Chapter 11
Public Water Supply Plan

11.0 Introduction

Purpose

This chapter documents water supply and characteristics of the municipal water system. In addition, forecasts of future water supply needs have been developed to assist in the planning of system expansions in an orderly manner and to anticipate future capital expenditures. The public water supply plan has been developed to:

- Provide for the delivery and conservation of water that is of consistent quality that meets drinking water standards;
- Provide for the delivery and conservation of water that is of consistent quantity for fire protection; and
- Provide sustainability of the water utility.

In addition to meeting community needs, this plan has been prepared to fulfill state mandates that are administered by the Department of Natural Resources (DNR), the Department of Health, the Minnesota Pollution Control Agency (MPCA) and the Metropolitan Council.

The Minnesota Department of Health commissioned Anoka County to complete a groundwater modeling effort. Anoka County completed the modeling effort in 2005. In turn, the City has submitted its Wellhead Protection Plan with the City Engineer acting as the City's Wellhead Protection Manager. This plan will address prevention of contamination to our aquifers.

Community Setting

Fridley is a fully developed, first ring suburban community lying to the north of the central cities of Minneapolis and St. Paul. The current population is estimated at approximately 26,459 (2007) and the number of persons employed by various businesses is approximately 23,595 (2005). Although there are few areas left for residential development, a limited amount of vacant land does exist for commercial and industrial development.

Public Water System Development

The municipal water system within Fridley was established in the early 1950s and designed to replace individual private wells. The current water system includes 13 wells, three water treatment facilities, two booster stations, two elevated water towers, and two ground reservoirs. Approximately 115 miles of water main serves the community.

The City contains three pressure zones due to the varied topography in the community. The low level zone contains 11 wells, two treatment facilities, two elevated water towers, and one ground storage reservoir. The intermediate pressure zone level contains two wells, one water treatment facility and one booster station. The high service level contains one booster station, one ground reservoir and one standpipe.

In August 1989, the City commissioned the preparation of a Water System Study to determine future water needs based upon the capability of the existing system. Additionally, information was gathered to evaluate the operation of the water system, analyze potential water conservation methods, develop a computer model of the distribution system, estimate the costs of future system improvements, and to preliminarily investigate an identified contamination problem.

As a result of this 1989 Study, an elevated 1.5 million gallon water tower and the third water treatment facility at 73 ½ Avenue and TH 65 were added to the system; improvements to the booster pump system were installed, and a well contamination monitoring program was instituted. The Twin Cities Army Ammunition Plant (TCAAP) water main interconnection to New Brighton was completed in 1994. It provides maximum flows of 3 million gallons per day from the non-peak months of September through April and 250,000 gallons per day from April to September.

The City provides an annual Water Quality report, as required by law, to the public by including it in the City newsletter. The most current report is also posted on the City web site at www.ci.fridley.mn.us/pubwks/water. Comparable to previous year's reports, the most recent Water Quality report, from 2007, shows current testing in certified laboratories demonstrates that no contaminants in excess of EPA limits were detected in the City of Fridley's drinking water supply.

11.1 Geologic Setting of the Community

The topography of the community is varied and influenced by the waterways. Higher elevations exist in the eastern and southeast portions of the community with the lowest associated with the Mississippi River floodplain.

Surficial and Underlying Geology

The surficial deposits of the Fridley area are classified as part of the Anoka Sand Plain, and were deposited primarily by glacial ice and meltwater during the most recent glaciation. However, the glacial landscape has been altered by soil formation and erosion during the postglacial periods. All of the glacial deposits were from the Grantsburg Sublobe and the overall thickness of the surficial deposits range from 50 to 100 feet.

There are five surficial deposits in Fridley. Two of the deposits are of glacial origin: lake sand and outwash deposits. The other three deposits are of postglacial origin: alluvium, eolian sand, and terrace deposits. All of the surficial deposits are postglacial.

The lake sand deposits are found along the eastern boundary of Fridley and consist of very fine to medium sand with minor silt, and include some areas of fluvial sand at or near the surface. The outwash deposits are located in the northern portion of the City and generally consist of sand and gravel. Alluvium deposits have been identified along Rice Creek and the Mississippi River. These deposits consist of primarily silty sand overlaid in places by sandy loam or peat. Eolian deposits, dunes of very fine to medium sand, are found in the extreme southeastern corner of the City. The terrace deposits are mainly sand and gravel in nature and are found over most of the western two-thirds of the City.

There are two types of uppermost bedrock immediately beneath the surficial deposits within the Fridley city limits. The two formations are called the St. Peter Sandstone and the Prairie du Chien Group. Both of

these bedrock units were deposited during the Ordovician period. Depth to the uppermost bedrock in Fridley ranges from 50 to 100 feet.

The St. Peter Sandstone is found as the uppermost bedrock in the southern half of the City and is typically 155 feet thick. The upper half to two-thirds of the formation consists of a fine- to medium-grained, poorly cemented quartzose sandstone. The lower one-third to half of the formation contains multicolored beds of mudstone, siltstone, and shale with an interbedded, very course sandstone. Many sand grains in the lower portion of the formation are dark gray.

The Prairie du Chien Group underlies the St. Peter Sandstone and is located near the Mississippi River along the western boundary of Fridley, and in the northern one-third of the City. Typically, the Prairie du Chien Group is 280 feet thick and is comprised of two principal formations, the Shakopee Formation and the Oneota Dolomite, both of which are predominantly light brownish-gray or buff, sandy, thin- to thick-bedded dolomite. It is typically varied and fractured and contains some thin layers of interbedded grayish-green shale. Bedrock geology is shown on **Figure 11.1**.

Aquifers and Groundwater Conditions

There are four aquifers in the Fridley area: the watertable system, the Prairie du Chien-Jordan, the Franconia-Ironton-Galesville, and the Mt. Simon-Hinckley.

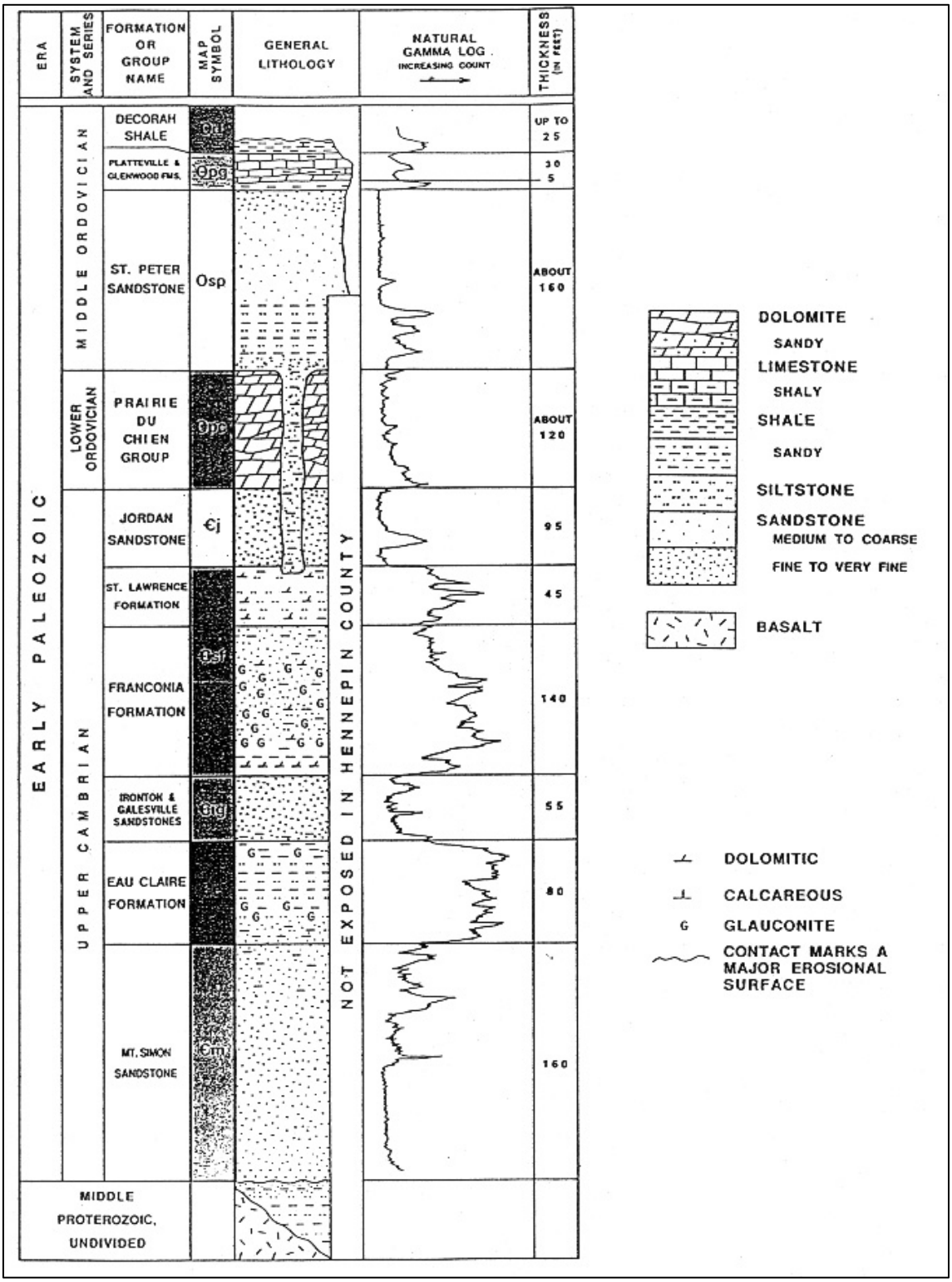
The uppermost aquifer, the watertable system, exists in many different types of geologic materials. Some of these may yield water to wells, such as sands and gravels, but others, such as till, do not. Due to the heterogeneous nature of the glacial deposits, the watertable system is highly variable in flow direction and velocity. Groundwater flow direction is generally west or southwest toward the Mississippi River.

The other three aquifers are bedrock aquifers. The uppermost bedrock aquifer, the Prairie du Chien-Jordan, is present throughout Fridley. The Prairie du Chien Group is up to 140 feet thick in some areas and groundwater flow is controlled by fractures, joints, and solution cavities within the dolomite. The Jordan Sandstone consists of fairly uniform quartzose sandstone and is highly permeable. The groundwater flow through this sandstone is primarily intergranular. Since there is no confining unit between the Prairie du Chien Group and the Jordan Sandstone, they act as a single aquifer. Groundwater flow direction is unknown, but is likely west to southwest toward the Mississippi River. The approximate maximum thickness of the aquifer is 470 feet and typical yields to individual wells range from 500 to 1000 gallons per minute. Total dissolved solids generally are less than 500 parts per million.

The Franconia-Ironton-Galesville bedrock aquifer exists beneath the Prairie du Chien-Jordan aquifer. The St. Lawrence Formation, a dolomite shale and siltstone ranging in thickness from 30 to 75 feet, acts as the confining unit between the two aquifers. The Franconia-Ironton-Galesville is comprised of three parts. The upper 105 to 190 feet consists of the Franconia Formation, glauconitic sandstone with some shale and dolomite. The next 25 to 30 feet consist of the Ironton Sandstone, and the lower 30 to 35 feet consist of the Galesville Sandstone. All three units are hydrologically connected. The groundwater flow direction in this aquifer is also unknown, but it is likely toward the Mississippi River. The approximate maximum thickness of the aquifer is 330 feet. Typical yields to individual wells range between 250 and 500 gallons per minute and total dissolved solids are generally less than 500 parts per million.

The deepest bedrock aquifer is the Mt. Simon-Hinckley. It is located beneath the Eau Claire Formation, a 60- to 125-foot thick siltstone, shale, and silty sandstone, which acts as the confining unit between the Mt. Simon-Hinckley aquifer and the Franconia-Ironton-Galesville aquifer. It consists of the Mt Simon Sandstone, which ranges from 125 to 270 feet in thickness and the Hinckley Sandstone, which is absent in many localities. In general, the Mt. Simon-Hinckley is hydraulically isolated from the shallow

Figure 11.1 Bedrock Geology



Source: SEH, Inc.

groundwater systems and surface waters above it. Therefore, most of its recharge comes from leakage. The groundwater flow direction and approximate maximum thickness in the Fridley area is unknown. Typical yields to individual wells range from 400 to 700 gallons per minute; and total dissolved solids range from 79 to 2400 parts per million.

According to the Regional Hydrogeologic Assessment of the Anoka Sand Plain, the sensitivity rating for the watertable system to pollution in the Fridley area ranges from very high in the central portion and eastern half to high in the northeastern, southwestern, and extreme western portions of the City. A sensitivity rating is a qualitative measure of the susceptibility of the aquifer to become contaminated from a release at the surface. The ratings correspond to an estimated travel time for waterborne contaminants at the land surface to reach the uppermost aquifer. A very high rating corresponds to a travel time of hours to months. A high rating corresponds to a travel time of weeks to years. The wellhead protection plan being prepared by the County should provide more distinct data for aquifer ratings.

Surface Water Characteristics

There are four lakes within the City of Fridley: Moore Lake, Locke Lake, Harris Pond and Farr Lake. Moore Lake consists of an east bay and a west bay. The lake is approximately 105 acres and has a maximum depth of 22 feet. According to the 1994 Minnesota Lake Water Quality Assessment, the mean total phosphorus, mean chlorophyll-a, and alkalinity values for the east and west bays during the summer are 58 and 99, 8 and 17, and 55,000 and 59,000 parts per billion, respectively. Water quality information for the other three lakes was not available.

There is one major creek in Fridley called Rice Creek. It is located in the central portion of the City and runs east to west toward the Mississippi River. Rice Creek discharges into and out of Locke Lake in the western portion of the City near where it discharges into the Mississippi River. Water quality information is available from Rice Creek Watershed District for Rice Creek.

11.2 Existing Water Supply and Water Storage

The following section describes the existing water supply system of Fridley. This system, which began in 1957, has taken approximately 50 years to construct and is nearly complete except for several minor improvements.

Aquifer and Groundwater Supply

The Fridley municipal water system depends upon the glacial drift, the Prairie du Chien-Jordan formation, the Franconia–Ironton–Galesville formation, and the Mt. Simon-Hinckley formation. The Prairie du Chien-Jordan group supplies Wells No. 6-9 and 12-13. The Mt. Simon-Hinckley group supplies Wells No. 1-5 and Well No. 11 is supplied from the Franconia-Ironton-Galesville group. Well No. 10 is served from glacial drift material. Wells No. 6, 8, and 9 were originally drilled to glacial drift but subsequently deepened to the Prairie du Chien-Jordan group.

Municipal Wells

The 13 municipal wells range in depth from 199 feet to 925 feet and have pumping capacities of 750 to 1,550 gallons per minute (gpm). Combined, the overall production capability of the city wells is 12,625 gpm or 18.18 million gallons per day (MGD). Therefore, the effective daily maximum pumping capacity is 15.95 MGD. **Table 11.1** depicts the characteristics of the City's wells.

Table 11.1 Ground Water Sources

Well #	Unique Well ID #	Year Installed	Well & Casing Depth (ft)	Well Diameter (in)	Capacity (GPM)	Geologic Unit	Status
1	206685	1957	389 156	16 20	700	Franconian, Gailesville, Mt. Simon-Hinckley	Standby
2	206674	1961	675 131	16 24	525	Mt. Simon-Hinckley	Active use
3	206670	1961	720 64	10 16	700	Mt. Simon-Hinckley	Active use
4	201158	1961	663 138	16 24	725	Mt. Simon-Hinckley	Active use
5	206675	1961	656	16	725	Mt. Simon-Hinckley	Active use
6	206673	1964	153	24	1400	Prairie du Chien-Jordan	Active use
7	206671	1966	138	12	800	Prairie du Chien-Jordan	Active use
8	206669	1966	138 64	12 16	1550	Prairie du Chien-Jordan	Active use
9	206672	1966	153 37	24 30	1500	Prairie du Chien-Jordan	Active use
10	206658	1969	128 16	16 24	800	Drift	Active use
11	206657	1970	344 225	23 30	825	Franconian-Galesville	Active use
12	29207	1970	234 153	24 30	1550	Prairie du Chien-Jordan	Active use
13	206696	1970	191	24	825	Prairie du Chien-Jordan	Standby
Total					12,625		

**1984 data, remaining data from 1998 as indicated*

Note: Does not include water supply from TCAAP in Arden Hills

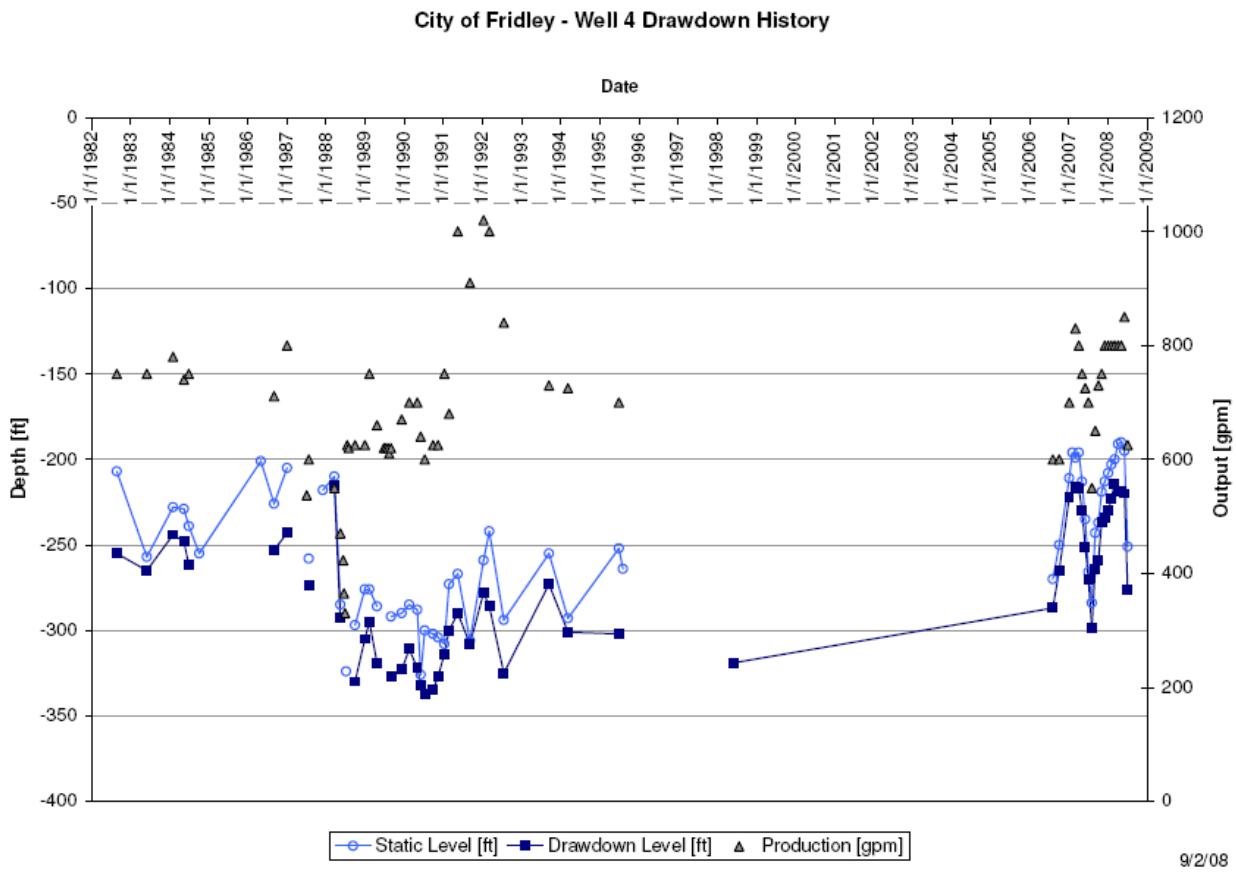
In review of the original and 1998 static levels, there had been a significant decline in Wells No. 1, 2, 4, and 5 that are served by the Mt. Simon-Hinckley aquifer and Well No. 11, which draws water from the Franconia/Galesville Formation. The 1998 static levels of all other wells are similar to the levels when the wells were originally drilled.

A comparison of the 1998 and 2007 well drawdowns, illustrated on **Table 11.2** below, shows the drawdowns in 2007 are reduced from 1998. A drawdown represents the distance the City must pump the water in order to reach ground level. In 2007, the water table was higher and, therefore, less energy was needed to pump water to the surface. Measurements taken by operations from 1982 through present illustrate that a stabilization, and varying slight recovery, in static and drawdown levels is occurring in Fridley's wells. See **Figure 11.2**, which shows data collected for Well 4 in chart format.

Table 11.2 Water Level Data (Well Drawdown Levels) – 1998 and 2007

Well No.:	1	2	3	4	5	6	7	8	9	10	11	12	13
1998	313’	281’	291’	319’	316’	63’	73’	86’	74’	57’	179’	80’	47’
2007	271’	241’	252’	251’	255’	55’	70’	69’	74’	53’	162’	77’	40’
Difference between 1998 and 2007	42’	40’	41’	68’	61’	8’	3’	15’	0’	4’	17’	3’	7’

Figure 11.2 Well 4 Drawdown Level Data – 1982 through 2008



Public Well Sites

The 13 public well sites are all located on city-owned property. Wells No. 2 through 9 are located within Commons Park, Well No. 1 off Cheri Lane, Wells No. 10 and 11 in Locke Park, Well No. 12 on property near the intersection of Highway 65 and 73 ½ Avenue, and Well No. 13 on East River Road and 51st Way. Only Wells No. 12 and 13 are near land uses that could have the potential for groundwater

contamination. **Table 11.3** below presents the characteristics of the ownership and land use of the well sites.

Table 11.3 Land Use Characteristics of Well Sites

Well No.	Ownership	Land Use	Use of Closest Structure
1	Public-fee title	Residential	Home
2-9	Public-fee title	Park	Public
10-11	Public-fee title	Park	Public
12	Public-fee title	Industrial	Industrial
13	Public-fee title	Industrial	Industrial

Source: Fridley Community Development Department

Trunk Water System and Service Areas

The Fridley water system consists of approximately 115 miles of water main which vary from 2 inches to 24 inches in diameter. The majority of the system is constructed of cast iron pipe. Water is distributed into three service areas in the City that are divided according to topographical conditions.

The low service area serves approximately 66% of the community and encompasses the western half of Fridley. Due to supply, fire flow, and operation issues raised in the 1989 Water System Study, the City constructed a 1.5 million gallon elevated tower in Locke Park to serve customers within this zone and to supply a portion of water to the intermediate and high service areas. Water pressure within this zone ranges from 45 to 85 pounds per square inch (psi). The low service area contains two booster pumps located at Commons Park that supplement the capacity of the nearby filtration plant.

In 1993, the City, in conjunction with New Brighton and the United States Army, constructed a water main to distribute excess water from New Brighton to the City from the (TCAAP) remediation plants. This system supplies up to three million gallons of water per day during non-peak months and 0.25 MGD during the summer peak months to augment the City's supply system. The system is connected at 29th Avenue in New Brighton and extends through the 63rd Avenue booster station to the main service line on the west side of T.H. 65 at 63rd Avenue. The water from the New Brighton system is tested once a month for iron and manganese and weekly for chlorine. The City adopted an agreement with New Brighton to use the water for twenty-five years, subject to change.

The intermediate service area comprises the eastern third of the City and approximately 33% of the total system demand. Pumps at Well Sites No. 1 and No. 12 transfer water from the low service area to this zone of the City. A water main loop near the Skywood Mall was completed within this area in 1991 to increase system reliability and to deliver required fire flows to the mall. The 63rd Avenue booster station was also reconstructed to receive the TCAAP water and provide better water service to the intermediate and high service areas.

The extreme southeast portion of the community is included within the high service area. This area contains only 1% of the community and is entirely residential. The Marion Hills pumping station, which provides water pressure at 40 to 53 psi, serves this area as does a 1.5 million gallon standpipe ground reservoir. There is no elevated structure that serves the high service area.

The city storage facilities include two elevated tanks and two ground reservoirs. One of the ground level reservoirs serves the low service area and the other consists of a standpipe that serves the high service area and can serve the intermediate area. **Table 11.4** below provides characteristics of the existing water storage facilities.

Table 11.4 Water Storage Capacity

Total Storage Capacity		**Average Day Demand** (average of last 5 years)
6,500,000 Gallons		3,892,000 Gallons per day
Type of Structure	Number of Structures	Gallons
Elevated Storage	2	2,000,000
Ground Storage	2	4,500,000

Water Supply Interconnections

The City has a major interconnection with the City of New Brighton as described earlier, which introduces water into the low and/or intermediate water system. The primary purpose of the interconnection is to deliver flow from New Brighton to Fridley. However, in an emergency situation in New Brighton, the interconnection could be used in reverse to deliver water from Fridley to New Brighton. In this mode, the interconnection could deliver in excess of 3 MGD to New Brighton.

The Fridley water system also provides water service to a limited number of residents of Coon Rapids, Mounds View, and New Brighton. But, the Fridley water system is not interconnected with the water systems of Coon Rapids and Mounds View. There are two physical interconnects, one with Minneapolis and one with Mounds View.

As noted in the Introduction, a groundwater model of Anoka County was completed in 2005. Three of the aquifers underlying Fridley – surficial, Prairie du Chien – Jordan, and Mt. Simon – Hinckley – have been modeled separately. The Minnesota Department of Health has made the model available to each of the cities in Anoka County. It is the health department's intention that each of the cities use the model and "build on it" to develop their wellhead protection plan. The wellhead protection planning rules have been established. The City of Fridley's wellhead protection plan is under review as of the date of this update.

Table 11.5 Wholesale Interconnections

Water Supply System	Water Purchased (MGD)	Capacity (MGD)
New Brighton via TCAAP	1.3 (average)	3.0

Note - Purchase of wholesale water from the City of New Brighton is discretionary and is excluded in capacity calculations.

11.3 Treatment and Storage Capacity Facilities

There are three water treatment plants – Commons Park, Locke Park, and Plant No. 3 – that filter most of the water consumed by residents of the City of Fridley. Originally the Commons Park and Locke Park water treatment plants removed only iron. In 1988, the Commons Park plan was upgraded to also remove manganese. A similar upgrade was completed at the Locke Park plant in 1994. Plant No. 3, located at Highway 65 and 73 ½ Avenue, was constructed as an iron and manganese removal plant in 1997. Commons Park again received upgrades in 2006 to its filter and backwashing system.

The Commons Park water treatment plant has a nominal capacity of 8,400 gpm. However, the plant is not limited to the combined capacities of Wells No. 2, 3, 4, 5, 6, 7, 8, and 9 (7,925 gpm). The Locke Park water treatment plant operates at 2,000 gpm. Plant No. 3 only filters water from Well No. 12. Therefore, its capacity is identical to that of Well No. 12 - 1,550 gpm. **Table 11.6** depicts the capacity of the City's three water treatment plants.

Table 11.6 Capacity of Water Treatment Facilities

Water Treatment Design Capacity – Commons Pk WTP	12.1 Million Gallons per day
Water Treatment Design Capacity – Locke Park	2.9 Million Gallons per day
Water Treatment Design Capacity – WTP No. 3	2.2 Million Gallons per day
Total Water Treatment Design Capacity*	**17.2** Million Gallons per day
Treatment Processes: Fe/Mn removal, filtration, fluoridation, chlorination at all WTPs. Radionuclide removal at Commons Park WTP. Fe/Mn sequestration, fluoridation, and chlorination from unfiltered Wells 1 and 13 (Standby).	

*Note: Total Emergency Capacity is 23.2 Million Gallons per day.

Wells No. 1 and 13 do not connect to any of the City's water treatment facilities due to the distance from these wells to the nearest treatment facility (Commons Park). **Table 11.7** below provides a summary of filtered water versus unfiltered water consumed by residents of the City of Fridley. Filtered water means that Iron and Manganese are filtered from the system. Water received from New Brighton in the TCAAP water line has been filtered since 1997.

Table 11.7 Filtered Versus Unfiltered Water

Year	Total Filtered Gallons (MGY)	Total Unfiltered Gallons (MGY)	Total Pumped Gallons* (MGY)
1999	828.1	72.0	900.1
2000	1338.7	24.0	1362.7
2001	1259.6	337.0	1596.6
2002	1020.8	23.0	1043.8
2003	1299.8	499.7	1799.5
2004	1080.7	78.0	1158.7
2005	1219.3	31.0	12503
2006	1152.7	192.0	1344.7

*Note: Includes Fridley Wells only, excludes TCAAP water.

11.4 Historic Water Demand and Supply: 1999-2006

The following section describes the past water use and demand of the City of Fridley. An analysis of this experience over the past 22 years will assist in ascertaining the needs of the Fridley water system in the coming years.

Water Demand Records

Fridley is a nearly fully developed community and substantial growth is not expected based upon past trends and the availability of land for new development. The City has maintained records of water service connections since 1985. The 1985-1998 water use history is on file at the Municipal Center. The categories of connection type are general and are defined below:

- Residential - Includes all single family, two to four family buildings, townhomes, apartment buildings, condominium units and mobile homes.

- Commercial/Industrial - Combines commercial and industrial uses. Each service connection represents a single business, or group of businesses located in one building. Also includes nonprofit uses such as schools, churches, city, county, and state buildings.

Table 11.8 depicts the number of water demands from 1998 through 2007. **Table 11.9** analyses changes in residential and non-residential connections.

Table 11.8 Water Demand, 1998-2007

Year	Total Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I Water Sold (MG)	Wholesale Deliveries (MG)	
1998	27,715	27,389	8,185	871	788	-	
1999	27,538	27,212	8,181	819	636	-	
2000	27,449	27,123	8,195	906	759	-	
2001	27,469	27,143	8,209	892	619	-	
2002	27,460	27,134	8,254	769	556	-	
2003	27,480	27,154	8,279	885	583	-	
2004	27,088	26,762	8,288	821	597	-	
2005	26,679	26,353	8,232	797	553	-	
2006	26,603	26,277	8,235	849	577	-	
2007	26,459	26,133	8,230	873	568	-	
Year	**Total Water Sold (MG)**	**Total Water Pumped* (MG)**	**Percent Unmetered/ Unaccounted**	**Average Demand (MGD)**	**Maximum Demand (MGD)**	**Residential gallons/ capita/day**	**Total gallons/ capita/day**
1998	1,659	1,872	11.4%	4.545	n/a	87.1	166.0
1999	1,455	1,703	14.6%	3.986	n/a	82.5	146.5
2000	1,666	1,801	7.5%	4.564	n/a	91.5	168.3
2001	1,511	1,768	14.5%	4.140	n/a	90.0	152.5
2002	1,325	1,501	11.7%	3.630	n/a	77.6	133.8
2003	1,468	1,778	17.4%	4.022	n/a	89.3	148.1
2004	1,417	1,429	0.8%	3.882	n/a	84.0	145.1
2005	1,350	1,604	15.8%	3.699	n/a	82.9	140.3
2006	1,426	1,560	8.6%	3.907	n/a	88.5	148.7
2007	1,441	1,615	10.8%	3.948	10.432	91.5	151.1

***Note: Includes water via New Brighton from TCAAP.**

Table 11.9 Service Connections 1999-2006

Year	Residential	Residential Percent Change	Commercial/ Industrial	Commercial Percent Change	Total
1999	7680	0.26	501	0.66	8181
2000	7690	0.13	505	0.88	8195
2001	7699	0.12	510	1.09	8209
2002	7743	0.57	511	0.22	8254
2003	7769	0.34	510	-0.22	8279
2004	7776	0.09	512	0.43	8288
2005	7726	-0.64	506	-1.09	8232
2006	7733	0.09	502	-0.85	8235

The number of residential service connections increased slightly on an annual basis from 1999 through 2004. After a slight drop in 2005, the connections continued to increase. The largest increase occurred in 2002. However, the annual increase in residential service connections has averaged only 0.12 % indicating a low level of residential growth.

The combined commercial and industrial connections have increased at an average annual rate of 0.33 % since 1999. Institutional connections are included with the commercial and industrial connection numbers. Those connections have decreased from 46 in 1999 to 38 in 2006, for a loss of 8 service connections.

Table 11.10 Top Ten Water Volume Users - 2007

Customer	Gallons per year	% of total annual use
Cummins	30,980,000	2.15
ELT Mpls	29,035,000	2.01
Aramark Uniform	27,287,000	1.89
Lofthouse Bakery	21,544,000	1.50
ELO	16,156,000	1.12
Stylmark Inc.	14,956,000	1.04
Minco Products	11,883,000	0.82
Spec Plating	11,031,000	0.77
HB Fuller Comp.	10,080,000	0.70
KCS Property Mgmt.	9,455,000	0.66

Records of water use by customer category have only been maintained since 1993. **Table 11.8** compares the volume of water use by customer category from 1998 through 2007. (Future water use is projected in **Table 11.12**.)

Water use by residential categories decreased between 1998 and 2007. Typical residential water use includes indoor household appliances, swimming pools, lawn irrigation, and other similar outdoor use. As noted later, the time of heaviest residential water use is during the summer months when outdoor use consumption substantially increases. Much of the residential summer use in Fridley is devoted to lawn irrigation and garden sprinkling.

Commercial and industrial water use declined significantly between 1998 and 2007. The reason for the decline of 200 MGD annually is that Webb Printing no longer operates in Fridley and BAE reduced the size of its operations.

Unmetered water uses include sprinkling of public properties, fires, fire hydrant flushing, under-registration of meters, leakage within the system and other municipal activities. Although there are a number of unmetered municipal water uses in the City of Fridley, the Water Department keeps estimates of the volume of water used for these purposes. Subtracting these estimates from the total unmetered water use results in unaccounted for water.

Unaccounted water averages less than half of the recommended 10%. Apparent Losses, mainly from meter inaccuracies, totaled an estimated 20 MG in 2007. This component can be addressed through more accurate metering. The City plans to study the cost-effectiveness of an aggressive re-metering program.

We have calculated the Unavoidable Real Losses (UARL) for the City of Fridley's water system according to the AWWA method. The UARL for the system is 58.3 MG annually, which is in just below the Real Losses for 2007 (estimated at 60 MG). The City has an aggressive five-year infrastructure replacement program, and responds rapidly to distribution and service line repairs, as can be illustrated by the near concurrence of the UARL and actual Real Losses.

Table 11.8 depicts the water pumped compared to water sold. The difference has been labeled "Unaccounted for Water" to reflect the fact that, although the water use is unmetered, it is estimated, and much of the water is billed for.

Peak Water Demand

As may be expected, the summer months are those that demand the greatest production of water with the winter months being relatively the lowest. Because outside water use by residential customers does not occur, the winter months will continue to be lower than the summer months.

Table 11.11 depicts the seasonal and peak demand characteristics of water production for Fridley from 1999 to 2006.

Table 11.11 Peak Water Production: 1999-2006

Year	Winter Production (January)		Summer Production (June)		Maximum Monthly	
	Monthly Production (MG)	Average Daily Production (MGD)	Monthly Production (MG)	Average Daily Production (MG)	Production (MG)	Month
1999	44.5	1.5	101.8	3.4	135.4	August
2000	51.9	1.7	148.0	4.9	210.3	August
2001	60.1	2.0	124.7	4.1	235.7	August
2002	54.4	1.8	108.3	3.6	150.2	July
2003	94.5	3.1	129.2	4.3	263.9	August
2004	51.2	1.7	115.1	3.8	149.1	July
2005	56.1	1.9	126.8	4.2	217.6	July
2006	42.1	1.4	224.3	7.5	227.7	July

Maximum monthly demands occurred during the 2006 drought when high temperatures accompanied little rainfall. The peak demand month occurred in August 2003 during the drought when 263.9 MG were pumped from the Fridley water system. The higher demand due to the drought was caused by greater water usage by customers for outdoor sprinkling and indoor cooling.

11.5 Sustainability

As a result of the 1989 Water System Study, the City has completed several improvements to its water system. These improvements include the construction of a 1.5 million gallon elevated tank facility west of Highway 65, the 63rd Avenue booster station, filter plant No. 3 at 73 ½ Avenue and the Skywood Mall water main loop.

Additionally, the City completed the TCAAP water distribution connection in conjunction with New Brighton and the United States Army to receive 3 million gallons of treated water per day during nonpeak months. However, certain other improvements are required in order to ensure reliability with the current system.

Improvements, such as ongoing repairs and elimination of dead-end lines will assist the City in meeting supply, efficiency, control, resource sustainability and fire-fighting demands. As mentioned in the introduction of this chapter, Fridley is in the process of writing a contingency plan that meets the requirement of the Minnesota Department of Health's Wellhead Protection Plan.

Capital improvements that will aid Fridley in achieving sustainability of water supply, treatment, and distribution systems include refinement and implementation of a long-range capital improvement plan to include proactive and scheduled replacement of distribution system piping and components, storage facilities, and treatment plant elements. In late 2007, charter-mandated rate restrictions on the City's Water Utility rates were eliminated through passage of referendum. Future rates need to be developed to sustain the components providing water supply and distribution to the community.

Programs Aimed At Conserving Water

Certain programs are aimed at conserving water and reducing demand. Fridley already tracks unaccounted water. Detecting and repairing leaks will minimize unaccounted for water use. Recovering unaccounted water will allow Fridley to establish and meet conservation goals. Fridley seeks to establish conservation goals that may be implemented during times of high unaccounted water.

In 1999, Fridley began publishing an annual "water quality report" in its newsletters to educate the community about water regulations and the quality of the water resource. The report relays to what extent the City meets or exceeds guidelines for a variety of substances, which may occur in the water supply. The City regularly tests the water to determine if the water from certain wells should be used or blended with others to continue to meet guidelines. Fridley has considered instituting an odd/even water sprinkling ban during drought seasons. Although this type of water ban often increases overall water use, the peak demand would decrease.

11.6 Future Water Demand and Supply

Although the City is nearly fully developed, there are still opportunities for the development of vacant commercial and industrially zoned land. Future water consumption needs are projected based upon past consumption and available land for new development.

As of 2006, little vacant land existed for residential development. Increased density obtained through redevelopment would increase water demand. For example, the Metropolitan Council anticipates that 1,000 more households will be added to Fridley by 2030. Otherwise, the largest factor that will influence residential water demand will be climatic influences and residents' needs to respond to those influences. Droughts and heat waves are typical influences that cause an increase in residential demand for water.

Demand Projections

For planning purposes, the 1989 Water System Study (on file with the City) utilized a rate of 65 gallons per capita per day for residential purposes. This was based upon 1988 winter quarter water usage. The 1994 and 1998 water consumption records indicate an average annual per capita residential water use of

87 gallons per day in 1994 and 82 gallons per day in 1998. Therefore, a conservative of 90 gallons per day is utilized for the projected water supply in this study.

In 2006, only 60 acres of the 1728 acres zoned for commercial/industrial use was undeveloped. For planning purposes, it is assumed that the remaining vacant acreage will undergo development by 2020 and possibly by 2010. The 1989 Water System Study estimated that water demand per acre per day was 1650 gallons based upon the winter billing rate. Further, this number represents a conservative approach in that it represents full occupancy of commercial/industrial properties.

Table 11.12 Ten-Year Demand Projections

Year	Total Community Population	Population Served	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Projected Demand (MGY)
2010	27000	26635	4.33	10.96	1579
2020	26900	26900	4.35	11.03	1588
2030	27500	27500	4.41	11.19	1608
Ultimate	30000	30000	4.64	11.86	1694

As indicated in **Table 11.12**, commercial/industrial water demands will slightly increase as additional property undergoes development. Although approximately 60 acres of commercial/industrial land remains undeveloped, the potential increase in water use is considered to be negligible compared to the existing commercial/industrial water use.

The City of Fridley has one private water service within its limits, which serves a private mobile home park. It is anticipated that the City of Fridley will begin to provide service to these 365 customers between 2010 and 2020.

The current capacity of the water supply system is sufficient to accommodate projected water demand. Treatment capacity exceeds pumping capacity. The system firm capacity (Fridley wells only, largest pump out of service) is currently 5,019 million gallons per year (MGY) and projected water demand in the year 2030 is 1,608 MGY. Including reasonable downtime for maintenance, capacity far exceeds projected demands.

11.7 Policies for Water Supply System Operations

Policies

The City has established the policies listed below that are directed towards the operation, improvement, and conservation of its water supply system. It is not anticipated that major expansions to the system will occur due to the status of development within the City. Based upon the inventory and analysis of future demands, the primary focus of the plan is service delivery and sustainability.

1. The City will provide municipal water service to residents and businesses in the community in the most fiscally responsible manner possible.
2. The municipal water system service will provide high quality water that will not negatively impact the natural water resources of the community or region.
3. The City will continue to make every effort within its means to provide high quality drinking water.
4. The emergency preparedness program will allow for the City to supply quality water to community users in a prioritized manner that protects the water resource to the extent possible.

11.8 Goals and Objectives

Goals and objectives have been assembled related to water supply. The term goal is used throughout the Comprehensive Plan to define the City's desired outcome relative to key community issues. Three of the four overriding goals that emerged from the 2007 neighborhood planning meetings can be related to the City's water supply.

Goals

1. Maintain Fridley as a desirable place to live
2. Maintain Fridley as a desirable place to invest in business
3. Keep Fridley a safe community for all to enjoy

A sound drinking water supply is an essential part of the quality of life in a community. It is also essential to many businesses – particularly the many industries – in Fridley. Also, besides clean air, the most essential public health issue in a community is a clean, safe water supply.

The following objectives were developed as the staff committee analyzed what was necessary to reach the goals of a sound drinking water supply that greatly affects the quality of life, business, and public health in Fridley.

Objectives

1. Protect the quality and quantity of the Fridley drinking water supply
2. Provide a plentiful supply of drinking water in Fridley
3. A public informed about the safety of the public water supply
4. Maintain a sustainable water supply into the future

11.9 General Conclusions and Action Steps

Several conclusions were drawn from the analysis of the existing water supply system. These findings were discussed and debated and related action steps that could address the needs of the water supply system were developed. These action steps reflect the City's general intentions and will guide the community in the attainment of goals.

1. During this past summer, water demand neared available supply for brief evening periods.

   Action Step: Staff needs to monitor summer hourly peak demands, and consider educational and legislative options to address these as needed.

2. In 2004, a water supply emergency plan was developed. The plan needs to be maintained to ensure reliable service to the community.

   Action Step: Update the emergency management plan, at minimum every 5 years, to incorporate the most recent technological advances.

3. Much has been accomplished in the past ten years to repair leaks in the water system. There will continue to be a discrepancy between the amount of water pumped versus the amount of water sold. In order to be sustainable, the City needs to monitor unmetered water use as an indicator of the condition of its distribution system. The City has a leak survey program in place.

   Action Step: The City needs to develop guidelines and anticipate actions if and when an unacceptable percentage of unmetered water usage is observed.

4. The removal of the charter amendment service fee restrictions will now allow the Fridley water utility to be fully-funded over time. Certain measures need to be taken to ensure sustainability of the system.

   Action Step: A rate study needs to be completed to establish the necessary revenue and optimum rate structure to sustain the long-term needs of the water supply and distribution systems.

5. Most of the City's water distribution infrastructure is 45-55 years old. This means the City can expect much of the system to need replacement within a short time frame.

   Action Step: The City needs to develop a plan for systematically replacing water mains over a scheduled period as a means to distribute costs over time.

6. The integrity of Fridley's well water supply is dependent upon the quality of water in different aquifers. As has been experienced in the past, contamination of that water has significant impact to the costs of running the system. A Wellhead Protection Plan is not only required by law, but it will help the City protect the City's drinking water supply.

   Action Step: The City will complete and submit its Wellhead Protection Plan by the end of 2008.

11.10 Summary

The current water supply system is sufficient to accommodate the projected future growth and redevelopment activities that will occur in Fridley to the year 2030 and beyond.

Now that service fee restrictions have been removed by the recent referendum, the City can now focus on planning for a sustainable system in terms of rates and rate structures to address its long-range capital improvement needs and preservation of water resources. As long as the integrity of the existing water supply system is preserved, Fridley's water supply system will adequately meet the needs of the community to 2030.