WATER SUPPLY AND DISTRIBUTION PLAN

City of Farmington

March 2009

Project Number: 000141-06287-0

Bonestroo

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INTRODUCTION

This report presents a Comprehensive Water Supply and Distribution Plan for a water system that will meet both the near-term and ultimate needs of the City of Farmington. The most recent Comprehensive Water Plan was completed in 1996.

GROWTH AND WATER DEMAND

Farmington has experienced rapid growth over the last 10 years. From 1990 to 2000, its population increased by 208%, going from a population of 5,940 to 12,365. The Metropolitan Council's certified population was 18,589 as of April 1, 2007. Water needs will continue to increase as the City builds to an estimated 2030 served population of approximately 32,700. The ultimate saturation population is estimated to be about 65,000.

Water use has increased steadily as population has grown. The City of Farmington currently pumps approximately 810 million gallons of water into the system each year. This corresponds to an average daily use of 2.2 million gallons per day. Maximum day water use was on July 16, 2007 with 6 million gallons being pumped in one day (MGD). The projected water demand for 2030 is a daily average of 3.8 MGD with an estimated daily maximum of 11.0 MGD. The projected ultimate average day demand is 8.5 MGD and the ultimate maximum day demand is 23.2 MGD. Projected water demands were based on the Ultimate Land Use Plan for the City of Farmington.

EXISTING FACILITIES

The existing water supply and distribution system has served Farmington's needs quite well. The existing distribution system operates under a single pressure zones, with a high water level (HWL) of 1117.33. Farmington presently obtains its raw water supply from seven wells throughout the city.

Two storage facilities stabilize pressures during peak water demands, and also serve as a source of water during fires or power outages. There is a total existing useful storage volume of 1.79 million gallons (MG).

Water from the supply wells is chlorinated, fluoridated, and pumped into the system. Raw water from the Jordan aquifer is considered to be hard and has occasional high concentrations of iron and manganese, but does not presently require treatment. The need for treatment in the future will be evaluated in light of customer desires and the mandates of the Safe Drinking Water Act.

2030 CAPITAL IMPROVEMENTS

The recommended improvements necessary to meet Farmington's estimated 2030 trunk water supply and distribution needs will cost about $14,250,000. Improvements include:

- 3 new supply wells
- raw water transmission main
- 1 new storage tower

- trunk distribution system improvements.

ULTIMATE WATER SYSTEM

The improvement program for Farmington's ultimate trunk water supply and distribution system is estimated to cost an additional $49,650,000. The ultimate system shown on the map in the back of this report consists of the 2030 improvements plus the following:

- 11 new supply wells
- additional raw water transmission main
- an additional 2 water storage towers
- over 10 miles of additional trunk water distribution mains
- a proposed water treatment plant, in case of future raw water quality problems.

ECONOMIC ANALYSIS

This report recommends that the City maintain the current system of using area charges and connection charges to finance the proposed Capital Improvement Plan. Area charges of $2,765 per acre developed are proposed to pay for 100% of distribution system costs and 25% of the ultimate supply and storage costs. Connection charges of $805 per residential equivalent connection are proposed to pay for 75% of the ultimate supply and storage costs. If water treatment is implemented, a special connection charge of $945 per residential equivalent connection will be required from both existing and future consumers to pay for water treatment.

The City should review the Capital Improvement Program annually and modify the program as needed to better serve community development needs. The entire water supply and distribution plan should be revised every five to ten years.

RECOMMENDATIONS

Based upon the results and analysis of this study, it is recommended that Farmington City Council:

1. Adopt this study and the Capital Improvement Program as a guide to the orderly expansion of the City's water system.
2. Annually review the Capital Improvements Program and water system service charges and make amendments, if necessary, to better serve community development needs.
3. Expedite acquisition of sites for wells, storage facilities, and any easements required to connect these sites to the water system.
4. Monitor water quality and consumer complaints to screen out problems with high iron and manganese concentrations and insure compliance with drinking water quality standards. The need for water treatment should be evaluated as raw water quality problems arise in the future.

1 Introduction

1.1 PURPOSE AND OBJECTIVES

The purpose of this water supply and distribution plan is to provide a comprehensive improvement program to meet the near-term and ultimate water supply needs for the City of Farmington. The most recent Water Supply and Distribution Plan was completed in 1996. The primary objective of this report is to revise and update the existing Water Supply and Distribution Plan and provide a comprehensive water system plan for the entire City, based on Farmington's anticipated land use plan. Specific objectives are as follows:

- Determine the potential ultimate water demands expected within the City and the production capacity, treatment capacity, and storage required to meet these demands.
- Revise the existing and proposed trunk water main system, as presented in the 1996 Water Supply and Distribution Plan, in accordance with present planning.
- Determine near-term supply, treatment, and storage needs in order to allow sufficient lead time for the addition of facilities to the system.
- Hydraulically analyze the existing and ultimate system to identify weak water main connections and propose solutions to ensure adequate residual pressures.
- Optimize supply, treatment, storage, and distribution combinations to develop an economical and efficient ultimate water system.
- Develop preliminary cost estimates for supply, treatment, storage, and distribution facilities to form a basis for a satisfactory financing program.
- Provide capacities and locations of proposed new water storage facilities.
- Incorporate the 2006 Water Emergency and Conservation Plan in order to reduce the overall demand for water and encourage wise use of a limited resource.

1.2 BACKGROUND

Farmington has experienced steady growth over the last 40 years, going from a population of 2,320 (in 1960) to 3,130 (in 1970) to 4,700 (in 1980) to 5,940 (in 1990) to a population of 12,365 in 2000. The Metropolitan Countil certified Farmington's population at 18,589 as of April 1, 2007. Water needs will continue to increase as the City builds to a forecasted population of 32,700 in 2030.

Water usage within the City has approximately doubled during the last 10 years. The City of Farmington is expected to pump 810 million gallons of water into the system in 2007. This corresponds to an average day demand of 2.2 MGD. Maximum day water demand was 6 MGD, recorded on July 16, 2007. The projected increase in population will correlate with an increase in water demand, making the provision of a well planned water supply and distribution system a necessity.

The development of a water system capable of supplying and distributing potable water of high quality to all points of demand at acceptable residual pressures requires advance planning. Such a system is dependent upon a strong network of trunk water mains complemented by properly sized and strategically located supply and storage facilities. A comprehensive plan based on the most reliable information presently available is

necessary to ensure that adequate facilities are provided during a significant growth period and to allow flexibility for future adjustments.

Without proper planning, haphazard and piece-meal construction can result in either undersized or oversized facilities. Either condition is very costly to a community since a water main that is too large is not fully utilized, while a main that is too small will eventually have to be paralleled or replaced. The purpose of this study is to provide the City of Farmington with a comprehensive Water Supply and Distribution Plan that will minimize these problems and will establish continuity in the development of a future water system by serving as a guide for future expansions and additions.

A municipal water system can be divided into three main categories: 1) supply and treatment facilities, 2) storage facilities, and 3) the distribution system.

- **Supply and Treatment Facilities** include all equipment necessary to supply, pump and treat the amounts of water demanded by the system. For Farmington, it is proposed to consider only groundwater supply sources. The supply facilities thus include the wells, pumps, pumphouses, controls, raw water transmission mains, water treatment facilities, and all related facilities.
- The **Storage Facilities** are the reservoirs used throughout the system to store water for usage during emergency and peak conditions. Water from storage is fed into the system either by gravity or by pumping through a booster station. Two types of reservoirs feed water directly into the system by gravity: (1) a ground reservoir with the floor resting on the ground and (2) an elevated reservoir with columns supporting the tank. A ground reservoir may also be constructed at an elevation which requires a booster station to pump the water into the system at the proper pressure.
- The **Distribution System** is made up of the trunk water mains (primarily 12 inches or larger in diameter), lateral water mains (6 to 8 inches in diameter), service pipes, valves, hydrants, and all appurtenances necessary to convey water from the supply sources and reservoirs to the points of demand. Since the lateral water mains are normally routed along residential streets within a development, it is impossible to predict with any degree of accuracy where future laterals will be placed in undeveloped areas. These lines are excluded from consideration in analyzing the distribution system hydraulics.

The phased construction of the Farmington water distribution system has primarily been dependent on development within the City. Where development occurs, water mains are constructed to serve those specific developments. However, development within a City is not always contiguous and gaps in the distribution system may result. As development continues to grow further away from the supply wells and reservoirs, these gaps can cause problems with insufficient supply and pressures since they prevent "looping" of the distribution system.

Looping of the distribution system provides system reliability in the event of a water main break, but more importantly it provides the large flows required for fighting fires. One of the purposes of this report is to evaluate potential water pressure and supply problems and determine the most feasible solutions.

2 Water Demands

2.1 GENERAL

Capacity requirements for the three water system components of supply and treatment, storage, and distribution are dictated by the demands placed upon them for production and distribution. The design of the water supply and distribution system for Farmington was based on estimates of the future water demands (for the 2030 service population and at build-out of the Ultimate study area). Phasing of the system improvements was based on estimates of near-term needs.

Water demand (both peak and average) is affected by many factors including population, population distribution, commercial and industrial activity, water quality, water rates, climate, soil conditions, economic level of the community, sewer availability, water pressures and the condition of the water system. The most important factor is land usage, which encompasses residential and non-residential development.

Projections of land usage and population for Farmington's Ultimate service area, and service population for the 2030 service area, were correlated with past and present water demands to develop estimates of water demands for each of these service areas. Historical well pumping records along with the existing parcel uses were compared to generally accepted design parameters, which were then used as the basis for the new water demand computation contained in this report.

2.2 RELATIONSHIP TO LAND USE PLAN AND POPULATION FORECASTS

The Water Supply and Distribution Plan was prepared based on the City's 2030 Comprehensive Plan. The household and population forecasts are based on the projected land uses within the study area. Full build-out of the Ultimate study area is not expected to occur until well after the year 2030. The City's ultimate land use plan is shown on Ultimate Land Use map as seen in Appendix A.

Demand projections for the Ultimate study area were based on land use and anticipated demand factors. Several of the comprehensive plan land uses are expected to have similar demand factors, and were merged as shown in Table 1 for the purposes of demand allocation.

TABLE 1. WATER SUPPLY AND DISTRIBUTION PLAN LAND USES

Comprehensive Plan Land Use	Modeled Land Use
Low Density	Low Density Residential
Low Medium Density	Low Density Residential
Medium Density	Medium Density Residential
High Density	High Density Residential
Commercial	Commercial
Industrial	Industrial
Public/Semi-public	Public/Semi-public
Restricted Development	Low Density Residential
Mixed-Use (Commercial/Residential)	Commercial

Population projections and water use forecasts were developed for the City at build-out of the Ultimate study area by taking the net developable acres for each future land use (as shown in Table 2) and multiplying by the appropriate demand factors in Table 3. Net developable acres are exclusive of areas such as right-of-way (ROW), wetlands, and steep slopes.

TABLE 2. DEVELOPABLE LAND USE SUMMARY

Land Use Type	Acres
Low Density Residential	2,442
Medium Density Residential	863
High Density Residential	232
Total/ Residential	*12,049*
Commercial	621
Industrial	434
Public	550
Total/ Non-Residential	*2,701*
Total	**14,750**
% Residential	68.8%
% Non-Residential	31.2%

TABLE 3. FUTURE WATER DEMAND RATES

Land Use Type	Persons/ Dwelling	Gallons/ Capita/ Day	Units/ Acre	Demand Rate (GPM/Acre)		
				Average Day	Maximum Day	Peak Hour
Low Density Res.	2.8	100	3.1	0.60	1.81	3.62
Med Density Res.	2.5	90	7.9	1.23	3.70	7.41
High Density Res.	2.0	80	12.8	1.42	4.27	8.53
Commercial	-	1500 gpd/acre	-	1.04	2.08	4.17
Industrial	-	1500 gpd/acre	-	1.04	2.08	4.17
Public	-	1000 gpd/acre	-	0.69	1.39	2.78

The facilities described in this plan are designed to serve an ultimate population of 65,000 at build-out of the Ultimate study area. Actual growth rates will affect only the timing of construction and not the design of the system. Table 4 summarizes the service population projections used for this study.

TABLE 4. SERVICE POPULATION PROJECTIONS

Year	Estimated Service Population
2008	19,540
2009	20,000
2010	20,500
2011	22,840
2012	23,360
2015	24,920
2020	27,510
2025	30,110
2030	32,700
Ultimate	65,000

2.3 VARIATIONS IN WATER USAGE

The rate of water consumption will vary over a wide range during different periods of the year and during different hours of the day. Several characteristic demand periods are recognized as being critical factors in the design and operation of a water system. The demand rates are expressed in million gallons per day (MGD), which in the case of a daily demand indicates the total amount of water pumped in a 24 hour period. Hourly rates are also expressed in million gallons per day. In the case of an hourly rate, the rate in MGD is determined by assuming that the demand would continue at the indicated rate for 24 hours.

The average day demand is equal to the total annual pumpage divided by the number of days in the year. The principal significance of the average day demand is as an aid in estimating maximum day and maximum hour demands. The average day demand is also used in estimating future revenues and operating costs such as power and chemical requirements, since these items are determined primarily by the total annual water requirements rather than by daily or hourly rates of usage.

The maximum day demand is the critical factor in the design of certain elements of the waterworks system. The principal items affected by the maximum day demand are:

- raw water supply facilities,
- treatment plant capacity, and
- treated water storage requirements.

The raw water supply facilities must be adequate to supply water near the maximum day demand rate and the water treatment plant must be capable of processing a majority of the water supplied. Sufficient treated water storage should be provided to meet hourly demands in excess of the water supply capacity. The installed capacities should also include reserves for growth, industrial development and fire protection.

The maximum demands upon the water system are encountered during short periods of time, usually on days of maximum consumption. These short period demands are referred to as hourly demands, and they

seldom extend over a period of more than three or four hours, generally during hot summer evenings when the sprinkling load is the highest. The existing maximum day occurred on July 16, 2007, at 6 MGD.

The maximum hour consumption rates impose critical demands on the distribution system, and major elements of the waterworks facilities must be designed to meet these demands and provide satisfactory service at all times.

Maximum hour demands in Farmington are supplied through a combination of water from the well pumps and water drawn from storage reservoirs on the distribution system. Although the rate of consumption is high during periods of maximum hourly demands, the duration of the extreme rate is relatively short. Therefore, a moderate quantity of water withdrawn from storage reservoirs strategically located on the system assures satisfactory service, minimizes the total maximum hour pumping and transmission main capacity required, and permits more uniform and economical operation of the wells. Storage on the system is also an important factor in insuring reliability of service during emergencies resulting from power failure, from temporary outages of water supply facilities, and from sudden and unusual demands brought about by fires or line breaks.

In Farmington another critical situation should be evaluated in designing the system. The storage tanks are refilled during the night and early morning hours when demand on the system is low. A strong network of piping is needed between the supply sources and the reservoirs to insure that a sufficient amount of water can reach the storage tanks during the refilling period to provide the required supply for the following day.

2.4 WATER DEMAND BY CUSTOMER CATEGORY

Analysis of past water usage by customer category provides additional insight into how water is being used in Farmington, and where potential for conserving water may be found. Data from 2006 indicates that City water use is 88% Residential and 12% Other. For more information on water conservation, please refer to the 2006 Water Emergency and Conservation Plan for the City of Farmington contained in Appendix B.

2.5 PROJECTED WATER USAGE

Estimated future water usage is based on population, land use, and water use trends. Peak demands vary with land use. High peak usage rates are experienced in low density areas during hot, dry periods due to extensive lawn sprinkling, while usage in high density areas depends on human consumption to a greater extent. Average daily usage for commercial and industrial areas is very high, but is much more stable than residential usage. Therefore, although commercial and industrial areas have high average usage, the peak usage (maximum day and maximum hour demands) is comparable to those in residential areas.

Each of the land use categories was examined with consideration given to population density, area of lawns to be sprinkled and other activities likely to occur compatible with the projected land usage. Demand rates were then developed for each land use type.

Total water usage at designated discrete points of demand on the water system was determined for the purpose of hydraulic analysis and system design. This was accomplished by dividing the City into subareas whose total demand was assumed to be located at a designated point in each subarea. The subareas were then further subdivided into the various land use categories, based on the Ultimate Land Use map. By applying the unit demand, the total demand for each subarea was developed.

Projected maximum day water demands are presented in Table 5. The maximum day water demands are used for the sizing of supply and storage facilities. A record of actual maximum and average day demands should be charted to aid in the sizing and phasing of future facilities. The maximum day demands at build-out of the Ultimate study area and for the 2030 service population are estimated to be 23.2 MGD and 11.0 MGD, respectively. The per-capita demands in the ultimate system increase due to the large Industrial area.

This plan incorporates the following built-in assumptions:

Conservation Plan: Assumes successful implementation of the 2006 Water Emergency and Conservation Plan. Exceeding the goals outlined in the conservation plan will result in additional water use reduction for the City.

Commercial/Industrial Water Use: The water use for any property can vary widely depending on their specific process, employment base, ability to recycle water, etc. Therefore, this report assumes a water use of 1,500 gallons per day per acre for Industrial and Commercial land use.

TABLE 5. PROJECTED WATER DEMANDS

Year Ending	Served Population	Per Capita Demand (gpcd)	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Max Day Per Capita Demand (gpcd)
2007	18,589	119	2.22	6	300
2008	19,540	116	2.3	6.5	305
2009	20,000	116	2.3	6.8	310
2010	20,500	117	2.4	7.0	315
2011	22,840	109	2.5	7.3	319
2012	23,360	110	2.6	7.5	320
2015	24,920	111	2.8	8.1	324
2020	27,510	113	3.1	9.0	329
2025	30,110	115	3.5	10.0	333
2030	32,700	117	3.8	11.0	336
Ultimate	65,000	131	8.5	23.2	357

2.6 FIRE DEMAND

Water usage for fire demand is also a vital consideration in the design of a water supply and distribution system. Fire demand varies greatly from normal usage in that an extremely large quantity of water is required from a single demand point in a very short time. The quantity of water used for fires is almost negligible when compared to other usage categories, but because of the extreme rate of usage during an emergency situation, fire demands frequently govern design.

The Insurance Services Office (ISO) recommends that a system the size of Farmington's be capable of delivering a fire demand of 1,000 gpm to 3,500 gpm for varying durations depending on the rate of demand. Commercial and industrial properties that implement fire suppression sprinkling systems typically

require less fire flow, and 2,500 gpm is generally considered sufficient for these properties. Fire flow requirements for specific properties should be confirmed with the Chief Fire Official. Table 6 shows the recommended fire flows used in the design of the Farmington water system.

TABLE 6. RECOMMENDED FIRE FLOWS

Land Use	Required Fire Flow (gpm)	Duration (hrs)
Commercial/Industrial	3,500	3
Institutional/Public	3,500	3
Sprinkled Buildings[1]	2,500	3
Multi-Family Residential	1,500	2
Single Family Residential	1,000	2

[1] Minimum desirable fire flow for Commercial/Industrial/Institutional/Public buildings

The most recent ISO survey for the City of Farmington was performed in 1999. Surveys are typically repeated every ten years or so, which suggests that Farmington may be surveyed again in the near future. Based on the 1999 survey the city received a total credit of 51.71, which is on the lower end for a Class 5 rating. The City's water system received 35.33 out of a possible 40 points. In addition, the fire system received 7.29 out of 10 points for receiving and handling fire alarms, and 19.11 out of 50 points for the fire department. The City also lost 10.02 points for divergence, which is calculated based on the following equation:

$$\text{Divergence} = \frac{[(\text{Fire Department}) \times 0.8 - (\text{Water Supply})]}{2}$$

Without the divergence calculation, it would be numerically possible for a City without a fire department to get 40 points (Class 6) without any fire-fighting capability. Similarly, a City without a water system but having an excellent fire system could theoretically receive 60 points (Class 4) without providing water.

The water system for Farmington lost only 4.67 points. Even if these points were gained, the City's overall score would only increase by 2.34 points because half of the gains would be lost to a greater divergence score. Gaining 2.34 points would not improve the City's fire class rating, since a total credit of at least 60 is required to achieve Class 4. If the City desires a lower ISO class, it should focus on the fire department section of the Fire Suppression Rating Schedule.

2.7 PHASING OF THE SYSTEM

For the purpose of phasing additions to the system, water demands for the Ultimate study area were determined by multiplying the demand rates by the appropriate acres of each land type expected to develop at build-out. Demands for interim periods were determined by multiplying the anticipated per-capita demand rates by the projected population. Based on these assumptions, the average day demand at build-out of the Ultimate study area is expected to be 8.5 MGD with a corresponding maximum day demand of 23.2 MGD. The 2030 average day demand is projected to be 3.8 MGD with a maximum day demand of 11.0 MGD.

3 Existing Facilities

3.1 WATER SUPPLY

GENERAL

The Twin Cities Metropolitan Area is underlain by geological formations that are capable of yielding large volumes of water. These formations were deposited in a trough that resulted in a unique dish-shaped geological structure centered below the Seven County Metropolitan Area.

The Twin City Artesian Basin contains a total of six aquifers. Four of these aquifers, the Ironton-Galesville, the Franconia, the St. Peter, and the Platteville-Decorah, are minor aquifers. The major aquifers are the Prairie du Chien-Jordan and the Mt. Simon-Hinckley. The area also includes numerous smaller glacial drift aquifers. The Prairie du Chien-Jordan is the major aquifer in the Seven County Metropolitan Area, supplying approximately 75 percent of the area's groundwater. The majority of the remaining groundwater is supplied by the Mt. Simon-Hinckley aquifer.

Where the Prairie du Chien-Jordan aquifer is overlaid by the St. Peter formation and the full thickness of the aquifer can be developed, well capacities can reach 2,500 gallons per minute (gpm). Where only the Jordan formation can be developed, the well capacities will usually fall into the range of 1,000 to 1,500 gpm. Hinckley wells can generally be developed to an 800-1,000 gpm capacity. The drawdown experienced with Hinckley wells causes higher pumping costs. Also, because the Hinckley formation lies beneath the Jordan and Franconia-Ironton-Galesville aquifers, Hinckley wells are more expensive to construct and operate than Jordan wells. In addition, State Legislation restricts the ability to withdraw water from the Mt. Simon-Hinckley aquifer.

The City of Farmington presently obtains its water supply from deep wells in the Prairie du Chien and Jordan aquifers. The water is pumped directly into the distribution system following chlorination and fluoridation.

There are seven existing wells that currently serve Farmington with well capacities ranging from 600 gpm to 2,000 gpm. The well capacities depend on the size of the well and the structure of the geologic formation at each well. The total well capacity in Farmington is 9,200 gpm (13.2 MGD). Firm capacity is defined as the capacity available with the largest well out of service. Firm capacity for Farmington is 7,200 gpm (10.4 MGD). Additional details about Farmington's wells can be found in Appendix D.

WELL WATER QUALITY/TREATMENT

The U.S. Environmental Protection Agency (EPA) has established national drinking water standards. These standards contain federally enforceable maximum contaminant level (MCL) standards for substances known to be hazardous to public health.

Water quality parameters are defined and regulated by two sets of standards – Primary and Secondary. Primary Standards are set for those substances known to be a hazard to public health. Secondary Standards are set for those substances that, although not hazardous to public health, frequently cause

drinking water to have objectionable aesthetic qualities, such as taste and odor. A discussion of the drinking water standards can be found in Appendix E.

Water quality test results on Farmington's raw water may also be found in Appendix D. The test results indicate that the raw water is moderately high in iron and manganese. Results from four of the existing wells exceed the limits recommended in the secondary standards for iron and manganese. Since secondary standards are indicative of the aesthetic quality of the water, this does not necessarily constitute a health hazard. However, the City may choose to treat for iron and manganese based on consumer complaints about water color and clarity. Typically, the political will to implement treatment for secondary standards is driven by the number of drinking water complaints exceeding the threshhold of acceptability.

Currently, raw water from Farmington's wells is treated with fluoride and chlorine at each wellhouse prior to entering the distribution system. No other treatment is provided. The water quality at the wells and in the distribution system is tested regularly to determine whether water quality meets primary and secondary drinking water standards. Appendix E should be updated as new water quality requirements are promulgated.

3.2 STORAGE

Maximum hour demands are supplied through a combination of water from the wells and water drawn from the storage reservoir on the water distribution system. Although the rate of consumption is high during periods of maximum hourly demand, the duration of the extreme rate is relatively short. Therefore, a moderate quantity of water withdrawn from storage reservoirs strategically located on the system assures satisfactory service, minimizes the total maximum hour pumping and transmission main capacity required, and permits more uniform and economical operation of the system and pumping facilities.

Storage on the system is also an important factor in insuring reliability of service during emergencies resulting from loss of power, temporary outages of water supply facilities, and from sudden and unusual demands brought about by fire. The storage tends to stabilize the peaks in water demand and allows the system to produce water at a lower, more uniform rate.

The City of Farmington currently has two gravity-fed storage facilities with a total capacity of 2.27 MG. Effective storage is defined as the storage available while still maintaining a sufficient residual pressure (generally within 30 ft. to 40 feet of the high water level). 1.79 MG of Farmington's storage can be considered effective. A summary of the existing storage facilities is presented in Table 7. Both existing and proposed water storage locations are shown on Map 1 - Ultimate Trunk Water System at the back of this report.

TABLE 7. EXISTING STORAGE FACILITIES

Storage Tank	Type of Storage	HWL	Effective Storage (MG)	Year Constructed
0.67 MG Standpipe	Ground	1117.33	0.29	1973
WTP Tower	Elevated	1117.33	1.5	1998

3.3 DISTRIBUTION SYSTEM

The existing distribution system consists of lines that vary in size from 4 inches to 24 inches in diameter. Water mains are primarily ductile iron pipe (DIP), although several older areas of the City are served with cast iron pipe (CIP).

The distribution system currently receives water from individual wells. A network of large distribution mains extend from the wells to other points in the system and to the storage reservoirs located throughout the City. The existing system can be seen on Map 1 in the back of the report.

The existing water system operates under a single pressure zone. The static high water elevation for the pressure zone is 1,117.33 feet above mean sea level. Static pressure readings within the zone generally range from about 45 pounds per square inch (psi) to 100 psi throughout the system.

3.4 HYDRAULIC ANALYSIS

A hydraulic analysis of Farmington's entire water supply and distribution system was conducted using computer modeling software. The results of this model are discussed in more detail in the next section. The first step in the process is to create a computer model of the existing supply and distribution system. The purpose of this model is to find any problems with the existing system and to serve as a foundation for a model of the entire (existing and ultimate) system.

3.5 ADEQUACY OF EXISTING FACILITIES

The existing water supply and distribution system for the City of Farmington meets the various current water demands placed on it. Phased improvements in the supply, storage, and distribution facilities have proven to be cost-effective and timely. The existing wells have met current supply needs.

Generally, the existing storage facilities provide satisfactory static and residual pressures to most areas. The existing distribution system consists generally of properly sized mains that are capable of conveying water and fire flows to the needed areas. Modifications proposed to strengthen and expand the existing system are discussed in the following section. The analysis identified the following problem areas.

- Water Storage. Farmington currently has 1.79 MG of effective storage, which is less than the 2.1 MG needed. The City plans to construct a new storage reservoir—providing an additional 2.5 MG of effective storage—in the near future to address this need. It is generally preferable to construct storage facilities prior to development in order to minimize complaints from residents.
- High Pressures. Some areas, primarily in the south and east of the city, have high pressures (greater than 90 psi). These are generally the result of relatively low ground elevations.
- High Headloss. There are several mains that experience headlosses exceeding 5'/1000' during peak demands. In general, these headlosses are found in pipes connecting the southeast portion of Farmington to the northwest portion.
- Low Fire Flows. With few exceptions, the entire City is able to meet the recommended fire flows. The exception is in southeast Farmington, where a number of nodes serving commercial and industrial areas were not able to provide 3,500 gpm. When applying the 2,500 gpm criteria for sprinkled buidings, only 3 of the nodes in question were unable to meet this fire flow requirement.

4 Proposed Facilities

4.1 SUPPLY-STORAGE CONSIDERATIONS

Supply capacity, storage volume, and distribution system capacity are interrelated. Tanks act as additional supply sources during peak periods when the primary supply source is incapable of meeting the demand. Thus, the storage tends to stabilize the peaks in water demand and allows the system to produce water at a lower, more uniform rate. Ideally, the distribution system should be capable of carrying the flows from both the supply sources and the tanks without allowing pressures to drop below approximately 40 psi or rise above 100 psi. Static pressure should be within a range of 50 psi to 90 psi, if possible. Static pressure is defined as the pressure available at the street when all the tanks are full and no one is using water. During fires or other emergencies, the pressure must not drop below 20 psi. The system must also be capable of conveying water from the supply source to the tanks for storage without allowing the development of high pumping heads and therefore high pressures in the system during low usage periods.

There are an infinite number of combinations of supply and storage that can be used to meet peak water demands. An economical system can be obtained through an analysis of supply and storage costs.

For the vast majority of communities, the ideal combination of supply and storage is found when the supply equals 100% of the maximum day demand. This is consistent with the recommendations in both Recommended Standards for Water Works by Great Lakes Upper Mississippi River Board, and American Water Works Manual of Practice M32 - Distribution Network Analysis for Water Utilities. The City of Farmington system capacity is established at 23.2 MGD which is 100% of the maximum day demand for the ultimate population of 65,000 persons (at full build-out of the Ultimate study area).

The amount of storage required for Farmington's water system is determined from the maximum day demand variation curve. This curve was developed by evaluating the well and storage operation during maximum demand days for a typical Minnesota community, and is presented in Figure 1. This curve should be checked with future peak days.

The shadowed area above the maximum day demand line in Figure 1 represents about 25% of the maximum total day demand. This volume of water takes into account hourly fluctuations and is provided by storage facilities. In addition, a safety factor is required to account for fire flows, unusual demands on the system and operational concerns. This safety factor is estimated to be approximately 5% of the maximum day total demand, and is based on a 3,500 gpm fire flow sustained for 3 hours and on actual operating levels in the reservoirs being 2 or 3 feet lower than the high water level. 8.0 MG of effective storage is planned for the ultimate system (at build-out of the Ultimate study area). Effective storage is considered to be water available for use at an adequate residual pressure (not lower than 40 feet below the system high water level). The resulting supply and minimum storage requirements for the ultimate system are shown in Table 8.

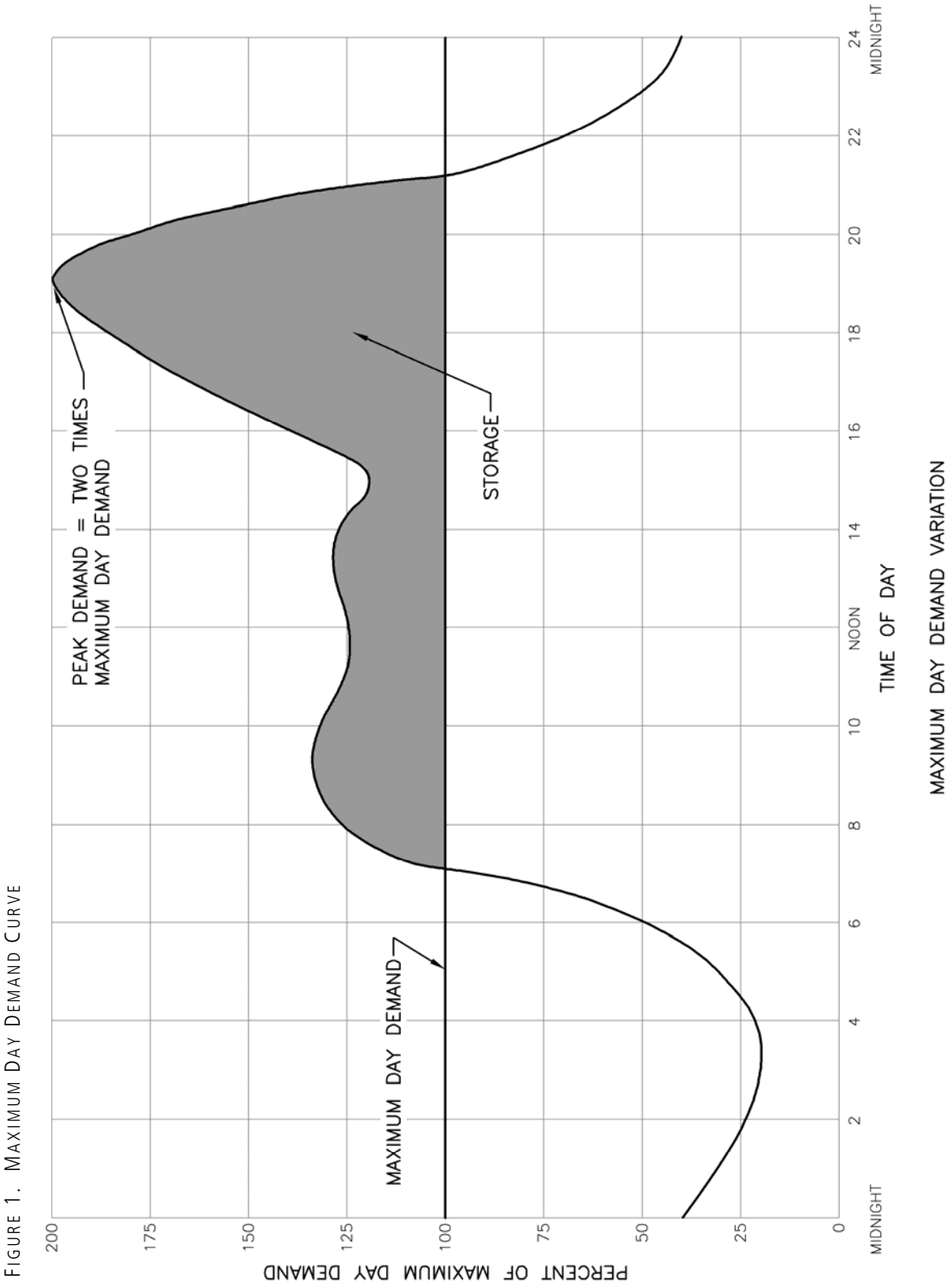


FIGURE 1. MAXIMUM DAY DEMAND CURVE

TABLE 8. ULTIMATE SYSTEM SUPPLY AND STORAGE REQUIREMENTS

Max. Day Demand (MGD)	Minimum Required Storage (MG)	Required Well Capacity (gpm)
23.2	8	16,100

Water storage tanks are typically constructed in standard sizes to avoid increased costs associated with custom tank sizes. As a result, minimum storage requirements within each pressure zone may be exceeded.

4.2 HYDRAULIC ANALYSIS

The Farmington water system was analyzed in detail using a hydraulic computer model, WaterCAD. The model describes the entire system, including wells, pumps, tanks, and distribution mains. The model incorporates the Hazen-Williams energy loss formula and the Hardy Cross procedure. The Hardy Cross procedure balances both flows and energy losses throughout the entire system.

Input for the computer model includes pipe sizes and lengths, point supplies and demands, storage tank characteristics, pump performance curves, and ground elevations all entered in a CAD drawing. The model then computes data for various times of the day based on the demand curve. These data include pipe flows and velocities, energy losses, pressures at each demand point, pumping rates, and storage tank levels.

Analysis of this data facilitates the design of an economical and adequate water system. Results of this analysis and recommendations for improvements are presented later in the report.

4.3 RAW WATER SUPPLY

WELLS REQUIRED

A total firm production capacity of 23.2 MGD (16,100 gpm) is required to meet the demand conditions in Farmington at build-out of the Ultimate study area. This represents 100% of the ultimate system's maximum day demand. For reliability, firm capacity is calculated by considering one out of every ten wells to be a back-up well. Providing a firm capacity equal to the maximum day demand will result in improved system reliability by enhancing performance during the tank-filling periods, and particularly in the event of an emergency such as a fire. Peak demands will be supplied by storage on the system.

One well field is planned for the Ultimate service area, and this is shown in Figure 2. The Well Field consists of the existing and proposed wells north of 212th Street (with the exception of Well 4).

Wells in the Jordan aquifer are expected to yield between 1,000 gpm and 1,500 gpm. Of the last four wells installed in Farmington, the lowest pumping capacity was 1,200 gpm. For this study, it was assumed that new wells will yield 1,000 gpm.

Since the cost of raw water main to connect Wells 1, 3, and 4 to the Well Field is prohibitive, it was assumed that these wells will eventually be relegated to emergency status. These wells were constructed between 1938 and 1973; they yield between 600 gpm and 1,000 gpm each; and are located on sites distant from the proposed future Water Treatment Plant site.

RAW WATER MAIN MAP
Figure 2

0 150 300 600
Scale in feet

N

EXISTING WELL

PROPOSED WELL

EXISTING RAW MAIN

PROPOSED RAW MAIN

WELL 4
WELL 11
WELL 7
WTP
WELL 5
WELL 6
WELL 10
WELL 9
WELL 8

16"
12"
20"
24"
30"
36"

EVEREST CIR
EXODUS CIR
EXODUS AVE
EVEREST PATH
EXPLORER CT
EXPLORER WAY
ESQUIRE WAY
ESSENCE TRAIL
EUCLID PATH
ENHANCE CT
CSAH 31/PILOT KNOB ROAD
ENGLISH AVE
185TH ST W
EDGEWOOD CT
188TH ST W
EXCLUSIVE PATH
EXCALIBUR TRAIL
ENGLEWOOD CIR
ENGLEWOOD WAY
ENGLEWOOD CT
189TH ST W
190TH ST W
EVERGLADE PATH
191ST ST W
EVEREST TR
EVERGREEN TR
EVENSTON DR
EVENING STAR WAY
ESTATE AVE
EPIC CT
193RD ST W
EUCLID CT
EUREKA AVE
EUREKA CT
EVENING STAR CT
AKIN ROAD
194TH ST W
ELMWOOD CIR
ELSMERE CT
ELLINGTON TRAIL
ELKRIDGE TRAIL
195TH ST W
ORIOLE DR
BLUEJAY CT
EWING ST
EXCEPTIONAL TR
EVENSONG AVE
MUNICIPAL DR
M. LARK WAY
HUMMINGBIRD
ROBIN
EAGLE
197TH ST W
GOLDFINCH
CANARY PATH
FALCON
EMERSON CIR
MEADOWLARK
198TH ST W
EMPEROR CT
EVERHILL AVE
EXCHANGE TRAIL
EXECUTIVE PATH
EVENSONG CT
EXCEL CT
EXCELSIOR LANE
EXPORT TR
200TH ST W
ENGLISH CT
LANGFORD LANE
MCKENDRY PATH
ERICKSON PATH
ERICKSON KNOLL
203RD ST W
203RD CT. W.
DUNBAR AVE

At saturation development, the total required firm capacity for Farmington is 16,100 gpm (23.2 MGD). The existing firm capacity is 7,200 gpm (10.4 MGD). With the replacement of Wells 1, 3, and 4, the total required additional capacity is 11,500 gpm. In addition, the two highest capacity wells will be required to serve as standby wells to meet firm capacity requirements. At 1,000 gpm per well, this equates to a total of 14 new wells required.

It was assumed that all fourteen of the future wells will be constructed on City property. Figure 2 shows fourteen future well sites in the Well Field, which where identified as part of a well siting study. Some of these sites have already been acquired by the City. Those sites that haven't yet been purchased will need to be obtained for the remaining future wells. Cost estimates found in Appendix F do not contain land acquisition costs.

WATER SUPPLY STRATEGIES

To address future water supply needs, the City will take the following actions:

- Plan to eventually replace Wells 1, 3, and 4. It would be cost-prohibitive to connect these wells to the future water treatment plant. In addition, these wells are among the oldest community wells serving Farmington, and are nearing the end of their useful life.
- Secure ownership and control of all identified well sites. Ideally, this would be done either prior to or in conjunction with development of adjacent areas.
- Construct new wells according to the phasing detailed later in this report.

4.4 WATER TREATMENT

The City of Farmington presently obtains its raw water supply from deep wells into the Prairie du Chien and Jordan Sandstone aquifers. Water obtained from the wells in Farmington is generally considered to be safe from pathogenic or disease-causing organisms.

The iron concentration in the City's wells ranges from 0.08 mg/L to 1.03 mg/L. The manganese concentration in the City's wells ranges from 0.02 mg/L to 0.078 mg/L. Iron and manganese precipitates from the water and accumulates in the distribution system, particularly in areas of low demands. When demand increases or when the system is interrupted for some reason, red water problems occur which cause staining of washed clothing and plumbing fixtures. Customer complaints can be minimized by frequent flushing and cleaning of lines in problem areas.

Because of public complaints and/or high maintenance costs, iron and manganese treatment may become necessary. Although a detailed analysis of the treatment alternatives is beyond the scope of this report, the following paragraphs describe some factors to consider as they relate to the planning of the overall distribution system.

Iron and manganese are typically removed at a water treatment plant. In anticipation of the need for future treatment, City staff has identified and purchased a site for a future water treatment plant. The location of the water treatment site and future well sites has been selected with the purpose of minimizing the number and size—and subsequently the cost—of raw water mains. In addition, some raw water mains have

already been installed within development areas to eliminate the costs of street reconstruction typically associated with the installation of raw water mains.

For this report, we are assuming that one treatment plant would be constructed, if necessary. It was assumed that all future wells in the Well Field will pump to a future water treatment plant located near the existing Public Works maintenance building. The water treatment plant would then pump water throughout the system. Map 1 shows the proposed location for the potential water treatment plant.

It is difficult to predict if any additional contaminants would need to be removed by a future water treatment plant. The following are possible future treatment scenarios: 1) a currently regulated contaminant could be detected at a level which would require treatment, 2) regulatory agencies could lower the maximum contaminant level of a currently regulated contaminant to the point where treatment of the existing water would be necessary, 3) an existing water constituent could be reclassified as a regulated contaminant at a level which would require treatment, 4) the utility may elect to provide treatment in response to customer complaints or for maintenance cost reasons, and 5) no treatment may be necessary.

An alternative method for controlling iron and manganese is to add polyphosphates to the water in the distribution system. Polyphosphates are added to the water at the well pumphouse with injection equipment. Polyphosphates keep the iron in suspension so that it does not settle out in the system. Unfortunately, polyphosphates are substantially less effective in keeping manganese in suspension in the distribution system. Also, the polyphosphates remain in the water through the wastewater treatment process and eventually become a source of nutrients in the Mississippi River.

Farmington's water is also considered hard, with an average hardness of 259 mg/L. Although softening can be accomplished at the water treatment plant, it is generally most cost effective to treat with in-home softeners.

Installation of an iron and manganese removal plant would not reduce the level of hardness in Farmington's water. However, existing softeners owned by the residents and businesses of Farmington will operate more efficiently since iron and manganese commonly foul softener media, causing shorter softening cycles.

WATER TREATMENT STRATEGY

To address future water treatment needs, the City has reserved a site within the Well Field for a potential water treatment plant. In general, future water treatment plant sites should be a minimum of five acres in size for iron and manganese treatment. More area may be required if the City wishes to reserve space for expansion to provide softening or treatment for possible future contaminants.

For the purposes of this report, it was assumed that the City land near the Public Works maintenance facility would be used for the potential water treatment plant. The costs for water treatment and raw water mains have been included in the economic analysis section of this report. It is recommended that the City proceed on the assumption that water treatment will eventually be considered necessary.

Raw water transmission mains should be constructed prior to development—where possible—or during street reconstruction projects. This will minimize the cost of conveying raw water to the water treatment plant.

4.5 STORAGE

The existing and proposed storage sites for the Farmington water distribution system are shown on the Ultimate Trunk Water System map (Map 1) at the back of this report. A total of 8.0 million gallons (MG) of effective storage at 4 sites is planned as seen on Table 9. The amount of storage required may be increased or reduced depending on population, water usage patterns, and conservation measures.

The most important considerations in the selection of the type of storage facilities are safety, reliability and ease of operation. A gravity-fed type of storage facility—whether an elevated tank or ground storage reservoir (GSR)—provides a safe and reliable source of water, is easy to operate, and allows for smooth operation of pump controls. It is recommended that all of Farmington's future storage be gravity-fed reservoirs.

A total effective storage volume of 4.0 million gallons is proposed at 2 sites to serve the 2030 service area. These sites are described in Table 9 and shown on Map 1. Development should be reviewed periodically to ensure that adequate storage is constructed prior to development. Phasing of storage construction is discussed in more detail later in this report.

TABLE 9. STORAGE FACILITIES IN THE ULTIMATE SYSTEM

Storage Location	Type of Storage	HWL	Effective Storage (MG)
WTP Tower	*Existing Elevated*	*1117.33*	*1.5*
NE 5MG GSR*	Proposed Standpipe	1117.33	2.5
NW 4MG GSR	Proposed Standpipe	1117.33	2.0
SW 4MG GSR	Proposed Standpipe	1117.33	2.0
		Total Ultimate Storage =	**8.0 MG**

* Anticipated storage facilities for 2030 System (plus existing facilities)

The future tanks have been located to take advantage of high ground, thus minimizing construction costs. They are also located at points within the distribution system which complement the primary supply points and thereby maintain more constant water pressure during peak demand periods. Depending on the phasing and location of controls, altitude valves may be required at one or more of the storage facilities.

When considering a potential water reservoir site, a clear space of 400 feet by 400 feet (or larger) should be identified to allow adequate room for construction staging and paint containment. Once the reservoir has been constructed, a lot 250 feet by 250 feet (62,500 square feet) is generally considered acceptable for future maintenance activities such as repainting and rehabilitation.

Considering the age of the 0.67 MG standpipe, and the relatively small amount of effective storage it provides, it is recommended that this facility be removed from service after the construction of the NE Ground Storage Reservoir. The cost of removing the standpipe is expected to be insignificant compared with the relatively high costs of maintaining and operating it.

4.6 DISTRIBUTION SYSTEM

GENERAL

The proposed distribution system for the City of Farmington is presented on the Ultimate Trunk Water System map (Map 1) at the back of this report. The system covers the entire City and reflects changes to previous reports and layouts.

The distribution system analysis was performed under the assumption that there will ultimately be a well field and potentially a water treatment plant for the City of Farmington. The site of the future water treatment plant is shown on Map 1. A strong network of trunk water mains is planned to extend in every direction from this site. Major water mains connect the storage tanks and are looped throughout the system in order to provide reliable service.

Because of the topography range within the Ultimate study area, it is recommended that the existing single pressure zone (HWL 1117.33) be maintained. This will provide a static pressure range of 45 psi to 100 psi (pounds per square inch) throughout the ultimate system. Static pressure is defined as the pressure available at street level when all the tanks are full and no one is using water. Properties experiencing a static pressure of greater than 90 psi may want to install individual pressure reducing valves. Properties experiencing a static water pressure less than 40 psi may desire individual booster stations. A minimum static pressure of 40 psi may be necessary for the operation of automatic sprinkler systems without a booster pump. Under emergency conditions, pressures must be maintained above 20 psi.

HYDRAULIC ANALYSIS

Hydraulic analysis of the Ultimate distribution system was performed by a computer program. The program computed flows and residual pressures which were then analyzed to locate problem areas. Water main sizes, storage tank characteristics, and pump controls were then revised and the program was run again until the problem was corrected.

The time simulation computer analysis was used to design and analyze the performance of the ultimate water system during the maximum demand day. The types of alternatives that were evaluated during multiple computer runs can be grouped into three categories:

1. Changes in size and location of the projected elevated tanks.
2. Changes in diameter of the proposed water mains.
3. Addition of new water mains.

After evaluating the different alternatives, the selected best option was a trade-off between the following parameters:

4. Tank Operation: Consider minimum level, ending level, and total operation time for each tank.
5. High Pressure Nodes: Identify high pressure nodes during low demand (tank-filling) periods.
6. Low Pressure Nodes: Identify low pressure nodes during high demand periods.
7. High Headloss Lines: Find pipes with unusually high headloss per thousand feet that need to be replaced, paralleled, or redesigned.
8. Fire Flows: Make sure that all nodes in the distribution system are able to get sufficient fire flows while maintaining a minimum residual pressure of 20 psi.

For the ultimate system shown on the Ultimate Trunk Water System map (Map 1) at the back of the report, the model indicates that the lowest pressures never drop below 34 psi (immediately after peak hour demand) and the highest pressures do not rise above 97 psi (overnight during tank filling conditions). The maximum headloss is 11 ft/1000 ft. These results are discussed in more detail in the following sections.

With few exceptions, all areas are able to meet or exceed the following fire flow recommendations while maintaining adequate residual pressures.

Area	Fire Flow (gpm)
Residential	1000
Commercial/Industrial	3500

- Low Pressure Areas: Low residual pressures (less than 40 psi) as determined by the computer model time simulation were primarily limited to a handful of nodes at higher elevations during peak hour demands. These nodes were located in the vicinity of the existing standpipe.
- High Pressure Areas: Several areas in the east and south of the City have high static pressures due to being at low elevations. Areas where ground elevations drop below 910 will experience static pressures greater than 90 psi. Properties in these areas may require individual pressure reducing valves.
- Fire Flows: The Insurance Services Office (ISO) recommended fire flows are shown in Table 6 (see Section 2). All areas outside the existing service area are designed for 3,500 gpm (gallons per minute) since it is not possible to determine the exact location of single family residential at this time. All areas, except as noted previously, are able to meet or exceed the recommended fire flows while maintaining 20 psi residual pressure.

4.7 WATER SYSTEM PHASING

The projected service population for the Farmington water system at build-out of the Ultimate study area is 65,000 and the projected service population for 2030 is 32,700. Based on the projected population growth, the timing of additions to the supply and storage facilities were estimated and these estimates are presented in Table 10. These additions will keep pace with the increasing needs of the community and at the same time maintain a desirable balance between storage and supply for economy and reliability. If growth rates deviate from the City's forecasts, if a major water consumer is added to the system, or conservation measures produce a result different than anticipated, the phasing schedule of Table 10 should be revised in accordance with the latest available data.

The data presented in Table 10 is based on the assumption that new wells will provide an average capacity of 1,000 gpm. Two standby wells will ultimately be provided above and beyond the required raw water supply. Tanks are designed to provide at least 30 percent of maximum day volume to protect against emergency demands and fires.

TABLE 10. SUPPLY/STORAGE PHASING

Year Ending	Served Population	Maximum Day Demand		Water Supply Wells		Effective Storage		Phasing Schedule
				Required[1]	Existing[2]	Required[3]	Existing	
		(gpm)	(MGD)	(gpm)	(gpm)	(MG)	(MG)	
2007	18,589	4,200	6	4,200	7,200	1.9	1.8	
2008	19,540	4,500	6.5	4,500	7,200	2.1	4	Install 5MG Ground Storage Reservoir (GSR)
2009	20,000	4,700	6.8	4,700	7,200	2.2	4	
2010	20,500	4,900	7.0	4,900	7,200	2.3	4	Install 1 new well as replacement for Well 1
2011	22,840	5,100	7.3	5,100	7,200	2.4	4	
2012	23,360	5,200	7.5	5,200	7,200	2.4	4	
2015	24,920	5,600	8.1	5,600	7,600	2.6	4	Install 1 new well as replacement for Well 3
2020	27,510	6,300	9.0	6,300	7,600	2.9	4	
2025	30,110	7,000	10.0	7,000	7,600	3.2	4	Install 1 new well as replacement for Well 4
2030	32,700	7,600	11.0	7,600	7,600	3.6	4	
Ultimate	65,000	16,100	23.2	16,100		8	8	Install up to 11 new wells Install two 4MG Ground Storage Reservoirs Construct Water Treatment Plant[4]

Notes:
[1] 100% of Maximum Day Demand
[2] Firm Capacity (1 of every 10 wells out of service)
[3] Minimum Effective Storage - approximately 30% of Maximum Day Demand
[4] Phasing of water treatment plant is uncertain, and may occur earlier

5 Economic Analysis

5.1 COST ESTIMATES

One of the basic objectives of this report was to determine the cost of completing Farmington's water supply and distribution system. The cost estimates presented in this report were based on current construction costs and can be related to the value of the ENR (Engineering News Record) Index for Construction Costs of approximately 8092 (November 2007). Future changes in this index are expected to reflect cost changes in the proposed facilities. During interim periods, between full evaluation of projected costs, capital recovery procedures can be related to this index.

A summary of the estimated total construction costs of future water supply, treatment, storage, and trunk distribution facilities is presented in Table 11. The costs in Table 11 also include replacement costs for three existing wells. Treatment costs will need to be split equitably between existing and future water customers. Appendix F contains a more detailed cost estimate.

TABLE 11. TRUNK WATER SYSTEM COST SUMMARY

System Component	Total Cost
Supply (Wells)	$ 15,400,000
Treatment (Plant)	$ 28,600,000
Storage (Reservoirs)	$ 8,500,000
Distribution (Trunk Mains)	$ 11,400,000
Total Ultimate System Cost	$ 63,900,000

5.2 RECOMMENDED TRUNK WATER SYSTEM IMPROVEMENTS

The installation of Farmington's trunk water system has proceeded steadily during past years, and a significant portion of the City is presently served with water. It is anticipated that growth of the water system will continue at a steady rate.

A capital improvement program for the City of Farmington's water supply and storage system is presented in Table 12. The table includes an estimate of the storage and supply facilities that will be added, the construction cost, and the total expenditure for the time period.

TABLE 12. CAPITAL IMPROVEMENT PLAN

Year Ending	Improvement	Estimated Cost	Period Cost	Total Cost
2008	NE 5MG Ground Storage Reservoir	$3,250,000	$3,586,000	$3,586,000
	Additional Trunk Water Main	$292,000		
	Additional Raw Water Main	$44,000		
2009	Additional Trunk Water Main	$292,000	$336,000	$3,922,000
	Additional Raw Water Main	$44,000		
2010	Well 9	$1,100,000	$1,436,000	$5,358,000
	Additional Trunk Water Main	$292,000		
	Additional Raw Water Main	$44,000		
2011	Additional Trunk Water Main	$292,000	$336,000	$5,694,000
	Additional Raw Water Main	$44,000		
2012	Additional Trunk Water Main	$292,000	$336,000	$6,030,000
	Additional Raw Water Main	$44,000		
2015	Well 10	$1,100,000	$2,105,000	$8,135,000
	Additional Trunk Water Main	$874,000		
	Additional Raw Water Main	$131,000		
2020	Additional Trunk Water Main	$1,457,000	$1,675,000	$9,810,000
	Additional Raw Water Main	$218,000		
2025	Well 11	$1,100,000	$2,775,000	$12,585,000
	Additional Trunk Water Main	$1,457,000		
	Additional Raw Water Main	$218,000		
2030	Additional Trunk Water Main	$1,452,000	$1,675,000	$14,250,000
	Additional Raw Water Main	$213,000		
Ultimate	11 Supply Wells	$12,100,000	$49,600,000	$63,900,000
	NW 4MG Ground Storage Reservoir	$2,600,000		
	SW 4MG Ground Storage Reservoir	$2,600,000		
	Water Treatment Plant	$26,000,000		
	Additional Trunk Water Main	$4,700,000		
	Additional Raw Water Main	$1,600,000		

5.3 EXISTING WATER SYSTEM CHARGES

The current policy of the City of Farmington is to finance trunk water supply, storage, and distribution costs with connection charges and area charges. The current charges are shown in Table 13.

TABLE 13. 2007 AREA AND CONNECTION CHARGES

Development Area	Area Charge (per acre)
2A1	$1,490
2A2	$2,335
2D1	$2,475
Unclassified	$2,570

Connection size	Charge (per connection)
3/4" or 1"	$775
1 1/4"	$1,200
1 1/2"	$1,730
2"	$3,075
2 1/2"	$4,140
3"	$5,660
4"	$12,285
6"	$27,625
8"	$49,120

It is common practice in the Metro Area to establish a policy of paying for the capital improvements with a combination of area charges and connection charges as the City currently does. This method allows the City to assess developable property for a portion of the trunk facilities costs at the time the facilities are constructed. The "area charge" is based on gross benefited area. Connection charges are then assessed at the time of hook-up and are used to finance the remaining capital cost.

In Farmington's case, several development areas have already partially paid their area charges. The reduced charges for these development areas reflect the remaining area charge due at the time of development. As is typical in many communities, Farmington collects a graduated connection charge based on the size of the connection.

We recommend that the City revise the existing area and connection charge systems according to the cost estimates provided in this report. These charges should be reviewed and adjusted annually, according to the ENR construction cost index.

5.4 LATERAL BENEFIT

Lateral benefit is the portion of the cost of a trunk water main that would normally be paid for by the developer. Under the City's existing policy, any development in Farmington would be expected to pay for an 8-inch water main to serve residential development and an 8-inch main to serve commercial or industrial development. We recommend that commercial / industrial properties be required to install a minimum 10-inch line to provide adequate fire flows. An estimate of the revenue the City would receive through lateral benefit is shown on Table 14.

TABLE 14. LATERAL BENEFIT ESTIMATE

Ultimate System	
Total length of ultimate system mains	116,600 LF
Assume 50% of length is assessable	58,300 LF
Assessable cost of 8 inch main	$55 per LF
Total Lateral Benefit	**$3,200,000**

5.5 AREA CHARGES

There are no set rules for the percentage of the capital costs to be paid for with area charges and the percentage to be paid for with connection charges. For the purposes of this report, the remaining portion of the ultimate distribution system costs (those not covered by lateral benefit), and 25% of all ultimate system supply and storage costs were divided by the number of developable acres to calculate an area charge. The area charge was further refined by accounting for the area of, and amount due from, previously assessed development areas. The method presented in this report also assumes that the City will break even at build-out of the ultimate study area, at 100% of the planned densities. An analysis could also be calculated based on breaking even at 2030 build-out, and with varying development densities.

The estimated total developable area in the ultimate study area is 5,142 acres. Table 15 shows the required area charges based on the built-out system. Based on the criteria and assumptions described above, the area charges are as follows:

TABLE 15. AREA CHARGE REQUIREMENTS

Ultimate System	
Total Distribution Costs	$11,400,000
- Lateral Benefit	$3,200,000
+ 25% of Supply / Storage Costs	$6,000,000
Total Area Charge Costs	$14,200,000
Total Developable Area (acres)	5,142
Area Charge (per acre)	**$2,785**

5.6 CONNECTION CHARGES

Water supply and storage facilities required in the provision of an overall water system can be directly related to the amount and type of development experienced by a community. It is a common practice to recover the majority of the costs for these facilities on a connected unit basis. As described above, this report assumes 75 percent of the ultimate supply and storage facility costs will be collected through connection charges. Table 16 presents estimated connections for Farmington based on future land use and anticipated revenue.

TABLE 16. ESTIMATED NUMBER OF CONNECTIONS

Land Use	Area	Residential Equiv.	
	(Acres)	Units/Ac	Total Units
Low Density Residential	2,442	3.1	7,571
Medium Density Residential	863	6.3	5,480
High Density Residential	232	7.3	1,693
Commercial	434	5.4	2,325
Industrial	621	5.4	3,325
Public/Semi-Public	550	3.6	1,965
Total Residential Equivalent Units (REU)			**22,358**

The connection charge for commercial/industrial properties can be further broken down by water meter size. However, to fully recover capital costs, the average connection charge should be maintained. The calculation of the average connection charge is shown below.

75% of Supply Cost	$11,550,000
75% of Storage Cost	$6,375,000
Total Connection Charge Costs	$18,000,000
Number of REUs	22,358
Connection Charge	$805 per REU

The connection charge for each land use designation is based on the amount of water it is expected to use in comparison to residential land use, and assumes a ¾" or 1" future connection size. The residential equivalent unit (REU) is used to compare relative water use between land use types.

5.7 IMPLEMENTATION

This section presents one example of how the charges for the ultimate water system could be split between lateral benefit, connection charge, and area charge. The City should review the system of lateral benefit, area charges, and connection charges presented in this chapter, and revise them annually to account for changes in the ENR index of construction costs. The entire analysis should be reviewed every five years to account for changes in development patterns, water use, and construction costs, and to check the balances in the trunk water fund.

The charges established in this chapter are primarily based on land use – and assumed water use associated with land usage. Actual water use can vary significantly for specific properties. The charges in this report should be viewed as the minimum charges required to provide water service and fire flows to properties. These charges should be increased to account for the proposed water use (including irrigation uses) for the property. Connection charges can easily be increased based on residential equivalents.

It is important to note that this combination of lateral benefit, area charges, and connection charges is intended to cover the costs for the ultimate system supply, treatment, storage, and distribution. It is suggested that an equitable method for covering the capital costs of treatment is one that splits these costs evenly between existing and future customers.

Appendices

A – Future Land Use Maps

B – Emergency and Conservation Plan

C – ISO Rating Report

D – Well Data and Water Quality Results

E – Water Quality Requirements

F – Cost Estimate Summary

G – Supplemental Map

Appendix A

Future Land Use Maps

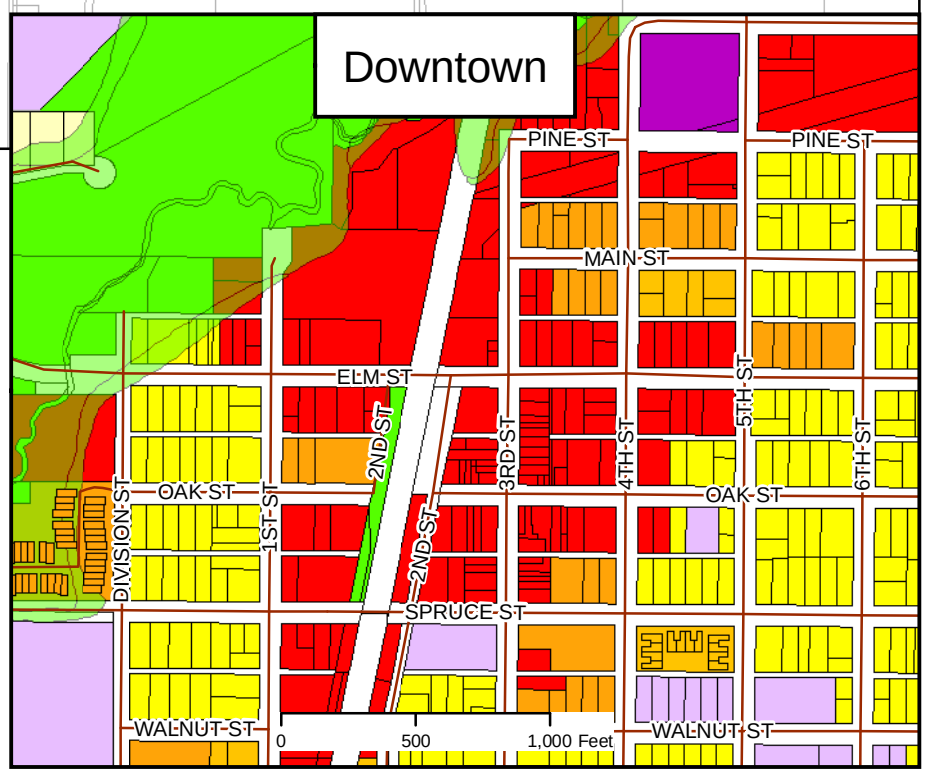
Ultimate Land Use

0 2,000 4,000 Feet

Legend

- Low Density
- Low Medium
- Medium Density
- High Density
- Commercial
- Industrial
- Public/Semi-Public
- Park/Open Space
- Mixed-Use (Commercial/Residential)
- Restricted Development
- ROW (Right-of-Way)
- Floodplain Overlay

Map current as of October 15, 2008.



Prepared for the Farmington Engineering Department by the Dakota County Office of GIS.

Project #11828

2030 Comprehensive Plan

(2008 Update)

Legend

- MUSA Line
- Ag Preserves
- Agricultural
- Commercial
- Industrial
- Mixed-Use (Commercial/Residential)
- Low Density (1.0-3.5 du/ac)
- Low Medium (3.5-6.0 du/ac)
- Medium Density (6.0-12.0 du/ac)
- High Density (12.0+ du/ac)
- Public/Semi-Public
- Park/Open Space
- Restricted Development
- ROW (Right-of-Way)
- Castle Rock OAA
- Empire OAA

0 2,000 4,000 Feet

N

Map current as of October 14, 2008.

Downtown

PINE ST
PINE ST
MAIN ST
ELM ST
OAK ST
OAK ST
SPRUCE ST
WALNUT ST
WALNUT ST
DIVISION ST
1ST ST
2ND ST
2ND ST
3RD ST
4TH ST
5TH ST
6TH ST

0 500 1,000 Feet

Prepared for the Farmington Community Development Department by the Dakota County Office of GIS.

Project #11663

Appendix B

Emergency and Conservation Plan

City of Farmington

Water Emergency and Conservation Plan

October 2006
(2008 update)

Bonestroo
Rosene
Anderlik &
Associates
Engineers & Architects

DEPARTMENT OF NATURAL RESOURCES - DIVISION OF WATERS and METROPOLITAN COUNCIL
WATER EMERGENCY AND CONSERVATION PLANS

These guidelines are divided into four parts. The first three parts, Water Supply System Description and Evaluation, Emergency Response Procedures and Water Conservation Planning apply statewide. Part IV, relates to comprehensive plan requirements that apply only to communities in the Seven-County Twin Cities Metropolitan Area. If you have questions regarding water emergency and conservation plans, please call (651) 259-5703 or (651) 259-5647 or e-mail your question to wateruse@dnr.state.mn.us. Metro Communities can also direct questions to the Metropolitan Council at watersupply@metc.state.mn.us or (651) 602-1066.

DNR Water Appropriation Permit Number(s)	590725
Name of Water Supplier	Farmington Water Utility
Address	19650 Municipal Drive, Farmington
Contact Person	Kevin Schorzman
Title	Director of Public Works / City Engineer
Phone Number	651.463.1607
E-Mail Address	kschorzman@ci.farmington.mn.us

PART I. WATER SUPPLY SYSTEM DESCRIPTION AND EVALUATION

The first step in any water supply analysis is to assess the current status of demand and supplies. Information in Part I, can be used in the development of Emergency Response Procedures and Conservation Plans.

A. ANALYSIS OF WATER DEMAND.

Fill in Table 1 for the past 10 years water demand. If your customer categories are different than the ones listed in Table 1, please note the changes below.

TABLE 1 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	Average Demand (MGD)	Maximum Demand (MGD)	Residential gallons/ capita/day	Total gallons/ capita/day
1996	8,423	8,423	3,269	279	49	-	328	342	4.3%	0.94	2.8	90	111
1997	9,700	9,700	3,301	254	49	-	303	327	7.3%	0.90	2.5	72	92
1998	10,319	10,319	3,594	311	62	-	373	381	2.0%	1.04	2.7	83	101
1999	11,500	11,500	3,894	326	65	-	391	396	1.3%	1.08	2.9	78	94
2000	12,460	12,460	4,136	370	81	-	450	461	2.3%	1.26	3.3	81	101
2001	14,000	14,000	4,454	421	76	-	497	518	4.1%	1.42	4.0	82	101
2002	16,275	16,275	4,896	383	79	-	462	479	3.5%	1.31	3.0	64	81
2003	18,282	18,282	5,426	511	77	-	588	663	11.3%	1.82	5.8	77	99
2004	19,354	19,354	5,591	507	83	-	589	589	0%	1.61	6.04	72	83
2005	19,810	19,810	5,819	539	86	-	624	628	0.6%	1.72	4.94	75	87

MG – Million Gallons **MGD** – Million Gallons per Day **C/I/I**- Commercial, Industrial, Institutional

Residential. Water used for normal household purposes, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens.

Institutional. Hospitals, nursing homes, day care centers, and other facilities that use water for essential domestic requirements. This includes public facilities and public metered uses. You may want to maintain separate institutional water use records for emergency planning and allocation purposes.

Commercial. Water used by motels, hotels, restaurants, office buildings, commercial facilities, both civilian and military.

Industrial. Water used for thermoelectric power (electric utility generation) and other industrial uses such as steel, chemical and allied products, food processing, paper and allied products, mining, and petroleum refining.

Wholesale Deliveries. Bulk water sales to other public water suppliers.

Unaccounted. Unaccounted for water is the volume of water withdrawn from all sources minus the volume sold.

Residential Gallons per Capita per Day = total residential sales in gallons/population served/365 days **Total Gallons per Capita per Day** = total water withdrawals/population served/365 days

NOTE: Non-essential water uses defined by Minnesota Statutes 103G.291, include lawn sprinkling, vehicle washing, golf course and park irrigation and other non-essential uses. Some of the above categories also include non-essential uses of water.

Water Use Trends. Discuss factors that influence trends in water demand (i.e. growth, weather, industry, conservation). If appropriate, include a discussion of other factors that affect daily water use, such as use by non-resident commuter employees or large water consuming industry.
Farmington's water use has increased steadily over the last ten years, due primarily to the growth of the community. Water use during the summer months is also dependent on precipitation and temperature, particularly to the extent that they influence landscape irrigation.

TABLE 2 Large Volume Users - List the top 10 largest users.

Customer	Gallons per year	% of total annual use
JIT POWDER COATING	4,983,000	0.8%
FAA / MMAC	4,707,000	0.7%
ROBERT ADELMANN	4,041,000	0.6%
DAKOTA STORAGE - Sprinkling	3,434,000	0.5%
VERMILLION GROVE - Sprinkling	3,429,000	0.5%
MIDDLE CREEK EAST - Sprinkling	2,729,000	0.4%
CHARLESWOOD - Sprinkling	2,609,000	0.4%
ALLEN HOMES - Sprinkling	2,606,000	0.4%
SPEEDWAY SUPER AMERICA	2,604,000	0.4%
DAKOTA ELECTRIC	2,420,000	0.4%

B. TREATMENT AND STORAGE CAPACITY.

TABLE 3(A) Water Treatment

Water Treatment Plant Capacity	- N/A -	Gallons per day
Describe the treatment process used (ie, softening, chlorination, fluoridation, Fe/Mn removal, reverse osmosis, coagulation, sedimentation, filtration, others). Also, describe the annual amount and method of disposal of treatment residuals, if any.		
Although there is no treatment plant, chlorination and fluoridation occur at each well house.		

TABLE 3(B) Storage Capacity - List all storage structures and capacities.

Total Storage Capacity		**Average Day Demand** (average of last 5 years)	
2,170,000	Gallons	1,720,000	Gallons per day
Type of Structure	Number of Structures	Gallons	
Elevated Storage	1	1,500,000	
Ground Storage	1	670,000	
Other:	- N/A -		

C. WATER SOURCES. List all groundwater, surface water and interconnections that

supply water to the system. Add or delete lines to the tables as needed.

TABLE 4(A) Total Water Source Capacity for System (excluding emergency connections)

Total Capacity of Sources	9,200	Gallons per minute
Firm Capacity (largest pump out of service)	7,200	Gallons per minute

TABLE 4(B) Groundwater Sources - Copies of water well records and well maintenance information should be included with the public water supplier's copy of the plan in Attachment F. If there are more wells than space provided or multiple well fields, please use the List of Wells template (see Resources) and include as Attachment (N/A).

Well # or name	Unique Well Number	Year Installed	Well & Casing Depth (ft)	Well Diameter (in)	Capacity (GPM)	Geologic Unit	Status
1	200932	1938	197	16	1000	OPCJ	Active
3	201154	1959	132	20	600	OPCJ	Active
4	235586	1973	392	24	1000	CJDN	Active
5	603051	1999	417	30	1200	CJDN	Active
6	626785	2002	386	30	2000	CJDN	Active
7	655902	2002	408	30	1400	CJDN	Active
8	731123	2006	460	30	2000	CJDN	Active

Status: Active use, Emergency, Standby, Seasonal, Peak use, etc. GPM – Gallons per Minute
Geologic Unit: Name of formation(s), which supplies water to the well

TABLE 4(C) Surface Water Sources

Intake ID	Resource name	Capacity (GPM/MGD)
	- N/A -	

GPM – Gallons per Minute MGD – Million Gallons per Day

TABLE 4(D) Wholesale or Retail Interconnections - List interconnections with neighboring suppliers that are used to supply water on a **regular basis** either wholesale or retail.

Water Supply System	Capacity (GPM/MGD)	Wholesale or retail
- N/A -		

GPM – Gallons per Minute MGD – Million Gallons per Day

TABLE 4(E) Emergency Interconnections - List interconnections with neighboring suppliers or private sources that can be used to supply water on an emergency or occasional basis. Suppliers that serve less than 3,300 people can leave this section blank, but must provide this information in Section II C.

Water Supply System	Capacity (GPM/MGD)	Note any limitations on use
City of Lakeville	<1 MGD	Manual valve operation to use
		Requires Lakeville's consent

GPM – Gallons per Minute MGD – Million Gallons per Day

D. DEMAND PROJECTIONS.

TABLE 5 Ten Year Demand Projections

Year	Population Served	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Projected Demand (MGY)
2006	20,502	2.0	6.0	734
2007	20,768	2.2	6.0	801
2008	21,290	2.3	6.5	824
2009	21,810	2.3	6.8	844
2010	22,320	2.4	7.0	879
2011	22,840	2.5	7.3	911
2012	23,360	2.6	7.5	938
2013	23,880	2.6	7.7	961
2014	24,400	2.7	7.9	987
2015	24,920	2.8	8.1	1,012

MGD – Million Gallons per Day MGY – Million Gallons per Year

Projection Method. Describe how projections were made, (assumptions for per capita, per household, per acre or other methods used).
Updated population projections were taken from the 2008 Comprehensive Plan. Demand projections were based on equivalent per-capita demand rates from the 2008 Water Supply and Distribution Plan text.

E. RESOURCE SUSTAINABILITY

Sustainable water use: use of water to provide for the needs of society, now and in the future, without unacceptable social, economic, or environmental consequences.

Monitoring. Records of water levels should be maintained for all production wells and source water reservoirs/basins. Water level readings should be taken monthly for a production well or observation well that is representative of the wells completed in each water source formation. **If water levels are not currently measured each year, a monitoring plan that includes a schedule for water level readings must be submitted as Attachment A.**

TABLE 6 Monitoring Wells - List all wells being measured.

Unique well number	Type of well (production, observation)	Frequency of Measurement (daily, monthly etc.)	Method of Measurement (steel tape, SCADA etc.)
200932	production	periodic	Sounder
201154	production	periodic	Sounder
235586	production	periodic	Sounder
603051	production	regular	SCADA
626785	production	regular	SCADA
655902	production	regular	SCADA
731134	observation	every 30 minutes	Data logger
731135	observation	every 30 minutes	Data logger
731136	observation	every 30 minutes	Data logger
Water Level Data. Summarize water level data including seasonal and long-term trends for			

each ground and/or surface water source. If water levels are not measured and recorded on a routine basis then provide the static water level (SWL) when the well was constructed and a current water level measurement for each production well. Also include all water level data taken during well and pump maintenance.

Each of the observation wells is equipped with a pressure transducer and automatic data logger. Well level data has been recorded in 30-minute increments since August 2006. For more information, please see Attachement A for the Well Level Monitoring Plan.

Attachment B: Provide monitoring data (graph or table) for as many years as possible.

Ground Water Level Monitoring – DNR Waters in conjunction with federal and local units of government maintain and measure approximately 750 observation wells around the state. Ground water level data are available online www.dnr.state.mn.us/waters. Information is also available by contacting the Ground Water Level Monitoring Manager, DNR Waters, 500 Lafayette Road, St. Paul, MN 55155-4032 or call (651) 259-5700.

Natural Resource Impacts. Indicate any natural resource features such as calcareous fens, wetlands, trout streams, rivers or surface water basins that are or could be influenced by water withdrawals from municipal production wells. Also indicate if resource protection thresholds have been established and if mitigation measures or management plans have been developed.

Groundwater monitoring has recently been initiated.

Sustainability. Evaluate the adequacy of the resource to sustain current and projected demands. Describe any modeling conducted to determine impacts of projected demands on the resource.

At present, it is thought that the north well field will provide a sustainable yield to meet current and projected water demands, with scheduled well field growth designed to meet increasing water demands. At the current north well field locations, the Jordan aquifer appears to offer sufficient yield to supply wells with 1500-2000gpm discharge each. Pumping tests conducted at the north well field wells indicates the Jordan aquifer is providing specific yields ranging between 40-70 gal/feet of drawdown, which is considered to be highly productive for the Jordan aquifer in the Twin Cities area.

The City is currently collecting data from their monitoring well network to observe groundwater levels to look for trends which may, or may not, indicate sustainability of the aquifer. With the installation of each new well, the City will continue to collect data regarding aquifer performance and drawdown in order to better refine their predictions of sustainable yield from the Jordan aquifer.

Source Water Protection Plans. The emergency procedures in this plan are intended to comply with the contingency plan provisions required in the Minnesota Department of Health's (MDH) Wellhead Protection (WHP) Plan and Surface Water Protection (SWP) Plan.

Date WHP Plan Adopted:	February 2, 2007
Date for Next WHP Update:	Upon notification by MDH.
SWP Plan:	☐ In Process ☐ Completed ☒ Not Applicable

F. CAPITAL IMPROVEMENT PLAN (CIP)

Adequacy of Water Supply System. Are water supply installations, treatment facilities and distribution systems adequate to sustain current and projected demands? ☐ Yes ☒ No If no, describe any potential capital improvements over the next ten years and state the reasons for the proposed changes (CIP Attachment C).

One new well and one new water storage reservoir are proposed over the next ten years. These improvements are necessary to serve the projected growth of Farmington over this time period. Phasing of the proposed improvements may be adjusted depending on actual water use.

Proposed Water Sources. Does your current CIP include the addition of new wells or intakes? ☒ Yes ☐ No If yes, list the number of new installations and projected water demands from each for the next ten years. Plans for new production wells must include the geologic source formation, well location, and proposed pumping capacity.

It is assumed that the future production well will yield 1,000 gpm or more from the Jordan aquifer. The well location has not yet been definitively determined, but it has been narrowed down to one of two possible sites.

Proposed Water Source Alternatives. If new water sources are being proposed, describe alternative sources that were considered and any possibilities of joint efforts with neighboring communities for development of supplies.

Future wells are planned to be developed from the existing source – the Jordan aquifer. Joint development of water sources with neighboring communities is not considered to be feasible at this time.

Preventative Maintenance. Long-term preventative programs and measures will help reduce the risk of emergency situations. Identify sections of the system that are prone to failure due to age, materials or other problems. This information should be used to prioritize capital improvements, preventative maintenance, and to determine the types of materials (pipes, valves, couplings, etc.) to have in stock to reduce repair time.

On a seven-year rotation, pumps are pulled from production wells and inspected. Repairs are made as needed, and the pumps are reinstalled. Cast-iron pipe and 4-inch mains are replaced during street reconstruction projects in the older section of the city. Hydrants are flushed twice annually, and are checked in winter to make sure they are dry.

PART II. EMERGENCY RESPONSE PROCEDURES

Water emergencies can occur as a result of vandalism, sabotage, accidental contamination, mechanical problems, power failures, drought, flooding, and other natural disasters. The purpose of emergency planning is to develop emergency response procedures and to identify actions needed to improve emergency preparedness. In the case of a municipality, these procedures should be in support of, and part of, an all-hazard emergency operations plan. If your community already has written procedures dealing with water emergencies we recommend that you use these guidelines to review and update existing procedures and water supply protection measures.

Federal Emergency Response Plan

Section 1433(b) of the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Public Law 107-188, Title IV – Drinking Water Security and Safety) requires community water suppliers serving over 3,300 people to prepare an Emergency Response Plan. **Community water suppliers that have completed the Federal Emergency Response Plan and submitted the required certification to the U.S. Environmental Protection Agency have satisfied Part II, Sections A, B, and C of these guidelines and need only provide the information below regarding the emergency response plan and source water protection plan and complete Sections D (Allocation and Demand Reduction Procedures), and E (Enforcement).**

Provide the following information regarding your completed Federal Emergency Response Plan:

Emergency Response Plan	Contact Person	Contact Number
Emergency Response Lead	Kevin Schorzman	651.463.1607
Alternate Emergency Response Lead	Police Chief	651.463.1700
Emergency Response Plan Certification Date	December 2004	

Operational Contingency Plan. An operational contingency plan that describes measures to be taken for water supply mainline breaks and other common system failures as well as routine maintenance is recommended for all utilities. Check here ☒ if the utility has an operational contingency plan. At a minimum a contact list for contractors and supplies should be included in a water emergency telephone list.

Communities that have completed Federal Emergency Response Plans should skip to Section D.

EMERGENCY RESPONSE PROCEDURES

A. Emergency Telephone List. A telephone list of emergency contacts must be included as Attachment to the plan (complete template or use your own list). The list should include key utility and community personnel, contacts in adjacent communities, and appropriate local, state and federal emergency contacts. Please be sure to verify and update the contacts on the emergency telephone list on a regular basis (once each year recommended). In the case of a municipality, this information should be contained in a notification and warning standard operating procedure maintained by the warning point for that community. Responsibilities and services for each contact should be defined.

B. Current Water Sources and Service Area. Quick access to concise and detailed information on water sources, water treatment, and the distribution system may be needed in an emergency. System operation, water well and maintenance records should be maintained in a central secured location so that the records are accessible for emergency purposes and preventative maintenance. A detailed map of the system showing the treatment plants, water sources, storage facilities, supply lines, interconnections, and other information that would be useful in an emergency should also be readily available. Check here ☐ if these records and maps exist and staff can access the documents in the event of an emergency.

C. Procedure for Augmenting Water Supplies. List all available sources of water that can be used to augment or replace existing sources in an emergency. In the case of a municipality, this information should be contained in a notification and warning standard operating procedure maintained by the warning point for that community. Copies of cooperative agreements should be maintained with your copy of the plan and include in Attachment . Be sure to include information on any physical or chemical problems that may limit interconnections to other sources of water. Approvals from the MN Department of Health are required for interconnections and reuse of water.

TABLE 7 (A) Public Water Supply Systems – List interconnections with other public water supply systems that can supply water in an emergency.

Water Supply System	Capacity (GPM/MGD)	Note any limitations on use
Skip to Section D.		

GPM – Gallons per Minute MGD – Million Gallons per Day

TABLE 7 (B) - Private Water Sources – List other sources of water available in an emergency.

Name	Capacity (GPM/MGD)	Note any limitations on use
Skip to Section D.		

GPM – Gallons per Minute MGD – Million Gallons per Day

D. Allocation and Demand Reduction Procedures. The plan must include procedures to address gradual decreases in water supply as well as emergencies and the sudden loss of water due to line breaks, power failures, sabotage, etc. During periods of limited water supplies public water suppliers are required to allocate water based on the priorities established in Minnesota Statutes 103G.261.

Water Use Priorities (Minnesota Statutes 103G.261)

First Priority. Domestic water supply, excluding industrial and commercial uses of municipal water supply, and use for power production that meets contingency requirements.

NOTE: Domestic use is defined (MN Rules 6115.0630, Subp. 9), as use for general household purposes for human needs such as cooking, cleaning, drinking, washing, and waste disposal, and uses for on-farm livestock watering excluding commercial livestock operations which use more than 10,000 gallons per day or one million gallons per year.

Second Priority. Water uses involving consumption of less than 10,000 gallons per day.

Third Priority. Agricultural irrigation and processing of agricultural products.

Fourth Priority. Power production in excess of the use provided for in the contingency plan under first priority.

Fifth Priority. Uses, other than agricultural irrigation, processing of agricultural products, and power production.

Sixth Priority. Non-essential uses. These uses are defined by Minnesota Statutes 103G.291 as lawn sprinkling, vehicle washing, golf course and park irrigation, and other non-essential uses.

List the statutory water use priorities along with any local priorities (hospitals, nursing homes, etc.) in Table 8. Water used for human needs at hospitals, nursing homes and similar types of facilities should be designated as a high priority to be maintained in an emergency. Local allocation priorities will need to address water used for human needs at other types of facilities such as hotels, office buildings, and manufacturing plants. The volume of water and other types of water uses at these facilities must be carefully considered. After reviewing the data, common sense should dictate local allocation priorities to protect domestic requirements over certain types of economic needs. In Table 8, list the priority ranking, average day demand and demand reduction potential for each customer category (modify customer categories if necessary).

Table 8 Water Use Priorities

Customer Category	Allocation Priority	Average Day Demand (GPD)	Demand Reduction Potential (GPD)
Residential	1	1,476,000	500,000
<10,000 gpd C/Ind.	2	186,000	154,000
>10,000 gpd C/Ind.	5	24,700	24,600
Non-essential	6	35,000	35,000
	TOTALS	1,721,700	713,600

GPD – Gallons per Day

Demand Reduction Potential. The demand reduction potential for residential use will typically be the base demand during the winter months when water use for non-essential uses such as lawn watering do not occur. The difference between summer and winter demands typically defines the demand reduction that can be achieved by eliminating non-essential uses. In extreme emergency situations lower priority water uses must be restricted or eliminated to protect first priority domestic water requirements. Short-term demand reduction potential should be based on average day demands for customer categories within each priority class.

Triggers for Allocation and Demand Reduction Actions. Triggering levels must be defined for implementing emergency responses, including supply augmentation, demand reduction, and water allocation. Examples of triggers include: water demand >100% of storage, water level in well(s) below a certain elevation, treatment capacity reduced 10% etc. Each trigger should have a quantifiable indicator and actions can have multiple stages such as mild, moderate and severe responses. Check each trigger below that is used for implementing emergency responses and for each trigger indicate the actions to be taken at various levels or stages of severity in Table 9.

- ☒ Water Demand
- ☐ Treatment Capacity
- ☐ Storage Capacity
- ☐ Groundwater Levels
- ☐ Surface Water Flows or Levels
- ☐ Pump, Booster Station or Well Out of Service
- ☒ Governor's Executive Order – Critical Water Deficiency (required by statute)
- ☐ Water Main Break
- ☐ Loss of Production
- ☐ Security Breach
- ☐ Contamination
- ☐ Other (list in Table 9)

Table 9 Demand Reduction Procedures

Condition	Trigger(s)	Actions
Normal	Always	Odd/Even Sprinkling Ban Noon-6PM Sprinkling Ban
Stage 1 (Mild)	Demand = 97% of firm capacity	Eliminate 6th Priority water use.
Stage 2 (Moderate)	Demand = 98% of firm capacity	Eliminate 5th Priority water use.
Stage 3 (Severe)	Demand =100% of firm capacity	Eliminate 2nd Priority water use.
Critical Water Deficiency (M.S. 103G.291)	Executive Order by Governor & as provided in above triggers	Stage 1: Restrict lawn watering, vehicle washing, golf course and park irrigation and other nonessential uses Stage 2: Suspend lawn watering, vehicle washing, golf course and park irrigation and other nonessential uses

Note: The potential for water availability problems during the onset of a drought are almost impossible to predict. Significant increases in demand should be balanced with preventative measures to conserve supplies in the event of prolonged drought conditions.

Notification Procedures. List methods that will be used to inform customers regarding conservation requests, water use restrictions, and suspensions. Customers should be aware of emergency procedures and responses that they may need to implement.
Local media will be used for public notification regarding the water utility. Both the Farmington Independent and Channel 16 will be contacted in the event of a water emergency. In addition, information may be posted on the water utility website or included with billing notices.

E. Enforcement. Minnesota Statutes require public water supply authorities to adopt and enforce water conservation restrictions during periods of critical water shortages.

Public Water Supply Appropriation During Deficiency.
Minnesota Statutes 103G.291, Subdivision 1.

Declaration and conservation.
(a) If the governor determines and declares by executive order that there is a critical water deficiency, public water supply authorities appropriating water must adopt and enforce water conservation restrictions within their jurisdiction that are consistent with rules adopted by the commissioner.
(b) The restrictions must limit lawn sprinkling, vehicle washing, golf course and park irrigation, and other nonessential uses, and have appropriate penalties for failure to comply with the restrictions.

An ordinance that has been adopted or a draft ordinance that can be quickly adopted to comply with the critical water deficiency declaration must be included in the plan (include with other ordinances in Attachment D for Part III, Item 4). Enforcement responsibilities and penalties for non-compliance should be addressed in the critical water deficiency ordinance.
Sample regulations are available at www.dnr.state.mn.us/waters

Authority to Implement Water Emergency Responses. Emergency responses could be delayed if city council or utility board actions are required. Standing authority for utility or city managers to implement water restrictions can improve response times for dealing with emergencies. Who has authority to implement water use restrictions in an emergency?

☐ Utility Manager ☐ City Manager ☒ City Council ☒ Water Board
☒ Other (describe): Director of Public Works

Emergency Preparedness. If city or utility managers do not have standing authority to implement water emergency responses, please indicate any intentions to delegate that authority. Also indicate any other measures that are being considered to reduce delays for implementing emergency responses.
- N/A -

PART III. WATER CONSERVATION PLAN

Water conservation programs are intended to reduce demand for water, improve the efficiency in use and reduce losses and waste of water. Long-term conservation measures that improve overall water use efficiencies can help reduce the need for short-term conservation measures. Water conservation is an important part of water resource management and can also help utility managers satisfy the ever-increasing demands being placed on water resources.

> Minnesota Statutes 103G.291, requires public water suppliers to implement demand reduction measures before seeking approvals to construct new wells or increases in authorized volumes of water. Minnesota Rules 6115.0770, require water users to employ the best available means and practices to promote the efficient use of water. Conservation programs can be cost effective when compared to the generally higher costs of developing new sources of supply or expanding water and/or wastewater treatment plant capacities.

A. Conservation Goals. The following section establishes goals for various measures of water demand. The programs necessary to achieve the goals will be described in the following section.

Unaccounted Water (calculate five year averages with data from Table 1)		
Average annual volume unaccounted water for the last 5 years	23,315,400	gallons
Average percent unaccounted water for the last 5 years	3.9	percent
AWWA recommends that unaccounted water not exceed 10%. Describe goals to reduce unaccounted water if the average of the last 5 years exceeds 10%.		

Residential Gallons Per Capita Demand (GPCD)		
Average residential GPCD use for the last 5 years (use data from Table 1)	74	GPCD
In 2002, average residential GPCD use in the Twin Cities Metropolitan Area was 75 GPCD. Describe goals to reduce residential demand if the average for the last 5 years exceeds 75 GPCD.		

Total Per Capita Demand: From Table 1, is the trend in overall per capita demand over the past 10 years ☐ increasing or ☒ decreasing? If total GPCD is increasing, describe the goals to lower overall per capita demand or explain the reasons for the increase.

Peak Demands (calculate average ratio for last five years using data from Table 1)	
Average maximum day to average day ratio	3.0
If peak demands exceed a ratio of 2.6, describe the goals for lowering peak demands.	
It is reasonable to expect that the ratio for Farmington would be greater than that for older, established neighborhoods due to the growth of the community. Such growth is typically accompanied by large landscape irrigation demands for establishing new lawns. Five of the ten largest volume users in 2005 were accounts associated with landscape irrigation. In addition, residential water use is anticipated to continue growing at a faster rate than commercial or industrial water use. Farmington strives to reduce maximum day demands through enforcement of its odd/even and time of day sprinkling policies. This ratio is expected to decline as new sod becomes established and shade trees in new developments mature.	

B. Water Conservation Programs. Describe all short-term conservation measures that are available for use in an emergency and long-term measures to improve water use efficiencies for each of the six conservation program elements listed below. Short-term demand reduction measures must be included in the emergency response procedures and must be in support of, and part of, a community all-hazard emergency operation plan.

1. **Metering.** The American Water Works Association (AWWA) recommends that every water utility meter all water taken into its system and all water distributed from its system at its customer's point of service. An effective metering program relies upon periodic performance testing, repair, repair and maintenance of all meters. AWWA also recommends that utilities conduct regular water audits to ensure accountability. Complete Table 10 (A) regarding the number and maintenance of customer meters.

TABLE 10 (A) Customer Meters

	Number of Connections	Number of Metered Connections	Meter testing schedule (years)	Average age/meter replacement schedule (years)
Residential	5,432	5,432	as needed	10 / as needed
Institutional		(see Other)		/
Commercial		(see Other)		/
Industrial		(see Other)		/
Public Facilities		(see Other)		/
Other	387	387	as needed	3 / as needed
TOTALS	5,819	5,819		

Unmetered Systems. Provide an estimate of the cost to install meters and the projected water savings from metering water use. Also indicate any plans to install meters.
- N/A -

TABLE 10 (B) Water Source Meters

	Number of Meters	Meter testing schedule (years)	Average age/meter replacement schedule (years)
Water Source (wells/intakes)	6	as needed	11 / as needed
Treatment Plant	- N/A -		/

2. **Unaccounted Water.** Water audits are intended to identify, quantify, and verify water and revenue losses. The volume of unaccounted-for water should be evaluated each billing cycle. The AWWA recommends a goal of ten percent or less for unaccounted-for water. Water audit procedures are available from the AWWA and MN Rural Water Association.

Frequency of water audits: ☐ each billing cycle ☐ yearly ☒ other: No formal audit schedule.

Leak detection and survey: ☐ every year ☐ every years ☐ periodic as needed
Year last leak detection survey completed: Unknown

Reducing Unaccounted Water. List potential sources and efforts being taken to reduce unaccounted water. If unaccounted water exceeds 10% of total withdrawals, include the timeframe for completing work to reduce unaccounted water to 10% or less.
Potential sources of unaccounted water include annual flushing events, firefighting, and potential water main breaks. The Fire Department has ongoing fire prevention and safety programs. Old cast iron mains are being replaced during street reconstruct projects.

3. **Conservation Water Rates.** Plans must include the current rate structure for all customers and provide information on any proposed rate changes. Discuss the basis for current price levels and rates, including cost of service data, and the impact current rates have on conservation.

Billing Frequency: ☐ Monthly ☐ Bimonthly ☒ Quarterly
☐ Other (describe):

Volume included in base rate or service charge: zero gallons or cubic feet

Conservation Rate Structures
- ☒ Increasing block rate: rate per unit increases as water use increases
- ☐ Seasonal rate: higher rates in summer to reduce peak demands
- ☐ Service charge or base fee that does not include a water volume

Conservation Neutral Rate Structure
- ☐ Uniform rate: rate per unit is the same regardless of volume

Non-conserving Rate Structures
- ☐ Service charge or base fee that includes a large volume of water
- ☐ Declining block rate: rate per unit decreases as water use increases
- ☐ Flat rate: one fee regardless of how much water is used (unmetered)

Other (describe):

Water Rates Evaluated: ☒ every year ☐ every years ☐ no schedule
Date of last rate change:

Declining block (the more water used, the cheaper the rate) and flat (one fee for an unlimited volume of water) rates should be phased out and replaced with conservation rates. Incorporating a seasonal rate structure and the benefits of a monthly billing cycle should also be considered along with the development of an emergency rate structure that could be quickly implemented to encourage conservation in an emergency.

Current Water Rates. Include a copy of the actual rate structure in Attachment or list current water rates including base/service fees and volume charges below.
Availability fee: $10.80 per quarter Volume charge: < 25,000 gallons - $1.07 per 1,000 gallons > 25,000 gallons - $1.25 per 1,000 gallons

Non-conserving Rate Structures. Provide justification for the rate structure and its impact on reducing demands or indicate intentions including the timeframe for adopting a conservation rate structure.
- N/A -

4. **Regulation.** Plans should include regulations for short-term reductions in demand and long-term improvements in water efficiencies. Sample regulations are available from DNR Waters. Copies of adopted regulations or proposed restrictions should be included in Attachment D of the plan. Indicate any of the items below that are required by local regulations and also indicate if the requirement is applied each year or just in emergencies.

☒ Time of Day: no watering between Noon and 6 pm
(reduces evaporation) ☒ year around ☐ seasonal ☐ emergency only
☒ Odd/Even: (helps reduce peak demand) ☒ year around ☐ seasonal ☐ emergency only
☐ Water waste prohibited (no runoff from irrigation systems)
Describe ordinance:
☐ Limitations on turf areas for landscaping (reduces high water use turf areas)
Describe ordinance:
☒ Soil preparation (such as 4”-6” of organic soil on new turf areas with sandy soil)
Describe ordinance: City Engineering Guidelines require a minium of 6 inches of topsoil prior to sodding or seeding.
☐ Tree ratios (plant one tree for every square feet to reduce turf evapotranspiration)
Describe ordinance:
☐ Prohibit irrigation of medians or areas less than 8 feet wide
Describe ordinance:
☐ Permit required to fill swimming pool ☐ every year ☐ emergency only
☐ Other (describe):

State and Federal Regulations (mandated)

☒ Rainfall sensors on landscape irrigation systems. Minnesota Statute 103G.298 requires "All automatically operated landscape irrigation systems shall have furnished and installed technology that inhibits or interrupts operation of the landscape irrigation system during periods of sufficient moisture. The technology must be adjustable either by the end user or the professional practitioner of landscape irrigation services."

☒ Water Efficient Plumbing Fixtures. The 1992 Federal Energy Policy Act established manufacturing standards for water efficient plumbing fixtures, including toilets, urinals, faucets, and aerators.

Enforcement. Are ordinances enforced? ☒ Yes ☐ No If yes, indicate how ordinances are enforced along with any penalties for non-compliance.
Violation of the sprinkling policies results in a fine. Warnings are not issued.

5. **Education and Information Programs.** Customers should be provided information on how to improve water use efficiencies a minimum of two times per year. Information should be provided at appropriate times to address peak demands. Emergency notices and educational materials on how to reduce water use should be available for quick distribution during an emergency. If any of the methods listed in the table below are used to provide water conservation tips, indicate the number of times that information is provided each year and attach a list of education efforts used for the last three years.

Current Education Programs	**Times/Year**
Billing inserts or tips printed on the actual bill	-
Consumer Confidence Reports	1
Local news papers *(4 display ads, 48 water use reminders)*	52
Community news letters *(bi-monthly)*	6
Direct mailings *(Water Use Policy/Earth Friendly Tips)*	1
Information at utility and public buildings	Year round
Public Service Announcements	-
Cable TV Programs	-
Demonstration projects (landscaping or plumbing)	-
K-12 Education programs (Project Wet, Drinking Water Institute)	-
School presentations	-
Events (children's water festivals, environmental fairs) *(P2 Day, Earth & Arbor Day)*	2
Community education *(Farmington EXPO, Hadler Chiro.)*	2
Water Week promotions	-
Information provided to groups that tour the water treatment plant	-
Website (include address: *www.ci.farmington.mn.us*)	Year round
Targeted efforts (large volume users, users with large increases)	-
Notices of ordinances (include tips with notices)	-
Emergency conservation notices (recommended)	-
Other: *messages on cable TV*	Year round

List education efforts for the last three years in Attachment E of the plan. Be sure to indicate whether educational efforts are on-going and which efforts were initiated as an emergency or drought management effort.

Proposed Education Programs. Describe any additional efforts planned to provide conservation information to customers a minimum of twice per year (required if there are no current efforts).
See the 2007 Water Conservation Education Plan (also included in Attachment E).

A packet of conservation tips and information can be obtained by contacting DNR Waters or the Minnesota Rural Water Association (MRWA). The American Water Works Association (AWWA) www.awwa.org or www.waterwiser.org also has excellent materials on water conservation that are available in a number of formats. You can contact the MRWA 800/367-6792, the AWWA bookstore 800/926-7337 or DNR Waters 651/259-5703 for information

regarding educational materials and formats that are available.

6. **Retrofitting Programs.** Education and incentive programs aimed at replacing inefficient plumbing fixtures and appliances can help reduce per capita water use as well as energy costs. It is recommended that communities develop a long-term plan to retrofit public buildings with water efficient plumbing fixtures and that the benefits of retrofitting be included in public education programs. You may also want to contact local electric or gas suppliers to see if they are interested in developing a showerhead distribution program for customers in your service area.

A study by the AWWA Research Foundation (Residential End Uses of Water, 1999) found that the average indoor water use for a non-conserving home is 69.3 gallons per capita per day (gpcd). The average indoor water use in a conserving home is 45.2 gpcd and most of the decrease in water use is related to water efficient plumbing fixtures and appliances that can reduce water, sewer and energy costs. In Minnesota, certain electric and gas providers are required (Minnesota Statute 216B.241) to fund programs that will conserve energy resources and some utilities have distributed water efficient showerheads to customers to help reduce energy demands required to supply hot water.

Retrofitting Programs. Describe any education or incentive programs to encourage the retrofitting of inefficient plumbing fixtures (toilets, showerheads, faucets, and aerators) or appliances (washing machines).
- N/A -

Plan Approval. Water Emergency and Conservation Plans must be approved by the Department of Natural Resources (DNR) every ten years. Please submit plans for approval to the following address:

DNR Waters
Water Permit Programs Supervisor
500 Lafayette Road
St. Paul, MN 55155-4032

or Submit electronically to
wateruse@dnr.state.mn.us.

Adoption of Plan. All DNR plan approvals are contingent on the formal adoption of the plan by the city council or utility board. Please submit a certificate of adoption (example available) or other action adopting the plan.

Metropolitan Area communities are also required to submit these plans to the Metropolitan Council. Please see PART IV. ITEMS FOR METROPOLITAN AREA PUBLIC SUPPLIERS.

METROPOLITAN COUNCIL

PART IV. ITEMS FOR METROPOLITAN AREA PUBLIC SUPPLIERS

Minnesota Statute 473.859 requires water supply plans to be completed for all local units of government in the seven-county Metropolitan Area as part of the local comprehensive planning process. Much of the required information is contained in Parts I-III of these guidelines. However, the following additional information is necessary to make the water supply plans consistent with the Metropolitan Land Use Planning Act upon which local comprehensive plans are based. Communities should use the information collected in the development of their plans to evaluate whether or not their water supplies are being developed consistent with the Council's Water Resources Management Policy Plan.

Policies. Provide a statement(s) on the principles that will dictate operation of the water supply utility: for example, "It is the policy of the city to provide good quality water at an affordable rate, while assuring this use does not have a long-term negative resource impact."
The policy of the Farmington water supply system is to provide the water consumers with safe, high quality, and affordable drinking water. The system will provide this vital service while assuring the long-term protection of our supply from contamination and excessive depletion.

Impact on the Local Comprehensive Plan. Identify the impact that the adoption of this water supply plan has on the rest of the local comprehensive plan, including implications for future growth of the community, economic impact on the community and changes to the comprehensive plan that might result.
This water supply plan attempts to anticipate the changes that will soon be made to the Comprehensive Plan, but it is expected that this plan will need to be updated following the 2008 update of the Comprehensive Plan.

Demand Projections

Year	Population Served*	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Projected Demand (MGY)
2010	22,320	2.4	7.0	880
2020	27,510	3.1	9.0	1,140
2030	32,700	3.8	11.0	1,390
Ultimate	65,000	8.5	23.2	3,100

* Population projections should be consistent with those in the Metropolitan Council's *2030 Regional Development Framework*.

REVIEW OF THE PLAN

The plan must be prepared by the city according to the sequence outlined in Minnesota Statutes 473.175, and submitted to the Metropolitan Council, adjacent communities, and the county for review and comment. The Council determines if the plan is complete for review within 10 days. If incomplete, the Council will notify the community and request the necessary information. When complete the Council will complete its review within 60 days or a mutually agreed upon extension. The community officially adopts the plan after it is returned with comments by the Council.

PLAN SUBMITTAL

Plans can be submitted electronically to the Council; however, the review process will not begin until the Council receives a paper copy of the materials. Electronic submissions can be via a CD, 3 ½" floppy disk or to the email address below. Metropolitan communities should submit their plans to:

Reviews Coordinator Metropolitan Council 230 E 5th Street, St. Paul, MN 55101	electronically to: watersupply@metc.state.mn.us

Attachment A

Well Level Monitoring Plan

FARMINGTON WATER UTILITY

Well Level Monitoring Plan

Well Nos. 5, 6, and 7 have the capability to automatically measure water level within the well casing, and the SCADA system is currently capable of recording these values. The capability to report this data has not yet been developed. Well Nos. 1, 3, and 4 do not have automatic level measurement capability at this time.

The Water Utility will develop the capability to identify static water level readings, and will maintain monthly records of these values for each of the aforementioned wells. Monthly static water levels will also be recorded for all future production wells.

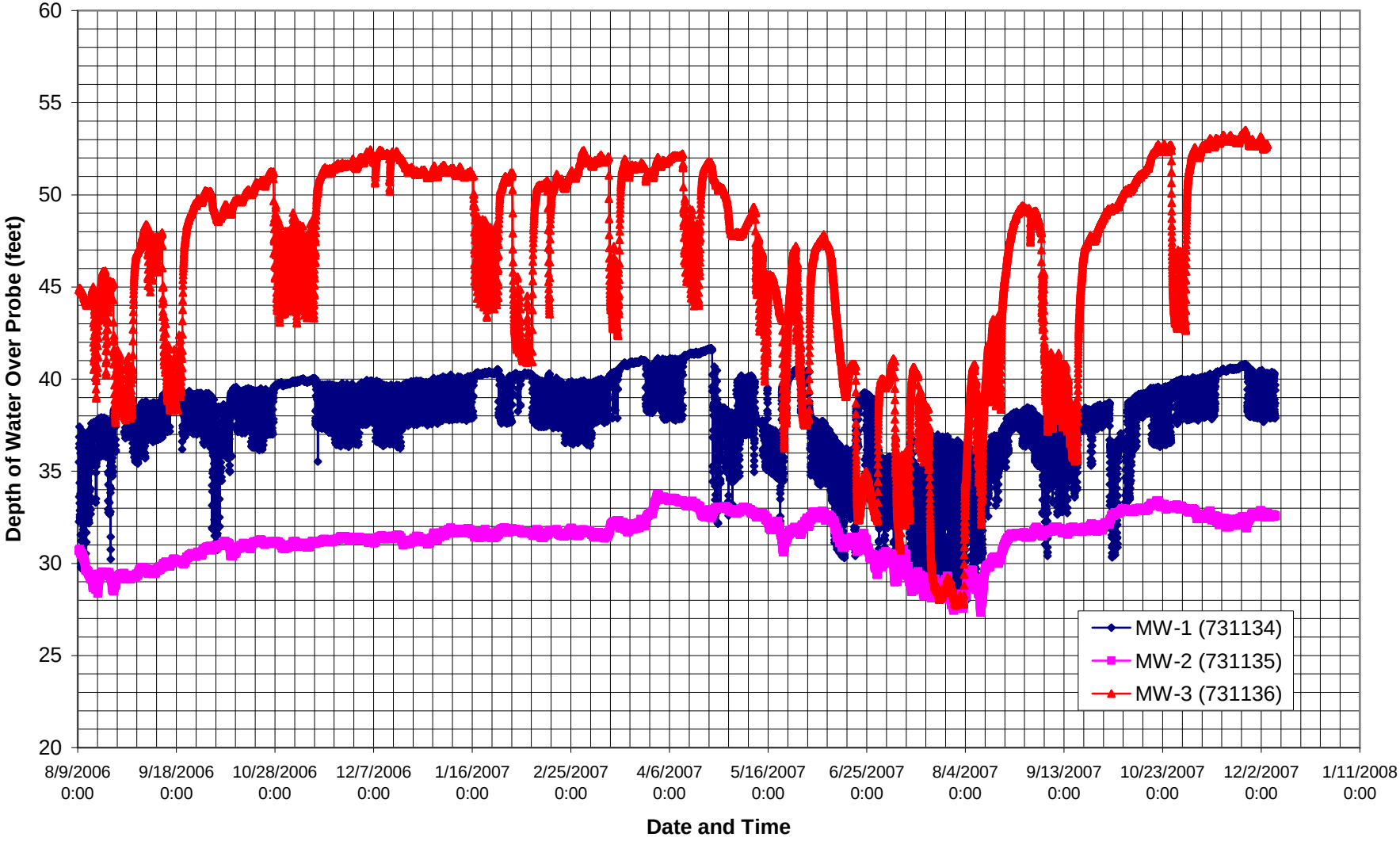
The City installed three dedicated monitoring wells in the Prairie du Chien aquifer in the summer of 2006, with the purposes of using these wells to measure the impacts of pumping from the high capacity Jordan aquifer production wells. MW-1 (731134) was installed in the center of the north well field in order to directly measure the influence of the wells on the Prairie du Chien aquifer. MW-2 (731135) was installed in the southeast portion of the City, away from the well field, near wetlands that are thought to be hydraulically connected to the Prairie du Chien aquifer. The purpose of this well was to determine whether far-reaching impacts from the well field eventually will reach this portion of the City and whether it can negatively influence water levels in the nearby wetlands. MW-3 (731136) was installed at the northwest edge of the north well field, at a site tentatively set aside as a possible future production well site.

Water level data has been continuously recorded at the three monitoring well site since August 2006, using automated data loggers and pressure transducers installed in each well. The data loggers are set to record water levels in 30 minute increments. A water level chart for all three wells is attached, showing the relative fluctuations in water levels in these wells. The water levels in MW-1 and MW-3 clearly show the influence of both seasonal trends in water levels and influences of nearby pumping of the production wells. The trend for MW-3 shows seasonal fluctuations in water levels, with reduced water levels in summer months and generally increasing trends in water levels during non-summer months when recharge is taking place. At present, it is unknown whether reduced water levels at MW-3 are a result of increased pumping from the City's well field or whether impacts are solely caused by seasonal trends, or some combination of both. Continued monitoring at these wells at the same frequency is planned to track water level trends at these sites in the coming years.

Attachment B

Well Level Data

Farmington Monitoring Well Data



STATIC WATER LEVEL MEASUREMENTS

Year	Well 1	Well 3	Well 4	Well 5	Well 6	Well 7
1938	11					
1959		9				
1973			15			
1995	12	10	22			
1997	9	9				
1998			16.5			
1999				63		
2002					53	
2003						57
Oct 2006	14	12	34	71	50	57

measurements in feet

Attachment C

Capital Improvement Plan

Capital Improvement Plan

Year	Phasing Schedule [4]
2007	Add Well 8
2008	Add 5.0 MG Ground Storage Reservoir
2009	
2010	Add Well 9 (replacement)
2011	
2012	
2013	
2014	
2015	Add Well 10

(1) 100% of Maximum Day Demand as recommended in this report.

(2) All new well capacities are based on 1000 gpm, numbers based on *total firm capacity*.

(3) Estimated value based on the ratio of storage to maximum day demand (30%).

(4) Well and reservoir construction should begin one to two years before facility is actually required.

Attachment D

Conservation Policies

Hand watering is always allowed.

Outside Water Use Restrictions

Odd/Even Days & No Watering between noon & 6pm

This policy is in effect year round.

- Properties having an odd numbered address may water on odd calendar days. Properties having an even numbered address are permitted to water lawns on even calendar days.

- No watering (garden sprinkling or other irrigation) is allowed between 12:00 noon and 6:00 pm, regardless of your watering day or having a temporary permit to water new sod or seed.

- Daily watering permits for new sod/seed are available at the Maintenance Facility, 19650 Municipal Drive, and City Hall, 325 Oak Street. There is **no charge** for this permit. But again, no lawn, garden, landscape sprinkling or other irrigation is allowed between 12 noon and 6pm.

- Hand watering (hose must be attended) of plants, and children's water toys, when IN USE by children, are not restricted.

- Other non-irrigating outside water uses such as vehicle washing are not restricted.

- The Water Board enacted the Water Use Policy to ensure that the public safety and essential needs of the citizens would not be jeopardized while still allowing water use flexibility.

Failure to comply with this policy will result in a fine. Warnings are not issued.

Weather conditions may require revisions in policy, that information will be posted on the City's website @ www.ci.farmington.mn.us and the City's cable channel 16. Questions? Call 463-1600.

Tips for Earth Friendly Lawn & Yard Care...

Water the lawn only when needed
Step on the grass; if it springs back up when you move your foot, it does not need water.

Use mulch
Mulching helps to retain moisture as well as control weeds that can compete with plants for water.

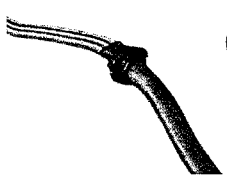
Plant native plants
Native plants are tolerant to variations in local climate and generally need little watering, and no fertilizer, pesticides or mowing.

Keep grass longer and mow less often
Longer leaf surfaces, 3 inches or more, promote deeper rooting and shade the root zone. Never remove more than 1/3 of the leaf blade in one mowing. Return mulched clippings to the lawn. Mowing often puts the grass under additional stress which requires more water.

Use a broom to clean the driveway and sidewalk
Sweeping the driveway and sidewalk instead of hosing them off will get them clean enough without wasting gallons of water.

Don't let the water run while washing the car
Better yet, go to a commercial car wash where water recycling is required.

Sponsored by the City of Farmington's Water Board in 2006.
Information courtesy of the Metropolitan Council.



Odd/Even Watering Policy &
No Watering between noon & 6pm

Presort
First Class
U.S. Postage
Paid
Farmington, MN
Permit No. 36

18. Erosion control shall at a minimum observe standards established in the following reports: "Protecting Water Quality in Urban Areas" (Best Management Practices for Minnesota), "National Urban Runoff Program" (NURP) and the "Storm Water Management Plan" for the City of Farmington or as modified herein.

19. Label all lot and block numbers.

20. Label all street names.

21. Show centerline street high point elevations every 100-feet and street grades.

22. Show typical lot detail indicating where lot and house elevations are.

23. Show typical street section.

24. Show drainage arrows at high points and major grade changes.

25. Show existing and proposed easements and outlots.

26. Wetland boundaries must be accurately shown along with the name of the person or company who delineated the wetland boundaries.

27. A grading record plan is required to be submitted and reviewed by the City prior to the issuance of building permits.

28. 1 roll of sod is required behind the back of curb in all locations at a minimum. Where sidewalks and bike trails are located, one roll of sod is required on the outside of the walkway, and the entire boulevard between the walkway and curb will be sodded. A minimum of one roll of sod will be placed on each side of trails located outside of road ROW's.

29. A minimum of 6" of topsoil must be applied to all disturbed areas of the development prior to seeding or sodding. Topsoil is defined as the top horizon of soil that existed on the site prior to grading of the development and is capable of adequately supporting grass. Soil that is predominantly sand, gravel, or clay will not be considered topsoil.

30. If dewatering is required for grading, a plan must be submitted to the City for review and approval prior to construction.

31. Erosion blanket shall conform to MNDOT 3885 category 4 for semi-permanent blankets. 8" staples shall be utilized for anchoring the blanket.

Streets/Trails

Streets shall conform to the most recent editions of "MNDOT Standard Specification for Highway Construction", "MNDOT Road Design Manual", "Minnesota Manual on

2-5-1: COMMISSION ESTABLISHED:

It is hereby recognized that in the city there was created in August of 1911 a "water board" which it is herein reaffirmed, did and continues to exist as an independent administrative utilities commission under the provision of MSA 412.341. The commission shall have jurisdiction over the municipal water system only and shall have all of the powers granted to it under MSA 412.361. (Ord. 080-88, 4-7-1980)

412.361 May remodel, expand, run utility; other powers.

Subdivision 1. **Contract; bid provisions apply.** The commission shall have power to extend and to modify or rebuild any public utility and to do anything it deems necessary for its proper and efficient operation; and it may enter into necessary contracts for these purposes. The provisions of section 412.311 relating to advertisement for bids shall apply to contracts of the public utilities commission.

Subd. 2. **Hire, direct, fix pay for personnel.** The commission shall have power to employ all necessary help for the management and operation of the public utility, prescribe duties of officers and employees and fix their compensation.

Subd. 3. **Buy fuel, supplies, wholesale energy.** The commission shall have power to buy all fuel and supplies, and it may purchase wholesale electric energy, steam heat, hot water energy, gas or water, as the case may be, for municipal distribution.

Subd. 4. **Fix rates; adopt service rules.** The commission shall have power to fix rates and to adopt reasonable rules and regulations for utility service supplied by the municipally owned public utilities within its jurisdiction.

Subd. 5. **Relations, finances with city.** The commission shall have power to enter into agreements with the council for payments by the city for utility service, compensation for the use by either the commission or the city of buildings, equipment, and personnel under the control of the other, payments to the city in lieu of taxes, transfers of surplus utility funds to the general fund, and also agreements on other subjects of relationships between the commission and the council.

HIST: 1949 c 119 s 46; 1953 c 735 s 6; 1973 c 123 art 2 s 1 subd 2; 1981 c 334 s 4

8-3-21: EMERGENCY REGULATIONS:

The Council may impose emergency regulations pertaining to the conservation of water by resolution of the Council and by giving notice by publication or by posting in the City Hall and at such public places as the Council may direct. (Ord. 173, 7-7-69)

Attachment E

Conservation Education Efforts

City of Farmington
Water Conservation Education Plan
2007

1. Promotional items: (distributed at Farmington EXPO, city buildings, in new resident packets to new homes, etc.)
    - Pens
    - Leak detectives
2. Direct Mail
    a) Community Calendar
    b) Water Policy Explained & Earth Friendly Yard Tips.....April
3. Advertisements in Farmington Independent (display ads)
    a) Outside Water Conservation display ad
        - Mid-April, 2006
        - June, 2006
    b) Inside Water Conservation display ad
        - August, 2006
        - November, 2006
    c) Odd/Even, no watering noon to 6pm advertisement
        - *Every other week* – May 6 thru October 14
4. Information in City newsletters
    a) Watering Policy & Inside Water Conservation
        - January
    b) Watering Policy & Outside Water Conservation
        - March
        - May
        - July
    c) Water Conservation - inside
        - September
        - November
5. Information on Cable
    a) Water Use Restrictions/Lawn & Yard Care .....year round
6. Information on City website.....year round
7. Educational Program
    a) Science Museum "Water!" Assembly Program
        - At P2 Day in September for 4th graders
        - other opportunities if available (ex. Earth & Arbor Day)

June 28, 2006

City of Farmington
Water Conservation Education Plan
2006

1. Farmington Expo – Pens promoting the Water Use Policy will be available to attendees of the Farmington Expo on January 28, 2006.
2. New residents building new or purchasing existing homes will receive a pen promoting the Water Use Policy in the new resident packet.
3. Direct Mail
   a) Water Policy Explained & Earth Friendly Yard Tips.....April
      This direct mail piece will also be included in new resident packets.
4. Advertisements in Farmington Independent (display ads)
   a) Outside Water Conservation display ad
      - Mid-April, 2006
      - June, 2006
   b) Inside Water Conservation display ad
      - August, 2006
      - November, 2006
   c) Odd/Even, no watering noon to 6pm advertisement
      - Weekly – May thru October
5. Information in City newsletters
   a) Watering Policy & Inside Water Conservation
      - January
   b) Watering Policy & Outside Water Conservation
      - March
      - May
      - July
   c) Water Conservation - inside
      - September
      - November
6. Information on Cable
   a) Water Use Restrictions/Lawn & Yard Care .....year round
7. Information on City website.....year round
8. Educational Program
   a) Science Museum "Water!" Assembly Program
      - At P2 Day in September for 4th graders
      - other opportunities if available

November 28, 2005

City of Farmington
Water Conservation Education Plan
2005

1. Farmington Expo – Pens and magnets with Water Policy will be available to attendees of the Farmington Expo in January, 2005.
2. New residents in new and existing homes will continue to receive a magnet in a new resident packet outlining the City's Water Policy.
3. Direct Mail
   a) Water Policy Explained & Earth Friendly Yard Tips.....April
4. Advertisements in Farmington Independent (display ads)
   a) Outside Water Conservation display ad
      - Mid-April, 2005
      - June, 2005
   b) Inside Water Conservation display ad
      - August, 2005
      - November, 2005
   c) Odd/Even, no watering noon to 6pm advertisement
      - Weekly – April/May thru October
5. Information in City newsletters
   a) Watering Policy & Inside Water Conservation
      - January
   b) Watering Policy & Outside Water Conservation
      - March
      - May
      - July
   c) Water Conservation - inside
      - September
      - November
6. Information on Cable
   a) Water Use Restrictions/Lawn & Yard Care .....year round
7. Information on City website.....year round
8. Educational Program
   a) Science Museum "Water!" Assembly Program
      - On grandstand at Dew Days
      - for 4th graders at P2 Day in Sept.

November 15, 2004

City of Farmington
Water Conservation Education Plan
2004

1. Farmington Expo – Pens and magnets with Water Policy will be available to attendees of the Farmington Expo in February, 2004.
2. New residents in new and existing homes will receive a pen and/or a magnet in a new resident packet outlining the City's Water Policy.
3. Direct Mail
   a) Water Policy Explained & Earth Friendly Yard Tips.....April
4. Advertisements in Farmington Independent (display ads)
   a) Outside Water Conservation display ad
      - Mid-April, 2004
      - June, 2004
   b) Inside Water Conservation display ad
      - August, 2004
      - November, 2004
   c) Odd/Even, no watering noon to 6pm advertisement
      - Weekly – April/May through October
5. Information in City newsletters
   a) Watering Policy & Inside Water Conservation
      - January
   b) Watering Policy & Outside Water Conservation
      - March
      - May
      - July
   c) Water Conservation - inside
      - September
      - November
6. Information on Cable
   a) Water Use Restrictions/Lawn & Yard Care .....year round
5. Information on City website .....year round
6. Educational Program
   b) Science Museum "Water!" Assembly Program for 4th graders .... P2 Day in Sept.

November 19, 2003

Attachment F

Well Records

Unique No. 00200932

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2003/10/21

Entry Date 1989/12/27

Township Name	Township	Range	Dir	Section	Subsection
	114	19	W	31	ACDBBB

Well Depth	Depth Completed	Date Well Completed
402 ft.	402 ft.	/19/38

Well Name FARMINGTON 1

Drilling Method

Contact's Name FARMINGTON 1

FARMINGTON MN 55024

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing Drive Shoe? ☐ Yes ☐ N

Hole Diameter

Casing Diameter 16 in. to 197 ft

Weight(lbs/ft)

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND + GRAVEL			0	50
QUICKSAND			50	96
SANDY CLAY			96	99
GRAVEL + BOULDERS			99	130
BLUE SHALE			130	165
SANDY SHALE			165	173
FINE SAND			173	185
HARDPAN			185	186
GRAY SHALE + LIME			186	195
YELLOW LIME			195	205
BLUE LIME			205	220
BLUE + BROWN LIME			220	318
JORDAN SANDSTONE			318	400
GREEN SHALE			400	402

Screen N

Open Hole From 197 ft. to 402 ft.

Make

Type

Static Water Level 11 ft. from Land surface Date /19/38

PUMPING LEVEL (below land surface)

19 ft. after hrs. pumping 230 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name

Model HP 25 Volts

Drop Pipe Length ft. Capacity g.p.m

Type T

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

FARMINGTON, MN

USGS Quad Farmington Elevation 903

Aquifer: OPCJ Alt Id: 59-072

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 27010

License Business Name

Name of Driller

Report Copy

HE-01205-06 (Rev. 9/96)

Unique No. 00201154

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2003/10/21

Entry Date 1990/06/29

Township Name	Township	Range	Dir	Section	Subsection
	114	19	W	31	CADCCB

Well Depth	Depth Completed	Date Well Completed
424 ft.	424 ft.	1959/07/31

Well Name FARMINGTON 3

Drilling Method

Contact's Name FARMINGTON 3

FARMINGTON MN 55024

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing Drive Shoe? ☐ Yes ☐ N

Hole Diameter

Casing Diameter Weight(lbs/ft)

20 in. to 60 ft

12 in. to 132 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND + GRAVEL			0	42
FINE SAND			42	80
SAND + GRAVEL			80	110
BLUE CLAY			110	119
FINE SAND WITH BLUE CLA			119	130
SHAKOPEE LIMESTONE			130	322
JORDAN SANDSTONE			322	422
ST. LAWRENCE SHALE			422	424

Screen N

Open Hole From 132 ft. to 424 ft.

Make Type

Static Water Level 9 ft. from Land surface Date 1959/07/31

PUMPING LEVEL (below land surface)

19 ft. after hrs. pumping 750 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name

Model HP 75 Volts

Drop Pipe Length ft. Capacity 700 g.p.m

Type T

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

M.G.S. NO.964. GAMMA LOGGED 12-1-87.

USGS Quad Farmington Elevation 909

Aquifer: OPCJ Alt Id: 59-072

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 27010

License Business Name

Name of Driller

Report Copy

HE-01205-06 (Rev. 9/96)

Unique No. 00235586

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2004/12/29

Entry Date 1989/12/27

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	14	DAAAAD

Well Depth	Depth Completed	Date Well Completed
477 ft.	477 ft.	1973/00/00

Well Name FARMINGTON 4

Drilling Method

Contact's Name FARMINGTON 4

FARMINGTON MN 55024

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter **Weight(lbs/ft)**

24 in. to 105 ft

16 in. to 392 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
TOPSOIL	BLACK		0	3
CLAY	YELLO		3	12
BROWN + GREEN CLAY MI			12	40
GREEN CLAY WITH STREA			40	80
ST. PETER SANDSTONE	YELLO	SOFT	80	105
ST. PETER SANDSTONE	YELLO	HARD	105	134
SHAKOPEE LIMEROCK			134	376
JORDAN SANDROCK			376	475
SHALE	GREE		475	477

Screen N

Open Hole From 392 ft. to 477 ft.

Make Type

Static Water Level 15 ft. from Land surface Date /19/73

PUMPING LEVEL (below land surface)

154 ft. after hrs. pumping 1200 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name

Model HP 100 Volts

Drop Pipe Length ft. Capacity E+03 g.p.m

Type T

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

FARMINGTON, MN

USGS Quad Farmington Elevation 921

Aquifer: CJDN Alt Id: 59-072

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No.

License Business Name

Name of Driller

Report Copy

HE-01205-06 (Rev. 9/96)

Unique No. 00603051

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2005/03/11

Entry Date 1999/08/18

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	24	

Well Depth	Depth Completed	Date Well Completed
512 ft.	512 ft.	1999/07/00

Well Name FARMINGTON 5

Drilling Method Cable Tool

Well Owner's Name FARMINGTON
195TH
FARMINGTON MN 55024

Drilling Fluid Water

Well Hydrofractured? ☐ Yes ☑ No
From ft. to ft.

Contact's Name FARMINGTON CITY HALL
325 OAK ST
FARMINGTON MN 55024

Use Community Supply (municipal)

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND & CLAY	BROW	SOFT	0	23
SAND & GRAVEL	BROW	SOFT	23	65
SAND (FINE)	BROW	SOFT	65	116
SANDSTONE	WHITE	HARD	116	135
SHALE, SANDSTONE	TAN	MEDIUM	135	139
SANDSTONE	YELLO	MEDIUM	139	181
LIMESTONE	GRAY	HARD	181	405
SANDSTONE	WHITE	MEDIUM	405	503
SHALEY SANDSTONE	BLUE	MEDIUM	503	512

Casing **Drive Shoe?** ☑ Yes ☐ N

Casing Diameter			Weight(lbs/ft)
30	in. to	139 ft	118.65
24	in. to	417 ft	94.62

Hole Diameter

in. to 417 ft
in. to 512 ft

Screen N

Make Type

Open Hole From 417 ft. to 512 ft.

Static Water Level 63 ft. from Land surface Date 1999/06/18

PUMPING LEVEL (below land surface)

98 ft. after 8 hrs. pumping 1400 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☑ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G	0	417	56	Y

Nearest Known Source of Contamination

700 ft. direction W type SDF

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☑ Not Installed Date Installed N

Mfr name

Model HP Volts

Drop Pipe Length ft. Capacity g.p.m

Type

Any not in use and not sealed well(s) on property? ☐ Yes ☑ No

Was a variance granted from the MDH for this Well? ☐ Yes ☑ No

USGS Quad Farmington Elevation 964

Aquifer: CJDN Alt Id: 59-0725

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012

License Business Name

Name of Driller SAMPSON, J.

Report Copy

Unique No. 00626785

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2005/03/11

Entry Date 2003/02/17

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	24	CBC

Well Depth	Depth Completed	Date Well Completed
485 ft.	485 ft.	2002/06/20

Well Name FARMINGTON 6

Drilling Method Cable Tool

Contact's Name CITY OF FARMINGTON/MANN, LEE
325 OAK ST
FARMINGTON MN 55024

Drilling Fluid Bentonite

Well Hydrofractured? ☐ Yes ☐ No
From ft. to ft.

Well Owner's Name FARMINGTON 6
198TH & ENGLISH ST
FARMINGTON MN 55024

Use Community Supply (municipal)

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
CLAY	BROW	MEDIUM	0	7
SAND & ROCKS	BROW	MEDIUM	7	101
ST PETER S.S.	TAN	MEDIUM	101	155
SHAKOPEE	GRAY	V.HARD	155	298
JORDAN	GRAY	M.SOFT	298	383
JORDAN	TAN	SOFT	383	465
JORDAN	GRAY	SOFT	465	480
ST. LAWRENCE	GREE	MEDIUM	480	485

Casing **Drive Shoe?** ☑ Yes ☐ N

Casing Diameter			Weight(lbs/ft)
30	in. to 126	ft	118.65
24	in. to 386	ft	94.65

Hole Diameter

in. to 382 ft
in. to 485 ft

Screen N

Make Type

Open Hole From 382 ft. to 485 ft.

Static Water Level 53 ft. from Land surface Date 2002/03/00

PUMPING LEVEL (below land surface)
86 ft. after 24 hrs. pumping 1850 g.p.m.

Well Head Completion
Pitless adapter mfr Model
Casing Protection ☐ 12 in. above grade
☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G	0	382	42	Y

Nearest Known Source of Contamination
80 ft. direction W type SDF
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed
Mfr name GOULDS
Model 14RJMC/4 HP 200 Volts 460
Drop Pipe Length 140 ft. Capacity E+03 g.p.m.
Type S

Any not in use and not sealed well(s) on property? ☐ Yes ☑ No

Was a variance granted from the MDH for this Well? ☐ Yes ☑ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

M.G.S. NO 4224.

USGS Quad Farmington Elevation 954
Aquifer: CJDN Alt Id: 59-0725

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 71015
License Business Name
Name of Driller SIGAFOOS, R.

Report Copy

HE-01205-06 (Rev. 9/96)

Unique No. 00655902
County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2005/03/11
Entry Date 2002/10/21

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	24	CAB

Well Depth	Depth Completed	Date Well Completed
501 ft.	501 ft.	2002/09/20

Well Name FARMINGTON 7

Drilling Method Cable Tool

Well Owner's Name FARMINGTON
5225 ORIOLE DR
FARMINGTON MN 55024

Drilling Fluid Water

Well Hydrofractured? ☐ Yes ☑ No
From ft. to ft.

Contact's Name CITY OF FARMINGTON
325 OAK ST
FARMINGTON MN 55024

Use Community Supply (municipal)

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND & GRAVEL	BROW	SOFT	0	11
CLAY & GRAVEL	BROW	SOFT	11	28
SANDSTONE-SHALEY	BROW	MEDIUM	28	166
LIMESTONE	GRAY	HARD	166	396
SANDSTONE	TAN	MEDIUM	396	501

Casing **Drive Shoe?** ☑ Yes ☐ N

Casing Diameter			Weight(lbs/ft)
30	in. to	70 ft	118.76
24	in. to	408 ft	94.71

Hole Diameter
in. to 408 ft.
in. to 501 ft.

Screen N
Make Type

Open Hole From 401 ft. to 501 ft.

Static Water Level 57 ft. from Land surface Date 2002/09/15

PUMPING LEVEL (below land surface)
84 ft. after 10 hrs. pumping 1800 g.p.m.

Well Head Completion
Pitless adapter mfr Model
Casing Protection Y ☑ 12 in. above grade
☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G	0	408	45	Y

Nearest Known Source of Contamination
150 ft. direction SW type BOW
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☑ Not Installed Date Installed N
Mfr name
Model HP Volts
Drop Pipe Length ft. Capacity g.p.m.
Type

Any not in use and not sealed well(s) on property? ☐ Yes ☑ No

Was a variance granted from the MDH for this Well? ☐ Yes ☑ No

USGS Quad Farmington Elevation 971
Aquifer: CJDN Alt Id: 59-0725

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012
License Business Name
Name of Driller SAMPSON, J.

Report Copy

HE-01205-06 (Rev. 9/96)

Appendix C

ISO Rating Report

INSURANCE SERVICES OFFICE, INC.
111 NORTH CANAL STREET SUITE 950 CHICAGO, ILLINOIS 60606-7270 (312) 930-3070 800) 444-4554 FAX (312) 930-3017

FIRE INSURANCE CLASSIFICATIONS

IMPROVEMENT STATEMENTS
FOR
FARMINGTON, MINNESOTA
Prepared by

INSURANCE SERVICES OFFICE, INC.
111 North Canal Street
Chicago, Illinois 60606

The following statements are based upon the criteria contained in our Fire Suppression Rating Schedule and upon conditions in Fire Protection District in Farmington MN. They indicate the performance needed to receive full credit for the specific item in the Schedule, and the quantity you have provided. Partial improvement will result in receiving a partial increase in the credit. These statements relate only to the fire insurance classification of your city. They are not for property loss prevention or life safety purposed and no life safety or property loss prevention recommendations are made.

RECEIVING AND HANDLING FIRE ALARMS

Credit For Telephone Service (Item 414).

For maximum credit in the Schedule, both the number to report a fire and the fire department business number should be listed under "Fire Department" in the white pages directory. Your fire number is listed and your business number is not listed under "Fire Department".

Credit For Operators (Item 422).

For maximum credit in the Schedule, 2 operators are needed on duty at all times. You have 1.25 operators on duty.

Credit For Dispatch Circuits (Item 432).

For maximum credit in the Schedule, the voice-amplification alarm dispatch circuit should be electrically supervised.

For maximum credit in the Schedule, the radio alarm dispatch circuit should be supervised in accordance with National Fire Protection Association Standard, 1221.

For maximum credit in the Schedule, the alarm dispatch circuits should be electrically supervised.

FIRE DEPARTMENT

Credit For Engine Companies (Item 513).

For maximum credit in the Schedule, 4 engine companies are needed in your district. These are calculated as follows:

3 for the Basic Fire Flow of 3500 gpm.

1 additional for the size of the area served.

You have 3 engine companies in service.
These are calculated as follows:

46 percent for Engine 4796 because of insufficient equipment, & there should be a minimum of 500 gpm in tested pumping capacity.

92 percent for Engine 4780 because of insufficient equipment.

91 percent for Engine 4781 because of insufficient equipment.

Credit For Reserve Pumpers (Item 523).

For maximum credit in the Schedule, 1 fully-equipped reserve pumper is needed. You have 0 reserve pumpers.

Credit For Pump Capacity (Item 532).

For maximum credit in the Schedule, at least 3500 gpm in fire department pump capacity is needed. You have 2700 gpm in creditable pump capacity. This is calculated as follows:

2700 gpm in service and reserve = 2700gpm

Credit For Ladder Service (Item 549).

For maximum credit in the Schedule, 1 ladder company and 1 service company is needed in your City. This is calculated as follows:

1 ladder and 1 service company due to method of operation.

You have 0 ladder and 2 service company.
This is calculated as follows:

68 percent for Service 4797 because of insufficient equipment.

67 percent for Engine Service 4780 because of insufficient equipment.*

*Limited to 50% credit maximum by Fire Suppression Rating Schedule due to dual operations.

Credit For Reserve Ladder Service (Item 553).

For maximum credit in the Schedule, 1 fully-equipped reserve ladder truck is needed. You have 0 reserve ladder trucks.

Credit For Distribution (Item 561).

For maximum credit in the Schedule, all sections of the district with hydrant protection should be within 1½ miles of an adequately-equipped engine company and 2½ miles of an adequately-equipped ladder, service, engine-ladder or engine-service company. The distance to be measured along all-weather roads.

Credit For Company Personnel (Item 571).

An increase in the response of fire department members by one person will increase the fire department credit by .2%.

Credit For Training (Item 581).

For maximum credit in the Schedule, the training program should be improved. You received 31 percent credit for the current training program and the use of facilities.

WATER SUPPLY

Credit For the Water Supply (Item 616).

For maximum credit in the Schedule, the needed fire flows should be available at each location in the city. Needed fire flows of 2500 gpm and less should be available for 2 hours, 3000 and 3500 gpm for 3 hours and all others for 4 hours.

All AWWA standard hydrants within 1000 feet of a building, measured as hose can be laid by apparatus, are credited; 1000 gpm for hydrants within 300 feet; 670 gpm for 301 to 600 feet; and 250 gpm for 601 to 1000 feet. Credit is reduced when hydrants lack a pumper outlet, and is further reduced when they only have only a single 2½-inch outlet.

Credit For Inspection and Condition of Hydrants (Item 631).

For maximum credit in the Schedule, all hydrants should be inspected twice a year, the inspection should include operation and a test at domestic pressure. Records should be kept of the inspections.

INSURANCE SERVICES OFFICE, INC.

07-88

HYDRANT FLOW DATA SUMMARY

City Farmington STATE MN ZIPCODE 55024 Witnessed by Insurance Services Office, Inc. Date December 4, 1999

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM INDIVIDUAL HYDRANTS			TOTAL	PRESSURE PSI STATIC	PRESSURE PSI RESID.	FLOW AT 20 PSI NEEDED **	FLOW AT 20 PSI AVAIL.	REMARKS
1	Comm	4th ST & PINE	Main				1860	80	44	3000	2500	
2	Comm	3rd ST & OAK	"				1236	80	60	3000	2200	
3	Comm	UPPER 183 ST & PILOTKNOB	"				2510	73	65	3000	7000	
4	Comm	6th ST & MAPLE	"				1770	76	46	3000	2500	
5	Comm	6th ST & HERITAGE WAY	"				2240	76	30	750	2500	
6	Comm	800 DEMMARK (HIGH SCHOOL)	"				2120	73	60	4500	4500	
7	Comm	2nd ST & ELM	"				1630	79	51	3500	2400	
8	Comm	8th & WALNUT	"				2430	80	40	4000	3000	
9	Comm	5400 RTE 50 W	"				1840	70	50	2000	3000	
10	Comm	MAIN ST & RTE 3	"				1530	80	40	2250	1900	
11	Comm	220 ST & W DELL RD	"				2120	70	43	3500	3000	
12	Comm	195th & AKIN	"				2550	46	42	3000	7000	
13	Comm	4200 208th ST (MIDDLE SCH)	"				3080	80	56	5000	5100	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION. THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial, Res = Residential

Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are **not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

[illegible]

CLASSIFICATION DETAILS

Municipality:	Farmington	State:	Minnesota	Population:	19,500
Date Surveyed:	January 22, 1999	Total Credit:	51.71	Class:	5

RECEIVING AND HANDLING FIRE ALARMS

This section of the Fire Suppression Rating Schedule reviews the facilities provided for the general public to report fires, and for the operator on duty at the communication center to dispatch fire department companies to the fires.

	Credit	
	Actual	Maximum
1. Credit for Telephone Service (Item 414)		
This item reviews the facilities provided for the public to report fires, including the listing of fire and business numbers in the telephone directory.	1.90	2.00
2. Credit for Operators (Item 422)		
This item reviews the number of operators on-duty at the communication center to handle fire calls.	1.89	3.00
3. Credit for Dispatch Circuits (Item 432)		
This item reviews the dispatch circuit facilities used to transmit alarms to fire department members.	3.50	5.00
4. Total Credit for Receiving and Handling Fire Alarms:	7.29	10.00
Relative Classification for Receiving and Handling Fire Alarms:	3	

Municipality:	Farmington	State:	Minnesota	Population:	19,500
Date Surveyed:	January 22, 1999	Total Credit:	51.71	Class:	5

FIRE DEPARTMENT

This section of the Fire Suppression Rating Schedule reviews the engine and ladder-service companies, equipment carried, response to fires, training and available fire fighters.

	Credit	
	Actual	Maximum
1. Credit for Engine Companies (Item 513)		
This item reviews the number of engine companies and the hose equipment carried.	7.20	10.00
2. Credit for Reserve Pumpers (Item 523)		
This item reviews the number of reserve pumpers, their pump capacity and the hose equipment carried on e:	0.41	1.00
3. Credit for Pump Capacity (Item 532)		
This item reviews the total available pump capacity.	3.86	5.00
4. Credit for Ladder-Service Companies (Item 549)		
This item reviews the number of ladder and service companies and the equipment carried.	0.00	5.00
5. Credit for Reserve Ladder-Service Companies (Item 553)		
This item reviews the number of reserve ladder and service trucks, and the equipment carried.	0.10	1.00

Municipality:	Farmington	State:	Minnesota	Population:	19,500
Date Surveyed:	January 22, 1999	Total Credit:	51.71	Class:	5

FIRE DEPARTMENT
(continued

	Credit	
	Actual	Maximum
6. Credit for Distribution (Item 561)		
This item reviews the percent of the built-upon area of the city which has an adequately-equipped, responding first-due engine company within 1.5 miles and an adequately-equipped, responding ladder-service company within 2.5 miles.	0.90	4.00
7. Credit for Company Personnel (Item 571)		
This item reviews the average number of equivalent fire fighters and company officers on duty with existing companies.	3.85	15.00+
8. Credit for Training (Item 581)		
This item reviews the training facilities and their use.	2.79	9.00
9. Total Credit for Fire Department:	19.11	50.00+
Relative Classification for Fire Department:	7	

+ This indicates that credit for manning is open-ended, with no maximum credit for this item.

Municipality:	Farmington	State:	Minnesota	Population:	19,500
Date Surveyed:	January 22, 1999	Total Credit:	51.71	Class:	5

WATER SUPPLY

This section of the Fire Suppression Rating Schedule reviews the water supply system that is available for fire suppression in the city.

	Credit	
	Actual	Maximum
1. Credit for the Water System (Item 616)		
This item reviews the supply works, the main capacity and hydrant distribution.	30.63	35.00
2. Credit for Hydrants (Item 621)		
This item reviews the type of hydrants, and method of installation.	2.00	2.00
3. Credit for Inspection and Condition of Hydrants (Item 631)		
This item reviews the frequency of inspections of hydrants and their condition	2.70	3.00
4. Total Credit for Water Supply:	35.33	40.00
Relative Classification for Water Supply:	2	

Needed Fire Flow Basic Report

Risk ID	County	Low	Dir	Street	Type	Surv. Type	NFF gpm	R	C	P	Eff Area	Div Wall	C -	Sty	CSP	Total Area
State	Terr	Community		Alt Cmty (FPD)							Building Description					
221696000100	DAKOTA	517		1	ST	A	1,750	1	4	5	15,000		3	1	0531	15,000
MINNESOTA	190	FARMINGTON									HANSON BEVERAGE COMPANY (1					
22MN99002434	DAKOTA	525		1	ST	A	2,500	1	1	5	6,960		4	1	3959	6,960
MINNESOTA	190	FARMINGTON									BAUER CONSTRUCTION (1S)					
221696000120	DAKOTA	701		1	ST	A	0	4	1	5	0		4	1	3959	30,840
MINNESOTA	190	FARMINGTON									DAKOTA WOOD DESIGN 6 TENANT					
22MN99004739	DAKOTA	4200		208	ST	A		4	4	5	0		2	2	1052	163,360
MINNESOTA	190	FARMINGTON									FARMINGTON MIDDLE SCHOOL-1S					
22MN99016795	DAKOTA	5147		208	ST	A	0	4	4	5	0		4	1	2800	20,040
MINNESOTA	190	FARMINGTON									AEROSPACE FABRICATION (1S)					
22MN99008228	DAKOTA	5205		208	ST	A		4	4	5	0		2	1	6850	70,200
MINNESOTA	190	FARMINGTON									BERNARD DALSIN MANUFACTURI					
22MN99001822	DAKOTA	5095		211	ST	A		4	4	5	0		4	2	3809	11,600
MINNESOTA	190	FARMINGTON									AUSTIN PRODUCTS (2S)					
22MN99016675	DAKOTA	5145		211	ST	A	0	4	4	5	0		3	1	0563	11,808
MINNESOTA	190	FARMINGTON									MINNESOTA PIPE (1S)					
221696000950	DAKOTA	5200		211	ST	A	0	4	6	5	0		2	1	6810	40,800
MINNESOTA	190	FARMINGTON									ALBERT J LAUER INC - 3 TENANTS					
221696000940	DAKOTA	5119		212	ST	A	6,000	1	1	5	77,078		3	1	0932	77,078
MINNESOTA	190	FARMINGTON									MINNESOTA COACHES - 4 TENANT					
221696001690	DAKOTA	6300		212	ST	A	2,250	1	3	9	34,670		2	2	0900	34,742
MINNESOTA	190	FARMINGTON									CHRISTIAN LIFE CHURCH (2S)					

Distribution Date: 12/16/2007

Definition *Survey Type: A = Automated (FRF-51), D = Data Capture*
C - = Combustibility Class

Risk ID	County	Low	Dir	Street	Type	Surv. Type	NFF gpm	R	C	P	Eff Area	Div Wall	C -	Sty	CSP	Total Area
State	Terr	Community		Alt Cmty (FPD)							Building Description					
22MN99001694	DAKOTA	3330		213	ST	A		4	1	5	0		2	4	0852	75,508
MINNESOTA	190	FARMINGTON									SOUTH SUBURBAN TERRACE (4S)					
221696001901	DAKOTA	3410		213	ST	A	2,250	1	4	5	30,850		2	1	0851	30,850
MINNESOTA	100	FARMINGTON									SANFORD MEMORIAL HOSPITAL (1					
221696001902	DAKOTA	3410		213	ST	A	2,000	1	4	5	22,041		2	1	0852	24,981
MINNESOTA	100	FARMINGTON									TRINITY CARE CENTER (1S)					
221486000150	DAKOTA	3338		220	ST	A	1,000	1	3	5	6,760		2	1	0933	6,760
MINNESOTA	190	FARMINGTON									AIR LAKE AUTO BODY 2 TENANTS					
221696001935	DAKOTA	3360		220	ST	A	1,500	1	1	5	3,720		2	1	6850	3,720
MINNESOTA	190	FARMINGTON									TRAILERS PLUS INC (1S)					
221486000120	DAKOTA	3360	W	220	ST	A	1,750	2	1	5	6,192		2	1	0933	6,192
MINNESOTA	190	FARMINGTON									STARR AUTOMOTIVE (1S)					
221696000115	DAKOTA	4300		220	ST	D					0					0
MINNESOTA	190	FARMINGTON														
221696001905	DAKOTA	44100	W	220	ST	A	1,000	1	4	5	8,912		2	1	0702	8,912
MINNESOTA	190	FARMINGTON									DAKOTA COUNTY EXTENSION BLD					
22MN99020187	DAKOTA	3100		225	ST	A	2,500	2	1	9	11,172		3	1	0563	11,172
MINNESOTA	190	FARMINGTON									CITIES ELECTRIC INC (1S)					
22MN99016266	DAKOTA	7984		257	ST	A	0	4	1	10	0		2	3	0075	24,518
MINNESOTA	190	FARMINGTON		EUREKA TWP							RUTH CORNELL HOUSE (3S)					
22MN99016265	DAKOTA	7984		257	ST	A	0	4	1	10	0		2	2	0900	12,896
MINNESOTA	190	FARMINGTON		EUREKA TWP							RUTH YOUNGDAHL LODGE (2S)					
22MN99002892	DAKOTA	200		3	ST	A		4	1	5	0		2	1	0757	8,186
MINNESOTA	190	FARMINGTON									EAGLES CLUB #4031 (1S)					

Risk ID / State	County / Terr	Community	Low	Dir	Street / Alt Cmty (FPD)	Type	Surv. Type	NFF gpm	R	C	P	Eff Area / Building Description	Div Wall	C -	Sty	CSP	Total Area
221696000290	DAKOTA		309		3	ST	A	2,250	1	1	5	7,032		3	2	0434	9,360
MINNESOTA	190	FARMINGTON										MO MERC (2S)					
221696000500	DAKOTA		324		3	ST	A	1,500	1	2	5	6,000		3	2	0843	12,000
MINNESOTA	190	FARMINGTON										MO (2S)					
22MN99002915	DAKOTA		329		3	ST	A	1,000	1	2	5	3,678		3	1	0542	4,236
MINNESOTA	190	FARMINGTON										FARMINGTON STEAK HOUSE (1S)					
221696000520	DAKOTA		334		3	ST	A	2,500	1	1	5	10,826		3	2	0433	15,371
MINNESOTA	190	FARMINGTON										MO (2S)					
221696000590	DAKOTA		508		3	ST	A	0	4	4	5	0		2	2	1051	17,304
MINNESOTA	190	FARMINGTON										DAKOTA COUNTY LIBRARY 2 TEN					
221696000380	DAKOTA		821		3	ST	A	2,000	1	4	5	21,448		3	2	0433	28,576
MINNESOTA	190	FARMINGTON										821 BUILDING 6 TENANTS (2S)					
221696000450	DAKOTA		831		3	ST	A	1,000	1	6	5	9,579		3	1	1251	9,579
MINNESOTA	190	FARMINGTON										HMONG FARMING COOP (1S)					
22MN99002005	DAKOTA		1017		3	ST	A	750	2	2	5	1,728		3	1	1180	1,728
MINNESOTA	190	FARMINGTON										TLS DANCE (1S)					
221696000601	DAKOTA		15		4	ST	A	3,000	1	4	5	69,139		2	2	2000	97,716
MINNESOTA	190	FARMINGTON										WESSONER USA (2S)					
221696000800	DAKOTA		27		5	ST	A		4	4	5	0		3	1	0841	13,385
MINNESOTA	190	FARMINGTON										FARMINGTON LANES (1S)					
221696000900	DAKOTA		10		8	ST	A		4	1	5	0		3	1	0542	12,081
MINNESOTA	190	FARMINGTON										AMERICAN LEGION (1S)					
221696000840	DAKOTA		100		8	ST	A	1,750	1	2	5	7,040		4	1	5500	7,040
MINNESOTA	190	FARMINGTON										MASTERTECH PLASTICS INC (1S)					

Risk ID	County	Low	Dir	Street	Type	Surv. Type	NFF gpm	R	C	P	Eff Area	Div Wall	C -	Sty	CSP	Total Area
State	Terr	Community		Alt Cmty (FPD)							Building Description					
221696000850	DAKOTA	610		8	ST	A	2,000	1	2	5	15,504		2	2	0900	18,696
MINNESOTA	190	FARMINGTON									FAITH UNITED METHODIST CHURC					
221696000810	DAKOTA	701		8	ST	A	3,500	1	1	5	13,172		4	2	0434	13,772
MINNESOTA	190	FARMINGTON									M O MFG-NON MFG (2S)					
221696002212	DAKOTA	913		8	ST	A	500	1	4	5	0		3	1	1052	10,528
MINNESOTA	190	FARMINGTON									FARMINGTON MALL 2 TENANTS (1					
221696002216	DAKOTA	921		8	ST	A	0	4	4	5	0		2	1	0844	8,288
MINNESOTA	190	FARMINGTON									FARMINGTON MALL 2 TENANTS (1					
221696002217	DAKOTA	933		8	ST	A	0	4	4	5	0		2	1	0844	4,928
MINNESOTA	190	FARMINGTON									FARMINGTON MALL BILLIARDS (1S					
221696002219	DAKOTA	941		8	ST	A	0	4	2	5	0		2	2	0702	8,600
MINNESOTA	190	FARMINGTON									FARMINGTON MALL - OFFICES (2S					
221696002220	DAKOTA	945		8	ST	A	0	4	4	5	0		3	1	0921	12,060
MINNESOTA	190	FARMINGTON									FARMINGTON MALL- 3 TENANTS (1					
22MN99011469	DAKOTA	953		8	ST	A	1,000	1	2	5	3,540		3	1	0542	4,720
MINNESOTA	190	FARMINGTON									MEXICAN RESTAURANT (1S)					
22MN99014165	DAKOTA	20600		AKIN	RD	A		1	1	5	0		2	1	0900	27,345
MINNESOTA	190	FARMINGTON									FARMINGTON LUTHERAN CHURCH					
22MN99018062	DAKOTA	22020		CANTON		A	1,500	1	4	5	8,000		5	1	1212	8,000
MINNESOTA	190	FARMINGTON									FARMINGTON MINI STORAGE BLD					
22MN99018061	DAKOTA	22020		CANTON		A	1,500	1	4	5	8,000		5	1	1212	8,000
MINNESOTA	190	FARMINGTON									FARMINGTON MINI STORAGE BLD					
22MN99018060	DAKOTA	22020		CANTON		A	1,500	1	4	5	8,000		5	1	1212	8,000
MINNESOTA	190	FARMINGTON									FARMINGTON MINI STORAGE BLD					

Risk ID	County	Low	Dir	Street	Type	Surv. Type	NFF gpm	R	C	P	Eff Area	Div Wall	C -	Sty	CSP	Total Area
State	Terr	Community		Alt Cmty (FPD)							Building Description					
221486000520	DAKOTA	21130		CHIPPENDALE	AVE	A	5,000	1	3	5	91,640		4	1	0567	91,640
MINNESOTA	190	FARMINGTON									DAKOTA STORAGE (1S)					
22MN99011731	DAKOTA	21140		CHIPPENDALE	AVE	A	0	4	3	5	0		2	1	0432	79,100
MINNESOTA	190	FARMINGTON									MARIGOLD FOODS-KEMPS (1S)					
22MN99015120	DAKOTA	22080		CHIPPENDALE	AVE	A	1,750	1	1	5	5,160		2	1	0933	5,160
MINNESOTA	190	FARMINGTON									AUTO BODY EXCELLENCE (1S)					
22MN99016208	DAKOTA	22280		CHIPPENDALE	AVE	A	1,000	1	4	5	3,992		3	1	0432	3,992
MINNESOTA	190	FARMINGTON									FARMINGTON BP INC (1S)					
22MN99020475	DAKOTA	22428		CHIPPENDALE	AVE	A	1,750	2	1	5	4,620		3	1	0434	4,620
MINNESOTA	190	FARMINGTON									DAKOTA MARINE 3 TENANTS (1S)					
22MN99016492	DAKOTA	20811		DUBARRY		A	1,250	2	2	10	2,560		4	1	0922	2,560
MINNESOTA	190	FARMINGTON									K9 TO 5 BEYOND INC (1S)					
22MN99000160	DAKOTA	21020		EATON	AVE	A	0	4	4	5	0		2	1	6850	46,916
MINNESOTA	190	FARMINGTON									JIT POWDER COATING (1S)					
221696000545	DAKOTA	21075		EATON	AVE	A		4	3	5	0		4	2	3959	18,594
MINNESOTA	190	FARMINGTON									THELEN CABINETS (2S)					
221696000300	DAKOTA	21080		EATON	AVE	D					0					0
MINNESOTA	190	FARMINGTON														
22MN99016515	DAKOTA	21130		EATON	AVE	A	1,500	1	4	5	6,880		4	1	0922	6,880
MINNESOTA	190	FARMINGTON									CROP CHARACTERISTICS (1S)					
22MN99018692	DAKOTA	21205		EATON	AVE	A	0	4	4	5	0		4	1	0567	18,000
MINNESOTA	190	FARMINGTON									VINGE TILE STONE - 2 TENANTS (					
221696000550	DAKOTA	21210		EATON	AVE	A	0	4	4	5	0		3	1	0563	10,400
MINNESOTA	190	FARMINGTON									CONTROLLED AIR INC (1S)					

Risk ID	County	Low	Dir	Street	Type	Surv. Type	NFF gpm	R	C	P	Eff Area	Div Wall	C -	Sty	CSP	Total Area
State	Terr	Community		Alt Cmty (FPD)							Building Description					
221696000910	DAKOTA	21025		EDMONTON	AVE	A		4	4	5	0		2	1	6850	30,000
MINNESOTA	190	FARMINGTON									PERFORMANCE INDUSTRIAL COA					
221696000920	DAKOTA	21030		EDMONTON	AVE	A	1,750	1	4	5	21,368		2	1	6850	21,368
MINNESOTA	190	FARMINGTON									LEXINGTON STANDARD CORP (1S)					
22MN99010743	DAKOTA	21105		EDMONTON	AVE	A	1,500	1	4	5	14,484		2	1	6850	14,484
MINNESOTA	190	FARMINGTON									RUFF MANUFACTURING (1S)					
22MN99010909	DAKOTA	113		ELM	ST	A	1,500	1	4	5	9,504		3	1	0563	9,504
MINNESOTA	190	FARMINGTON									PELLICCI ACE HARDWARE (1S)					
22MN99002420	DAKOTA	115		ELM	ST	A	2,500	1	4	5	32,382		3	2	0433	33,280
MINNESOTA	190	FARMINGTON									MORE 4 (2S)					
221696000980	DAKOTA	115		ELM	ST	A	1,500	1	4	5	10,602		3	1	0434	10,602
MINNESOTA	190	FARMINGTON									M O-SUITES C-G (1S)					
221696001000	DAKOTA	121		ELM	ST	A	3,500	1	1	5	14,400		4	1	3959	14,400
MINNESOTA	190	FARMINGTON									AUSTIN PRODUCTS (1S)					
221696001120	DAKOTA	212		ELM	ST	A	3,500	2	1	5	15,208		3	2	0433	15,450
MINNESOTA	190	FARMINGTON									M O (2S)					
221696001060	DAKOTA	301		ELM	ST	A	1,250	1	4	5	17,020		3	1	0433	24,357
MINNESOTA	190	FARMINGTON									LINN S CARPET (1S)					
221696001080	DAKOTA	307		ELM	ST	A	1,500	1	2	5	8,280		2	1	0933	11,040
MINNESOTA	190	FARMINGTON									JIM HAUGEN FORD (1S)					
22MN99013879	DAKOTA	321		ELM	ST	A	750	2	2	5	1,768		2	1	0933	1,768
MINNESOTA	190	FARMINGTON									M R AUTO (1S)					
221696001160	DAKOTA	416		ELM	ST	A	1,000	2	4	5	4,000		3	1	0434	4,000
MINNESOTA	190	FARMINGTON									TOM THUMB GROCERY (1S)					

Risk ID	County	Low	Dir	Street	Type	Surv. Type	NFF gpm	R	C	P	Eff Area	Div Wall	C -	Sty	CSP	Total Area
State	Terr	Community		Alt Cmty (FPD)							Building Description					
22MN99001796	DAKOTA	511		ELM	ST	A	500	2	2	5	1,080		2	1	0702	1,080
MINNESOTA	190	FARMINGTON									DENTAL BUILDING (1S)					
22MN99017110	DAKOTA	19650		ESCALADE		A	2,250	1	1	5	10,952		2	2	0331	13,536
MINNESOTA	190	FARMINGTON									CHARLESWOOD CROSSINGS (2S)					
221696009050	DAKOTA	90		LOCUST	ST	A	1,000	1	4	5	6,560		2	1	1052	6,560
MINNESOTA	190	FARMINGTON									CHAPPELL SCHOOLS (1S)					
221696001177	DAKOTA	290		MAIN	ST	D		1	3	5	0				1610	0
MINNESOTA	190	FARMINGTON									STEEL WHSE					
221696001175	DAKOTA	290		MAIN	ST	D		1	1	5	0				1610	0
MINNESOTA	190	FARMINGTON									GRAIN ELEVATOR W/DRYER					
221696001176	DAKOTA	290		MAIN	ST	D		1	3	5	0				1610	0
MINNESOTA	190	FARMINGTON									(6) STEEL GRAIN BINS					
221696001370	DAKOTA	216		OAK	ST	A	1,000	1	2	5	3,420		3	1	0542	5,280
MINNESOTA	190	FARMINGTON									DISTINCTIVE CATERING (1S)					
22MN99020855	DAKOTA	300		OAK	ST	A	1,250	2	2	5	4,128		3	2	0434	6,624
MINNESOTA	190	FARMINGTON									WELCOME FRIENDS FLORAL 4 TE					
221696001400	DAKOTA	308		OAK	ST	A	2,250	1	2	5	8,280		5	1	0434	9,720
MINNESOTA	190	FARMINGTON									MO (1S)					
221696001425	DAKOTA	314		OAK	ST	A	1,000	2	2	5	3,502		3	2	0434	4,828
MINNESOTA	190	FARMINGTON									BRADLEY HAUGE - 4 TENANTS (2S					
221696001440	DAKOTA	324		OAK	ST	A		4	4	5	0		2	1	0702	10,088
MINNESOTA	190	FARMINGTON									FIRST NATIONAL BANK (1S)					
221696001320	DAKOTA	401		OAK	ST	A	1,250	1	3	5	9,004		3	1	0434	9,004
MINNESOTA	190	FARMINGTON									MO (1S)					

Risk ID	County	Low	Dir	Street	Type	Surv. Type	NFF gpm	R	C	P	Eff Area	Div Wall	C -	Sty	CSP	Total Area
State	Terr	Community		Alt Cmty (FPD)							Building Description					
221696001480	DAKOTA	18266		PILOT KNOB	RD	A	3,000	2	1	5	11,400		3	1	0434	11,400
MINNESOTA	190	FARMINGTON									BENEDICT PLAZA (1S)					
22MN99015178	DAKOTA	18350		PILOT KNOB	RD	A	1,500	1	3	5	10,108		3	1	0434	10,108
MINNESOTA	190	FARMINGTON									FARMINGTON LIQUOR-4 TENANTS					
221696001540	DAKOTA	201		SPRUCE	ST	A	1,250	1	2	5	6,000		2	1	0933	6,600
MINNESOTA	190	FARMINGTON									FISCHER BLDG (1S)					
221696005120	DAKOTA	510		WALNUT	ST	A		4	2	5	0		2	2	1052	97,750
MINNESOTA	190	FARMINGTON									KINDERGARTEN DISTRICT OFFIC					
221696001660	DAKOTA	510		WILLOW	ST	A	500	1	4	5	0		4	1	5500	40,581
MINNESOTA	190	FARMINGTON									PEERLESS PLASTICS INC (1S)					

Appendix D

Well Data and Water Quality Results

City of Farmington, MN
Well Data and Water Quality Results

	1	2	3	4	5	6	7	8
Year Installed	1938	ABANDONED	1959	1973	1999	2002	2002	2007
Aquifer	OPCJ		OPCJ	CJDN	CJDN	CJDN	CJDN	CJDN
Service Area	single		single	single	single	single	single	single
Casing Depth (ft)	197		132	392	417	386	408	368
Total Depth (ft)	402		424	477	512	485	501	460
Diameter	16"		20"/12"	24"/16"	30"/24"	30"/24"	30"/24"	30"/24"
Static Water Level (ft)	11		11	14	63	53	57	28
Drawdown (ft)	8		10	139	35	33	27	37
Drawdown at gpm	230		750	1200	1400	1850	1800	1710
Peak Demand Capacity (gpm)	1000		600	1000	1200	2000	1400	2000
Pump Type	VT		VT	VT	VT	VT	VT	VT
WATER QUALITY								
Date of Test	Oct 1978		Oct 1978	Oct 1978	Jun 1999	Jul 2002	Sep 2002	Jul 2006
pH	8.4		8.6	8.6	7.6	-	7.6	7.5
Total Alkalinity (mg/L)	227		256	249	240	256	246	252
Total Hardness (mg/L)	235		264	255	230	287	290	252
Chloride (mg/L)	<1		<1	<1	<5	0.8	6.52	<3
Iron (mg/L)	0.09		0.11	0.08	0.5	0.9	1.03	0.42
Manganese (mg/L)	0.02		0.06	0.03	0.077	0.077	0.078	0.06
(1) Average Pumping Rate								

Outside Secondary Standards

Unique No. 00200932

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2003/10/21

Entry Date 1989/12/27

Township Name	Township	Range	Dir	Section	Subsection
	114	19	W	31	ACDBBB

Well Depth 402 ft. **Depth Completed** 402 ft. **Date Well Completed** /19/38

Well Name FARMINGTON 1

Drilling Method

Contact's Name FARMINGTON 1

FARMINGTON MN 55024

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter 16 in. to 197 ft **Weight(lbs/ft)**

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND + GRAVEL			0	50
QUICKSAND			50	96
SANDY CLAY			96	99
GRAVEL + BOULDERS			99	130
BLUE SHALE			130	165
SANDY SHALE			165	173
FINE SAND			173	185
HARDPAN			185	186
GRAY SHALE + LIME			186	195
YELLOW LIME			195	205
BLUE LIME			205	220
BLUE + BROWN LIME			220	318
JORDAN SANDSTONE			318	400
GREEN SHALE			400	402

Screen N **Open Hole** From 197 ft. to 402 ft.

Make Type

Static Water Level 11 ft. from Land surface Date /19/38

PUMPING LEVEL (below land surface)

19 ft. after hrs. pumping 230 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name

Model HP 25 Volts

Drop Pipe Length ft. Capacity g.p.m

Type T

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

FARMINGTON, MN

USGS Quad: Farmington Elevation 903

Aquifer: OPCJ Alt Id: 59-072

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 27010

License Business Name

Name of Driller

Report Copy

Unique No. 00200934

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2005/01/28

Entry Date 1989/12/27

Township Name	Township	Range	Dir	Section	Subsection
	114	19	W	31	ACDBBB

Well Depth		Depth Completed		Date Well Completed
399	ft.	399	ft.	1952/10/01

Well Name FARMINGTON 2

Contact's Name FARMINGTON 2

FARMINGTON MN 55024

Drilling Method

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter **Weight(lbs/ft)**

12 in. to 197 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND + GRAVEL			0	128
CLAY + SAND			128	189
GRAVEL + CLAY			189	192
LIMESTONE + SAND			192	316
JORDAN SAND			316	397
SHALE + LIME	GREE		397	399

Screen N

Open Hole From 197 ft. to 399 ft.

Make Type

Static Water Level 12 ft. from Land surface Date 1952/10/01

PUMPING LEVEL (below land surface)

ft. after hrs. pumping g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Mfr name

Model HP 0 Volts

Drop Pipe Length ft. Capacity g.p.m

Type

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 27010

License Business Name

Name of Driller

USGS Quad: Farmington Elevation 912

Aquifer: OPCJ Alt Id: 59-072

Report Copy

HE-01205-06 (Rev. 9/96)

Unique No. 00201154

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2003/10/21

Entry Date 1990/06/29

Township Name	Township	Range	Dir	Section	Subsection
	114	19	W	31	CADCCB

Well Depth		Depth Completed		Date Well Completed
424	ft.	424	ft.	1959/07/31

Well Name FARMINGTON 3

Contact's Name FARMINGTON 3

FARMINGTON MN 55024

Drilling Method

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND + GRAVEL			0	42
FINE SAND			42	80
SAND + GRAVEL			80	110
BLUE CLAY			110	119
FINE SAND WITH BLUE CLA			119	130
SHAKOPEE LIMESTONE			130	322
JORDAN SANDSTONE			322	422
ST. LAWRENCE SHALE			422	424

Casing Diameter **Weight(lbs/ft)**

20 in. to 60 ft

12 in. to 132 ft

Screen N

Open Hole From 132 ft. to 424 ft.

Make Type

Static Water Level 9 ft. from Land surface Date 1959/07/31

PUMPING LEVEL (below land surface)

19 ft. after hrs. pumping 750 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name

Model HP 75 Volts

Drop Pipe Length ft. Capacity 700 g.p.m

Type T

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 27010

License Business Name

Name of Driller

REMARKS, ELEVATION, SOURCE OF DATA, etc.

M.G.S. NO.964. GAMMA LOGGED 12-1-87.

USGS Quad: Farmington Elevation 909

Aquifer: OPCJ Alt Id: 59-072

Report Copy

Unique No. 00235586

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2004/12/29

Entry Date 1989/12/27

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	14	DAAAAD

Well Depth	Depth Completed	Date Well Completed
477 ft.	477 ft.	1973/00/00

Well Name FARMINGTON 4

Contact's Name FARMINGTON 4

FARMINGTON MN 55024

Drilling Method

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter **Weight(lbs/ft)**

24 in. to 105 ft

16 in. to 392 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
TOPSOIL	BLACK		0	3
CLAY	YELLO		3	12
BROWN + GREEN CLAY MI			12	40
GREEN CLAY WITH STREA			40	80
ST. PETER SANDSTONE	YELLO	SOFT	80	105
ST. PETER SANDSTONE	YELLO	HARD	105	134
SHAKOPEE LIMEROCK			134	376
JORDAN SANDROCK			376	475
SHALE	GREE		475	477

Screen N

Open Hole From 392 ft. to 477 ft.

Make Type

Static Water Level 15 ft. from Land surface Date /19/73

PUMPING LEVEL (below land surface)

154 ft. after hrs. pumping 1200 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name

Model HP 100 Volts

Drop Pipe Length ft. Capacity E+03 g.p.m

Type T

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

FARMINGTON, MN

USGS Quad: Farmington Elevation 921

Aquifer: CJDN Alt Id: 59-072

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No.

License Business Name

Name of Driller

Report Copy

Unique No. 00603051

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2007/01/12

Entry Date 1999/08/18

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	24	CBDBBB

Well Depth		Depth Completed		Date Well Completed
512	ft.	512	ft.	1999/07/00

Well Name FARMINGTON 5

Well Owner's Name FARMINGTON
195TH
FARMINGTON MN 55024

Contact's Name FARMINGTON CITY HALL
325 OAK ST
FARMINGTON MN 55024

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND & CLAY	BROW	SOFT	0	23
SAND & GRAVEL	BROW	SOFT	23	65
SAND (FINE)	BROW	SOFT	65	116
SANDSTONE	WHITE	HARD	116	135
SHALE, SANDSTONE	TAN	MEDIUM	135	139
SANDSTONE	YELLO	MEDIUM	139	181
LIMESTONE	GRAY	HARD	181	405
SANDSTONE	WHITE	MEDIUM	405	503
SHALEY SANDSTONE	BLUE	MEDIUM	503	512

USGS Quad: Farmington Elevation 971

Aquifer: CJDN Alt Id: 59-0725

Report Copy

Drilling Method Cable Tool

Drilling Fluid Water

Well Hydrofractured? ☐ Yes ☑ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☑ Yes ☐ N

Casing Diameter				Weight(lbs/ft)
30	in. to	139	ft	118.65
24	in. to	417	ft	94.62

Hole Diameter

in. to 417 ft

in. to 512 ft

Screen N

Make Type

Open Hole From 417 ft. to 512 ft.

Static Water Level 63 ft. from Land surface Date 1999/06/18

PUMPING LEVEL (below land surface)

98 ft. after 8 hrs. pumping 1400 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☑ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G	0	417	56	Y

Nearest Known Source of Contamination

700 ft. direction W type SDF

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☑ Not Installed Date Installed N

Mfr name

Model HP Volts

Drop Pipe Length ft. Capacity g.p.m

Type

Any not in use and not sealed well(s) on property? ☐ Yes ☑ No

Was a variance granted from the MDH for this Well? ☐ Yes ☑ No

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012

License Business Name

Name of Driller SAMPSON, J.

Unique No. 00626785

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2007/01/12

Entry Date 2003/02/17

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	24	CCDBAB

Well Depth		Depth Completed		Date Well Completed
485	ft.	485	ft.	2002/06/20

Well Name FARMINGTON 6

Drilling Method Cable Tool

Contact's Name CITY OF FARMINGTON/MANN, LEE
325 OAK ST
FARMINGTON MN 55024

Drilling Fluid Bentonite

Well Hydrofractured? ☐ Yes ☐ No
From ft. to ft.

Well Owner's Name FARMINGTON 6
ENGLISH ST
FARMINGTON MN 55024

Use Community Supply (municipal)

Casing **Drive Shoe?** ☑ Yes ☐ N

Hole Diameter
in. to 382 ft
in. to 485 ft

Casing Diameter **Weight(lbs/ft)**
30 in. to 126 ft 118.65
24 in. to 386 ft 94.65

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
CLAY	BROW	MEDIUM	0	7
SAND & ROCKS	BROW	MEDIUM	7	101
ST. PETER S.S.	TAN	MEDIUM	101	155
SHAKOPEE	GRAY	V.HARD	155	298
SHAKOPEE	TAN	HARD	298	372
JORDAN	GRAY	M.SOFT	372	383
JORDAN	TAN	SOFT	383	465
JORDAN	GRAY	SOFT	465	480
ST. LAWRENCE	GREE	MEDIUM	480	485

Screen N

Open Hole From 382 ft. to 485 ft.

Make Type

Static Water Level 53 ft. from Land surface Date 2002/03/15

PUMPING LEVEL (below land surface)
86 ft. after 24 hrs. pumping 1850 g.p.m.

Well Head Completion
Pitless adapter mfr Model
Casing Protection ☑ 12 in. above grade
☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G	0	382	42	Y

Nearest Known Source of Contamination
80 ft. direction W type SDF
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed
Mfr name GOULDS
Model 14RJMC/4 HP 200 Volts 460
Drop Pipe Length 140 ft. Capacity E+03 g.p.m
Type S

Any not in use and not sealed well(s) on property? ☐ Yes ☑ No

Was a variance granted from the MDH for this Well? ☐ Yes ☑ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

M.G.S. NO. 4224.

USGS Quad: Farmington Elevation 951
Aquifer: CJDN Alt Id: 59-0725

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 71015
License Business Name
Name of Driller SIGAFOOS, R.

Report Copy

HE-01205-06 (Rev. 9/96)

Unique No. 00655902

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2007/01/12

Entry Date 2002/10/21

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	24	CABBDB

Well Depth		Depth Completed		Date Well Completed
501	ft.	501	ft.	2002/09/20

Well Name FARMINGTON 7

Well Owner's Name FARMINGTON
5225 ORIOLE DR
FARMINGTON MN 55024

Contact's Name CITY OF FARMINGTON
325 OAK ST
FARMINGTON MN 55024

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND & GRAVEL	BROW	SOFT	0	11
CLAY & GRAVEL	BROW	SOFT	11	28
SANDSTONE-SHALEY	BROW	MEDIUM	28	166
LIMESTONE	GRAY	HARD	166	396
SANDSTONE	TAN	MEDIUM	396	501

USGS Quad: Farmington Elevation 971
Aquifer: CJDN Alt Id: 59-0725

Report Copy

Drilling Method Cable Tool

Drilling Fluid Water

Well Hydrofractured? ☐ Yes ☑ No
From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☑ Yes ☐ N

Casing Diameter				Weight(lbs/ft)
30	in. to	70	ft	118.76
24	in. to	408	ft	94.71

Hole Diameter
in. to 408 ft
in. to 501 ft

Screen N
Make Type

Open Hole From 401 ft. to 501 ft.

Static Water Level 57 ft. from Land surface Date 2002/09/15

PUMPING LEVEL (below land surface)
84 ft. after 10 hrs. pumping 1800 g.p.m.

Well Head Completion
Pitless adapter mfr Model
Casing Protection Y ☑ 12 in. above grade
☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G	0	408	45	Y

Nearest Known Source of Contamination
150 ft. direction SW type BOW
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☑ Not Installed Date Installed N
Mfr name
Model HP Volts
Drop Pipe Length ft. Capacity g.p.m
Type

Any not in use and not sealed well(s) on property? ☐ Yes ☑ No

Was a variance granted from the MDH for this Well? ☐ Yes ☑ No

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012
License Business Name
Name of Driller SAMPSON, J.

Unique No. 00731123

County Name Dakota

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2007/03/06

Entry Date 2006/07/18

Township Name	Township	Range	Dir	Section	Subsection
	114	20	W	25	BBCCCA

Well Depth		Depth Completed		Date Well Completed
460	ft.	460	ft.	2006/06/18

Well Name FARMINGTON 8

Well Owner's Name FARMINGTON 8
15525 200TH W ST
FARMINGTON MN 55024

Contact's Name CITY OF FARMINGTON
325 OAK ST
FARMINGTON MN 55024

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND	BROW	SOFT	0	40
CLAY & STONES	GRAY	MEDIUM	40	50
ST. PETER SANDSTONE	TAN	MEDIUM	50	130
BASAL ST. PETER	GRAY	HARD	130	150
SHAKE MIX	GRAY	HARD	150	185
SHAKOPEE/ONEOTA	GRY/T	V.HARD	185	355
JORDAN SANDSTONE	GRY/T	HARD	355	460

REMARKS, ELEVATION, SOURCE OF DATA, etc.

M.G.S. NO. 4561.

USGS Quad: Farmington Elevation 940
Aquifer: CJDN Alt Id: 4561

Report Copy

Drilling Method Cable Tool

Drilling Fluid Additive (+ Bentonite)

Well Hydrofractured? ☐ Yes ☑ No
From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☑ Yes ☐ N

Casing Diameter				Weight(lbs/ft)
30	in. to	78.5	ft	118.76
24	in. to	368	ft	94.71

Hole Diameter

in. to 368 ft
in. to 460 ft

Screen N

Make Type

Open Hole From 365 ft. to 460 ft.

Static Water Level 28 ft. from Land surface Date 2006/06/06

PUMPING LEVEL (below land surface)
65 ft. after 8 hrs. pumping 1710 g.p.m.

Well Head Completion
Pitless adapter mfr Model
Casing Protection ☑ 12 in. above grade
☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G		367	38	Y

Nearest Known Source of Contamination
500 ft. direction S type SEW
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☐ Not Installed Date Installed
Mfr name
Model HP Volts
Drop Pipe Length ft. Capacity g.p.m
Type

Any not in use and not sealed well(s) on property? ☐ Yes ☑ No

Was a variance granted from the MDH for this Well? ☐ Yes ☑ No

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 71015
License Business Name
Name of Driller SIGAFOOS, R.

Appendix E

Water Quality Requirements

EPA National Primary Drinking Water Standards

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Acrylamide	TT[8]	Nervous system or blood problems;	Added to water during sewage/wastewater increased risk of cancer treatment	zero
OC	Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha particles	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
IOC	Arsenic	0.010 as of 1/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
OC	Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
R	Beta particles and photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
OC	Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04
OC	Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes	MRDLG=4[1]

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG=4[1]
D	Chlorine dioxide (as ClO_2)	MRDL=0.8[1]	Anemia; infants & young children: nervous system effects	Water additive used to control microbes	MRDLG=0.8[1]
DBP	Chlorite	1.0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection	0.8
OC	Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
IOC	Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1
IOC	Copper	TT[7]; Action Level = 1.3	Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	1.3
M	*Cryptosporidium*	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
IOC	Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0.2
OC	2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07
OC	Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2
OC	1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	zero
OC	o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
OC	p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
OC	1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
OC	cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
OC	trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
OC	Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC	1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	Di(2-ethylhexyl) adipate	0.4	Weight loss, live problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC	Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC	Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007
OC	Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	zero
OC	Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC	Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1

LEGEND

D Dinsinfectant

DBP Disinfection Byproduct

IOC Inorganic Chemical

M Microorganism

OC Organic Chemical

R Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC	Epichlorohydrin	TT[8]	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC	Ethylbenzene	0.7	Liver or kidneys problems	Discharge from petroleum refineries	0.7
OC	Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
IOC	Fluoride	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
M	*Giardia lamblia*	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP	Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a[6]
OC	Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC	Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M	Heterotrophic plate count (HPC)	TT[3]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	n/a
OC	Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05
IOC	Lead	TT[7]; Action Level = 0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	zero
M	*Legionella*	TT[3]	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero
OC	Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002
IOC	Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0.002
OC	Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04
IOC	Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
IOC	Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
OC	Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines	0.05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004
OC	Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
OC	Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms (including fecal coliform and *E. coli*)	5.0%[4]	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present[5]	Coliforms are naturally present in the environment as well as feces; fecal coliforms and *E. coli* only come from human and animal fecal waste.	zero
DBP	Total Trihalomethanes (TTHMs)	0.10 0.080 after 12/31/03	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a[6]
OC	Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
OC	1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.20
OC	1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
OC	Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero
M	Turbidity	TT[3]	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing micro-organisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	n/a
R	Uranium	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero

LEGEND

D Dinsinfectant

DBP Disinfection Byproduct

IOC Inorganic Chemical

M Microorganism

OC Organic Chemical

R Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero
M	Viruses (enteric)	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

NOTES

1 Definitions

- Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- *Giardia lamblia*: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- *Legionella:* No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, for systems servicing >10,000, and January 14, 2005, for systems servicing <10,000, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

4 No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli* if two consecutive TC-positive samples, and one is also positive for *E. coli* fecal coliforms, system has an acute MCL violation.

5 Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

6 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

7 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

8 Each water system must certify, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05% dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent).

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

National Secondary Drinking Water Standards

National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

Office of Water (4606M)
EPA 816-F-03-016
www.epa.gov/safewater
June 2003

Appendix F

Cost Estimate Summary

Farmington Water Supply & Distribution Plan

File 000141-06287-0

2030 System Cost Estimates

December 2007

SUPPLY Item	Unit Cost	Quantity	Total
1,000 gpm Supply Wells[1]	$ 1,100,000	3	$ 3,300,000
			$ 3,300,000

STORAGE FACILITIES Item	Unit Cost	Quantity	Total
5 MG Ground Storage Reservoir[2]	$ 3,250,000	1	$ 3,250,000
			$ 3,250,000

TREATMENT Item	Unit Cost	Quantity	Total
Raw Water Main	$1,000,000	1	$ 1,000,000
			$ 1,000,000

DISTRIBUTION Item	Unit Cost[1]	Quantity	Total
8" Water Main	$ 55	3,800	$ 200,000
12" Water Main	$ 70	13,900	$ 1,000,000
16" Water Main	$ 95	32,600	$ 3,100,000
18" Water Main	$ 115	3,200	$ 400,000
20" Water Main	$ 145	12,700	$ 1,800,000
24" Water Main	$ 160	1,500	$ 200,000
			$ 6,700,000

TOTAL 2030 SYSTEM COST SUMMARY	
Supply	$ 3,300,000
Treatment	$ 1,000,000
Storage	$ 3,250,000
Distribution	$ 6,700,000
	$ 14,250,000

NOTES

[1] Costs include 30% Engineering, Administrative, Legal, and Contingencies

[2] Costs include 25% Engineering, Administrative, Legal, and Contingencies

Farmington Water Supply & Distribution Plan

File 000141-06287-0

Ultimate System Cost Estimates (Total)

December 2007

SUPPLY Item		Unit Cost	Quantity		Total
1,000 gpm Supply Wells[1]	$	1,100,000	14	$	15,400,000
				$	**15,400,000**

STORAGE FACILITIES Item		Unit Cost	Quantity		Total
4 MG Ground Storage Reservoir[2]	$	2,600,000	2	$	5,200,000
5 MG Ground Storage Reservoir[2]	$	3,250,000	1	$	3,250,000
Remove 0.67 MG Standpipe	$	50,000	1	$	50,000
				$	**8,500,000**

TREATMENT Item		Unit Cost	Quantity		Total
24 MGD Water Treatment Plant	$	26,000,000	1	$	26,000,000
Raw Water Main	$	2,600,000	1	$	2,600,000
				$	**28,600,000**

DISTRIBUTION Item		Unit Cost[1]	Quantity		Total
8" Water Main	$	55	4,000	$	220,000
12" Water Main	$	70	39,000	$	2,730,000
16" Water Main	$	95	55,300	$	5,250,000
18" Water Main	$	115	3,200	$	370,000
20" Water Main	$	145	15,200	$	2,200,000
24" Water Main	$	160	3,900	$	620,000
				$	**11,400,000**

TOTAL ULTIMATE SYSTEM COST SUMMARY		
Supply	$	15,400,000
Treatment	$	28,600,000
Storage	$	8,500,000
Distribution	$	11,400,000
	$	**63,900,000**

NOTES

[1] Costs include 35% Engineering, Administrative, Legal, and Contingencies

[2] Costs include 30% Engineering, Administrative, Legal, and Contingencies

Appendix G

Supplemental Map

Emergency Inter-Connection with Lakeville

Standpipe 0.67 MG

Ground Storage 4.0 MG

Ground Storage 5.0 MG

Elevated Tank 1.5 MG

Ground Storage 4.0 MG

WTP

- Existing Node
- Future Node
- Existing Tank
- Future Tank
- WTP Future Water Treatment Plant
- Existing Pipe
- Future Pipe
- Study Boundary
- Parcels
- **1117.33** HWL

City of Farmington

Ultimate Trunk Water System

March 2009

Map 1

N W E S

Feet

1500 750 0 1500

CITY OF FARMINGTON A PROUD PAST - A PROMISING FUTURE

Bonestroo

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