5
COMMUNITY FACILITIES & WATER RESOURCES

COMMUNITY FACILITIES
BACKGROUND

The City of Watertown operates a number of facilities which provide various public services. These facilities include the Watertown City Hall, Watertown Fire Station, Public Works building, wastewater treatment facility and the water treatment facility. Additional facilities include trail systems, various parks, and recreational areas.

PUBLIC SERVICE FACILITIES INVENTORY

Watertown City Hall - 309 Lewis Avenue South

The Watertown City Hall government building was built in 1996. It serves as the community's main center for local government activity. Government meetings such as City Council, Planning Commission, Parks Commission, and other such meetings are regularly held at the City Hall. In addition, the building is used by civic groups and community organizations for various events and occasions. Adjoining the City Hall is the Watertown Library. The entire City Hall building is 17,000 square feet in size, and it currently serves to conduct regular municipal activities.

At present, the City Hall is at full capacity. With the requisition of additional City staff and changing community needs, the City will need to relocate to a larger facility. The City will need to conduct a Space Needs and Site Feasibility Study to determine requirements for future expansion. A Space Needs and Site Feasibility Study conducted in 1990 determined that more space was needed for a local government center.

Public Works Building – 700 Lewis Avenue North

The Watertown Public Works building houses the Public Works Department, whose various maintenance responsibilities include: public street, park and trail maintenance, maintenance of water and sanitary sewer facilities, boulevard tree pruning, planting or removal, and other duties as needed. The mission statement of the Watertown Public Works Department is as follows:

- To pursue excellence in serving the community of Watertown in the area of Public Works.
- To represent the city in a professional manner.
- To treat residents as valued customers and strive to provide them with services that represent good value and good quality in a timely fashion.
- To provide a work environment that encourages employee training and growth.
- To promote a supervisory environment that listens, is sensitive to employee issues and practices a proactive approach to work place issues.
- To treat fellow employees with respect and consideration.
- To provide water that promotes the health and well being of the citizens of Watertown.
- To produce wastewater effluent that provides a safe aquatic environment.
- To provide parks and recreation areas that are beautiful, environmentally friendly places in the community.
- To provide clean, safe streets that are maintained in a professional manner.

Currently, the Public Works building is adequate; however, it will need to be expanded as the growth of Watertown demands it.

Watertown Fire Station – 401 Carter Street NE

The Watertown Fire Department (WFD) has grown considerably since it was incorporated in 1878. Currently, the WFD has 30 volunteer members who are either certified Emergency Medical Technicians (EMTs) or First Responders. Of these 30 volunteers, six are members of Carver County's Hazardous Materials (Haz-Mat) crew. The WFD responds to over 250 calls annually. 65% of these calls are for medical emergencies; other calls include fires, motor vehicle accidents, water rescue, hazardous material situations and others situations as needed.

The current Fire Station building was constructed in 1999. This building stores the City's fire equipment vehicles in a 9,000 square-foot apparatus bay. These vehicles include:

- 2007 GMC Light Rescue
- 2003 Custom Engine
- 1997 American LaFrance 65-foot Ladder Truck
- 1989 Smeal Engine
- 1997 Central 3,500 Gallon Tanker
- 1986 Smeal Heavy Rescue
- 1980 Barnett 1,500 Gallon Tanker
- 1985 Blazer Command Vehicle
- 1996 Polaris Ranger ATV
- 1995 Boat

The Watertown Fire Station building also houses equipment for Carver County, including two Hazardous Materials (Haz-Mat) trailers, as well as an ambulance vehicle for the Delano and Montrose fire districts. The building also has an office area, a dispatch center, a training room and training office area, and a room for Ridgeview Paramedics. The station has a back up generator that is connected with the Water Treatment plant.

The Watertown Fire District is 56 square miles in size, and it is made up of Watertown, Hollywood, Franklin, and Woodland Townships. The Watertown City Council oversees the Fire Department and the Fire Advisory Board The Fire Advisory Board is made up of representatives from each of the four of the surrounding township boards, and a City staff person acts as a liaison for the Board.

Wastewater Facility – 700 Lewis Avenue North

Sewer facilities are meant to carry wastewater from homes and buildings to a plant where it can be treated before it is released into a larger water body such as a river or stream. The plant removes particulate and tertiary materials and other waste from the water through various treatment processes.

The wastewater treatment plant was built in 1994 and it services 1,260 homes and businesses, and over 4,000 people. It is located in the northeastern corner of the City just south of County Road 27. A permit held with the Minnesota Pollution Control Agency (MPCA) allows the facility to expel treated water into the South Fork of the Crow River.

Water Treatment Plant – 409 County Road 20

The City must provide an adequate supply of potable drinking water as well as water for industrial and irrigation systems. The City of Watertown does not generate a separate supply of "grey" water for agricultural and residential irrigation systems or industrial uses, as to avoid possible cross-contamination with drinking water. The water treatment plant has four wells from various aquifers. The City has one water tower with a 300,000 gallon storage capacity; the water storage reservoir near the water treatment plant has a 120,000 gallon capacity.

WASTEWATER AND COMPREHENSIVE SEWER PLAN

BACKGROUND

The preparation of a wastewater and comprehensive sewer plan (CSP) is mandated by the Metropolitan Council. The plan requirements are defined in the organization's Local Planning Handbook and Appendix B-2 of its Water Resources Management Plan

Scope

The purpose of this element of the Comprehensive Plan is to the update the City's comprehensive sewer plan taking into account current population and land use projections. This involves the following steps:

a. Estimate future wastewater flows based on population and land use projections.

b. Establish preliminary trunk sewer alignments and sizes to service the growth areas.

c. Evaluate the capacity and adequacy of existing facilities.

d. Investigate alternatives for facilities with inadequate capacity and for areas where service feasibility is suspect.

e. Define trunk sanitary sewer system improvements and a phasing plan.

f. Estimate the approximate cost of the trunk systems improvements.

The updated plan will provide a guide plan for the extension of sanitary sewer through new developments to ensure that all portions of 2030 growth area can ultimately be serviced.

Past Planning Activities

Past plans and studies which are being updated by this CSP include the following:

a. Chapter Seven, Water and Sewer, from 2020 Comprehensive Plan.

b. Wastewater Treatment Facility Plan dated September 2005.

c. Feasibility Study for Trunk Highway 25 Sanitary Sewer and Watermain Extension dated February 2003.

d. Feasibility Study for Southeast Lift Station and Forcemain dated April 2006.

e. Feasibility Study for Echo Development dated March 2006.

EXISTING SANITARY SEWER SYSTEM

Description of Municipal System

The existing municipal sanitary sewer system is shown on Map 5-1. The major components of the system consist of:

a. Wastewater Treatment Plant located on the west side of the south fork of the Crow River on the north side of the city. This plant is an extended aeration facility with filtration and disinfection.

b. Seven lift stations and related forcemains.

c. Trunk gravity sewer ranging in diameter from 10-inches to 24 inches.

d. Eight inch diameter lateral gravity sewers.

The service area for each lift station is also shown on Map 5-1. Lift Station 1, the main lift station, pumps all of the City's wastewater to the treatment plant. The other lift stations discharge to gravity sewers which flow to Lift Station 1. In some cases, 8-inch lateral sewers function as trunk sewers.

On-site Sewage Disposal Facilities (Septic Systems)

The existing on-site individual sewage treatment systems are shown on Map 5.2. This shows systems within the current City boundaries and also systems outside of the current City boundaries but within the 2030 growth boundary. There are several islands of properties that are surrounded by the City boundary, but are not within the City. There are about ten ISTSs within the current City boundaries. Recent municipal sanitary sewer extensions on the west side of State Highway 25 will allow about seven of these to convert to the sewer system.

Additional ISTSs may be added as the City boundaries are expanded through annexation. These properties will convert to the municipal sewer system over time as required by City ordinance.

SANITARY SEWER FLOWS

Existing Flows

The existing wastewater flow is metered at the treatment plant. The 2006 average daily flow was 0.345 million gallons per day (mgd). The average daily flow for individual months ranged from 0.277 mgd for August to 0.482 mgd for May. Appendix C includes a Wastewater Influent Report which shows the monthly flows from 1995 through November 2007.

The flows to individual lift stations can be estimated by multiplying the pump running time which is recorded at each station times the pump capacity. Using the pump running time recorded for 2007 through December 14th and the pump capacity information found results in the following:

FIGURE 5-1

Lift Station Average Daily Flows

Lift Station	Average Daily Flow (mgd)
1-Main	0.282
2-Newton	NA
3-Sugarbush	0.043
4-Whitetail	0.049
5-Hutchinson	0.024
6-Rosewood	NA
7-Tuscany	NA

Incomplete information does not allow computation of the flows to Lift Station 2, 6, and 7. As Lift Station 1 pumps the entire flow to the treatment plant, the flow should correlate to the 0.345 mgd flow measured at the plant. Resolving the difference would require additional study. One explanation is that the pumps are actually pumping at a higher capacity.

Land Use and Population Projections

Chapter Three presents land use and population projections used for the analysis and planning of the sanitary sewer system. Following are the population, household and employment projections from that chapter:

FIGURE 5-2

Population, Households and Employment Projections

	2007	2010	2020	2030
Population	4100	4800	6500	7700
Households	1472	1800	2500	3000
Employment	800	1200	1550	1770

Design Criteria

Municipal wastewater is comprised of a mixture of domestic sewage, commercial and industrial wastewater, groundwater infiltration and surface water inflow. The Metropolitan Council's guidelines recommend a per capita design flow of 100 gallons per capita per day (gpcd). This plan uses the 100 gpcd for all future population growth. For existing population, a rate of 75 gpcd is used for future flow projections which compares with a 2006 actual residential only rate of 58 gpcd.

Existing commercial and industrial wastewater flow is based on winter quarter water usage. Future commercial and industrial flow is based on 750 gallons per acre per day. Existing flow from schools is based on winter quarter water usage. Future flows from schools are increased by the same ratio as the population increase from 2007 values.

Sanitary sewer flow varies from month to month as shown on the Wastewater Influent Report in Appendix C. The flow also varies over a 24-hour period with peak flows generally in the morning and evenings. The sanitary sewer system capacity must accommodate peak flows and therefore to size the facilities, the variation between average, and peak flows is estimated. The flow variation, or peak factor, typically ranges from 2.5 for major trunk facilities to 4.2 for local lateral sewers. The peak factor is determined from a formula from the 10-State "Standards for Wastewater Facilities" which is based on population. As the population increases, the peak factor decreases.

The density for low-density residential land use is based on 2.4 units per net acre of land area. Net area is defined as gross area less wetlands and flood plain and less a 20 percent allowance for public streets, parks, stormwater facilities, etc. The population projections are based on 2.7 persons per unit.

SERVICE AREA

a. Existing Sewer Service Districts

The City is divided into individual sewer service districts which correspond to the area serviced by individual lift stations. The exception to this is Lift Station 1 which receives gravity flows from Service Area 1 and also the flow from Lift Stations 2 through 7. These districts are shown on Map 5-1; the existing sanitary sewer system map.

b. Planning Area

The Planning Area for the sanitary sewer system is the 2030 growth boundary as described in Chapter Three and shown on Map 3-3. This is the Planning Area for the extension of sanitary sewer service. Servicing the expanded area requires a combination of expansion of several existing sewer service districts and creation of three new districts which will require three future lift stations. Map 5-3 shows the new districts identified as A, B, and C and the expanded existing sewer service districts. This also shows the major districts subdivided into several sub-districts as required for the analysis of existing facilities or preliminary design of new facilities.

c. Beyond Planning Area

The sewer system planning will also analyze the potential for ultimate expansion of the system beyond the Planning Area.

FIGURE 5-3
Existing & Projected Average Daily Sewer Flows (gpd)

Service Area	2007	2010	2020	2030 (7700 Pop.)	Planning Area Ultimate Pop. 13,500
1	305,239	381,966	458,693	535,420	675,620 [(1)]
2	1,425	1,425	1,425	1,425	1,425
3	55,500	56,037	56,573	57,110	63,800
4	19,950	26,012	32,073	38,135	45,550
5	25,725	64,302	102,879	141,455	166,925
6	1,200	4,189	7,178	10,167	20,000
7	2,475	18,687	34,899	51,111	253,175
A		11,039	22,077	33,116	170,700
B		2,516	5,031	7,547	27,900
C		4,999	9,997	14,996	77,300
Total LS 1	411,514	563,656	715,979	867,939	[(2)] 1,368,744
Total City	411,514	571,170	730,826	890,482	1,502,395

Figure 5-3 shows a projected 2007 to 2030 flow increase of 116%, while the population increase from 4,100 to 7,700 is 88%. This results from use of 75 gpcd for the existing population and 100 gpcd for future population growth and from the addition of future commercial and industrial development flows.

[(1)] Service Area 1 Planning Area Ultimate Pop. Includes Subservice Area B1 sewer flow.

[(2)] Total LS 1 does not include high school flow from Service Area 1.

Infiltration and Inflow (I/I)

Infiltration is defined as groundwater which enters the sewer system. This can occur through leaking joints and broken pipes. Inflow is defined as surface water which enters the sewer system. This can occur through sump pump discharge, drain tile, surface drain and roof drain connections to the sewer. Both infiltration and inflow use available capacity in the sewer system and therefore reducing I/I can restore capacity in the system. As the Wastewater Influent Report in Appendix C shows, the maximum monthly 2006 wastewater volume was 14.943 million gallons (mg) in May and the minimum was 8.578 mg in August. The difference, which equates to 205,000 gallons per day, is typically resulting from I/I.

The City has had an aggressive program of lining the older vitrified clay pipe sewers which have the most significant infiltration. Map 5-4 shows the sewers which have

already been lined and also the proposed schedule for lining the balance of the clay pipe within the City.

The per capita unit flows discussed in the Design Criteria section includes an allowance for I/I and therefore no separate addition is made for I/I in projecting future sewer flows.

Wastewater Flow Projections

The primary focus of this plan element is to define the sewer system improvements required to service the projected 2030 population of 7700. The Planning Area is the 2030 growth boundary as shown on the 2030 Land Use Plan, Map 3-3 (Chapter Three). Based on the land-use population density described above in the Design Criteria section, the Planning Area will support an ultimate population of about 13,500. The city currently has about 830 vacant lots which have been final platted or approved for final platting. With full development of these lots, the city will have an estimated population of 6,341. This leaves 1,359 persons, or development of an estimated 503 lots, to achieve the projected 2030 population of 7,700. Therefore, development of only a portion of the 2030 growth boundary will be required to support the 2030 population of 7700.

The flow projections are presented for the 2030 population of 7700 and also for the ultimate development of the entire Planning Area. The projections for the 7,700 population are based on all final platted lots and lots approved for final platting developing and the balance of the new development being distributed into all of the sewer service districts in the growth area.

Figure 5-3 summarizes the existing and projected average and peak sanitary sewer flows for the seven present sewer service districts and the three future districts. The detailed flow projections spreadsheet is included in Appendix D. This also shows the flows for subdistricts.

EVALUATION OF EXISTING FACILITIES

Existing Capacities

a. Wastewater Treatment Plant

The existing treatment plant is an extended aeration facility with filtration and disinfection. It was constructed in 1993 and was designed for a population of 4026. The treatment plant and capacity are analyzed in detail in the Wastewater Treatment Facility Plan dated September 2005. This plan is included as Appendix E in this document. The plant has a hydraulic flow capacity of 0.8 mgd and an organic treatment capacity of 740 pounds per day of carbonaceous biochemical oxygen demand ($CBOD_5$). The former stabilization pond is used as a flow equalization basin.

b. Lift Station and Forcemains

The existing lift stations and average daily flow are shown in Figure 5-1. The standard criterion for lift station capacity is to accommodate peak hourly flow with one pump being out of service. Stations 2 through 7 are two-pump stations and the design capacity is therefore the capacity of one pump. Lift Station 1 has

three pumps and the design capacity is the combined capacity of two pumps. All pumps in a lift station can operate simultaneously if required for emergency situations. However, the total combined pumping capacity is typically significantly less than the sum of the individual pumps, due to increased friction losses in the forcemain.

The lift station capacity may also be limited by the size of the forcemain from the lift station to the gravity sewer and by the size of the gravity sewer. The pumping capacity of a station can be increased by installing higher capacity, larger horsepower pumps. This requires that the station size is adequate for the larger pumps and that the forcemain and downstream gravity sewer have adequate capacity. Figure 5-4 shows the pump, forcemain, and station diameter for each station.

FIGURE 5-4
Lift Station Data

No.	Location	Design Pump Capacity (gpm)	Pump HP	No. of Pumps	Station Capacity (gpm)	Station Size	Forcemain Diameter (in.)	Downstream Gravity Sewer Diameter (in.)
1	Main	870	25	3	1740	10'x 12'	12"	(1)
2	Newton	NA	NA	2	NA	NA	NA	8"
3	Sugarbush	240	10	2	240	8' dia.	4"	8"
4	Whitetail	228	10	2	228	8' dia.	6"	8"
5	Hutchinson	200	10	2	200	8' dia.	6"	8"
6	Rosewood	156	3	2	156	6' dia.	4"	8"
7	Tuscany (temporary)	119	5	2	119	6' dia.	4"	8"

(1) Discharge to wasterwater treatment plant

c. Trunk and Lateral Sewers

The capacity of gravity sewer mains is dependent on the grade of the pipe, the smoothness of the pipe interior and the condition of the pipe. It is typical that at least portions of any critical sewer main were constructed at minimum grade, which then become the limiting pipe capacity. Figure 5-5 provides the flow

capacity of sewer pipes at the minimum grade based on the pipe being clean and in good condition and on no surcharging (water level above the top of the pipe in manholes) in both gallons per minute (gpm) and cubic feet per second (cfs). The capacity of lined pipe is less than new pipe, as about half an inch of diameter is lost with the lining. Unlined clay capacity is significantly lower. There are no critical sections of unlined clay pipe, so that capacity is not provided.

FIGURE 5-5

Pipe Capacity – Gravity Flow at Minimum Grade

Pipe Type	**Capacity**	
PVC	**gpm**	**cfs**
8”	510	1.14
10”	773	1.72
12”	1103	2.46
15”	1634	3.64
18”	2407	5.36
21”	3299	7.35
24”	4172	9.29

CIPP Lined VCP	**gpm**	**cfs**
8”	435	0.97
10”	664	1.48
12”	978	2.18

DIP	**gpm**	**cfs**
24” (0.5% slope)	8541	19.03

SEWER SERVICE LIMITATIONS

General

The capacity of the sanitary sewer system is limited by the system component with the lowest capacity. The limitation could affect the over-all city, one sewer service district or even a subdistrict.

Wastewater Treatment Plant

Based on the information provided in the Wastewater Treatement Facility Plan, the limiting factor is the organic treatment capacity of 740 pounds of $CBOD_5$. Also, the current biosolids generation exceeds the biosolids treatment and storage capacity. The available reserve capacity in the treatment plant was evaluated in August 2007. The information from this evaluation is summarized in the Wastewater Capacity slide presentation contained in Appendix F. This shows, based on actual $CBOD_5$ loadings for 2006 and 2007 through July, that the existing plant has capacity for 4,800 population. This equates to 260 additional units. This will require use of temporary biosolids storage.

Lift Stations

Figure 5-6 compares the existing lift station capacity from Figure 5-4 with the existing and projected peak sewer flows from from Appendix D (Sanitary Sewer Flow Projections). The existing capacities are based on one pump in each station being out of service.

FIGURE 5-6

Existing and Future Required Lift Station Capacity

Lift Station No.	**Existing Capacity (gpm)**	**Existing Peak Flow (gpm)**	**7700 Population Peak Flow (gpm**	**Planning Area Ultimate 13,500 Population Peak Flow (gpm)**
1	1740	950	1850	2762
3	240	148	158	171
4	228	56	107	128
5	200	70	384	453
6	156	4	30	59
7	NA	7	145	617

Flow is in excess of Lift Station capacity

Figure 5-6 shows that the current capacities of Lift Stations 3, 4 and 6 are adequate for the 2030 population projection of 7,700 and also for the ultimate development of the Planning Area. Lift Station 2 can be eliminated when gravity sewer is extended south from the Forest Hills area and, therefore, is not shown.

Lift Station 7 is currently a temporary lift station which will service only the Tuscany Village Townhomes. Any future development within sewer service district 7 will require construction of a new permanent Lift Station 7 in the same general location as the temporary station. The permanent station will have the required depth and pumping capacity to service the Planning Area with flexibility to expand to service area south of the Planning Area boundary.

The existing capacity of Lift Station 5 is significantly less than the 7,700 and 13,500 population flows. Both of these flow projections include full development of the 80 acres of industrial land use property which is within the Planning Area and is located south of County Road 122. This area generates an estimated 130 gpm peak flow. Removing this from the 7,700 population flow results in a flow of 254 gpm, which is marginally above the capacity of one existing pump. The station was constructed in 1999. Based on an estimated pump life of 20 years, the pumps would be scheduled for replacement around 2019.

The existing lift station structure and forcemain are adquate to accommodate higher capacity pumps to meet the ultimate demand. However, the forcemain discharges into an 8-inch gravity sewer on Westminster Avenue. This sewer, along with the downstream sewers on Lewis Avenue to Lift Station 1, have capacity for the area north of County Road 122, but are under capacity when the 80 acres south of the road area added. This is based on assumed sewer flows from the industrial property. The Lewis Avenue sewer will also receive the flow from the conceptual redevelopment in the south end of downtown. This projection will need to be reviewed as actual development occurs and the lift station should be monitored to determine when it is approaching full capacity.

Lift Station 1 is shown to be slightly under capacity at the 7,700 population and significantly under at the 13,500 population. This station was constructed in 2005. The existing capacity is projected to be adequate until the pumps are scheduled for replacement in 2025. This is based on the projected population of 7,700 at 2030.

The station structure is adequate to accommodate higher capacity pumps to meet the ultimate demand. The existing 12-inch forcemain to the treatment plant, however, is not adequate. Replacement with a 16-inch forcemain or construction of a second 12-inch forcemain will be required.

Trunk Sewer Mains and Critical Lateral Mains

Trunk sewer mains are defined as sewer mains 10-inches in diameter and larger. These typically provide both lateral sewer service to adjacent properties and conveyance of flow from outside service districts. The 8-inch diameter lateral sewers typically provide lateral service to adjacent properties and conveyance of flow from adjacent neighborhoods. However, in Watertown's case, several 8-inch sewers receive flow from lift stations and are, therefore, critical mains.

Map 5-5 shows the locations of the critical sewer mains with potential capacity limitations. In general, these are sewer segments that receive flow from lift stations. Each segment is identified with a number. Figure 5-7 summarizes the existing capacity and flow in the sewer for the existing conditions, for the 2030 projected population of 7,700 and for the Planning Area ultimate development population of 13,500 for each segment. The projected flows shown are at the downstream end of the sewer segment.

FIGURE 5-7

Critical Sewer Segment Capacities and Flows

Sewer Segment	**Location**	**Diameter**	**Existing Capacity (gpm)**	**Existing Peak Flow (gpm)**	**7,700 Pop. Peak Flow**	**Planning Area Ultimate 13,500 Pop. Peak Flow (gpm)**
1	Lewis Avenue	12”	978	644	958 (1)	1037 (1)
2	Lewis Avenue	10”	664	523	837 (1)	906 (1)
3	Westminster Avenue/Madison St.	8”	435	149	463 (1)	532 (1)
4	Ortloff Trail	10”	773	104	629 (2)	958 (2)
5	Mill Avenue	8”	435	386	446	485
6	River Crossing	24”	8541	*	*	2312
7	Mill Avenue	21”	3299	*	*	1926
8	West Side Forest Hills	18”	2407	*	*	918
9	North Side Forest Hills	15”	1634	*	*	864
10	Paul Avenue	12”	1103	*	*	433

* Flow is not critical

Flow is in excess of pipe capacity

(1) Flow including Lift Station 5, Rerouting Lift Station 5 Addresses Capacity Issue

(2) Flow including Lift Station 5 and Lift Station B, Rerouting Lift Station B Addresses Capacity Issue

Sewer segments 1, 2 and 3 convey the flow from Lift Station 5 to Lift Station 1 and the treatment plant. Both Lift Station 5 and these sewer segments have inadequate capacity to accommodate the sewer flow from the industrial land use property south of County

Road 122. Segments 1 and 2 will also receive the sewer flow from the conceptual redevelopment area at the south end of downtown and this is reflected in the projected flows. Removing the Lift Station 5 flow by rerouting the forcemain would restore adequate capacity in these three segments. The alternatives for rerouting of the forcemain consist of connection to the existing sewer on Jackson Avenue or connection to a southward extension of the existing gravity sewer on Rosewood Lane. Both alternatives ultimately convey the Lift Station 5 flow to the 10-inch sewer on Ortloff Trail.

Segment 4, the 10-inch sewer on Ortloff Trail, currently receives flow from sewer service district 1B and from Lift Station 6. The flows described in Figure 5-6 reflect the connection of future Lift Station B to this segment. However, after the rerouting of the Lift Station 5 forcemain, Segment 4 will be under capacity. The proposal to address this is to construct a forcemain from Lift Station B to the treatment plant.

Segment 5, the 8-inch sewer on Mill Avenue, receives flow from sewer service district 1C and from Lift Stations 3 and 4. Figure 5-7 shows this segment to be slightly under capacity for future conditions. The actual flow should be monitored during peak wet weather flow to confirm if it is under capacity. An alternative for removing flow from this segment is to connect the forcemain from Lift Station 3 to the future forcemain along County Road 10 from future Lift Station 7 to the 18-inch sewer on the west side of Forest Hills.

Segments 6 through 10 consist of the river crossing and the Mill Avenue/Forest Hills area trunk sewers. These segments have adequate capacity to convey flow from the Planning Area at ultimate development.

FUTURE SEWER SYSTEM

System Improvements for Planning Area

a. General

The future sewer system improvements required to service the entire Planning Area are shown on Map 5-6. This Planning Area boundary will provide for an estimated total population of 13,500, which is significantly greater than the projected year 2030 population of 7,700. The schedule for individual system improvements is dependent on the actual locations of future development proposals. For example, future Lift Station A is required for any development within sewer district A in the northeast portion of the City. The schedule for the treatment plant expansion and for Lift Station 1 can be determined based on population projections, as these facilities service the entire city. The development phasing schedule shown on Map 3-4, Staged Development Plan, provides for appropriate and orderly phasing of sewer system improvements.

b. Wastewater Treatment Plant

Based on the information in the Wastewater Treatment Plant Capacity slide presentation in Appendix F, the plant has capacity for an additional 700 population or 260 equivalent residential units (ERU) based on use of additional temporary biosolids storage. Based on the incremental annual projected population increase shown on Figure 3-8 in Chapter Three, this additional population would be reached in 2010 based on Met Council population projections.

The Wastewater Treatment Facility Plan presents information which shows expansion of the plant to a capacity of 1.9 mgd, or a design population of 9,900. This expansion will service the needs of the City's needs beyond the 2030 population projection of 7,700.

It is recommended that the plant expansion includes the addition of a SCADA base system which will allow monitoring the treatment plant, lift stations, water treatment plant, elevated water storage and wells. The SCADA equipment for individual lift stations, etc. should be included with each individual improvement project.

c. Lift Stations and Forcemains

Map 5-6 shows the addition of new Lift Stations A, B and C located in the northeast, north central and northwest portions of the Planning Area, respectively. The need for these stations is triggered by development proposals within the respective sewer service districts, except that development in service district C requires both Lift Stations B and C.

Permanent Lift Station 7 will be required to service additional development within sewer service area 7, as the temporary station is intended to service only Tuscany Village.

Lift Stations 7, A, B and C all have service areas which could ultimately expand beyond the 2030 planning area. The lift station structures and forcemains should be designed and constructed to provide flexibility to allow future capacity expansion.

The forcemain from Lift Station B could initially be discharged into the 10-inch sewer on Ortloff Trail. However, with the re-routing of the Lift Station 5 forcemain, a new forcemain will be required from Lift Station B to the treatment plant. Lift Station 7 will require a new 12-inch forcemain to the 18" sewer on the west side of Forest Hills. The 12" forcemain along the Tuscany Village development was installed as part of that development.

Figure 5-6 shows that the capacity of Lift Stations 1 and 5 will be exceeded by the 7,700 population peak flow. Lift Station 1 was constructed in 2005. Lift station pumps have an expected useful life of about 20 years. The existing pumps are adequate until at least 2025 based on Met Council population projections. The replacement pump capacities should be appropriately increased along with the forcemain to the treatment plant.

Lift Station 5 was constructed in 1999. The need for additional capacity is triggered by the development of the property south of County Road 122, which is projected to occur after 2025. Therefore, the existing pumps appear to be adequate until about 2019 when routine replacement of pumps would normally be scheduled. The capacity of the replacement pumps can be appropriately increased. This will trigger the need to re-route

the forcemain. The new portion of the forcemain should be increased from 6 to 8-inch diameter to reduce the friction loss in the pipe.

Figure 5-8 shows the projected flows for future Lift Stations 7, A, B and C, along with the anticipated forcemain diameter. The future required capacities of existing lift stations are shown in Figure 5-6.

FIGURE 5-8

New Lift Station Capacities

Lift Station No.	7,700 Pop. Peak Flow (gpm)	Planning Area Ultimate 13,500 Pop. Peak Flow (gpm)	Planning Area Plus Potential Additional Area Peak Flow (gpm)	Forcemain Diameter
7	145 (1)	617	1790	12”
A	(1)	431	805	10”
B	(1)	391	718	8”
C	(1)	208	535	8”

(1) Dependent on development proposals size and location

Lift Station 2 can be eliminated by extension of a gravity sewer from the 18” trunk sewer on the west side of Forest Hills. Lift Station 6 can be eliminated after construction of a 12-inch gravity sewer from Lift Station B along Mapes Creek to Highway 25.

d. Trunk Sewer Extensions

The future trunk sewer extensions required to service the Planning Area are shown on Map 5-6. This also shows the additional area beyond the Planning Area which can be serviced with additional sewer main extensions, provided the sewers within the Planning Area are appropriately sized. Map 5-6 shows each major branch of sewer extension identified by branch number and also shows the sewer pipe diameter and projected peak flow. The flows and pipe sizes are based on ultimately extending sewer service to the boundary beyond the Planning Area.

The sewer pipe sizes are based on the full capacity of the pipe, except for sewer service districts B and C. For districts B and C, the sizes are based on the pipes flowing at half full capacity. This is a typical procedure which provides a safety factor or flexibility for future sewer extensions which are not currently anticipated. This procedure is used only

on districts B and C, as these districts are proposed to discharge directly to the treatment plant and are, therefore, not restricted by the capacity of the existing sewer system.

The sewer main locations on Map 5-6 are general corridors along the lowest ground elevation. Actual main locations, in general, will follow future street alignments. Lateral sewers, as required to service development, will be extended from the trunk sewer system shown.

SEWER SYSTEM IMPROVEMENTS SCHEDULE

The schedule for the majority of the sewer system improvements is dependent on the timing and location of individual development proposals. The schedule for the treatment plant expansion and upgrade of Lift Station 1, which both service essentially the entire city, can be based on the population and related sewer flow projections.

Figure 5-9 summarizes the schedule for trunk sewer improvements.

FIGURE 5-9
Trunk Sewer Improvements Schedule

Improvement		**Year Completion is Required(2)**	**Triggering Event**
1.	Wastewater Treatment Plant	2010	Existing capacity exceeded
2.	Lift Station 1 Capacity Upgrade	2025	Scheduled pump replacement or existing capacity exceeded
3.	Lift Station 5 Capacity Upgrade and Forcemain Re-routing	2019	Scheduled pump replacement, downtown redevelopment or development of area south of Co. Rd. 122
4.	Lift Station 7 and 12” Forcemain	(1)	Any development within district 7
5.	Lift Station A and 10” Forcemain	(1)	Any development within district A
6.	Lift Station B	(1)	Any development within districts B or C
7.	Lift Station C and 8” Forcemain	(1)	Any development within district C
8.	12” Gravity sewer – Hwy. 25 to Lift Station B	(1)	Any development within district C

9.	10” Forcemain from Lift Station B to treatment plant	(1)	Existing capacity of Ortloff Trail sewer exceeded
10.	Gravity sewer extension to allow abandonment of Lift Station 2	-	When station requires significant maintenance or upgrading
11.	Trunk sewer main extensions	(1)	Development proposals in Planning Area

(1) Schedule dependent on development size and location

(2) Based on Met Council population projections

ULTIMATE SERVICE AREA BEYOND PLANNING AREA

Map 5-6 shows the future sanitary sewer system improvements required to service all property within the Planning Area. It also shows an expanded service area beyond the Planning Area. The trunk sewer main sizes shown are based on servicing this expanded area. The area beyond the Planning Area includes an estimated 1412 net developable acres.

Sewer service districts 7, A and 1F include the majority of the area beyond the 2030 growth boundary. Figure 5-10 shows the projected peak flows from these districts.

FIGURE 5-10

Projected Peak Flows – Beyond 2030 Growth Boundary

Sewer Service District	**Projected Peak Flow (gpm)**
7	1173
A	374
1F	139
Total	1689

Districts 7, A and 1F all discharge flow into the Forest Hills/Mill Avenue trunk sewer system. Figure 5-11 shows reserve capacity available in each segment of this system.

FIGURE 5-11

Capacities in Trunk Mains – Forest Hills to Lift Station 1

Sewer Segment	Location	Total Capacity (gpm)	Planning Area Flow (gpm)	Reserve Capacity (gpm)
18”	West Side Forest Hills	2407	918	1489
21”	Mill Avenue	3299	1926	1373
24”	River Crossing	8541	2312	6229

Figure 5-11 shows the 21-inch sewer segment to have the limiting capacity. The 1373 gpm reserve capacity is the capacity available to service the area beyond the Planning Area. This would allow development of about 81 percent of the area beyond the Planning Area in districts 7 and A. The reserve capacity would be reduced if it is necessary to connect the forcemain from Lift Station 3 to the future forcemain from Lift Station 7 in order to reduce flow in the 8-inch Mill Avenue Sewer.

Sewer service district C also shows area beyond the Planning Area which is within Carver County. In addition, about 280 net developable acres in Wright County could be serviced by extension of mains from future Lift Stations B and C. The flow projections do not include the Wright County area. However, the sewer main sizes shown on Map 5-6 are based on the pipes flowing half full, which provides flexibility to expand the service area.

The trunk sewer system shown on Map 5-6 will have capacity to support the ultimate population of 13,500 within the Planning Area, plus an additional 7,500 beyond the Planning Area, or a total of about 21,000.

POLICY FOR ON-SITE SEWAGE DISPOSAL SYSTEMS (SEPTIC SYSTEMS)

The 2030 Land Use Plan (Map 3-3 in Chapter Three) shows several areas as rural or large-lot residential (sewered or unsewered). The feasibility of extending municipal sewer will be investigated for rural or large lot development proposals. If it is not feasible, on-site sewage disposal systems will be allowed.

Watertown does not have an Individual Sewage Treatment System (ISTS) ordinance. Therefore, new and any existing systems must comply with Carver County’s ISTS ordinance and Minnesota Rule 7080. The County’s ordinance is included as Appendix G. The Watertown Municipal Code requires that all properties within 500 feet of a public wastewater collection system connect after receiving official notice from the City.

SANITARY SEWER SYSTEM COST ANALYSIS

a. Improvement Project Costs

One of the objectives of this plan element is to determine the cost of expanding Watertown's municipal sewer system to service future growth. This will provide the basis for analyzing the current trunk charge and determining whether it is adequate to fund the expansion.

The locations and sizing of the system improvements shown on Map 5-6 are used to develop an approximate total cost. The cost estimates are based on anticipated 2008 construction costs. The costs include construction, engineering, legal and administrative costs. No easement acquisition costs are included, as it is assumed the majority of the easements will be dedicated as a part of development proposals. It is assumed that the trunk sewer segments will be paid by the developer and only the oversizing paid by the City. A 25% contingency has been added for unanticipated costs. The developer will be responsible for the entire cost of all 8-inch and 10-inch mains.

Figure 5-12 summarizes the estimate project costs for the trunk sewer system improvements required to service the Planning Area. Normal system operation and maintenance costs are not included.

FIGURE 5-12

Trunk Sewer Expansion Project Cost Summary

Improvement		**Total Estimated Project Cost**
1.	Wastewater Treatment Plant	$10,300,000*
2.	Lift Station 1 Capacity Upgrade	$240,000
3.	Lift Station 5 Capacity Upgrade and Forcemain Re-routing	$452,000
4.	Lift Station 7 and 12" Forcemain	$892,000
5.	Lift Station A and 10" Forcemain	$406,000
6.	Lift Station B	$263,000
7.	Lift Station C and 8" Forcemain	$336,000
8.	Sewer Branch B-1, 12" Gravity Sewer – Hwy. 25 to Lift Station B	$97,000
9.	10" Forcemain from Lift Station B to Treatment Plant	$317,600
10.	Gravity Sewer Extention to Allow Abandonment of Lift Station 2	$205,300
11.	Sewer Branch A-3	$21,500
12.	Sewer Branch 7-5	$183,400
13	Sewer Branch 7-10	$124,200

.		
14.	Sewer Extension 1E-1	$60,700
15.	Sewer Extension C-1	$36,800
	TOTAL	**$13,935,500**

* Estimates for Wastewater Treatment Plant expansion range from $7 to 12 million depending on the actually design options selected.

2. Funding

The current funding policy for trunk sanitary sewer improvements consists of a trunk sewer charge of $4,000 per equivalent residential unit (ERU) and an area charge of $2,600 per gross acre for treatment plant expansion. For this analysis gross acre will be assumed to be gross area, less flood plain and wetlands.

The sewer expansion projects listed in Figure 5-12 all have a design population of 13,500, except for the treatment plant, which has a design population of 9,900. The total estimated project cost of the 13,500 design projects is $3,635,500. Prorating this to a population of 9,900 results in an adjusted cost of $2,254,000. Adding this to the treatment plant cost results in a 9,900 design population sewer project cost of $12,554,000.

The 9,900 design population is a 5,800 gain from the existing population. Based on the criteria of 2.7 persons per unit and 2.4 units per acre, this population gain would require 2,148 additional residential units and 1,119 acres of additional development. This results in the following total revenue from sewer charges:

2148 ERU x $4000/unit =	$8,592,000
1119 Acres x $2600/acre =	$2,909,400
Total Sewer Revenue =	$11,501,400

The projected revenue from access charges and area charges is approximately one million dollars less than the estimated project costs. These revenue projections do not include equivalent units or acres from commercial/industrial development. The apparent shortfall will be covered by monthly plant and usage charges. A utility rate study is completed annually to determine the appropriate monthly and usage charges.

SANITARY SEWER SYSTEM
GOALS, POLICIES AND IMPLEMENTATION STRATEGIES

Watertown recognizes the necessity of providing sanitary sewer service to support growth and development.

1. GOAL

The City will provide sewer service in an efficient and orderly manner that balances resident and development demands with low cost.

POLICY

This service should be funded by those receiving the greatest benefit.

IMPLEMENTATION STRATEGIES

- Require new development to fund additional capacity, extension, and connection to the municipal utility system.
- Require that adequate public facilities be in place prior to the construction of new development.
- Ensure that all development complies with the staged development plan so as to minimize the premature construction of public utilities.
- Continue program of infiltration and inflow reduction by completing lining of old clay sewer mains. Expand the program to include elimination of sump pump discharges and drain tile connections to the sanitary sewer system.
- Investigate the feasibility of connection to municipal sewer prior to allowing new individual septic systems. Require that individual systems conform to Minnesota Rules Chapter 7080 and relevant Carver County Ordinances.
- Monitor the capacity of critical sewer system facilities and implement construction of system improvements prior to capacities being exceeded.
- Review the adequacy of utility rates, sewer access charges and trunk area charges to fund future reconstruction and expansion of the sewer system.
- Evaluate ongoing routine maintenance needs for the sewer systems and incorporate the needs into a capital improvement program (CIP).

COMPREHENSIVE WATER PLAN

INTRODUCTION

Scope

The purpose of this element of the Comprehensive Plan is to the update the City's comprehensive water plan taking into account current population and land use projections. The updated plan will provide a guide plan for the extension of municipal water through new developments to ensure that all portions of the planning area can ultimately be serviced.

The preparation of water supply plan is mandated by the Metropolitan Council. The plan requirements are defined in its Local Planning Handbook and Appendix B-1 of its Water

Resources Management Plan. The Handbook states, "If the water supply plan was completed before the full comprehensive plan update, the comprehensive plan update only needs to include a summary of changes made since the water supply plan was submitted to the DNR and Metropolitan Council." Watertown submitted its Water Supply Plan in June 2007.

Past Planning Activities

Past plans and studies which are being updated by this Comprehensive Water Plan include the following:

g. Chapter Seven, Water and Sewer, from 2020 Comprehensive Plan

h. Water Supply Plan, dated May 2001

i. Water Supply Plan, Prepared 2006

j. Feasibility Study for Trunk Highway 25 Sanitary Sewer and Watermain Extension, dated February 2003

k. Feasibility Study for Echo Development, dated March 2006

EXISTING WATER SYSTEM

Description of Municipal System

The existing municipal water system is shown on Map 5-7. The major components of the system consist of:

1. Water treatment plant located at State Street and County Road 20. The plant provides iron and manganese removal treatement, along with chlorination and fluoridation and has a capacity of 1050 gallons per minute (gpm). Treated water flows into a 120,000 gallon below-grade reservoir. Pumps with a capacity of 1100 to 1200 gpm pump water from the reservoir to the distribution system and elevated storage. Filter backwash water is detained and reclaimed by mixing with well water and is then treated. Sludge from the backwash water tank is discharged to the sanitary sewer.
2. 300,000 gallon elevated storage tank
3. Four groundwater wells – Wells 2 and 4, with capacities of 400 and 700 gpm, respectively, pump to the treatment plant. Wells 1 and 3, with capacities of 150 and 350 gpm, respectively, are used only when required to meet peak demand. Well 1 is currently out of service. Wells 1, 2, and 3 are drift wells. Well 4 is a deeper well drawing water from the Franconia - Ironton – Galesville (FIG) Aquifer.
4. Distribution system consisting of 4-inch through 12-inch diameter watermains.

Current Water Supply Plan

The current water supply plan was prepared by the City staff and submitted to the DNR and Metropolitan Council in June 2007. This includes the Water Emergency and Conservation Plans, which is included within Appendix H. The comprehensive water

plan will reference information in the water supply plan and update it, but not repeat the information.

WATER DEMAND

Historic Water Demand

The historic water demand data for 1996 to 2005 is presented in Table 1 of the Water Supply Plan (Appendix H). The historic water demand data shows that the average day demand has increased since 1996, due primarily to increased population. The per capita usage is based on the total water use in the community. The data shows that the per capita usage has decreased. This results from the population and related residential water demand increasing at a higher rate than the non-residential water use (commercial, industrial and institutional).

FIGURE 5-13

Historic Water Demand

Year	Total Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I Water Sold (MG)	Wholesale Deliveries (MG)	Total Water Sold (MG)	Total Water Pumped (MG)	Percent Unmetered/ Unaccounted	Avg. Demand (MGD)	Max. Demand (MGD)	Residential Gallons/ Capita/day	Total gallons/ Capita/day
2006	3850		1262	105.55			118.98	123.90	4%	0.339	0.804	75.1	88.2
2007	4100							124.20		0.340	0.772		83.0

MG = Million Gallons MGD = Millions Gallons Per Day

As indicated in figure 5.13, unaccounted-for water (which is the difference between total water pumped and total water sold) was 4 percent for 2006. Water used for flushing watermains, firefighting, flooding ice skating rinks, water treatment plant filter backwashing and water lost during watermain breaks and leakage are examples of unaccounted for water. A general guideline is up to 15 percent unaccounted for water is acceptable for a municipal water system.

A municipal water system must have adquate capacity to meet peak day demand. This typically occurs during lawn sprinkling demand. This varies from year to year, depending on rainfall amounts and high temperature extremes. In projecting future demand, it is helpful to establish "peak factors" based on the ratio of the peak day to average day demand. The City implemented an odd day/even day lawn sprinkling restriction in 2006, which would be expected to reduce the peak factor. The average peak factor for 2006 and 2007 is 2.32 compared to an average for 2004 and 2005 of 2.76.

Fire Demand

Water usage for firefighting is a vital consideration in the design of a water supply and distribution system. Fire demands vary greatly from normal usage, in that a large quantity of water is required at a single demand point for a very short period of time. For small municipal systems, fire demand typically governs the distribution system design. Typical fire demand requirements are 1000 gpm for single family residential areas and

1500 gpm or higher for attached housing. The requirements for commercial and industrial buildings can vary significantly, based on building construction, building use and if the building has a fire suppression sprinkler system.

Insurance Services Office, Inc. (ISO) completed a Public Protection Classification survey in August 2004. This included evaluation of the municipal water systems to provide fire protection. Eleven hydrant flow tests were done as part of the evaluation. ISO found one location with deficient fire flow availability. This was the commercial area north of Maple Street where 3500 gpm fire flow was required and 1600 was available.

Past water plans have used 2000 gpm for a two-hour duration as the recommended fire demand. With the development of the industrial park and the conceptual plan for redevelopment of the south end of Lewis Street, it is appropriate to increase the recommended fire flow to 3000 gpm for a three-hour duration.

Land Use and Population Projections

Chapter Three presents the land use and population projections used for the analysis and planning of the water system. Figure 5-2 summarizes the population, household and employment projections.

Design Criteria

The municipal water demand is comprised of domestic demand, commercial, industrial and institutional demand, fire flow demand and an allowance for unaccounted for water use. This plan uses a per capita average demand of 100 gallons per capita per day (gpcd). This compares with an actual average of 92.9 for 1996 to 2007.

The water system capacity must provide for peak demand. This plan uses a peak factor of 2.4 for peak day demand. This compares with an average of 2.32 for 2006 and 2007.

SERVICE AREA

Planning Area

The Planning Area for the water system is the 2030 growth boundary, as described in Chapter Three and shown on Figure 3-3. This is consistent with the sanitary sewer Planning Area.

Beyond Planning Area

The water system planning also analyzes the potential for ultimate expansion of the system beyond the Planning Area, again consistent with the sanitary sewer planning. The area beyond the Planning Area serviceable by sanitary sewer will support an additional population of 7,500.

Future Water Demand Projections

The primary focus of this plan element is to define the water system improvements required to service the projected 2030 population of 7,700. As discussed in the comprehensive sanitary sewer section, the Planning Area will support an ultimate

population of about 13,500. Therefore, only a small portion of the Planning Area will need to be developed to support the projected 7,700 population.

Figure 5-14 summarizes the existing and projected average and peak day demands through 2030. Also shown are the demands for ultimate development population of 13,500 within the Planning Area and for the additional area beyond the Planning Area.

FIGURE 5-14

Water Demand Projections

Year	Population	Average Day Demand (mgd)	Peak Factor	Peak Day Demand (mgd)
2007	4,100	0.410	2.4	0.984
2010	4,800	0.480	2.4	1.152
2020	6,500	0.650	2.4	1.560
2030	7,700	0.770	2.4	1.848
Ultimate Development of Planning Area	13,500	1.350	2.4	3.24
Development Beyond Planning Area	21,000	2.100	2.4	5.04

EVALUATION OF EXISTING FACILITIES

Design Criteria

It is standard engineering practice to design water production facilities (wells) to satisfy the peak day demand with the largest single pumping unit out of service. This is referred to as firm capacity.

System storage adequacy can be assessed in several ways. The minimum storage recommended by the Minnesota Department of Health is equal to the average daily demand. By this standard, 340,000 gallons would be the present desired storage for Watertown for 2007.

Another approach is to consider the individual storage components needed for pressure equalization, fire demand and emergency reserve. Water production and storage must be considered together, since a reduction in storage can be compensated for by an increase in production and vice versa. In addition, the coincident draft during fire fighting can be taken as the maximum day rate versus the peak hour demand rate. This can be done, since the chances of peak hour demand coinciding with a major fire demand are slight.

Based on the above reasoning, the required storage can be calculated from the following expression:

$$S = Qf(t) + 1(Qm - Qs) + Ve$$

Where:

- S = Required Storage (gal)
- Qf = Fire Flow = 3000 gpm
- t = Fire Flow Duration = 180 minutes
- Qm = Maximum Daily Demand (gal)
- Qs = Daily Firm Capacity of Supply (gal)
- Ve = Equalizing Storage Volume = 20% Max Daily Demand

The water distribution system must have capacity to convey the peak demands without excessive drop in pressure. The fire flow demand in any specific area is typically greater than normal demand and is, therefore, the critical demand.

Water Supply

The firm capacity of the existing water system is the capacity with Well 4, the highest capacity unit being out of service. Well 1 is currently out of service and the current firm capacity is the combined capacity of Wells 2 and 3, which is 750 pgm or 1.08 mgd. With Well 1 placed in service with an expanded capacity of 350 gpm, the firm capacity is 1100 gpm or 1.584 mgd. Based on the criteria used for projecting future demand, this firm capacity will service a population of about 6600. Based on the population projections, this population is expected in 2021 based on Met Council population projections.

Water Treatment

The existing water treatment plant has a capacity of 1050 gpm, or 1.512 mgd, based on 24 hours per day operation. The filter requires periodic back-washing, which reduces the daily treatment capacity. This is essentially the full combined pumping capacity of Wells 2 and 4. This capacity will service a population of about 6,300, which is expected to be reached in 2019 based on Met Council population projections.

Water Storage

The City has 300,000 gallons of storage in the elevated storage tank and 120,000 gallons of storage in the below grade reservoir at the water treatment facility. The water in the elevated storage is available during a power outage, while water in the below grade reservoir, which needs to be pumped, is not available. Unless provided with an electric generator, water storage which requires pumping is typically not included as available storage. The 2006 Minnesota Department of Health Water Supply report noted that the storage capacity is less than the average day water demand.

Distribution Systems

The capacity of a water system to supply the critical demand flow can be determined by a computer analysis. The computer analysis involves establishing a water system model, calibration with known conditions and then analysis for the critical water demand.

The computer analysis was done using Bentley Watercad Version 8.0 software. The watermain network is described to the computer using node and pipe numbers. The wells and tanks providing water supply and the water demand are also described to the model. The model is calibrated by comparison of field hydrant flow tests with the results from the computer analysis.

Computer analyses were performed on the existing water system for the estimated peak hour flow demand and for fire flow demand. The peak hour was assumed to be two times the average demand for the peak day. For 2007, the peak day demand was 984,000 gallons per day or 683 gpm over the entire 24-hour period. The estimated peak hour demand is twice the average gpm or 1366 gpm.

Map 5-8 shows the pressure contours generated by the computer analysis of the peak hourly flow. This shows that the peak hourly demand can be provided to all parts of the City at acceptable pressure.

Map 5-9 shows the available fire flow contours for the entire city. This shows that adequate fire flows can be provided except for the commercial area north of Maple Street and for the areas serviced by 4-inch diameter mains. Map 5-7, the Existing Water System Map shows the hydrants color coded to reflect the available fire flow based on the computer analysis. It is recommended that additional field hydrant flow testing be done to confirm the computer model is appropriately calibrated.

FUTURE WATER SYSTEM

System Improvements for Planning Area

General:

The future water system improvements required to service the entire Planning Area are shown on Map 5-10. This Planning Area boundary will provide for an estimated population of 13,500 at full development, which is significantly greater than the projected year 2030 population of 7,700. The required water supply, treatment and storage facilities' capacities are based on the population and related water demand for the entire city, regardless of the location of the growth. The phasing of the trunk and lateral watermain extensions is dependent on the specific locations of individual development proposals.

Water Supply:

The current firm pumping capacity (Wells 2 and 3) is 750 gpm or 1.080 mdg. Based on the flow projections, this can supply a population of 4,500 which is expected in 2009. Placing Well 1 back in operation and increasing the pumping capacity to 350 gpm would increase the firm capacity to 1100 gpm or 1.584 mgd. This can supply a population of

6,600 which is expected in 2021. All of the anticipated improvement dates are based on Met Council population projections.

Figure 5-15 shows the required firm pumping capacities for the present condition through 2030 and beyond 2030. Well 5 will be required in 2021. The Figure shows this to be a 700 gpm well. Based on existing Well 4, this well capacity should be available from a well drawing water from the FIG aquifer. Additional study is required to confirm water quality, water source and well location. With the addition of Well 5, the firm capacity is projected to be adequate for the projected 2030 population of 7,700.

FIGURE 5-15

Water Supply and Storage Requirements

Year	Population (Met Council)	Average Day Demand (mgd)	Peak Day Demand (mgd)	Firm Pumping Capacity (mgd)	Required Storage Based on MDH Std. (mg)	Required Storage Based on Formula (mg)
2007	4,100	0.410	0.984	1.080	0.410	0.641
2010	4,800	0.480	1.152	1.584 (1)	0.480	0.338
2020	6,500	0.650	1.560	1.584 (1)	0.650	0.828
2030	7,700	0.770	1.848	2.592 (2)	0.770	0.166
2030 +	9,000	0.900	2.160	2.592 (2)	0.900	0.540
Ultimate Development of Planning Area	13,500	1.350	3.24	3.744 (3)	1.35	0.684
Development Beyond Planning Area	21,000	2.10	5.04	5.328 (4)	2.10	1.260

(1) Based on placing Well 1 back in service with capacity of 350 gpm

(2) Based on addition of Well 5 in 2021 with 700 gpm capacity

(3) Based on addition of Well 6 and 7 with 800 gpm combined capacity

(4) Based on addtion of Wells 8 and 9 with 1100 gpm combined capacity

■ Controlling Method for Calculating Storage Requirements

Water Treatment:

The existing treatment plant has a capacity of 1050 gpm, or 1.512 mgd. This capacity will service a population of about 6,300 which is expected in 2019 based on Met Council population projections. An additional treatment plant will be required in 2019. It is recommended that this plant have an ultimate capacity of about 1100 gpm with raw water supply provided by a new 700 gpm FIG well (Well 5) and a new 400 gpm drift well (Well 6). This is similar to the existing treatment

plant and Wells 2 and 4. As the existing treatment plant site does not allow for expansion and the new wells must be a significant distance from the existing wells to avoid impacting existing capacities, the additional water treatment will need to be at a separate plant. The plant will need to be adjacent to an existing or future trunk watermain. As the need for additional treatment precedes the need for the addition of Well 5, the schedule for Well 5 will need to be accelerated to match the treatment plant. It is assumed that the treatment requirements will be iron and manganese removal, same as the existing plant. This will need to be confirmed by water quality analysis.

a. Water Storage

Figure 5-15 also shows the required total water storage for the present condition through 2030 and beyond 2030. This shows both the Health Department guideline and also the calculated volume based on the formula in the Design Criteria Section.

The Health Department guideline storage volume governs in all cases, except the existing condition and the 2020 condition. The existing storage volume is less than required by both methods and therefore, additional storage is recommended to be added. This is consistent with recommendations provided over the past several years.

A 750,000 gallon elevated tank was proposed in 2006. This was to be located on Newton Avenue, adjacent to the proposed Luce Line Village development. The project was postponed, due to the slow down in development and home construction. The 750,000 gallon tank would provide a total of 1,050,000 gallons (1.05 mg) of storage. Based on the population projections and storage requirements shown in Figure 5-15, this would service a population of about 10,500, or well beyond 2030. The 500,000 gallon tank, along with the existing tank, would support a population of 8,000, just slightly over the projected 2030 population. A cost analysis prepared in March 2006 showed the cost per gallon of storage was $1.95 for a 500,000 gallon tank and that the incremental cost to increase it to 750,000 gallons was $0.64 per gallon for the additional 250,000 gallons. On this basis, the 750,000 gallon tank was recommended. The City Council with the assistance of staff's analysis and research will make the decision on the size of a new water tower. Ultimately, several factors including growth rate will need to be considered in order to properly size a new water tower and begin construction.

b. Trunk Watermain

The future trunk watermain extensions required to service the Planning Area are shown on Map 5-10. The future mains provide a trunk watermain loop around essentially the entire city. This provides a strong backbone for the distribution system and provides capacity to meet future projected water demand within the entire Planning Area. In addition, this backbone allows for extension of water service to areas beyond the Planning Area. Map 5-10 shows a second loop on the east and south side of the Planning Area. The future system would also provide flexibility to similar extensions in other directions and areas.

Map 5-10 also shows the addition of a 10-inch watermain on Lewis Avenue extending north of State Street. This will improve the fire flow north of Maple Street which is deficient. Also shown is a 12-inch main on Mill Avenue from State Street to the existing 12-inch main.

Computer analysis was also performed on the future water system. Map 5-11 shows the pressure contours based on supplying peak hourly flow and Map 5-12 shows the available fire flow contours. These maps show that the future water system can supply both peak hourly demand and fire flow demand at acceptable pressure to all future growth areas.

c. Schedule

Figure 5-16 shows the projected schedule for the future water supply, treatment and storage improvements to the water system which are required for the 2030 population of 7,700.

FIGURE 5-16

Trunk Water Systems Improvement Schedule

	Improvement	Year Completion is Required	Triggering Event
1.	Restore Well 1 to service	2009	Firm capacity exceeded
2.	Water Tower	2009	Existing capacity currently inadequate
3.	Well 5	2019	Firm capacity exceeded
4.	Treatment Plant 2	2019	Existing capacity exceeded
5.	Trunk Watermain Extensions	(1)	Development proposals in 2030 growth area

(1) Schedule dependent on development

Ultimate Service Area Beyond Planning Area

Map 5-10 shows the future watermain extensions required to service the expanded area beyond the Planning Area. This is generally consistent with the expanded area that can be serviced with municipal sanitary sewer extensions. Expansion of the water system is more flexible than the sanitary sewer system. As such, extension of municipal utility service to growth areas is typically controlled by the feasibility of extending sanitary sewer.

As shown in Figure 5.15, two additional wells (Wells 6 and 7) and a treatment plant with a combined capacity of 1100 gpm will be required to service the full development

population of 13,500 in the Planning Area. A second set of wells with a combined capacity of 1100 gpm will be required to service the area shown beyond the Planning Area.

An additional water tower is needed to meet the projected population. A 750,000 gallon tank would provide capacity for up to a population of 10,500. An additional 1,000,000 gallons of storage will be required to support the full development of the Planning Area and the additional area beyond the Planning Area.

Water System Cost Analysis

a. Improvement Project Costs

Determining the cost of expanding Watertown's municipal water system is a critical objective of this plan element. This will provide the basis for analyzing the current trunk charge and determining if it is adequate to fund the expansion.

The location and sizing of the system improvements shown on Map 5-10 are used to develop an approximate total project cost. The cost estimates are based on anticipated 2008 construction costs. The costs include construction, engineering, legal and administrative costs. No easement costs are included as it is assumed the majority of the easements or street right of way will be dedicated as a part of the development proposals. It is assumed that the trunk watermains will be paid by the developer and only oversizing cost paid by the City. A 25% contingency has been added for unanticipated costs. The developer will be responsible for the entire cost of all 10-inch and smaller watermains.

Figure 5-17 summarizes the estimated project cost for the trunk water improvements required to service the Planning Area. Normal system operation and maintenance costs are not included.

FIGURE 5-17
Trunk Water Expansion Projects
Project Cost Summary

	Improvement	**Total Estimated Project Cost**
1.	Restore Well 1 to Service	$20,000
2.	Water Tower	$1,249,000
3.	Well 5 (700 gpm FIG Well)	$411,000
4.	Treatment Plant 2	$3,090,000
5.	10" Watermain on Lewis Avenue – north of State Street	$263,000
6.	12" Watermain on Mill Avenue – State Street to Terrace Drive	$196,000
7.	12" Trunk Watermain Extensions – 2030 Growth Area	$1,151,000
	TOTAL	**$6,380,000**

b. Funding

The current funding policy for trunk water improvements consists of a trunk water charge of $4,000 per equivalent residential unit (ERU).

The elevated tank, well and treatment plant project costs listed in Figure 5-17 all have an approximate design population of 9,900. The balance of the projects have a design population of about 13,500. The total estimated project cost of the 13,500 design projects is $1,630,000. Pro rating this to a population of 9,900 results in an adjusted cost of $1,010,600. Adding this to the project cost of $4,750,000 for the tank, well and treatment plant results in a 9,900 design population cost of $5,760,600.

The 9,900 design population is a 5,800 gain from the existing population. Based on the criteria of 2.7 persons per unit, this gain would require 2,148 units. This results in the following total revenue from water charges:

2148 ERU x 4000/unit = $8,592,000

The projected revenue is about 2.8 million dollars greater than the projected project costs. The revenue projections do not include ERU's from commercial/industrial development.

WATER SYSTEM
GOALS, POLICIES AND IMPLEMENTATION STRATEGIES

Watertown recognizes the necessity of providing municipal water service to support growth and development. However, this service should be funded by those receiving the greatest benefit.

1. GOAL

The City will provide quality water service in an efficient and orderly manner that balances resident and development demands

POLICY

Maintain cost-effective water services by assessing those who receive most benefits of the service

IMPLEMENATION STRATEGIES

- Require new development to fund additional capacity, extension, and connection to the municipal water system.

- Require that adequate public facilities be in place prior to the construction of new development.

- Ensure that all development complies with the staged development plan so as to minimize the premature construction of public utilities.

- Monitor the capacity of critical water system facilities and implement construction of system improvements prior to capacities being exceeded.

- Review the adequacy of utility rates, water access charges and trunk area charges to fund future reconstruction and expansion of the water system.

- Evaluate ongoing routine maintenance needs for the water systems and incorporate the needs into a capital improvement program (CIP).

- Continue implementation of water conservation efforts to provide for efficient use of water resources and to delay the expansion of the City's water supply facilities.

CITY OF WATERTOWN

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EXISTING SANITARY SEWER SYSTEM MAP
MAP 5.1

LEGEND

- FORCEMAIN
- SANITARY SEWER *
- LIFT STATION
- MANHOLE
- SEWER SERVICE DISTRICT BOUNDARY
- 1A SEWER SERVICE DISTRICT NO.

* ALL SANITARY SEWER IS 8" UNLESS OTHERWISE NOTED

0 1200 2400

SCALE FEET

BOLTON & MENK, INC.
Consulting Engineers & Surveyors
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EXISTING ON-SITE SEWAGE DISPOSAL FACILITIES MAP
MAP 5.2

LEGEND

- PROPERTIES WITH ON-SITE SEWAGE DISPOSAL FACILITIES
- FORCEMAIN
- SANITARY SEWER *
- LIFT STATION
- MANHOLE
- SEWER SERVICE DISTRICT BOUNDARY
- 1A SEWER SERVICE DISTRICT NO.

* ALL SANITARY SEWER IS 8" UNLESS OTHERWISE NOTED

0 1200 2400

SCALE FEET

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PLANNING AREA AND SEWER SERVICE DISTRICTS MAP 5.3

LEGEND

- EXISTING SEWER MAIN
- SEWER SERVICE DISTRICT BOUNDARY
- A1 SEWER SERVICE DISTRICT NO.
- LIFT STATIONS
- PLANNING AREA

0 1600 3200
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CIPP SEWER PIPE LINING PROGRAM MAP 5.4

LEGEND

- FORCEMAIN
- SANITARY SEWER
- LIFT STATION
- MANHOLE
- VCP SEWER WITH EXISTING CIPP LINER
- VCP SEWER PROPOSED FOR LINER–2008
- VCP SEWER PROPOSED FOR LINER–2009
- VCP SEWER PROPOSED FOR LINER–2010
- VCP SEWER PROPOSED FOR LINER–2011

N

0 800 1600
SCALE FEET

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CRITICAL SEWER MAINS MAP 5.5

LEGEND

SEWER SERVICE DISTRICT BOUNDARY

1A SEWER SERVICE DISTRICT NO.

CRITICAL SEWER SEGMENTS:

1 2 3 4 5 6 7 8 9 10

0 800 1600

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PROPOSED PLANNING AREA SANITARY SYSTEM MAP 5.6

LEGEND

- EXISTING SEWER MAIN
- SEWER SERVICE DISTRICT BOUNDARY
- A1 SEWER SERVICE DISTRICT NO.
- FUTURE SEWER MAINS
- LIFT STATIONS
- 199 FUTURE SEWER FLOW IN GPM
- PLANNING AREA
- GENERAL FLOW DIRECTION

0 1600 3200
SCALE FEET

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EXISTING WATER SYSTEM MAP
MAP 5.7

WELL 1
TANK 1
WELL 2
WELL 3
WELL 4
WATER TREATMENT PLANT

LEGEND

2 PVC
4
6
8
10
12

- WELL
- TREATMENT PLANT
- STORAGE TANK

HYDRANTS AVAILABLE FIRE FLOW (GPM)

COLOR	
1500 +	
1000 – 1500	
500 – 1000	
0 – 500	
UNDETERMINED	

FACILITY	CAPACITY (MGD)
TREATMENT PLANT	1.512

FACILITY	PUMPING RATE (GPM)
WELL NO. 1 *	150
WELL NO. 2	400
WELL NO. 3 *	350
WELL NO. 4	700

* EMERGENCY USE ONLY

STORAGE FACILITY	CAPACITY (GAL)
TOWER NO. 1	300,000

0 1200 2400
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EXISTING WATER SYSTEM PEAK HOUR DEMAND PRESSURE CONTOURS MAP 5.8

PRESSURE CONTOUR LEGEND

- <=10 PSI
- <=20 PSI
- <=30 PSI
- <=40 PSI
- <=50 PSI
- <=60 PSI
- <=70 PSI
- <=80 PSI

0 1200 2400
SCALE FEET

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EXISTING WATER SYSTEM FIRE FLOW CONTOURS MAP 5.9

AVAILABLE FIRE FLOW CONTOUR LEGEND

- <=500 GPM
- <=1000 GPM
- <=1500 GPM
- <=2000 GPM
- <=2500 GPM
- <=3000 GPM
- <=3500 GPM

0 1200 2400
SCALE FEET

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PROPOSED PLANNING AREA WATER SYSTEM MAP 5.10

LEGEND

	EXISTING	FUTURE
8" WATERMAIN		
10" WATERMAIN		
12" WATERMAIN		

PLANNING AREA

MAINS SMALLER THAN 8" ARE NOT SHOWN

0 1600 3200

SCALE FEET

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FUTURE WATER SYSTEM PEAK HOUR DEMAND PRESSURE CONTOURS MAP 5.11

PRESSURE CONTOUR LEGEND

- <=10 PSI
- <=20 PSI
- <=30 PSI
- <=40 PSI
- <=50 PSI
- <=60 PSI
- <=70 PSI
- <=80 PSI

PLANNING AREA

0 1600 3200

SCALE FEET

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FUTURE WATER SYSTEM FIRE FLOW CONTOURS MAP 5.12

AVAILABLE FIRE FLOW CONTOUR LEGEND

- <=500 GPM
- <=1000 GPM
- <=1500 GPM
- <=2000 GPM
- <=2500 GPM
- <=3000 GPM
- <=3500 GPM

PLANNING AREA

0 1600 3200
SCALE FEET

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