

Water System Master Plan



Prepared for:



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EXECUTIVE SUMMARY

The City of Appleton is a community of approximately 73,000 persons located in East Central Wisconsin. The Appleton Water Utility provides water service to residences and businesses within the City of Appleton and wholesale water supply to Waverly and Grand Chute Sanitary Districts.

The City of Appleton water system consists of a surface water treatment plant (WTP), four elevated storage tanks, two ground level reservoirs, two booster pumping stations, and approximately 358 miles of transmission and distribution water mains. The water system is separated into three pressure zones to meet the service needs of the customers.

POPULATIONS

The 2005 City of Appleton population, according to the East Central Wisconsin Regional Planning Commission (ECWRPC), was approximately 73,000. For this study, it was assumed the total City of Appleton population served by the Utility by the year 2030 will be 82,196.

In addition, it is projected that the Grand Chute Sanitary District will increase in service population from approximately 20,000 to approximately 27,500 by the year 2030. The Waverly Sanitary District number of service connections is projected to increase from approximately 1,500 customers to approximately 3,300 by the year 2030. The Village of Sherwood, a potential wholesale customer of the City of Appleton, currently has approximately 2,200 customers and is projected to increase to approximately 5,000 customers by the year 2030. Figure ES-1 illustrates the projected service population for the City of Appleton Water Utility.

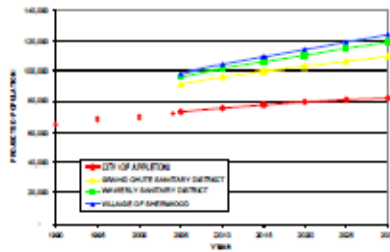


FIGURE ES-1: POPULATION PROJECTIONS

WATER REQUIREMENTS

Based on an analysis of land development and population growth in the City of Appleton and within current and potential wholesale customers, the projected 2030 average day water requirement is estimated to be approximately 12.63 million gallons per day (MGD), as illustrated in Figure ES-2. This represents an increase in water requirements of nearly 35 percent from the current average day water requirement of approximately 9.40 MGD.

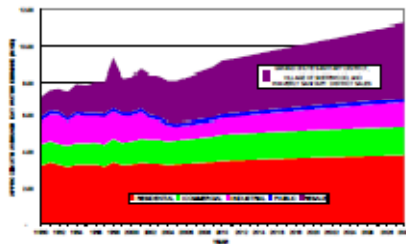


FIGURE ES-2: WATER DEMAND PROJECTIONS

WATER SYSTEM EVALUATION

The major findings from the existing water system evaluation include the following:

1. Under normal operating conditions, water system pressures experienced by City of Appleton customers vary from approximately 35 pounds per square inch (psi) to nearly 85 psi. Under peak hour demand conditions, a few isolated areas near the Main and Ridgeway Pressure Zones boundary experience pressures below 35 psi.
2. The majority of the water system has adequate fire flow availability. Many of the deficiencies are in commercial and industrial land use areas. Other deficiencies, as in many water systems, are the result of dead ends, small diameters, and significant aging in water main.
3. High headloss and velocities under peak hour demands occur at the interconnection of Kernan Avenue and Meadow Grove Boulevard. The key location with only high headloss is on Spencer Street just west of Linwood Avenue.
4. Under average day demand conditions, water age within the vast majority of the water system is below the desired age of five days. Water age exceeds eight days in the North Pressure Zone, north portion of the Ridgeway Pressure Zone, and the extremities of the system.
5. The City of Appleton can maintain water supply provided with auxiliary sources of power in the event of a power emergency or interruption. The City of Appleton has standby power on site at the WTP and the North Booster Station, and a transfer switch at the Lindbergh Booster Station for a portable generator.
6. There is reliable adequate booster pumping capacity in the Ridgeway and North Pressure Zones to meet current and projected 2030 maximum day demands.
7. There is adequate reliable supply capacity to meet design maximum day demands currently; however, there is inadequate reliable supply capacity (high lift booster pumping capacity) to meet projected 2030 demands. In addition, the WTP will be operating at over 90 percent capacity year round in the year 2030.
8. There currently is a slight storage deficiency in the North and Ridgeway Pressure Zones which is projected to grow to approximately 0.5 million gallons (MG) and 0.4 MG, respectively, based on projected 2030 projections.
9. The total available effective storage in the Main Pressure Zone is adequate to meet existing and projected demand conditions; however, there is currently an operational storage deficiency of approximately 1.8 MG, based on the current operating strategy, which is projected to grow to over 2.6 MG by 2030.
10. The results of the KANEW analysis indicate that the City of Appleton should replace approximately 166 miles of water main (approximately 46 percent of system) by the year 2030 at an initial average annual rate of nearly 13 percent which decreases in the next 5 years to approximately 1 percent for the long-term. Results of the water main prioritization analysis conducted as part of the study summarize the annual replacement sequence based on the KANEW results.

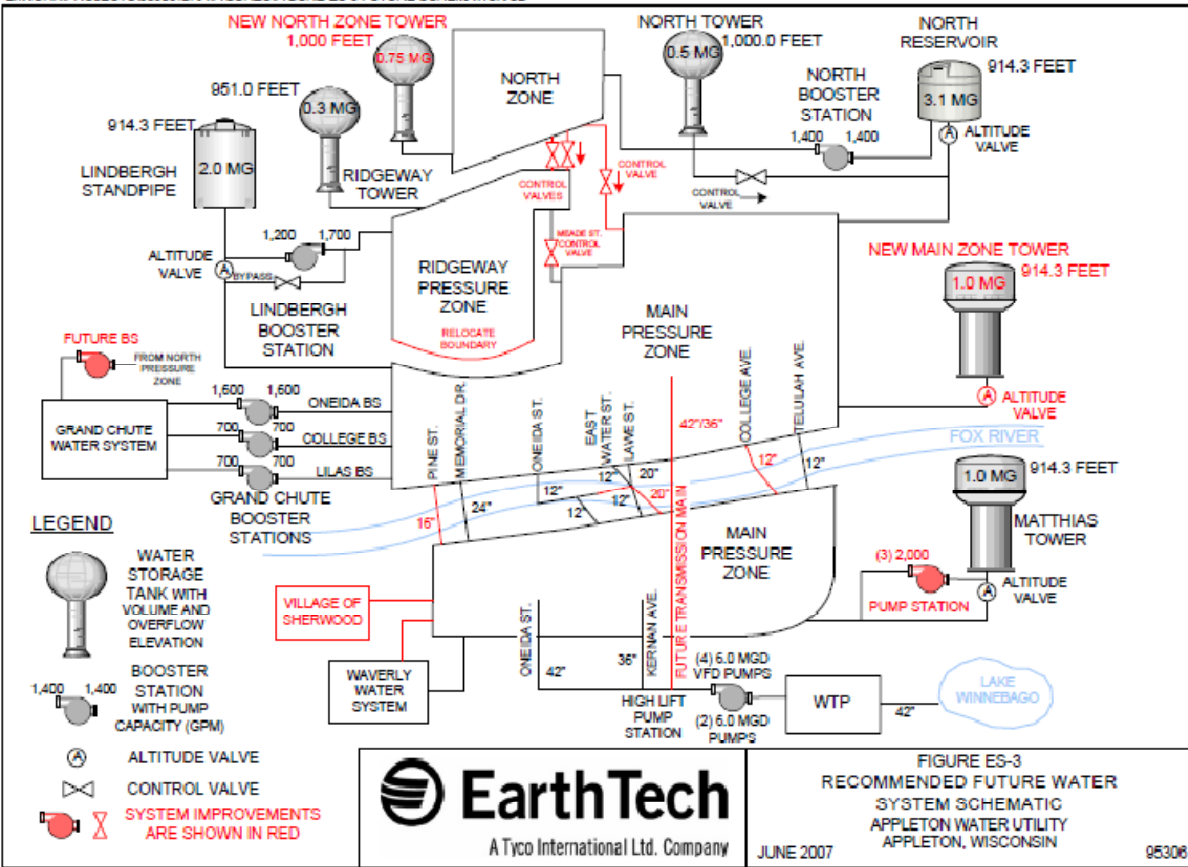
CAPITAL IMPROVEMENTS PLAN

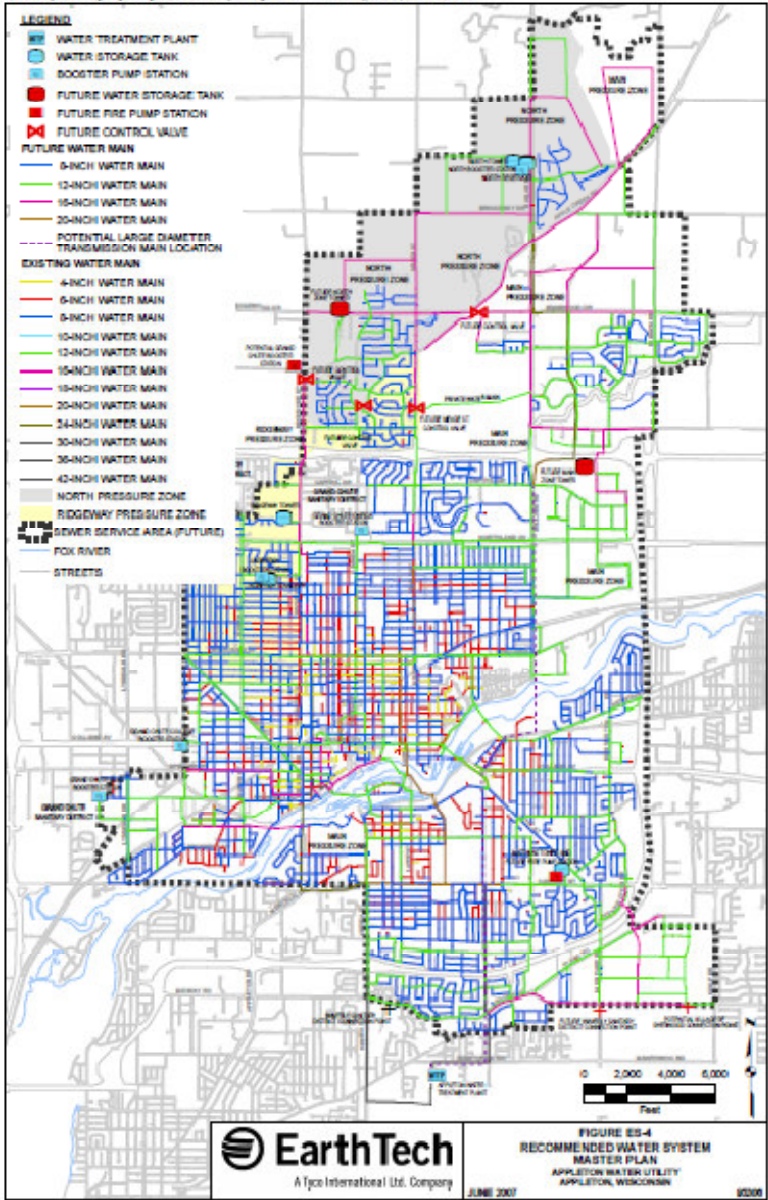
The schematic of the recommended future water distribution system is illustrated in Figure ES-3. Table ES-1 summarizes the proposed Capital Improvements Plan for the City of Appleton water system, which is illustrated in Figure ES-4.

TABLE ES-1
CAPITAL IMPROVEMENTS PLAN

Short-Term Improvements (2008 through 2012)		Estimated Cost ¹
New Control Valve Station between Ridgeway and Main Pressure Zones		\$175,000
Two New Control Valves between Ridgeway and North Pressure Zones		\$350,000
Water Distribution System Improvements to Address Existing Deficiencies (Segments A - K, approximately 16,400 feet, illustrated in Figure 7-10)		\$1,490,000
Transmission Mains for Development (assumed approximately 15,000 feet) ¹		\$1,800,000
Water Main Replacement/Rehabilitation (approximately 110,000 miles) (2010 - 2012 costs)		\$10,007,800
5-year City of Appleton Water Main Capital Improvement Plan (see Figure 7-9) (2008 - 2011 costs)		\$27,453,500
Meter and Telemetry for Second Connection with Waverly Sanitary District		\$20,000
	Subtotal	\$41,296,300
Engineering and Contingencies ²		\$14,453,800
	Total	\$55,750,000
Mid-Term Improvements (2012 through 2020)		Estimated Cost
New Booster Pumping Station at Mathias Tower		\$700,000
New Control Valve Station between North and Main Pressure Zones		\$175,000
Transmission Mains for Development (assumed approximately 30,000 feet) ¹		\$3,600,000
Water Main Replacement/Rehabilitation (approximately 335,000 miles)		\$30,792,200
	Subtotal	\$35,267,200
Engineering and Contingencies ²		\$12,350,000
	Total	\$47,617,000
Long-Term Improvements (2020 through 2030)		Estimated Cost
New 1.0 MG Tower in Main Pressure Zone		\$1,800,000
New 0.75 MG Tower in North Pressure Zone		\$1,400,000
42/36-inch Transmission Main from WTP to Ballard Road and Capital Drive		\$12,250,000
Transmission Mains for Development (assumed approximately 30,000 feet) ¹		\$3,600,000
Water Main Replacement/Rehabilitation (approximately 415,000 miles)		\$38,425,700
	Subtotal	\$57,475,700
Engineering and Contingencies ²		\$20,120,000
	Total	\$77,596,000
	Grand Total	\$180,963,000

Footnotes:
¹ Water main cost estimates were based on \$120 per foot for future expansion water main.
² Assumed 15 percent for engineering and 25 percent for contingencies.
³ Estimates do not include land purchase if necessary (refer to Table ES-2).





Based on the recommended capital improvements plan, Table ES-2 summarizes the land purchases necessary.

TABLE ES-2
SUMMARY OF LAND ACQUISITION REQUIREMENTS

Short-Term Improvements
New Control Valve Station between Ridgeway and Main Pressure Zones (along Meade Street north of Highway 41)
New Control Valve Station between Ridgeway and North Pressure Zones (near Richmond Street & Crossing Meadows Lane)
Mid-Term Improvements
New Control Valve Station between North and Main Pressure Zones (along Edgewood Drive near Apple Creek Road)
Long-Term Improvements
New 1.0 MG Tower in Main Pressure Zone (northeast of Ballard Road and Northland Avenue)
New 0.75 MG Tower in North Pressure Zone (northeast of Richmond Street and Edgewood Drive)

Additional recommendations for evaluations to ensure proper improvements are constructed at optimum timing are included in Table ES-3.

TABLE ES-3
RECOMMENDED WATER SYSTEM EVALUATIONS

Evaluation	Timing
City of Appleton Evaluations	
Water System Supply Reliability Evaluation	Complete in short term
WTP Discharge Pressure and Transmission Evaluation	Mid-term study, timing is dependent on growth and the acceptable level of discharge pressure increase
WTP Expansion Study	Long-term study that should be completed 3 - 5 years before projected expansion is needed
Update Water System Model	Complete annually
Update Water System Master Plan	Mid-term study, plan to update every 5 - 10 years
Wholesale Customer Evaluations	
Village of Sherwood Wholesale Supply Study	Complete in short term
Grand Chute Sanitary District Additional Connection Evaluation	Long term, if Grand Chute Sanitary District desires fourth connection

WHOLESALE CUSTOMERS

The Waverly Sanitary District would like an additional connection to the City of Appleton. In addition, it is recommended that the City update the wholesale water customer agreement with the Waverly Sanitary District and discuss the possibility of upsizing the existing metered connection with the Waverly Sanitary District in the future.

The Grand Chute Sanitary District may want a fourth connection to the City of Appleton. For planning purposes, it is assumed that water from the City of Appleton's North Pressure Zone will supply this connection, and additional booster pumping capacity will be required at the North Booster Station to have adequate reliable booster pumping capacity. In addition, it is recommended that the City update the wholesale water customer agreement with the Grand Chute Sanitary District, as they are currently near the capacities in the current agreement.

The Village of Sherwood has expressed an interest in obtaining water from the City of Appleton for future water supply. It is recommended that a study be completed to evaluate the best approach to supply the Village of Sherwood from the City of Appleton if this project proceeds. Based on preliminary discussions, the Village of Sherwood could be supplied directly from the City of Appleton distribution system or from the City of Appleton through the Waverly Sanitary District water system.