contract with CH2M Hill and their work on and supporting of the Application for Great Lakes water.

Monday, March 8, 2010
Committee of the Whole/Waukesha Water Commission
Open House informational forum where consultants and staff will provide the public with information related to the Great Lakes Water Application. Meeting agenda (1) the update of the Draft Application for Great Lakes Water by the General Manager and the Utility Consultants; and (2) public comments and questions. An open house was held with stations on different components of the Application for Great Lakes Water followed by a presentation on the updated Draft Application for Great Lakes Water by the Water Utility General Manager and consultants followed by public comments and questions.

Thursday, February 25, 2010
Committee of the Whole/Waukesha Water Commission
Open House informational forum where consultants and staff will provide the public with information related to the Great Lakes Water Application - An open house was held with stations on different components of the Application for Great Lakes Water followed by a presentation on the updated Draft Application for Great Lakes Water by the Water Utility General Manager and consultants followed by public comments and questions.

Thursday, January 28, 2010
Committee of the Whole/Waukesha Water Commission
Agenda Item #1 - Presentation of the Draft Application for Great Lakes Water by the General Manager and Utility Consultants - The Waukesha Water Utility General Manager and the Utility Consultants provided a presentation on the Draft Application for Great Lakes Water. Public comments and questions were welcomed.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Thursday, January 21, 2010
Waukesha Water Commission
Agenda Item #5 - Approve Resolution #1-10 Well Protection Agreements Relating to the Development of City Wells on the Lathers - discussion and approval of a resolution related to well protection agreements for the properties impacted from well development on the Lathers parcel. Agenda Item #6 - Approve Future Water Supply Contracts - discussion and approval of contracts with CH2M Hill and with Martin Schreiber and Associates related to the development and support work associated with an Application for Great lakes Water.

Thursday, December 17, 2009
Waukesha Water Commission
Agenda Item #12 - Approve a Resolution to Develop Well Protection Agreements Relating to the Development of City Wells on the Lathers Property - discussion on the acquisition of the Lathers parcel as a redundant supply/alternative if the great lakes application was not approved and the development of well protection agreements for wells that were negatively impacted by the development of high capacity wells.

Thursday, November 19, 2009
Waukesha Water Commission
Agenda Item #5 - Approve 2010-2014 Five-Year Capital Improvement Plan Agenda Item #7 - Approve 2010 Budget - Agenda Items #5 and #7 included discussion regarding the significant budget items which included the Great Lakes application and associated projects. Agenda Item #11 - Approve First Change Order to CH2M Hill Contract - discussion on the CH2M Hill contract and their work on the application for Great Lakes Water.

Thursday, October 15, 2009
Waukesha Water Commission
Agenda Item #14 - Discussion 2009-2013 Five-Year Capital Improvement Plan Agenda Item #15 - Discuss 2009 Budget – Agenda Items #14 and 15 included discussion regarding the significant budget items, which included the Great Lakes application and associated projects.

Monday, October 12, 2009
Committee of the Whole/Waukesha Water Commission
Presentation of the Preliminary Draft of the Great Lakes Application - The Waukesha Water Utility General Manager and the Utility Consultants provided a presentation on the Draft Application for Great Lakes Water. Public comments and questions were welcomed.

Thursday, September 17, 2009
Waukesha Water Commission
Agenda Item #9 - Discuss/Approve Procedural Requirements for Water Supply Plans - discussion of the water supply plan that was required to be provided as part of the application for Great Lakes Water. It also included a discussion on population projections, demand projections and service area. Agenda Item #10 - Discuss 5-Year Capital Improvement Plan - discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Thursday, May 21, 2009
Waukesha Water Commission
Agenda Item #6 - Approve Resolution to Join the Southeastern Wisconsin Watersheds Trust (SWWT) - discussion on the SWWT and joining the trust. This relates specifically to Great Lakes water and return flow options involving the Underwood Creek and the Menomonee River. Agenda Item #10 - Approve Utility Membership to the Milwaukee 7 Water Council - discussion about joining the M7 Water Council. This relates specifically to the City of Waukesha's application for Great Lakes water.

Thursday, April 16, 2009
Waukesha Water Commission
Agenda Item #11 - Discuss Water Supply Status Report - discussion on the status of the existing wells and water supply facilities and the need for a new water supply updating the status of the search.

Thursday, March 24, 2009
Waukesha Water Commission
Agenda Item #9 - Approve Water Modeling Agreement with MMSD - discussion regarding the water modeling required for the return flow of wastewater to Underwood Creek and this study being completed to address the water quality related concerns. Agenda Item #13 - Discuss Stipulated Order and Operation and Monitoring Plan - general discussion by the commission that reviewed the terms and requirements of the Stipulated Order entered into with the Department of Justice as a result of the radium compliance issue and how the development of a new water supply and the Great Lakes water application fit into this plan.

Tuesday, March 3, 2009
Common Council
Agenda Item #VI. A. A motion will be made to go into closed session pursuant to Section 19.85(1)(g) Wis. Stats to discuss with legal counsel possible settlement with the Department of Natural Resources related to radium. - This item included a discussion of the details of the Consent order with the Common Council. Once they returned to open session they made a motion to enter into the agreement with the Department of Justice and also discussed the settlement as it was" in the best interest of the citizens of Waukesha."

Thursday, February 19, 2009
Waukesha Water Commission
Agenda Item #13 - Review and Approve Waukesha Water Utility Statement on the SEWRPC Water Supply Study - discussion regarding the SEWRPC regional water plan and the comments that would be made with regards to the plan recommendations by the water commission. The commission also reviewed a proposed letter to be sent to SEWRPC supporting the plan. Agenda Item #14 **-** Approve Reinhart Boerner Professional Services Agreement - discussion on the history with Reinhart Boerner and the Professional Services provided by the firm including the services related to the development of a new water supply.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Thursday, January 15, 2009
Waukesha Water Commission
Agenda Item #9 - Approve New Water Supply Development Contracts - discussion regarding the new water supply contracts with Martin Schreiber and Associates and GeoSyntec. The discussion included the topics of the Great Lakes Application, Public Outreach, the Conservation Plan, Educating the political area/region and advocation of the Waukesha position.

Thursday, November 20, 2008
Waukesha Water Commission
Agenda Item #7 - Approve 2009 Budget Agenda Item #8 - Approve 2009-2013 Five-Year Capital Improvement Plan –
Agenda Items 7 and 8 - discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Thursday, October 16, 2008
Waukesha Water Commission
Agenda Item #7 **-** Approve Change Order #1 to GeoSyntec Consultants Contract - discussion of Geosyntec's contract and their role with the Great Lakes application. Agenda Item #9 **-** Discussion 2009-2013 Five-Year Capital Improvement Plan Agenda Item #11 - Discuss 2009 Budget – Agenda Items 9 and 11- discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Thursday, September 25, 2008
Waukesha Water Commission
Agenda Item #12 - Update on ProCorp Pilot Project discussion on a pilot project for radium removal at one of our non-compliant radium wells as well as a discussion on where this potential technology could be utilized. Agenda Item #13 **-** Discuss 2009-2013 Five-Year Capital Improvement Plan. Agenda Item #15 - Discuss 2009 Budget – Agenda Items #13 and #15 - discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Thursday, August 21, 2008
Waukesha Water Commission
Agenda Item #13 - Discuss 5-Year CIP - discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Thursday, May 22, 2008
Waukesha Water Commission
Agenda Item #11 - Discuss Great Lakes Compact - discussion on the Great Lakes Compact legislation and the implementation legislation and how it affected the potential Great Lakes application from the City of Waukesha.

Tuesday, April 17, 2008
Waukesha Water Commission
Agenda Item #12 - Discuss Water Supply Status Report - discussion on the status of the existing wells and water supply facilities and the need for a new water supply updating the status of the search.

Thursday, March 20, 2008
Waukesha Water Commission
Agenda Item #13 - Approve Reinhart Boerner Van Deuren s.c. Legal Agreement - discussion on the history with Reinhart Boerner and the Professional Services provided by the firm including the services related to the development of a new water supply.

Thursday, January 17, 2008
Waukesha Water Commission
Agenda Item #13 **-** Approve Professional Services Agreement for Radium Compliance Engineering Services - held pending a discussion with the DNR. Agenda Item #18 **- A**pprove New Water Supply Development Contracts - discussion regarding the new water supply contracts with Martin Schreiber and Associates and GeoSyntec. The discussion included the topics of the Great Lakes Application, Public Outreach, the Conservation Plan, Educating the political area/region, advocation of the Waukesha position, legislation to be introduced regarding the Great Lakes Compact and the return flow of wastewater to the Great Lakes basin.

Tuesday, January 13, 2008
Committee of the Whole/Waukesha Water Commission ***NO MINUTES***
Agenda Item #2 - Presentation by Peter Annin Author of Great Lakes Water Wars - Agenda Item #3 - Presentation by the Department of Natural Resources on the process for a Great Lakes water application. - discussion on the history of the Great Lakes and diversion applications as well as the impending Great Lakes Compact legislation. Agenda Item #3 - included a presentation by the DNR regarding the process that would be followed if the City of Waukesha applied for Great Lakes water. After both of these items, the common council, the water commission and the public were invited to as questions related to the subject matter.

Wednesday, November 14, 2007
Waukesha Water Commission
Agenda Item #5 CLOSED SESSION - PURSUANT TO SEC. 19.85(1)(e) and (g), WISCONSIN STATUTES, TO DISCUSS STRATEGY RELATIVE TO OUR LONG TERM WATER OPTIONS, AS WELL AS RADIUM COMPLIANCE, WITH LEGAL COUNSEL - no action taken. Agenda Item #6 **-** Approve 2008-2012 Five-Year Capital Improvement Plan Agenda Item #8 - Approve 2008 Budget – Agenda Items #6 and #8 included discussion regarding the significant budget items which included the Great Lakes application and associated projects. Agenda Item #11 - Approve Change Order #1 to Geosyntec Consultants Contract **-** discussion of Geosyntec's contract and their role with the Great Lakes application.

Wednesday, October 17, 2007
Waukesha Water Commission
Agenda Item #15 **-** Discuss 2008-2012 Five-Year Capital Improvement Plan - Agenda Item #17 **-** Discuss 2008 Budget – Agenda Items #15 and #17 included discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Thursday, September 20, 2007
Waukesha Water Commission
Agenda Item #12 - Discuss Five-Year Capital Improvement Plan and Five-Year Financial Plan – discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Wednesday, August 15, 2007
Waukesha Water Commission
Agenda Item #11 - Discuss 2008-2012 Capital Improvement Plan - discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Thursday, June 21, 2007
Waukesha Water Commission
Agenda Item #10 - Discuss Water Supply Status Report - discussion on the status of the existing wells and water supply facilities and the need for a new water supply updating the status of the search.

Thursday, April 19, 2007
Waukesha Water Commission
Agenda Item #15 - Approve Reinhart Boerner Professional Services Agreement - discussion on the history with Reinhart Boerner and the Professional Services provided by the firm including the services related to the development of a new water supply.

Thursday, January 18, 2007
Waukesha Water Commission
Agenda Item #7 - Approve New Water Supply Development Contracts **-** discussion regarding the new water supply contracts with Martin Schreiber and Associates and GeoSyntec. The discussion included the topics of the Great Lakes Application, Public Outreach, Development of the Conservation Plan, access to the Legislators and assistance with Lobbying and Public Relations.

Thursday, December 14, 2006
Waukesha Water Commission
Agenda Item #5 - Approve 2007-2011 5-Year Capital Improvement Plan Agenda Item #**7** **-** Approve 2007 Budget Agenda Item – Agenda Items #5 and #7 - discussion regarding the significant budget items which included the Great Lakes application and associated projects.
Agenda Item #10 - Approve Right of Entry Agreement with Fiduciary Real Estate Development, Inc. - discussion regarding access to the Lathers parcel for geophysical testing on the Lathers site to determine the potential for new shallow wells.

Waukesha Water Utility
Summary of Public Meetings for a Future Water Source

Friday, November 17, 2006
Waukesha Water Commission
Agenda Item #10 **-** Approve Legal Services Agreement with Reinhart, Boerner, Van Deuren, Norris and Rieselbach, SC - discussion on the history with Reinhart Boerner and the Professional Services provided by the firm related to the development of a new water supply. Agenda Item #14 **-** Approve 2007-2011 5-Year Capital Improvement Plan Agenda Item #16 **-** Approve 2007 Budget – Agenda Items #14 and #16 included discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Friday, November 17, 2006
Waukesha Water Commission
Agenda Item #21 - Discuss Water Utility Information/Public Communication - discussion regarding communication with the public regarding the radium compliance issue, water conservation and the future water supply information. The discussion included the availability of water commissioners to the public, use of the city web site to disseminate information and the efficient use of bill stuffers and mailings to inform the public.

Thursday, November 9, 2006
Common Council
Agenda Item #VI. A. - Presentation by the Water Utility regarding the history of Future Water Supply Options - This item included a presentation by the water utility general manager talking about the future water supply study and how it ties to radium compliance and the development of a new water supply for the city.

Friday, October 20, 2006
Waukesha Water Commission
Agenda Item #3 - Approve Offer to Purchase for the Engler Well Site **-** discussion regarding the purchase of the Engler site to develop a new shallow well no. 13. Agenda Item #8 **-** Approve Southeastern Wisconsin Regional Planning Commission (SEWRPC) Agreement for Modeling the Troy Bedrock Valley - discussion of and agreement with SEWRPC and several other communities to develop a model to predict the impacts of installing shallow wells within the Troy Bedrock Valley. Agenda Item #10 - Discuss 2007-2011 5-Year Capital Improvement Plan Agenda Item #12 **-** Discuss 2007 Budget - Agenda Items #10 and #12 included discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Friday, September 15, 2006
Waukesha Water Commission
Agenda Item #6 **-** Discuss 5-Year Capital Improvement Plan and 5-Year Financial Plan - discussion regarding the significant budget items which included the Great Lakes application and associated projects.

Friday, August 25, 2006
Waukesha Water Commission
Agenda Item #12 **-** 2007-2011 Capital Improvement Plan **-** discussion regarding the significant budget items which included the Great Lakes application and associated projects. Agenda Item

#14 **-** Discuss Appointment to the Legislative Council on the Great Lakes Water Resources Compact **-** discussion regarding the general manager's appointment to the Legislative Council on the Great Lakes Water Resources Compact, the goals of that committee and how it was directly related to the potential application for Great Lakes water.

Friday, July 21, 2006
Waukesha Water Commission
Agenda Item #11 - Discuss Radium Compliance Strategy - discussion regarding development of a radium compliance strategy. This discussion included the following topics: the potential Lathers annexation; well no. 10 radium removal project; long term water supply development; Water Resources Development Act (WRDA) and the Great Lakes Compact; environmental issue associated with the development of a new water supply; return flow component related to a great lakes supply; and funding efforts.

Tuesday, May 16, 2006
Waukesha Water Commission
Agenda Item #10 - Approve Contract Amendment with Godfrey and Kahn, S.C. - discussion of a legal contract with Godfrey and Kahn for review of the current laws regarding the use of Great Lakes water as a water source.

Thursday, April 13, 2006
Waukesha Water Commission
Agenda Item #10 - Discuss Water Supply Status Report - discussion regarding the status of the existing wells, water supply facilities and the need for a new water supply updating the status of the search.

Thursday, March 16, 2006
Waukesha Water Commission
Agenda Item #14 - Ratify Godfrey and Kahn Change Order No. 1 - discussion of a legal contract with Godfrey and Kahn for review of the current laws regarding the use of Great Lakes water as a water source.

Thursday, February 16, 2006
Waukesha Water Commission
Agenda Item #15 - Approve Legal Services Contract - discussion of a legal contract with Godfrey and Kahn for review of the current laws regarding the use of Great Lakes water as a water source.

Town of Waukesha

Questions and Answers

Q1	As of today, does the city Public Service Commission have only one rate for its customers or more based on type of service, i.e. residents, businesses or commercial users.
A1	The Wisconsin Public Service Commission reviews and approves the rates for the Waukesha Water Utility and currently we have 2 different rate schedules. The first rate structure is for residential class customers and the second one is for Commercial, Industrial and Public Customers.
Q2	If we approve the service area to include the **Town of Waukesha** and you do acquire Lake Michigan water, and **<u>if</u>** you get the "green light" for shallow wells on the former Lathers property, please address the following. Will the city utility combine water from these shallow wells with Lake Michigan water. True or False?
A2	If we are successful in obtaining Lake Michigan water, shallow wells will be used for back-up water supply in the event of a problem with the Great Lakes water system.
Q3	If True, what other locations of shallow wells within the **Town or City** are being proposed or re-purposed for additional return volume?
A3	There are no wells being considered to allow the City to create additional return flow volume. This has not ever been the case or the purpose of developing shallow wells.
Q4	What locations of shallow wells within the **Town or City** will be used for other purposes and what are those purposes.
A4	I am not aware of any wells being proposed for purposes other than a municipal water supply.
Q5	Who decided to include portions of the **Town of Waukesha** in the proposed ***"Water Service Area"***, and why. Please address the drawing/map that depicts which portions of the **Town of Waukesha** are included in the proposed ***"Water Service Area"*** (and which portions are not). Explain, in detail, who decided which portions to **<u>include</u>**, and why. Explain, in detail, who decided which portions to **<u>exclude</u>**, and why.
A5	Under state law, the service area boundaries were developed by the regional planning authority, SEWRPC, which determined which lands were included and excluded. If the Town would like to add additional lands or exclude additional lands, that request would be made through SEWRPC.
Q6	Please provide a conceptual drawing/map that depicts the route(s) by which the water would be conveyed from **Lake Michigan** to the proposed ***"Water Service Area"***, and the route(s) by which it would be returned to the **Great Lakes Drainage Basin**. Will any of the proposed routes pass through the **Town of Waukesha**?

A6	The preliminary layouts of the facilities and pipelines associated with a Lake Michigan supply are in Appendix N of the Application for Lake Michigan Water which can be downloaded from the City's website. The Lake Michigan supply pipeline, regardless of supplier, ends at the City of Waukesha Hillcrest Reservoir on the east side of the City. The attached maps show the preliminary routes and where they pass through the Town of Waukesha. The preliminary pipeline alignments shown were prepared for the purpose of evaluating water supply alternatives. They were selected to maximize use of existing rights-of-way and established utility corridors and to minimize environmental impacts. The preliminary pipeline alignments are not the result of a complete pipeline routing study which will be completed in the future.
Q7	Address the above question for all potential **Lake Michigan** water utility providers and identify them and the routes individually.
A7	See above response A6.
Q8	If the **Town of Waukesha** would agree to receive **Lake Michigan** water and potentially sewer from the City of Waukesha water utility, how would the water utility produce equal water pressures throughout the Town, especially our remote areas in order to supply water?
A8	We have not completed any detailed studies that would determine how the water would be distributed to the Town of Waukesha residents; however, the City's 2006 Water System Master Plan included some portions of the Town and it was determined that a new booster station and elevated storage tank would be necessary to reliably serve the area. Payment for any improvements would be based on the type of service the Town of Waukesha requested: either retail service or wholesale service. Under a retail service agreement, the City would be responsible for the improvements and to pump, store and distribute the water. Under a wholesale agreement, the Town of Waukesha would be responsible to pump, store and distribute the water. Under either scenario, the improvements would be funded through the rates established by the Wisconsin Public Service Commission.
Q9	Please provide detailed data including assumptions made to produce the data related to anticipated usage. Please breakdown this information by current area and Town of Waukesha expansion area by: type of development, population, and any other criteria utilized to develop the model of usage requirements.
A9	The water demand forecasts for the water supply service area, including the Town, were developed by licensed professional engineers using drinking water utility industry standards. The future water demand forecasts were based on the Regional and State population projections for the Town, Regional and County future land use plans, and the water use intensity factors in the City of Waukesha's water system master plan. Water use intensity factors are accepted measures used to estimate water use in terms of "how many gallons each person uses per day". The City evaluated a range of water use intensity factors and based its long-range water supply plan on the mid-point of the range. This same approach was applied to the Town portion of the water supply service area. The table below illustrated the calculation for the Town. Additional details of the water demand forecasts are provided in Appendix K of the application.

A9

Town of Waukesha					
Estimated Population					
2050	9,897				
	City Water Use Intensity				Town Water
	Lower Band	Upper Band	Mid-Point		Demand forecast
	(gpcd)	(gpcd)	(gpcd)		(mgd)
Residential	45	50	47.5		0.470
Commercial	35	39	37		0.366
Public	5	6	5.5		0.004
Industrial	5% over planning period				0.040
Metered Sales					0.880
UFW	6% Unaccounted-for water (leaks)				0.053
			Town total		0.933

Q10	Assume that the approval to obtain water from **Lake Michigan** is ultimately approved, and further assume that the **Town of Waukesha** requests water. Provide a conceptual drawing/map to depict the infrastructure system (water mains, reservoirs and/or water towers, pumping stations, etc.) that would need to be constructed to deliver the water to the **Town of Waukesha**. Explain and/or depict how this infrastructure system for the **Town of Waukesha** would interface with the infrastructure system that is now in place. Please provide preliminary cost estimates for this infrastructure system, and identity who would be responsible for the costs.
A10	The planning, siting and engineering work associated with this new infrastructure would be completed if/when the Town requested water service and the type of request that was made, wholesale or retail.
Q11	We understand that there may be a requirement to ***"return"*** most of the water that is obtained from **Lake Michigan** to the **Great Lakes Drainage Basin**. Please confirm that this understanding is correct, and explain this requirement in some detail. If this is true, how would the water that is provided to the **Town of Waukesha** be ***"returned"*** to the **Great Lakes Drainage Basin**? Would every ***"customer"*** who is connected to the water supply system also need to be connected to a sanitary sewer system? If the answer to the last question is *"yes"*, explain and/or depict how the sanitary sewer system for the **Town of Waukesha** would interface with the existing sanitary sewer system that is now in place. Please provide preliminary cost estimates for this sanitary sewer system, and identity who would be responsible for the costs.
A11	Yes, there is a requirement to return the water less an allowance for consumptive use. If the City were to obtain approval for Great Lakes water and if the Town were to request service, the properties served would also need to meet this requirement. The portions of the Water Service Area that are in the Town of Waukesha are also included within the City of Waukesha Sanitary Sewer Service Area. Both of these service areas were delineated by SEWRPC. No cost estimates for sanitary sewer service have been developed at this time. Cost

	responsibilities for construction of new infrastructure depend on the type of service requested by the Town.
Q12	Are you more likely to receive approval of your application to obtain water from **Lake Michigan** because you have included portions of the **Town of Waukesha** in the proposed ***"Water Service Area"***? If the answer to this question is *"yes"*, please explain why.
A12	No.
Q13	If the **Town of Waukesha** chooses to remain in the expanded ***"Water Service Area"*** (as you have proposed in your application), and assuming that your application is ultimately approved, please provide some specific information about the composition, authority, etc. of the ***"governing body"*** for the expanded ***"Water Service Area"***. Will the **Town of Waukesha** have a ***"seat at the table"***?
A13	At this time there is no specific information about a governing body. This would be determined in future discussions with the Town, if the Town was ever to consider requesting water service. The present approval of the City water supply service area plan by the Town is only requested in order to provide the Town with an option for City water services in the future if the Town so chooses. Without this option, the Town will not have access to Lake Michigan water from the City, if the City's application is successful.
Q14	If you are not successful in obtaining Lake Michigan water what other options have you identified? What would be the costs of these options? How would they impact potential water service to the **Town of Waukesha?**
A14	The City has evaluated several water supply options. If the application is unsuccessful, the City will pursue options that include groundwater from shallow wells locate on land currently in the Town of Waukesha. Compared to Lake Michigan, the other options are not as cost effective, not as protective of public health and not as protective of the environment. The alternative costs are listed in the following table:

A14

EXHIBIT WS 10-12
Water Supply Alternative Cost Estimates

Water Supply Alternative	Capital Cost[a] ($ million)	Annual Operation/Maintenance Cost ($ million)	20 yr. Present Worth Cost ($ million, 6%)	50 yr. Present W Cost ($ million,
Deep and shallow aquifers	189	7.2	272	302
Shallow aquifer and Fox River alluvium	184	7.4	269	301
Unconfined Deep Aquifer	228	6.6	304	332
Lake Michigan and Shallow Aquifer	238	7.5	324	356
Lake Michigan with return flow to Underwood creek	164	6.2	235	262
Deep, shallow aquifers, Fox River, quarries, Silurian dolomite	319	7.9	410	444

[a]Includes direct construction cost, contractor administrative costs (insurance, bonds, supervision etc), 25% contingency, and costs for permitting, legal, engineering, administrative.

Q15 The **Water Utility** has indicated that annexation is not required or needed for access to City water, how would you intend to memorialize that representation?

A15 If water service is requested by the Town, specific service plans and actions would be worked out by the Town and City officials on a case by case basis; one option may be a Memorandum of Understanding or a letter from the City Council.

OFFICE OF THE CITY ADMINISTRATOR Steve Crandell
201 DELAFIELD STREET scrandell@ci.waukesha.wi.us
WAUKESHA, WISCONSIN 53188-3633
TELEPHONE 262/524-3701 FAX 262/524-3899

March 27, 2012

Honorable Tom Barrett
Mayor of Milwaukee
City Hall Room 201
200 E. Wells Street
Milwaukee WI 53202

Honorable Allan Foeckler
Mayor of Oak Creek
8640 S. Howell Ave.
PO Box 27
Oak Creek WI 53154

Honorable John Dickert
Mayor of Racine
City Hall Room 303
730 Washington Avenue
Racine WI 53403

Dear Mayors Barrett, Foeckler and Dickert:

Thank you for your letter with questions regarding the City of Waukesha's Application for Lake Michigan Water. As the designated spokesperson on water supply negotiations for the Waukesha Common Council, I appreciate the opportunity to provide the attached response on behalf of Waukesha.

Most of the information your letter seeks can be found in our May 2010 Application and supplementary materials. Such information has been available in publicly accessible drafts of the Application for more than two years, as well as in the City's response to review comments from the Wisconsin Department of Natural Resources (WDNR). Application documents and other information are available at the Waukesha Water Utility website http://www.ci.waukesha.wi.us/982.

Considering that detailed and productive supplier discussions have been ongoing with Oak Creek and Racine for months, we were somewhat surprised by the statement in the letter that it is "early in the process as we prepare for discussion over the possibility of selling water to the City of Waukesha." We have been pleased with the substantial progress that has been made in crafting options to make these communities more cost-effective alternatives. We look forward to continuing and intensifying those negotiations with Oak Creek and Racine.

In the case of a water supply from the City of Milwaukee, the Milwaukee Common Council passed legislation in October 2011 requesting information from the City of Waukesha and directing several reports to be prepared by various internal Milwaukee departments before the start of negotiations. Waukesha provided its information in December, and we understand that the only thing keeping the Milwaukee Common Council from authorizing the start of negotiations is the completion of those internal Milwaukee reports. We hope the information will be provided to the Council shortly and that Milwaukee will soon participate in the negotiating process.

As you know, the WDNR has indicated that an agreement in principal with a water supplier must be in place before the Application for Great Lakes water is submitted to the other Great Lakes states for review and approval. We expect that submission to occur this summer. It is critical that negotiations continue with interested suppliers to keep that process on track and to meet our court-ordered deadline for a radium-compliant water supply. Because we understand that each of your communities will need to go through your own due diligence and approvals, we are prepared to meet with officials in your cities immediately to provide information, make public presentations or to discuss any related issues.

We appreciate the importance of the impacts of our water use on the environment. That's why the citizens of Waukesha have undertaken the most aggressive water conservation program in the state. We are committed to increasing those efforts. Current measures include conservation rates (charging customers higher rates for higher use), a daytime ban on sprinkling, toilet rebate programs and public education programs. However, our current water supply is unsustainable, largely due to a layer of rock in our area that restricts water recharge to the deep aquifer. Years of scientific research have led to one single, unanimous conclusion: Waukesha needs to develop a new water supply. Great Lakes water is the most environmentally sustainable solution for the long term because we will return the water back to the Lake after use.

The City of Milwaukee was an active negotiator and supporter of the Wisconsin's Great Lakes Compact implementation law (2007 Act 227) that governs our request. That law created the new requirement to develop water supply plans. Under the law, the boundaries of our water supply service area are developed by the Southeastern Wisconsin Regional Planning Commission (SEWRPC), not by the City, and must be approved by the WDNR. Reflecting sound planning, the boundaries are generally consistent with wastewater service area boundaries.

Only 15% of the service area would be available for development, putting to rest any fears about a new water supplier fueling new, uncontrolled growth. (Please see a map of the planned service area at http://www.ci.waukesha.wi.us/c/document_library/get_file?folderId=42481&name=DLFE-7500.pdf). The remainder of the service area is either already developed or is environmentally protected and will not be developed. For the most part, any new water service beyond Waukesha's current service area will serve areas that are already developed but are using private wells for water supply. Under the Waukesha County 2035 recommended land use plan, only 1.2% of the water supply service area outside of the City is planned for industrial land use and 0.9%, for commercial land use.

Under the Compact implementation law, Waukesha's water supply plan must be able to accommodate population growth, along with the potential for existing well owners to switch to municipal water. Annual population growth in the service area is predicted to be modest, 0.52% between 2010 and build-out in approximately 2050.

In the media coverage following the sending of your letter, there were concerns raised that providing water to Waukesha would harm the economies of your cities. It's important for us to make clear that our City also believes in regional cooperation. To that end, the City of Waukesha is operating under the Milwaukee 7 Code of Ethics, which recognizes the importance of partnerships and cooperation in the seven counties of southeastern Wisconsin. The Code includes non-poaching agreements, such as not soliciting intra-region company relocations and not soliciting a fellow member's out-of-region prospects.

Our need for a water supply is not about growth or gaining a competitive advantage. Our need for a new water supply is about protecting public health and choosing the water supply that is most environmentally protective of the waters of the state – both groundwater and surface water. Withdrawing and then recycling water back to the Great Lakes after use – instead of pumping unreliable supplies of groundwater resources from one of the state's two groundwater management areas – is the logical and sustainable policy choice and our only reasonable water supply alternative.

We should point out that a water sale will actually provide an economic advantage to the selling community. Waukesha's water rates are expected to at least double in order to obtain a new water supply. However, rates in the water supplier's community will decline, providing an incentive for businesses to locate or expand there. In Racine, for instance, local officials have said a large customer like SC Johnson could save up to $1 million per year if Waukesha were added to the customer base. In addition, the water supply projects estimated construction cost of well over $100 million would create hundreds of jobs in construction for unemployed workers throughout the region at a time when those jobs are badly needed.

We firmly believe that negotiations between our communities will result in a win-win scenario for the ultimate supplier community and for Waukesha. The sale of water to Waukesha will mean a substantial increase in revenue for one of your water utilities and potentially lead to substantial reductions in rates for your industrial, commercial and residential customers. In addition, improvements that will need to be constructed in your communities will increase the PILOT (payments in lieu of taxes) paid by the water utility to the city general fund, directly reducing property taxes for your constituents. In a time of shrinking municipal budgets, this is an opportunity that any community official would be eager to pursue.

In the spirit of regional cooperation that led you to send a joint letter outlining your questions, we hope that you will support our efforts to finalize an agreement with a water supplier in the very near future. We look forward to responding to your questions and to negotiating a timely water supply agreement.

Sincerely,

Steve Crandell
Interim City Administrator

ATTACHMENT 1

Response to Questions

The response to questions raised by the mayors of the City of Milwaukee, the City of Oak Creek and the City of Racine in a letter dated March 7, 2012, are as follows:

1	Given our understanding that the overall water use by the current customer base of the Waukesha Water Utility (WWU) has been dropping over the past several years, what is the current average (mgd) being used in 2011 versus 2006? What is the City's estimated water use for its current service area in 2035 and 2050?

In 2006, the City's average day demand was 7.18 mgd; in 2011, 6.97 mgd. The factors apparently having the greatest impact on water use in recent years are the weak economy, the availability of water-efficient water fixtures and equipment, and the City's water conservation measures.

As required by 2007 Act 227 (Wisconsin's Great Lakes Compact implementation law), the water supply service area (WSSA) boundaries were developed by the Southeastern Wisconsin Regional Planning Commission (SEWRPC). The boundaries are generally consistent with wastewater sewer service area boundaries. Water demand projections were developed on the basis of ultimate projected population of the water supply service area (WSSA), regardless of whether the area served is located within or outside the current service area boundary. These projections are described in Appendix K to the Application that is available at the following link:

http://www.ci.waukesha.wi.us/web/guest/982

This same approach of considering the entire WSSA was used by SEWRPC in A Regional Water Supply Plan for Southeastern Wisconsin (SEWRPC, 2010) which is available at the following link: http://www.sewrpc.org/SEWRPCFiles/Publications/pr/pr-052-regional-water-supply-plan-vol1.pdf

The WSSA average day water demand forecast is approximately 10.2 mgd in 2035 and 10.9 mgd in 2050. The water demand forecasts were developed assuming that the City's water conservation program is continued and expanded in the future to meet its water savings goal of 1 mgd by 2050, or 10 percent of its projected demand.

In response to Application review comments from the WDNR, SEWRPC provided the WSSA ultimate projected population by civil division. Within the planned WSSA, approximately 80 percent of the ultimate projected population is located within the limits of the City of Waukesha.

Based on the best available land use planning information, the 2035 Waukesha County Recommended Land Use Plan, approximately 15 percent of the land within the planned WSSA is available for new development. A map of the planned WSSA is available at the following link: http://www.ci.waukesha.wi.us/web/guest/982

If water service is extended beyond the City's current service area boundary, it will primarily serve areas that are already developed today and using private wells for water supply. Within the City, the majority of development would be in-fill development or redevelopment of blighted areas. Annual population growth in the WSSA is projected to be 0.52% between 2010 and build-out (approximately 2050).

2007 Act 227 requires that Waukesha's water supply plan be based on amounts needed to accommodate the projected residential, commercial, industrial, and public authority water uses in the WSSA.

2	In recent years we understand that the City's water conservation efforts have resulted in reduction of water use, we would like to know how much water has been saved through these efforts by category of use (residential, commercial, industrial, public spaces) and if that impacts future estimated water use?

Water use and estimated water savings by customer class are published in Waukesha Water Utility Annual Reports to the Public Service Commission of Wisconsin (PSC) and in the Waukesha Water Utility Report on Water Conservation Programs to the PSC. Water savings from hardware measures (like toilet replacement incentives) and policy measures (like conservation rates and outdoor sprinkling restrictions) are reported. These documents are posted to the PSC's web site: http://psc.wi.gov/apps40/tariffs/viewfile.aspx?type=water&id=6240

The continuation of the City's water conservation program is built into its estimates of water use in the future. The water use intensity factors used in the projections assume the water conservation is expanded to meet the City's water savings goal of 1 mgd by 2050.

3	With respect to the expanded service area included in the City of Waukesha's diversion application submitted to the State of Wisconsin, it is our understanding that the application does not include specific information on current water use or water conservation measures in communities outside the WWU's current service area. Can the City of Waukesha provide us with this information for the proposed expanded service area? And, what steps will the City take to ensure that its water conservation measures will be implemented in those communities and households within the expanded service area?

Current water conservation programs vary among the communities with area located within the planned WSSA. Estimates of current water use in areas outside the City's current water service area were not prepared due to the fact that these properties are mainly on unmetered individual wells and septic systems.

Estimates of potential future water demands for all areas within the WSSA were prepared on the basis of current land use, Waukesha County 2035 recommended land use plan, and water use factors established for various land use categories. The recommended land use in the planned WSSA is shown below. In preparing the water demand forecasts, it was assumed that land use would follow the recommended land use plan, that environmental corridors and other sensitive areas would not be developed, and that residential water use intensity would be the same across the WSSA.

CITY OF WAUKESHA WATER SUPPLY SERVICE AREA 2035 RECOMMENDED LAND USE PLAN

LAND USE CATEGORY	CITY OF PEWAUKEE ACRES	CITY OF WAUKESHA ACRES	TOWN OF DELAFIELD ACRES	TOWN OF GENESEE ACRES	TOWN OF WAUKESHA ACRES	TOTAL ACRES
Commercial	0.00	1,008.83		26.65	116.95	1,152.43
Extractive		0.13				0.13
Governmental and institutional	14.95	1,046.37	43.07	2.34	165.88	1,272.61
High density residential		679.79			0.00	679.79
Highway Rights of Way	13.66	703.84	24.46	80.28	427.31	1,249.56
Industrial		1,786.60		39.62	158.92	1,985.14
Isolated Natural Resource Area	15.10	337.17	91.55	48.29	232.50	724.61
Isolated Natural Resource Water		6.90	15.53	0.25	2.21	24.89
Low density residential	272.92	458.22	28.67	420.50	4,172.22	5,352.54
Medium density residential	0.00	6,927.98			13.74	6,941.73
Mixed Use		1.10		31.68	146.19	178.96
Other agricultural or open lands	2.82	186.27		293.05	815.61	1,297.74
Primary Environmental Corridor	9.55	1,292.85	0.71	928.82	2,633.09	4,865.02
Primary Environmental Corridor Water	1.27	103.82		51.74	30.12	186.95
Recreational	17.76	678.30	12.13	0.04	495.72	1,203.95
Rural density residential		0.01	597.12	386.04	382.93	1,366.10
Secondary Environmental Corridor	29.25	178.15	106.87	3.15	13.46	330.88
Secondary Environmental Corridor Water		1.96				1.96
Suburban density I residential	133.36	21.71	42.96	71.56	46.62	316.21
Suburban density II residential		4.51	237.22	564.56	1,633.01	2,439.30
Surface water		12.65		0.11	3.06	15.81
Transportation, communication and utilities		620.09			7.28	627.37
Grand Total	**510.63**	**16,057.26**	**1,200.29**	**2,948.67**	**11,496.81**	**32,213.67**

Further, the estimates reflect the fact that all customers would be subject to the City's water conservation service rules. The water conservation measures implemented by the City apply to its customers, whether they are located within city limits or not. Water service rules prescribed by the PSC make City water customers subject to the City's conservation measures, including the water rate schedule, outdoor water use restrictions, and financial incentives to install water-saving toilets. The steps the City will take to ensure requirements are met will be to make compliance with the service rules a prerequisite condition of any water service agreement. Through its public education and outreach activities, the City will make available information, services and incentives to help all its customers use water efficiently.

4	Apparently the City of Waukesha is currently providing its citizens with water supplies that meet the state and federal safe drinking water standards for all or almost all of the year. If Waukesha does not obtain a diversion, and it maximizes its use of existing infrastructure and aggressive conservation measures, what combinations of water supply alternatives would it employ (e.g. additional shallow wells, new wells in the unconfined deep aquifer, additional treatment, etc.) to provide water to its current service area and what are the estimated costs for these alternatives? What are the additional estimated costs for providing water to an expanded service area?

Exceeding the radium standard was only one of the factors involved in the decision to develop a new water supply. The need to develop a new water supply is driven by a lack of long-term water quantity sustainability, declining water quality, and adverse environmental impacts. Regardless of the radium issue, the City of Waukesha would need to develop a new water source due to diminishing groundwater supplies and other contamination issues related to continued use of our current water source[1].

As a result, fourteen different water supply sources and combinations of sources were evaluated in various studies[2],[3],[4],[5]. After screening for feasibility, six water supply alternatives were evaluated in detail, including a Lake Michigan water supply. Five water supply alternatives had greater adverse environmental impacts, were less protective of public health, were not as sustainable long-term and were more costly than a Lake Michigan alternative. The shallow aquifer (Alternative 2 in the Application) had the next lowest cost with an estimated capital cost of $184 million and annual cost of $7.4 million versus a Lake Michigan water supply at $164 million capital cost and $6.2 million annual cost. However, this shallow aquifer alternative also had significantly more adverse environmental impacts, was less sustainable and less protective of public health than a Lake Michigan water supply. Details of the water supply alternatives and cost estimates are in the Application and supporting materials.

In the event the diversion request is not approved and it withstands the eventual legal challenges provided for in the Compact, Waukesha would be required to implement an alternative that is not as sustainable and not as protective of the environment or public health.

The water supply alternative cost estimates do not include the costs to distribute water to areas outside the City's current service area. These costs would be determined if and when a community or new customers request water service from the City.

---

[1] Reeves, H.W., 2010, Water Availability and Use Pilot—A multi-scale assessment in the U.S. Great Lakes Basin: U.S. Geological Survey Professional Paper 1778

[2] Future Water Supply Study. CH2M HILL and Ruekert & Meilke. 2002.

[3] SEWRPC. December 2010. A Regional Water Supply Plan for Southeastern Wisconsin.

[4] City of Waukesha. Application for Lake Michigan Water Supply (May 2010).

[5] City of Waukesha. Response to WDNR Questions: Regarding Letter to Waukesha Water Utility (December 2, 2010) on Application for Lake Michigan Water Supply (May 2010).

5	If Waukesha supplies additional water to an expanded service area as proposed in its diversion application, what additional amount of water is estimated to meet that demand for the users in this expanded area broken down by category of user (residential, commercial, industrial, public) in 2015, 2035 and 2050? What are the estimated costs for the new infrastructure to serve the expanded service area (construction, operation, maintenance costs) for 2015, 2035 and 2050?

The water demand projections broken down by customer class are presented for 2028, 2035 and Ultimate Buildout (estimated to occur around year 2050) in Appendix K to the Application that is available at the following link:

http://www.ci.waukesha.wi.us/web/guest/982

The water supply cost estimates do not include the costs to distribute water to areas outside the City's current service area. These costs would be determined if and when a community or new customers request the water service from the City.

Under the state's Compact implementation law, Waukesha's water supply plan must accommodate the forecasted water demand within service area boundaries that are determined by the regional planning commission.

6	It is our understanding that the City of Waukesha has a rate increase request pending before the Wisconsin Public Service Commission to implement improvements for its existing infrastructure to provide water for its current service area. Is this correct, and what are the estimated costs included in this request and the rate increase for the various categories of users (residential; commercial, industrial, public)? If the City of Waukesha receives approval of its diversion application to supply water to an expanded service area beyond its current service area, will it be seeking another rate increase from the State of Wisconsin for this infrastructure and its operation and maintenance? What communities will be included in paying for these costs and what will the estimated fees be for an average household?

The City of Waukesha Water Utility does have a rate case pending before the Wisconsin Public Service Commission (PSC). Information related to this rate case is available at http://psc.wi.gov/ under file 6240-WR-107. This rate increase is due to normal operational increases, as well as costs associated with the development of a new water supply. This increase is estimated to be 25% and will be distributed equitably among the customer classes as we move through the rate setting process. You are able to continue to monitor this process through the PSC website as mentioned above.

The City of Waukesha Water Utility has hired a financial consultant to develop a 10year financial plan to assist the utility with financial planning for this project. The plan projects a minimum of 5 years of 25% increases to fund the new water supply. As with all rate cases, the utility will take its direction from the PSC regarding future rate increases associated with the development of a new long-term water supply. As with water utility rate cases throughout the state, the PSC will review the request for rate increases and enforce the regulations so that water utility costs are fairly built into customers' rates.

It is too early in the process to determine the cost impacts related to service outside the current service area, however, the utility has stated that all costs associated with the extension of infrastructure to service the area will be borne by the customers requesting the service. All related rates would apply as determined by the PSC.

7	If the City of Waukesha receives approval for a diversion, will it be upgrading its wastewater treatment facilities to meet the higher state and federal water quality standards that apply for discharges to the waters of Lake Michigan and its tributaries? How much will the added improvement for treatment cost? If the City will also be treating an additional amount of wastewater for an <u>expanded service area,</u> how much more capacity and infrastructure will the City's waste water facility and conveyance system require and how much will the added capacity, operation and maintenance to serve the expanded area cost?

The City completed a 20-year wastewater treatment plant (WWTP) facility plan[6,7] to identify and evaluate improvements needed to provide service within its planned Sewer Service Area and to meet future receiving water quality standards, such as the revised phosphorus limits that will be phased-in for every community in Wisconsin over the next several years. This planning was completed in a manner consistent with a future Lake Michigan water supply, but the improvements needed to meet the City's objectives are the same, whether or not future WWTP discharge continues to the Fox River or is moved to Underwood Creek. The WWTP effluent limits for discharge to the Fox River or Underwood Creek will be very similar, as discussed in Section 5 of the May 2010 Application (see page 5-12 and Exhibit 5-7). The City's current WWTP effluent permit has some water quality limits that are <u>more restrictive</u> than several Lake Michigan <u>tributary</u> dischargers. These limits are also discussed in the Application (see Exhibit 5-7).

A return flow discharge to the Fox River, Underwood Creek, or Root River would also require <u>more strict</u> effluent limits than a discharge <u>directly</u> to Lake Michigan. For example, NR 217 phosphorus effluent limits for a Lake Michigan discharge would be 0.6 mg/l while discharge to the Fox River, Underwood Creek, or Root River would likely be 0.075 mg/L (this is equivalent to the water quality criterion for these rivers). In other words, the WWTP effluent limit is 8 times more stringent for a tributary river or stream discharge than for a discharge for the cities of Milwaukee, Oak Creek or Racine, whose discharge is directly to Lake Michigan.

Costs for the proposed WWTP improvements are summarized in the Facility Plan. The only WWTP improvement associated included with a Lake Michigan water supply is the return flow pump station and force main to the Lake Michigan basin. The capital and operation and maintenance costs for the return flow pump station and force main were included in Appendix M to the Application. Additional cost details were provided to the WDNR in April 2011[8] and are publicly available on the City's website (http://www.ci.waukesha.wi.us/982).

8	It is our understanding that detailed analysis and cost estimates have not yet been provided by the City of Waukesha for return flow alternatives discharging to Underwood Creek, Root River and Oak Creek. We would appreciate receiving the cost estimates for each. We would also appreciate receiving analyses of other alternatives and estimated costs for a separate pipeline from Waukesha directly to Lake Michigan and what the costs would be to hook up to MMSD? Has Waukesha estimated net savings that could be attributed by hooking up to the MMSD system and closing the Waukesha wastewater treatment plant?

[6] Strand Associates. May 2011. City of Waukesha Wastewater Treatment Plant Facility Plan. Available at: http://www.ci.waukesha.wi.us/publicworkswastewater.

[7] CH2M HILL. January 2012. City of Waukesha Facility Plan Amendment: Wastewater Treatment Plant Improvements for Returning Water Withdrawn from Lake Michigan. (Updated from April 2010 Facility Plan Amendment).

[8] City of Waukesha. Response to WDNR Questions: Regarding Letter to Waukesha Water Utility (December 2, 2010) on Application for Lake Michigan Water Supply (May 2010). See Attachment "WS Cost".

The City has completed extensive analysis, water quality modeling and cost estimating for return flow alternatives directly to Lake Michigan and tributary discharges to Underwood Creek and Root River. The capital and operation and maintenance costs for the return flow pump station and force main were included in Appendix M to the May 2010 Application and in supplemental information provided to the WDNR in April 2011, specifically in the Water Supply response section (http://www.ci.waukesha.wi.us/982).[9] The detailed analysis of the return flow pipelines, including a pipeline directly to Lake Michigan, was included in Section 5 of the May 2010 Application, in the Environmental Report (Appendix N of the May 2010 Application) and responses to questions RF5, RF17-22 from the April 2011 WDNR supplemental information.

With regards to return flow to the Milwaukee Metropolitan Sewerage District (MMSD), this option was evaluated by SEWRPC in the Regional Water Supply Plan[10] and again by the City as part of the May 2010 Application. As discussed in the Application, two subalternatives were evaluated for return flow to MMSD: (1) sanitary sewer flow treated at the City of Waukesha WWTP with return flow to MMSD; and (2) sanitary sewer and return flow conveyed to MMSD without treatment at the Waukesha WWTP. For either option, a pipeline alignment was selected to provide return flow while minimizing impacts to environmental resources and other land uses. The City would continue to operate its WWTP, even for subalternative #2 where the City would return untreated sanitary sewer flow to the MMSD. Continued City WWTP operation would occur to minimize out of basin water in return flow. To prevent returning more than 100 percent of the withdrawn water (i.e., prevent creating a diversion into Lake Michigan), discharge to the Fox River for the sanitary sewer volume in excess of the water withdrawal volume would continue. Intermittent operation of the City's WWTP would not be possible without significant modification of the existing processes.

In addition, for either subalternative #1 or #2, improvements to the MMSD collection system and treatment plants are likely required to maintain the same level of service MMSD member communities currently receive, especially during wet weather. The MMSD system is capacity-limited during wet weather, so any flow returned to MMSD would likely require additional conveyance and treatment capacity equivalent to the return flow.

This is consistent with the conclusions developed under SEWRPC's 2007 Regional Water Quality Management Plan Update that evaluated the City of South Milwaukee abandoning their existing wastewater treatment plant and connecting to MMSD. During that analysis, consideration was given to MMSD providing 6.0 mgd of wastewater treatment on an average annual basis, and 25 mgd on a peak flow basis for the South Milwaukee wastewater. (This is compared to Waukesha's current wastewater discharge, which is 13.0 mgd on an average annual basis and has been as high as 50 mgd during wet weather.) Given the location of the South Milwaukee plant relative to the MMSD South Shore plant, no significant conveyance costs were involved in SEWRPC's South Milwaukee evaluation. The connection of the City of South Milwaukee to the MMSD was estimated to have a capital cost of about $25.9 Million at that time.

Unlike South Milwaukee, connection of the City of Waukesha sewerage system to the MMSD system would require a pipeline connection to transfer the water to the wastewater treatment plant, along with the development of additional WWTP capacity significantly higher than those predicted for South Milwaukee.

[9] City of Waukesha. Response to WDNR Questions: Regarding Letter to Waukesha Water Utility (December 2, 2010) on Application for Lake Michigan Water Supply (May 2010). See Attachment "WS Cost".

[10] SEWRPC. December 2010. A Regional Water Supply Plan for Southeastern Wisconsin. Planning Report No. 52.

Using the costs developed for the South Milwaukee connection, and escalating those for the significantly higher flow rates and infrastructure requirements for a City of Waukesha return flow, SEWRPC's analysis in the Regional Water Supply Plan concluded that, for a City of Waukesha return flow to MMSD, "the costs involved would be well in excess of the cost of the return flow alternatives [discharge to Underwood Creek or Root River or direct to Lake Michigan] previously described"[11]. It would also eliminate any of the potential benefits that would be obtained through return of the water through a tributary.

9	As part of an earlier water supply alternatives study conducted by SEWRPC, it was recommended that the communities located east of the Sub-continental Divide that were still using groundwater from the deep aquifer should begin to transition to Lake Michigan water. The benefit of this would be to reduce the pumping from the deep aquifer and allow the aquifer to "recharge" or rebound. In addition, these communities would not have to go through the lengthy review process triggered by a Great Lakes diversion, and communities such as Waukesha, which are located west of the Sub-continental Divide, would benefit from a higher rebounding groundwater table. Given these benefits, has the City of Waukesha pursued negotiations with the communities east of the Divide who still draw their water from deep wells to assist them in a transition to Lake Michigan water? In the end, such a strategy could be far more environmentally sustainable for the region's water supplies and may prove to be far less costly for Waukesha.

The SEWRPC Regional Water Supply Plan[12] evaluated the alternative of the City of Waukesha staying on groundwater while other groundwater communities east of the sub-continental divide transitioned to Lake Michigan water. SEWRPC compared this alternative to the alternative in which the City of Waukesha is on Lake Michigan water along with the other communities. SEWRPC's conclusion was that a Lake Michigan supply for the City of Waukesha was more cost effective and more environmentally sustainable than a groundwater supply. Further, SEWRPC concluded that a Lake Michigan water supply for the City of Waukesha is also more environmentally sustainable for the regional groundwater and surface water resources. Other studies support these conclusions.

10	How does the City of Waukesha propose to "make up" the difference of the water lost to the Great Lakes basin after the return flow has been shut down, and waters are diverted to the Fox River? If the City plans to use inflow and infiltration into sanitary sewers, how does this comply with the Great Lakes Compact's requirement for minimizing any co-mingling of Mississippi River basin water with Great Lakes water?

As discussed on pages 5-1 through 5-4 in the Application, return flow "make-up" water is available because the City's WWTP receives more wastewater volume than water supply volume during parts of the year. While the City's sewer system is a closed system and does not contain any combined sewers, infiltration and inflow (I/I) does exist. Like many cities in Wisconsin, the City of Waukesha has been and will continue to invest in system improvements to reduce I/I. The fact that eliminating I/I is not practicable was recognized by the Great Lakes Compact and Wisconsin implementation statute by requiring "minimizing" the "out-of-basin" water in return flow. As discussed on pages 5-5 and 5-6 in the Application, the City is minimizing out-of-basin water through the return flow management plan, thereby minimizing out-of-basin water in return flow and complying with the requirements of the Compact and Wisconsin implementation statutes. Details on the return flow management plan are found in the Return Flow Section of the April 2011 DNR letter response (http://www.ci.waukesha.wi.us/web/guest/982) and Section 5 of the May 2010 Application.

[11] SEWRPC. 2010. *A Regional Water Supply Plan for Southeastern Wisconsin,* Chapter 9, Page 631. Planning Report No. 52.

[12] SEWRPC. 2010. *A Regional Water Supply Plan for Southeastern Wisconsin*

11	We are also interested in knowing whether you are planning to seek other communities interest in sharing costs of a pipeline as additional customers and any strategies or plans for rainwater flooding

The area to be served by a Lake Michigan diversion is limited to the planned City WSSA.

The return flow management plan discussed in the Application will prevent the return flow from causing any additional flooding in the downstream communities by operating in a manner that will limit the amount of water returned under rainwater flooding conditions.