Chapter 8: Water Resources Management

8.1 WASTEWATER AND COMPREHENSIVE SEWER PLAN

INTRODUCTION

The purpose of this section is to initiate goals and policies to provide for the effective and efficient removal of sanitary sewage for all areas of the City of Edina, while also eliminating Inflow and infiltration, protecting the health, safety and welfare of our citizens, and supporting the needs of a dynamic and sustainable community.

A major part of this plan is a look forward that anticipates ongoing development and potential redevelopment within the City. It quantifies how those activities will impact the sanitary sewer infrastructure in the City and the regional infrastructure owned and operated by the Metropolitan Council Environmental Services (MCES).

Relationship to Comprehensive Plan Requirements
This plan has been prepared in accordance with the current requirements of the Metropolitan Land Planning Act and the content of the sewer element included in the Local Planning Handbook prepared by the Metropolitan Council in 2005. In addition, it provides the data figures and descriptions specifically required in the City's system statement.

Relationship to Surface Water Plan
In 2003-2004, the City of Edina developed the *Comprehensive Water Resource Management Plan* to address current and future storm water issues, especially those related to future development and redevelopment. As part of the plan development, the City completed a city-wide hydrologic and hydraulic modeling analysis of the existing storm water system. The City has since undertaken a joint storm water and sanitary sewer system modeling effort to assist in identifying and eliminating inflow and infiltration to the sanitary system.

Relationship to Land Use Plan
This plan has been prepared based on the current and planned land use in the City of Edina. Future sanitary sewer infrastructure needs are based on proposed land uses that are consistent with the land use portion of the City's Comprehensive Plan. A general review of the increased flows that may be produced as a result of higher density development is included in this section.

EXISTING CONDITIONS

This section of the plan deals with the current condition of the sanitary sewers serving the City of Edina. The first portion of this section deals with the local sanitary sewer system which is owned and operated by the City of Edina. The second portion of this section will address the sewers that serve the City which are owned and operated by the Metropolitan Council Environmental Services (MCES) and originate at the borders of the City. These two systems must interact smoothly if the City is to ensure safe and reliable service for its population now and throughout the planning period.

SANITARY SEWER SYSTEM – LOCAL

The local sanitary sewer system consists of trunk and lateral sewer lines that collect and carry sewage to the Metropolitan Council Environmental Services (MCES) interceptors. There are no MCES interceptors flowing through the City. Edina's sewer system is fully developed. There have been regular evaluations of the City's sanitary sewer system including:

- An evaluation prepared by Donohue and Asociates in the 1980's.
- Another evaluation prepared by Toltz, King, Duvall, Anderson and Associates, Incorporated in 1997.
- A current system evaluation related to eliminating I&I is being performed by Barr Engineering Co. and includes a joint storm water/sanitary sewer system modeling effort.

The majority of the system was constructed in the 1940's and 50's, with some development occurring in the west half of the City during the 1960's and 70's. In the 1990's one of the last large tracts of land was developed when a local gravel mine in the southeast corner of the City stopped operation and was sold to developers, resulting in a significant amount of mixed-use development. The Edina sanitary sewer system currently serves almost all properties within the City. The only exceptions to this are

seven locations that are served by Individual Sewage Treatment Systems and regulated by Hennepin County.

Edina's sewer system consists of about 197 miles of trunk and lateral lines, 5,017 manholes, and 24 lift stations. These facilities convey Edina's sewage to interceptors that are part of the Metropolitan Disposal System (MDS) which is owned and operated by the Metropolitan Council Environmental Services (MCES). The majority of the sewage flows easterly and leaves the City along its eastern border via interceptors that are shown on Figure S-1. A small amount of sewage flows to the north into St. Louis Park through four smaller pipes that carry no more than one block each. Finally, there is a small section of commercial and industrial land along the southern border of the City that flows south into Bloomington via interceptor 3-BN-499.

The City's sewer system has been divided into five main sewer districts which are shown on Figure S-2. Four of the districts are associated with MCES interceptors based on the meter and interceptor to which they flow. The fifth is a catch-all group in the northern part of the City that includes all of the small areas that do not flow to one of the other four interceptors.

The system is further divided into sub-districts based on lift station service. Each area that is tributary to a given lift station has been color-coded. Lift station sub-districts are depicted on Figure S-3 by a system of colors. The general location where the forcemain from each lift station flows is also noted on the figure.

Note that there is one area that can flow to more than one interceptor. This is the result of a special force main constructed from lift station 4 to help alleviate excessive flows in interceptor 1-RF-491 by directing flow to 1-RF-490. Under normal conditions, flow is discharged to 1-RF-490 at a nominal flow rate determined by MCES. When incoming flow exceeds that flow rate, another set of pumps are called to operate and discharge the excess flow to 1-RF-491.

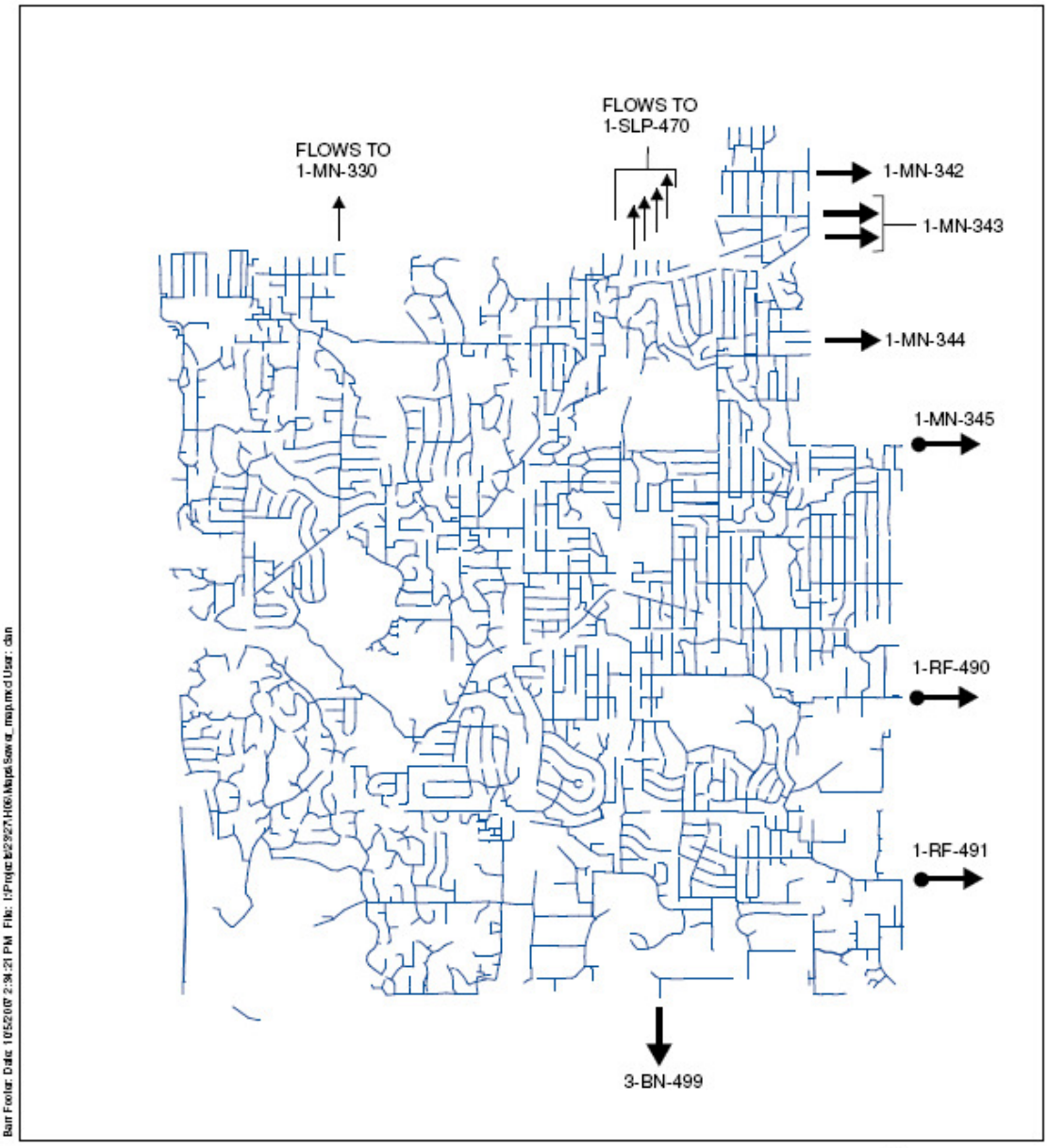
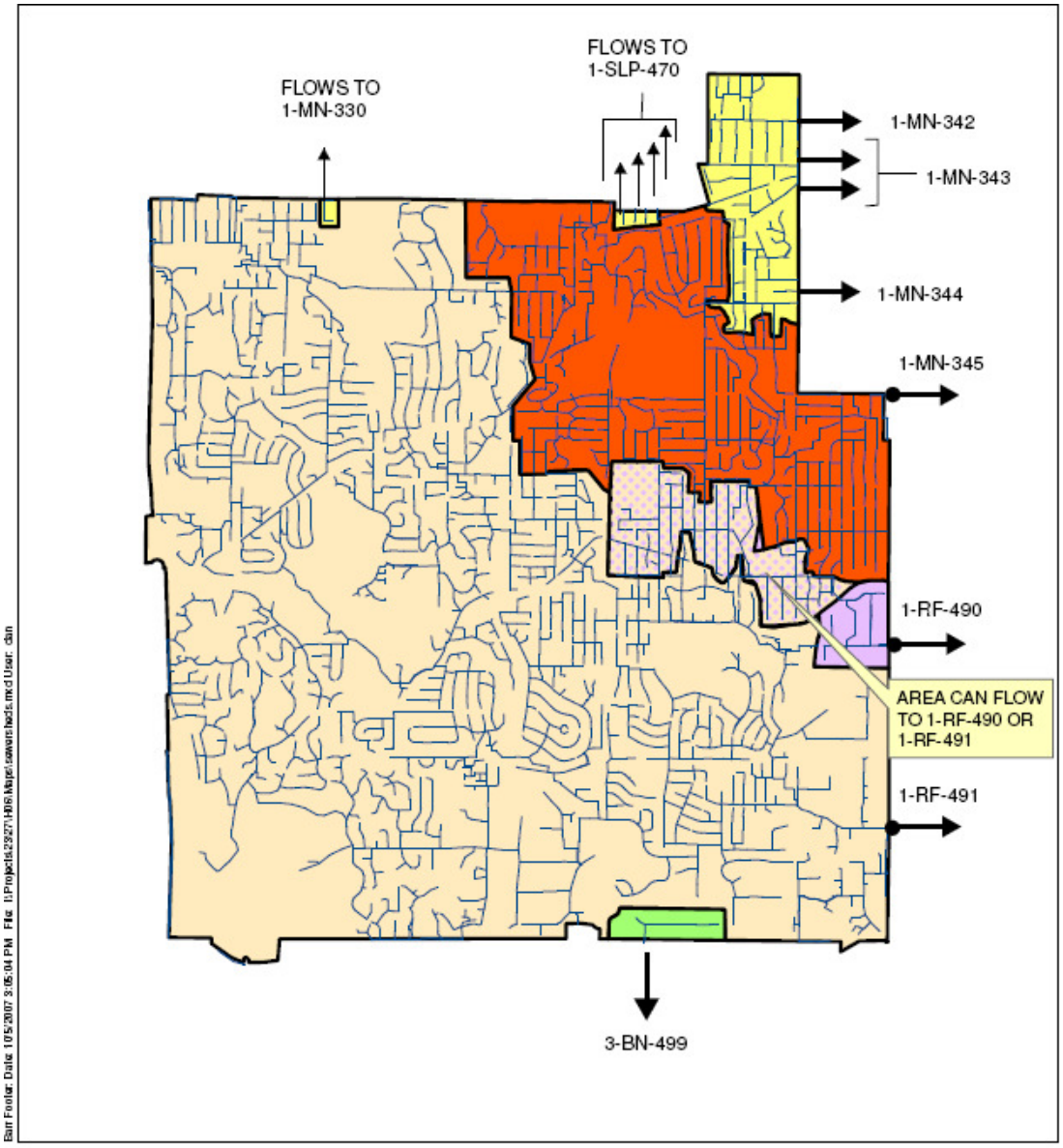


Figure S-1

SANITARY SEWER MAP
2008 Comprehensive Plan
City of Edina
Edina, MN



LEGEND

- MCES INTERCEPTOR
- LOCAL SEWER OUTLET
- LOCAL SEWER PIPE
- MCES FLOWMETER
- 1-RF-491 MCES INTERCEPTOR LABEL

Figure S-2

MAJOR SEWER SHEDS AND OUTLETS
2008 Comprehensive Plan
City of Edina
Edina, MN

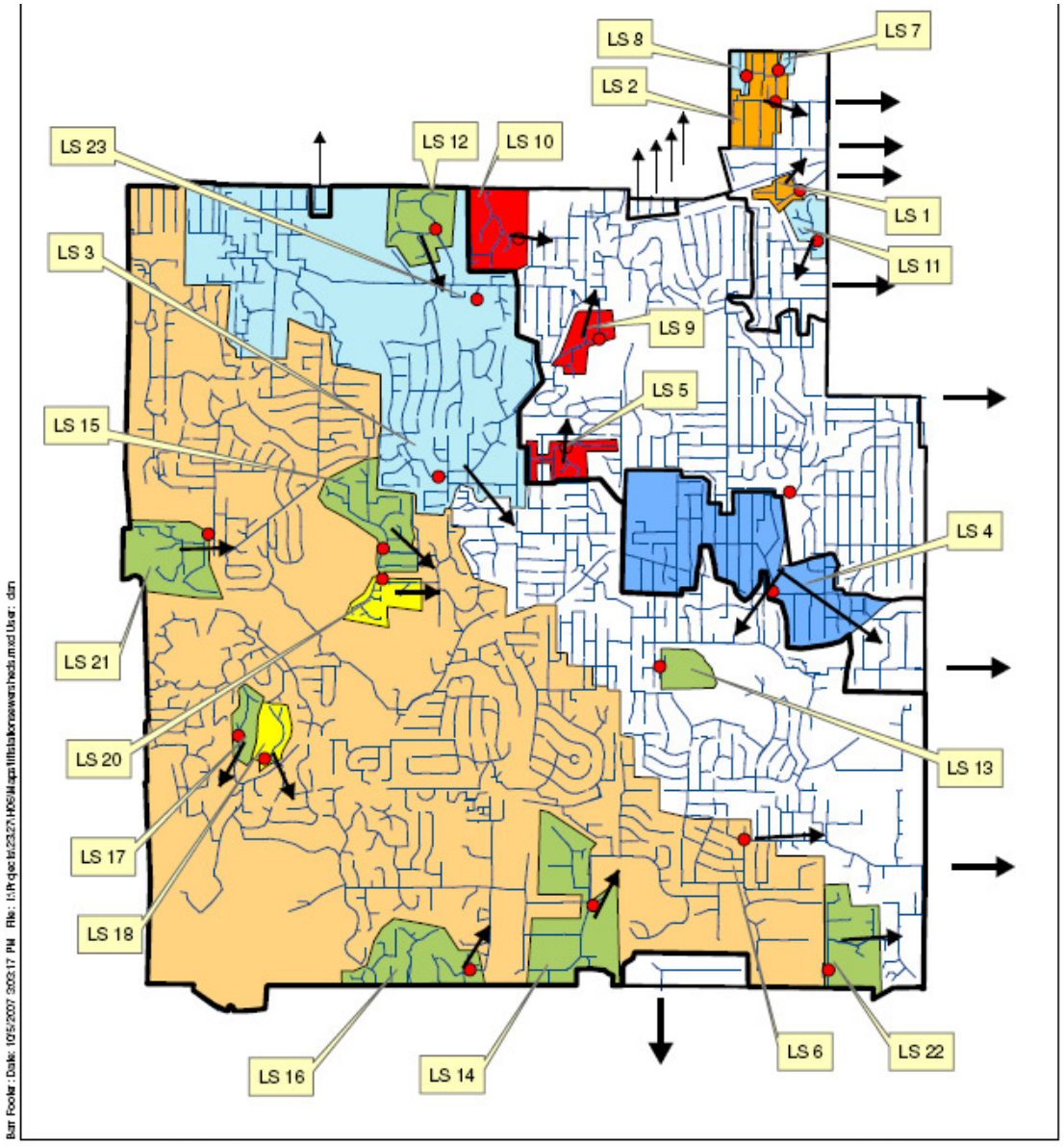


Figure S-3

LIFT STATION SEWERSHEDS AND OUTLETS
2008 Comprehensive Plan
City of Edina
Edina, MN

System Flows

Annual historic sanitary flows decreased by about twenty-three percent from 1980 through 2000, as can be seen in Table S-1 Historic Sanitary Sewer Flows. From that time to the present, they have remained relatively constant. The decrease is a result of a number of factors, including the City's efforts to reduce inflow and infiltration and increased water conservation efforts as low-flow plumbing fixtures become more prevalent. Table S-1 represents the sanitary flow metered by MCES for the majority of the City as reported by MCES. The flows below represent those metered in MCES meters M127, M128 and M129. As already noted, some flows leave the City and flow into other communities unmetered. Those flows are estimated later in this plan, but are not reflected in Table S-1.

Table S-1
HISTORIC SANITARY SEWER FLOWS

Year	Population	Flow (MGY)
1979-80	46,073	2,664
1996	46,984	2,727
1994	46,841	2,508
1995	46,845	2,559
1996	47,029	2,208
1997	47,128	2,336
1998	47,227	2,150
1999	47,326	2,187
2000	47,425	2,046
2001	47,583	2,162
2002	47,740	2,238
2003	47,898	2,157
2004	48,055	2,129
2005	48,213	2,138
2006	48,370	2,133

SANITARY SEWER SYSTEM – REGIONAL

The collection and treatment of sanitary wastewater are primary functions of the City of Edina and the Metropolitan Council. Generally, the City's sanitary sewer system flows in an east to southeasterly direction out of the City via three metered connections to MCES interceptors. Additional flow leaves the City via six other unmetered minor trunk

lines and five small laterals. These pipes carry flows to surrounding cities and eventually to other MCES interceptors. All effluents exiting the City are carried through MCES interceptors to the Metro Waste Water Treatment Plant, except those from south-central Edina that flow via an MCES interceptor through the City of Bloomington to the Seneca Wastewater Treatment Plant.

The MCES interceptors that carry Edina wastewater are identified as Interceptor Nos. 1MN-343, 1-MN-344, 1MN-345, 1RF-490, 1RF-491, and are depicted on Figure S-1, Sanitary Sewer Map. The MCES monitors flow rates at the border of the City in three of the main interceptors in special meter stations that it uses to determine the City's wastewater fees.

The majority of Edina's sewage flows through metered connections to these interceptors. The metered interceptors include 1-RF-491, which is served by MCES meter M129; 1-RF-490, which is served by meter M128; and 1-MN-345, which is served by meter M127. The remainder of the City's sewage flows through interceptors 1-MN-344, 1-MN-343, 1-MN-342.

Approximately two thirds of the City's sewage flows though MCES meter M-129 and into interceptor 1-RF-491. This interceptor is critical to the planning of Edina's future since the majority of planned future flow increases will be directed to this interceptor. MCES is currently in the process of planning a significant relief sewer to run roughly parallel to the current interceptor. Construction on this interceptor will be completed by approximately 2010. Planning efforts in this document take into account the increased capacity that will be available from that interceptor.

TRENDS AND ANALYSIS OF FUTURE CONDITIONS

In this section, the impacts of redevelopment in the City will be discussed. Projecting future flows generated by the anticipated growth is critical in planning local trunk lines and regional facilities such as interceptors and treatment plant expansions.

TRENDS AND ANALYSIS OF SANITARY SEWER SYSTEM - LOCAL

In recent years, the City has seen significant redevelopment of several large areas. The areas are generally connected and form a J shape. The area starts at Southdale and runs south to 494, then west along the southern border of the City to a point just west of Highway 100, then north to approximately 70th Street. Plans for these areas generally include a higher density of residential and commercial development than currently exists. This will result in increased sanitary sewer flows in the future. The density of this

redevelopment will determine the amount of increase in future sewage flows. Almost all of this redevelopment is planned to occur in areas tributary to MCES interceptor 1-RF-491 though a small portion will flow to MCES interceptor 1-RF-490 and another small portion along the southern border will flow to 3-BN-499.

Table S-2 shows the projected increase in flow based on the currently projected 2030 population and the flows that would be generated by the potential ultimate population. The impacts of redevelopment and the associated increased sanitary flows are considered in Scenarios 1 and 2 in the next section and also in the regional section. Scenarios 1 and 2 analyze the impacts of 2030 development and ultimate development, respectively.

Table S-2
Future Sanitary Sewer Flow Estimates

Year	Population	Employment	Total Flow Based on MCES Population and Employment (MGY)
2010	48,500	52,100	2,510
2020	49,100	55,000	2,553
2030	50,000	57,400	2,600
Ultimate	**70,149**	**70,000**	**3,267**

In order to plan for the impacts of this redevelopment, Barr Engineering Co. has analyzed the potential range of flows that will result from two different development scenarios. Each assumes a different total population and level of commercial development. Both scenarios would be allowable based on the proposed land use in the areas that are subject to redevelopment. The scenarios analyzed are described as follows:

Scenario 1: This scenario assumes Metropolitan Council projections of population, households and employment. Under this scenario, the 2030 population is assumed to be 50,000 with 22,500 households and an employment base of 57,400. The flow generated by this level of population and employment increase was calculated.

The majority of the flow will be conveyed to MCES interceptor 1-RF-491. A relief interceptor is planned to help accommodate projected growth in this area. Calculations indicate that Edina's current sanitary system could accommodate this level of development without major trunk line upgrades. However, the MCES interceptors are

very near capacity. Even the moderate growth assumed by MCES projections will exceed conservative estimates of available capacity in interceptor 1-RF-491. The capacity available in the planned relief sewer will be adequate for this growth.

Scenario 2: This scenario is based upon the ultimate potential development. Under this scenario, the area of redevelopment was analyzed based on allowed land use and all areas were assumed to develop to the fullest extent allowed. This represents an ultimate build-out scenario and yields an ultimate population of 70,149 in 30,767 dwelling units.

Under this scenario, significant trunk line upgrades would be needed to meet projected flow increases. Areas where upgrades would be needed vary depending on actual redevelopment densities and patterns. Areas where upgrades may be needed are shown on Figure S-4. This figure simply shows the lines that may need to be increased in size to accommodate the added flow. The actual increase in size would be determined in subsequent analysis once the level of development is more clearly defined.

This figure should be checked whenever a project is proposed over or very near a trunk line that will need to be increased in size to handle future flows. Under some circumstances, it may be appropriate to upsize the trunk line at the time of the proposed project in order to eliminate a subsequent project in the same location just a few years down the line. The method of paying for the trunk line upgrades will be addressed initially by existing policy, and then by the City on a case-by-case basis as specific projects are proposed and may include fees distributed through out the City, assessments of entities that benefit from the trunk line improvement or other methods not yet identified.

SOUTHERN EDINA FLOWING TO INTERCEPTOR 3-BN-499

There are regions in the City where redevelopment is occurring that will affect entities other than the City. One such area is in the southern part of Edina and currently flows into Bloomington via interceptor 3-BN-499. It is expected that significant redevelopment in this area will result in increased sanitary flows. These increases will have some regional impact in this area due to potential projects planned by MCES that will involve the City of Bloomington as well. Because of this, flows in this specific area will be addressed in greater detail. The table below shows current sanitary sewer flows generated in this area, along with the projected increases that could occur up though ultimate flow generation from this area. The current flow estimate is based on water sales data from the City of Bloomington, with estimates for inflow and infiltration

included. The future estimate is based upon preliminary development plans for the area..

Table S-3
3-BN-499 Current and Future Flow Estimate

Year	Flow (MGY)
2006	67
2010	80
2020	105
2030	136

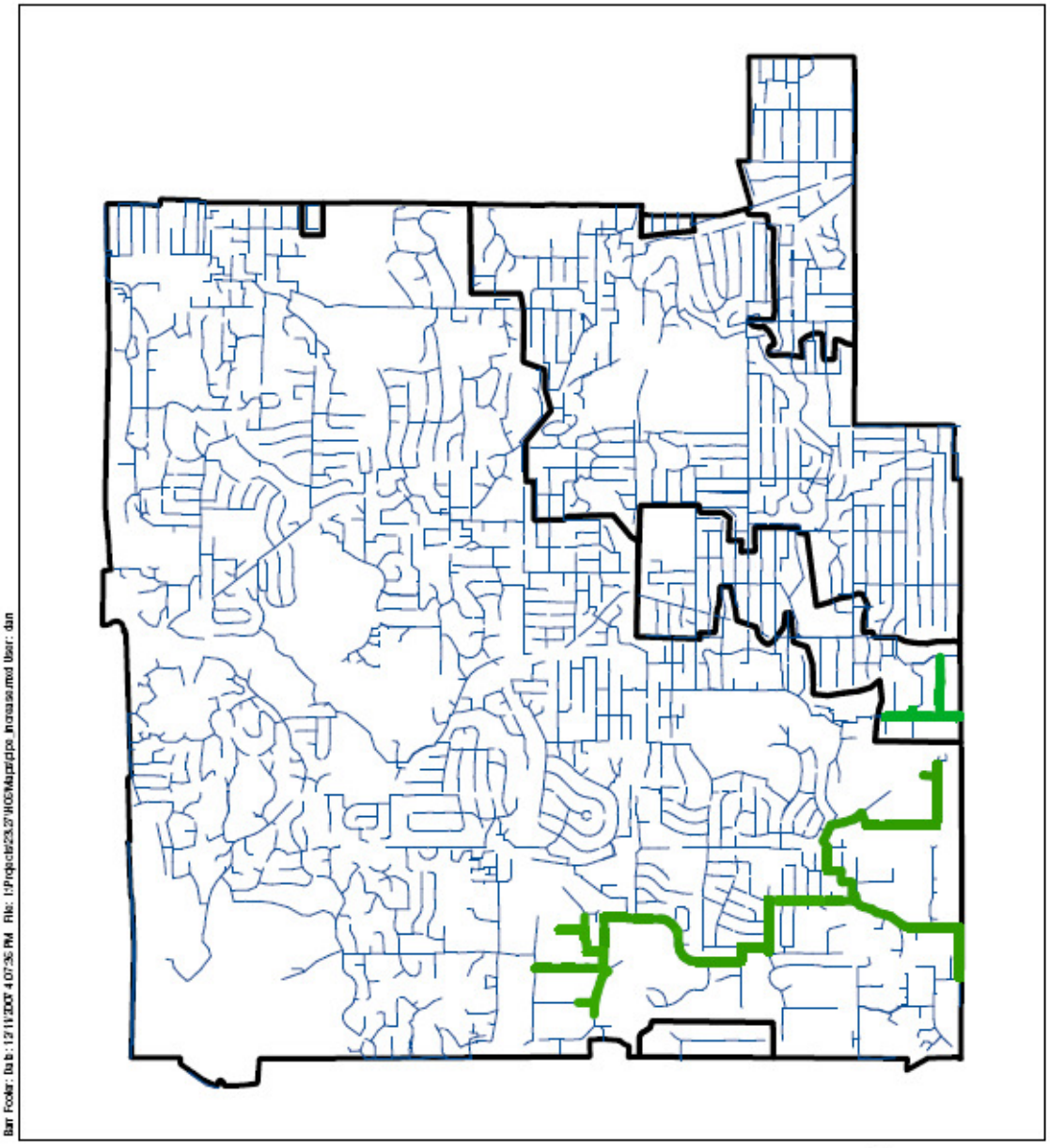


Figure S-4

POTENTIAL TRUNK UPGRADE MAP
2008 Comprehensive Plan
City of Edina
Edina, MN

TRENDS AND ANALYSIS OF SANITARY SEWER SYSTEM - REGIONAL

The increased flow projected in the previous section ultimately flows out of the City and to the regional treatment plants via the regional interceptors discussed earlier in this plan. Projected increases in flow will have an impact upon those facilities, as well as the City's own trunk lines. Projected sanitary sewer flows into these interceptors are shown in Table S-4 below. This table includes the 2000 Sanitary Sewer Improvement Projects that provide a divergence of a portion of the 1MN-345 interceptor flow to 1RF-490.

Table S-4
Metropolitan Council Sanitary
Sewer Flow Estimates for Edina (MGY)

SERVICE AREA	2005	2010	2020	2030	Ultimate
All interceptors north of 1MN-345	146	146	146	146	146
1MN-345	566	566	566	566	566
1RF-490	135	136	137	139	191
1RF-491	1573	1583	1599	1614	2227
Bloomington interceptor	67	80	105	136	136
TOTAL	**2487**	**2510**	**2553**	**2600**	**3267**

It is important that the City maintain a close working relationship with MCES as it redevelops. As the City's flows increase, the remaining capacity of some of the regional interceptors will be used up and, at some point, new larger interceptors will be needed. This is already the case for interceptor 1-RF-491, which has recently been identified as under capacity for future flows. A current plan is underway to add capacity via a parallel relief sewer which should be completed in 2010. As noted previously, the City also has the ability to divert flow from the 1RF-490 service area to the 1RF-491 service area. This allows Edina to keep flows below 0.94 MGD to 1RF-490 and any flow in excess of 0.94 MGD is directed toward 1RF-491.

GOALS AND POLICIES

Operation of the sanitary sewer system is based on the following goal:

- Provide for the effective, efficient removal of sanitary sewage for all areas of the City of Edina, while also eliminating inflow and infiltration and protecting the health, safety and welfare of our citizens now, as well as through the year 2030.

Policies needed to maintain the system are:

- Continuously monitor sewage flow at principal metering points to insure capacity of the system.
- Continue and upgrade the monitoring of the local system through both televising lines and electronic utility data collection.
- Continue to eliminate points of inflow and infiltration to the system on public property, and require elimination of inflow and infiltration on private property as outlined above.
- Continue to maintain operating efficiency, minimize sewage blockages, and reduce potential for inflow and infiltration.
- Continue to review all sanitary sewer mains and services prior to reconstructing any roadway.
- Continue strict standards and inspections for private sewer line connections to the public sanitary sewer system.
- Repair pipes immediately upon detection of a failure or problem.
- Continue to eliminate private on-site sewage systems (only seven remaining).
- Identify all future sanitary sewer facility improvements in the Capital Improvement Plan.
- Continue to maintain and enforce the following ordinances and new ones adopted that deal with the sanitary system.

The following ordinances exist in the City's code regarding the sanitary sewer system:

- Section 445: Requiring Connections to Sanitary Sewer.
- Section 445: Restricting discharge of clear water into Sanitary Sewer.
- Section 850.16 Subdivision 12 Paragraph F: Requiring that all projects needing a conditional use permit in zoning district PCD-3 must perform an I&I study and eliminate on site I&I.

IMPLEMENTATION

This section addresses the specific projects or day-to-day tasks that City staff undertake to implement the goals and policies laid out in this plan. Some tasks have been ongoing for many years and simply represent the high quality of service that the City has always provided to its population, while others are new initiatives that are the City's responses to recent programs implemented by MCES and to recent development..

System Maintenance & Improvement

The City aggressively maintains the sanitary sewer system. The City has implemented a standard jet-cleaning program for all lateral collection piping. Each pipe is cleaned on a four-to-five year revolving schedule. The main trunk sewers are not included in the cleaning program since they receive regular scouring velocities from normally occurring peak flows and the flushing from cleaning in the laterals. The City also televises trunk lines and laterals to help determine areas in need of cleaning and improvements.

Inflow and infiltration

MCES has implemented a program to reduce inflow and infiltration (I&I) throughout the metropolitan area. As part of this program, they have determined the amount of I&I that each City is allowed to contribute to the MDS. Cities in excess of their allotted amount must eliminate the excessive I&I or pay a surcharge over and above their normal sanitary sewer fees to MCES to help pay for MCES-based projects that will help deal with the excessive flows. Edina is over their allotted I&I maximum and has undertaken a number of projects in order to reduce and eliminate as much I&I as possible.

Past Efforts

Edina has been working to eliminate excessive I&I for many years. Back in the 1980's, the City performed studies to identify sources of I&I and related mitigation measures. Again in the late 1990's, the City undertook another effort. The 1997 Evaluation of the City's Sanitary Sewer System by TKDA reanalyzed the City's I&I problem. As a result of that work, the City undertook an I&I reduction program with a goal of a 40% reduction in I&I. Programs and projects that the City has already completed as part of their I&I reduction efforts include:

- All buildings within the City were inspected for potential clear water connection.

- Buildings with sump pump systems were put on a regular inspection schedule for clear water connections.
- A one million gallon peak flow storage tank was installed in the sewer shed tributary to interceptor 1-MN-345.
- Ordinances were passed that required mitigation of I&I on private property as part of obtaining conditional use permits for redevelopment projects in certain key areas of the City.

The City recognizes that storage of peak flow caused by I&I is a temporary solution. By completion of current and future I&I reduction efforts, the need for this tank will be eliminated.

Current Efforts

When MCES initiated its current surcharge program, Edina hired Barr Engineering to perform a new I&I study. Since past efforts had already addressed inspections of private property and the elimination of sump pump and other clear water connections from the sewer, this effort was focused on the current City system. The City is in the middle of a series of projects that should significantly reduce inflow and infiltration into its system. Those projects include:

- Modeling sanitary sewer system
- Inspecting sanitary sewer manholes
- Working with private developers who are proposing projects on large parcels with known I&I issues
- Modifiying current City sanitary sewer ordinances
- Improving infrastructure to reduce inflow and infiltration

Modeling

One of the first projects included the preparation of a sanitary sewer model of the City's system. Barr used the new model of the sanitary system in conjunction with its existing model of the City's storm sewer system to determine areas within the current sanitary system where I&I was most likely coming from.

As part of this effort, flow meters were installed at a number of locations in the City's system on two separate occasions. During the first, dry weather flows were monitored during winter months. This data was used to calibrate a sanitary sewer system model

using water sales data as the input for sewage flow generation. Model parameters were adjusted until the flow rates in the model closely approximated those measured during the dry weather flow monitoring.

A second round of flow monitoring was performed during spring when there was the high likelihood of a rainfall event intense enough to produce measurable inflow. At the same time, a series of rainfall gauges were identified that would be able to provide a rainfall distribution throughout the study area for use in the storm water model.

An intense event was captured and data from the rainfall gauges gathered during this event were input into the City's storm water model to generate flood levels expected during the event. This produced water levels that, in many areas, were above existing manhole covers. This data was then used to help set inflow parameters in the sanitary model to calibrate it so that it would produce the flows measured in the sanitary system during the inflow event. This resulted in a sanitary model that was calibrated for both dry weather and wet weather conditions.

The model was then used to identify areas where higher than expected inflow and infiltration occurred during the recorded peak flow event. These areas are being investigated to identify the most likely source of inflow and infiltration.

Sanitary Sewer Manhole Inspection

As a result of the modeling, two main sources of inflow were identified. One was related to private connections to the sanitary sewer from parking ramps and other related facilities. These will be discussed in the next section. The other was from leaky manhole covers and deteriorated top sections of old manholes.

The City is now in the middle of a project to inspect every sanitary sewer manhole in its system over the next two years. A protocol was set up so that a specific and consistent set of data would be gathered on all manholes. This was facilitated by the use of a software program called City Works that Edina had elected to purchase to help with infrastructure management. The manhole inspections were prioritized based on the results of the combined sanitary sewer and storm sewer modeling effort. Those manholes most susceptible to inundation during high intensity rainfall events were inspected first.

Once these inspections are complete, the City will compile a list of manholes that are in need of rehabilitation. This list will be prioritized based upon several criteria. One of those will be that manholes most likely to contribute inflow during intense runoff events

will be given a high priority for immediate repair. Repairs of these manholes will be scheduled so that, to the extent possible, most will be complete prior to 2010.

Based on the inspections complete to date, the following is an abbreviated list of the types of repairs that will occur to mitigate inflow into the sanitary sewer system:

- Replacement of vented manhole covers solid water tight covers
- Removal of surface drainage cross connections
- Repair of manhole frames that have separated from rings in concrete street sections
- Replacement of dilapidated brick manholes with new precast manholes
- Installation of chimney seal systems on manholes that have evidence of inflow characteristics
- Complete relining or replacement of sewers constructed in low areas subject to frequent inundation, such as along creeks and wetlands

Work with Private Developers

One of the main sources of inflow continues to come from private connections. One of those sources is the connection of lower levels of parking ramps to the sanitary sewer. Though upper levels of ramps are connected to the storm sewer, lower levels are connected to the sanitary sewer. When runoff events exceed the capacity of the upper level collection systems, it often simply flows to the next level down where it runs directly into the sanitary sewer. Edina is working with private developers to prevent this from occurring on future proposed ramps and, in some cases, to correct existing ramps where this is known to be a problem.

In addition to dealing with I&I, the City will also address methods to fund trunk line projects that are necessitated by ongoing redevelopment within the City. As noted earlier, methods of funding the projects will be addressed on a case by case basis.

Modifications to Ordinances

The City already has ordinances prohibiting the connection of sump pumps and other clear water connections to the sanitary system. However, there are other sources of inflow from private systems that may not have been identified during earlier inspections of private buildings. The City is in the process of modifying its ordinances to require inflow and infiltration studies and corrections to certain private systems under specific

conditions that require permits for major construction. The City currently has one such ordinance but it is limited to a specific area and is only applicable to projects requiring a conditional use permit (see attached ordinance 850.16). In the future, this ordinance will be replaced by one that is wider reaching. The exact language of that ordinance has not yet been determined.

Another key component to inflow and infiltration is related to private services. Metropolitan Council Environmental Services estimates that as much as 70% of all I&I comes from private sources. As already noted, the City has completed a successful sump pump program. However, in addition to the sump pumps, many of the private sanitary sewer service laterals are old and susceptible to I&I. The City estimates that there is approximately 1,158,000 feet of service lateral in the City associated with 14,477 laterals. The City plans to modify its ordinances to deal with I&I that is being contributed to its system from the private laterals. The exact language of that ordinance also has not yet been determined.

I&I Related Infrastructure Improvement Projects

Finally, the City will be undertaking a number of infrastructure improvement projects over the next ten years in order to limit or eliminate I&I from its system. Those projects currently identified include:

- Manhole rehabilitation project based on the results of the manhole inspection project.
- Pipe rehabilitation of low lying sewers near Minnehaha Creek.
- Drainage improvements to the area near 70th and France to prevent water from ponding over floor drains connected to the sanitary system.
- Coordination with private developer to disconnect systems contributing runoff flow to the sanitary system.

A complete list of projects can be found in the City's current Capital Improvement Plan (CIP). The CIP is a five-year plan of projects the City may undertake. The CIP plan is updated every year.

8.2 Surface Water Management Plan

INTRODUCTION

The City of Edina believes in providing a high level of service to its residents, which includes providing effective storm water management and protecting the surface water resources of the city. In 2003-2004, the City developed the *Comprehensive Water Resource Management Plan* to address current and future storm water issues, especially those related to future development and redevelopment. The plan addresses storm water runoff management and flood control, water quality management, and wetlands protection through establishment of storm water planning policies and recommendations.

This plan was developed to assist the city of Edina in defining and implementing a comprehensive and environmentally sound system of surface water management. This plan is currently being reevaluated to reflect changes in the policies of the Minnehaha Creek Watershed District and the Nine Mile Creek Watershed District and is intended to be used as a tool to:

1. Plan for projects and other water management activities so as to correct existing problems and prevent the occurrence of foreseeable future problems.

2. Assist the City in considering water resource impacts resulting from variances to the city's long-range land use plan.

3. Enable the City to grow/redevelop in a systematic and orderly manner while protecting its vital water resources.

In order to accomplish these objectives, the plan considers a specific array of land uses within the City limits. If and when land uses change, this Plan provides the means to (1) address the proposed changes; (2) determine the impact of the changes on the city's infrastructure, flooding, and natural resources; and (3) determine the actions needed within the proposed areas of land use change to prevent undesirable impacts.

CURRENT CONDITIONS

The City of Edina and its residents value the surface water resources within the city, which include two creek systems, a number of lakes, and numerous wetlands (see Figure 8.2.1). In addition to being a major component of the City's storm water infrastructure, these resources supply aesthetic and recreational benefits and provide wildlife habitat and refuge. The northeast corner of the City drains to Minnehaha Creek, which enters the city limits northwest of West 44th Street and T.H.100 and flows in a southeasterly direction through the city, exiting near West 54th Street and York Avenue. The southwest corner of the city drains to the South Fork of Nine Mile Creek, which

meanders through the Braemar Golf Course and then exits the city limits toward Bloomington at West 78th Street. The remainder of the city drains to the North Fork of Nine Mile Creek, which enters the Edina city limits in the northwest corner of the city north of the intersection of T.H. 169 and Londonderry Road and flows in a southeasterly direction through the city, exiting to Bloomington near the intersection of T.H. 100 and Interstate 494.

The City of Edina encompasses portions of two watershed districts: the Nine Mile Creek Watershed District and the Minnehaha Creek Watershed District (see Figure 8.2.1). Watershed districts are local units of government that specifically address the management and protection of water resources based on hydrologic boundaries instead of political boundaries. Each District is governed by a Board of Managers, comprised of citizens appointed by the boards of the counties with land in the watershed district. The districts are charged by State statute "to conserve the natural resources of

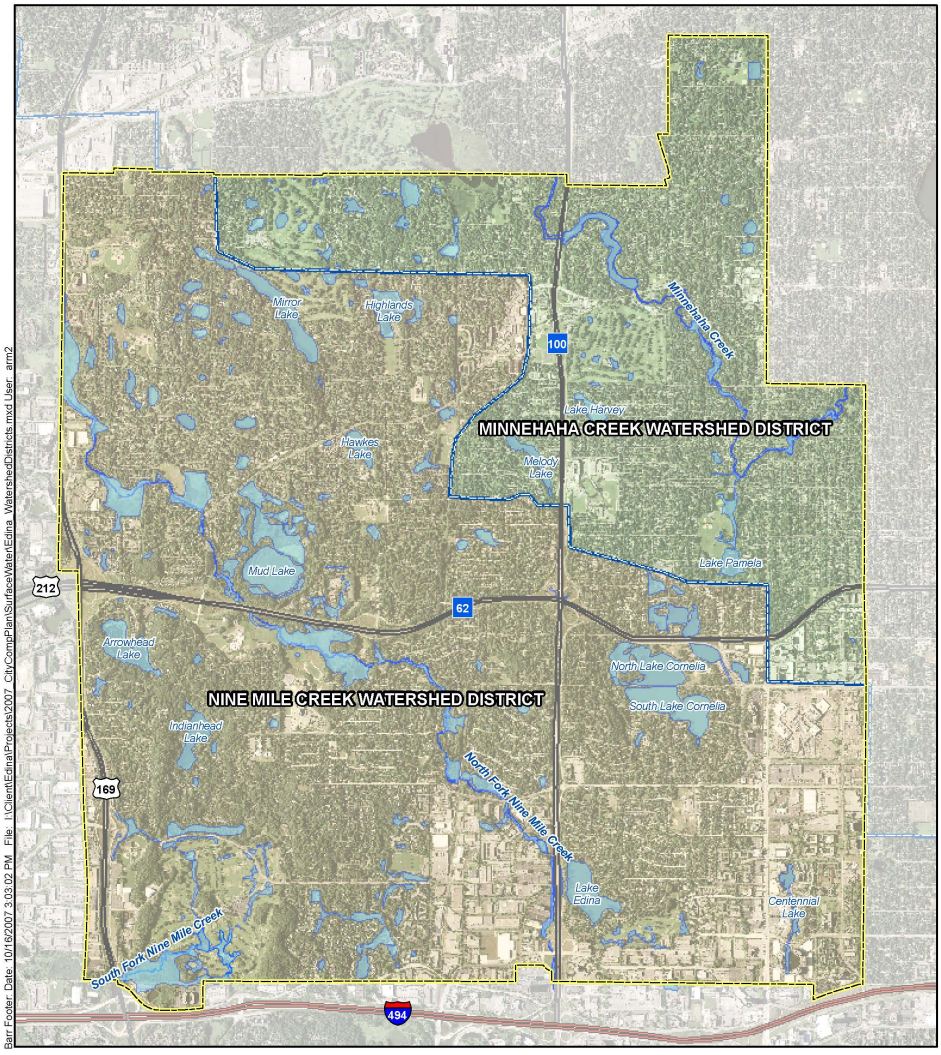


Figure 8.2.1
SURFACE WATER RESOURCES
2008 Comprehensive Plan
City of Edina
Edina, MN

the state by land use planning, flood control, and other conservation practices using sound scientific principles for the protection of the public health and welfare and provident use of the natural resource." Because these watershed districts are granted authority to regulate, conserve, and control the use of water resources within the district,

the City is required to comply with the specific storm water and water resource related requirements of each District.

The City of Edina places a high importance on providing quality storm water management service to its residents. Since the City of Edina has been a developing community throughout much of the past century, the age and condition of the existing storm water infrastructure is quite variable. The City completed a city-wide hydrologic and hydraulic modeling analysis of the existing storm water system as part of the Comprehensive Water Resource Management Plan to evaluate the capacity of the existing storm sewer system and identify storm water management and flood control issues. The storm water model was used to develop recommendations for system improvements and will continue to serve the City as a tool to evaluate additional storm water management initiatives and the impacts of future development and redevelopment.

TRENDS AND CHALLENGES

Recent years have seen significant changes in the regulation of storm water runoff and its impacts on surface water quality. A brief description of the regulatory changes and the associated impacts on the City of Edina are discussed below.

NPDES MS4 General Storm water Permit- SWPPP and Nondegradation Requirements

In 1990, the EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) Storm water Program, which regulated storm water runoff from large municipal separate storm sewer systems (MS4s), generally serving populations of 100,000 or greater. In 1999, the Phase II Rule of the NPDES Storm water Program extended the coverage of the NPDES program to operation of "small" MS4s in urbanized areas and operation of small construction sites. As a result,

the City of Edina was required to apply for coverage under the Minnesota Pollution Control Agency MS4 General Permit by March 10, 2003. Under this permit, MS4s are required to develop and implement a Storm Water Pollution Prevention Program (SWPPP), which must contain, at a minimum, the following six control measures:

1. Public education and outreach on storm water impacts.
2. Public involvement and public participation.
3. Illicit discharge detection and elimination.
4. Construction site storm water runoff control.
5. Post-construction storm water runoff control in new development and redevelopment.
6. Pollution prevention and good housekeeping for municipal operations.

The SWPPP must include best management practices (BMPs) and measurable goals for each of the six control measures. An annual report detailing the implementation of the control measures must be submitted by March 10 each year beginning in 2004. A copy of the City's SWPPP is available on the City's website.

In addition to development and implementation of a SWPPP, the City of Edina was selected as one of thirty cities in Minnesota required to complete a loading assessment and nondegradation report to determine whether additional control measures can reasonably be taken to reduce pollutant loading. The loading assessment evaluates the change in the City's storm water discharge loading for average annual flow volume, total suspended solids, and total phosphorus for the time periods from 1988 to 2007 and from the 2007 to 2020.

Results from the loading assessment indicated that the City's storm water pollutant loading has expanded since 1988 and is expected to increase slightly in the future. In response, an analysis of future BMPs was completed to address nondegradation and determine whether additional control measures can reasonably be taken to reduce pollutant loading from storm water runoff. The analysis found that through implementation of runoff design standards for development and redevelopment, such as the standards adopted by the Nine Mile Creek Watershed District in March 2008, the overall average annual flow volume from the City in 2020 is expected to decrease to levels below 1988 conditions. The City submitted the Non-degradation Report to the MPCA in December 2007.

Volume Reduction of Storm water Runoff

The city and watershed districts have implemented conventional storm water quality treatment requirements since the late-1980s, typically in the form of storm water detention ponds. Due to the developed nature of the city, regional detention ponds have generally been encouraged by the City, as opposed to individual on-site storm water treatment. Storm water detention ponds are effective for removal of sediment and phosphorus from storm water runoff.

In recent years, storm water quality treatment trends have shifted to incorporate volume reduction of storm water runoff, in addition to the removal of sediment and phosphorus. This movement comes in response to both the desire of citizens and local governments to embrace the challenge of protecting our urban surface water resources and the MPCA MS4 nondegradation requirements for storm water volume. Storm water volume reduction can be accomplished by reducing the fraction of impervious surface on a site and/or implementing BMPs to increase rainfall abstraction processes such as infiltration, evaporation, water storage, and vegetation management.

The Nine Mile Creek Watershed District adopted revised storm water management rules in March 2008 that include storm water volume reduction requirements. The Minnehaha Creek Watershed Districts is currently in the process of revising their storm water management rules which are also likely to include storm water volume reduction requirements. Once the Minnehaha Creek Watershed Districts' rule revisions are finalized, the City of Edina will update their *Comprehensive Water Resource Management Plan* to reflect the watershed district's new storm water management requirements.

As the City strives to meet the storm water volume reduction requirements of the MPCA MS4 nondegradation plan and the revised storm water rules of the watershed districts, it may be necessary to revise the City's ordinances.

Lake Water Quality Studies

The Nine Mile Creek Watershed District developed Use Attainability Analyses for several lakes within the City of Edina, including Lake Cornelia, Indianhead Lake, Arrowhead Lake and Mirror Lake. A Use Attainability Analysis is a scientific assessment of a water body's physical, chemical, and biological condition. The studies include a water quality assessment and prescription of protective and/or remedial measures for the lakes and their tributary watersheds. The City will work with the Nine Mile Creek Watershed District to implement the improvement recommendations presented in these studies.

Impaired Waters

The federal Clean Water Act (CWA) requires states to adopt water quality standards to protect the nation's waters. Water quality standards designate beneficial uses for each waterbody and establish criteria that must be met within the waterbody to maintain the water quality necessary to support its designated use(s). Section 303(d) of the CWA requires each state to identify and establish priority rankings for waters that do not meet the existing water quality standards. The list of impaired waters is updated by the State every two years. For impaired waterbodies, the CWA requires the development of a total maximum daily load (TMDL), which establishes the pollutant loading capacity within a waterbody and develops an allocation scheme amongst the pollutant contributors, which include point sources, non-point sources and natural background pollutants.

Several waterbodies within the City of Edina have been listed on the draft 2008 Impaired Waters list, including Lake Cornelia and Lake Edina for total phosphorus impairment, Nine Mile Creek for chloride, turbidity, and fish bioassessment, and Minnehaha Creek for chloride, fecal coliform, and fish bioassessment. The City of Edina will work with the MPCA and other agencies to improve the quality of the waterbodies on the Impaired Waters list so that they can be removed from the list.

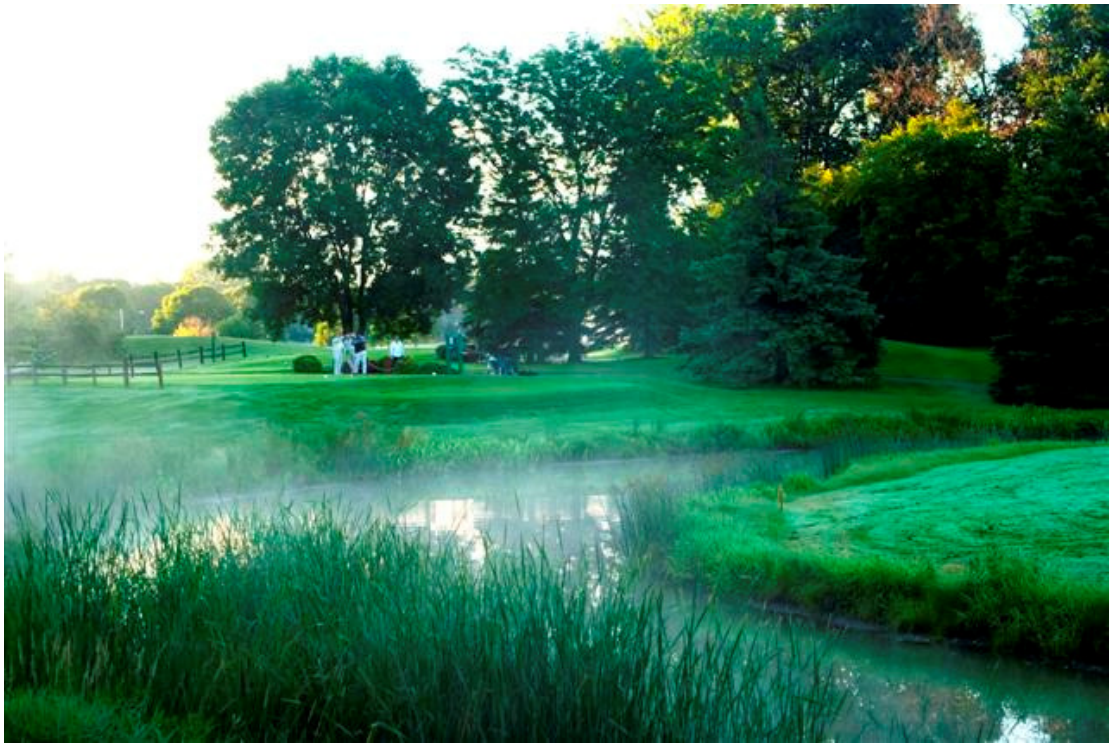
The Minnehaha Creek Watershed District has completed a draft TMDL study for Lake Hiawatha, in conjunction with the MPCA, to address the phosphorus impairment. Although Lake Hiawatha is not located in the City of Edina, a portion of the city drains to Minnehaha Creek, which impacts the water quality of Lake Hiawatha. As a result of the draft TMDL study, the Minnehaha Creek Watershed District has included an annual phosphorus load reduction requirement of 67 lbs for the City of Edina in the District's *2007 Comprehensive Water Resource Management Plan*. The City will work with the Minnehaha Creek Watershed District to develop a strategy to achieve the desired loading reduction.

GOALS AND POLICIES: SURFACE WATER MANAGEMENT

The City's *Comprehensive Water Resource Management Plan* addresses storm water runoff management and flood control, water quality management, and wetlands protection through establishment of water resource management goals, policies, and design standards. The City's plan is required to conform with the existing watershed district plans, as well as future watershed district plan updates. The Nine Mile Creek Watershed District adopted their *Water Management Plan* in March 2007 and the Minnehaha Creek Watershed District adopted their *Comprehensive Water Resource Management Plan* in July of 2007. The City intends to revise its *Comprehensive Water*

Resource Management Plan in 2009 to be consistent with the most current watershed district plans and rules.

A brief summary of the management goals in the City of Edina *Comprehensive Water Resource Management Plan* are summarized below. Additional information on the policies and design standards can be found in the latest version of the City's plan.



Storm water Runoff Management and Flood Control

- Adopt and implement a storm water management ordinance reflecting the policies and design standards detailed in the *Comprehensive Water Resource Management Plan.*
- Place high priority on providing 100-year level of protection for the City's storm water system.
- Require 10-year level of service for new storm water systems and for existing conveyance systems as opportunities arise.

Water Quality Management

- Modify City review, permitting and enforcement processes for construction activities to ensure water quality goals are met.
- Heighten community awareness of water quality management through education and training.
- Manage city water resources so that the beneficial uses of streams, wetlands, ponds, and lakes remain available to the community.
- Work with the adjacent municipalities to encourage upstream pollutant reduction in areas closer to the source of such pollutants.
- Encourage use of regional detention areas as opposed to individual on-site detention to reduce flooding, control discharge rates, and provide for water quality management.
- Promote storm water retention through infiltration practices and demonstration projects where soil conditions permit and where groundwater supplies will not be impacted.
- Adopt and implement a storm water management ordinance reflecting the water quality management standards and the erosion and sediment control policies detailed in the *Comprehensive Water Resource Management Plan.*

Wetland Protection

- Achieve no net loss of wetlands, including acreage, functions, and values.

- Discourage wetland alteration. Unavoidable wetland alterations must be mitigated in conformance with the Wetland Conservation Act (WCA) requirements and must be guided by the following principles, in descending order: avoid the impact, minimize the impact, rectify the impact, reduce or eliminate the impact over time, and compensate for the impact.

- Work in conjunction with the local government units (LGU) responsible for administering the Wetland Conservation Act in the City of Edina, the Nine Mile Creek Watershed District and the Minnehaha Creek Watershed District, on issues pertaining to wetland alterations within the city boundary.

- Maintain and periodically update the wetland inventory data and the wetland management classifications provided in the City's *Comprehensive Water Resource Management Plan*.

- Seek to restore previously existing wetlands and enhance existing wetlands.

- Provide buffer zones of native vegetation, where feasible, around ponds and wetlands to provide habitat. The City will educate the public regarding wetland protection and the importance of creating and maintaining vegetative buffers. Land use and property ownership may limit the ability to provide buffer zones.

- Encourage the minimization of water level fluctuations (bounce), where feasible, in wetlands to prevent adverse habitat changes.

- Involve the appropriate regulatory agencies (MPCA, U.S. Army Corps of Engineers, and the MnDNR) in the planning of any proposed water quality or flood control facilities identified in this plan that may be located within a wetland.

IMPLEMENTATION

The City of Edina has historically placed a high importance on providing quality storm water management services to its residents, with increased flood protection efforts following the significant rainfall events of 1987 and 1997. Design criteria have been established to ensure that a proper level of service for storm water management and level of protection from flooding is provided to residents of the City. The existing storm sewer system throughout the City has been analyzed using hydrologic and hydraulic computer modeling software to identify areas throughout the city where the current storm water management and flood protection system does not meet the City's design standards. The problem areas and potential solutions have been identified and the resulting capital improvements and other related activities to be undertaken in the next ten years are summarized in the City's *Comprehensive Water Resource Management Plan*.

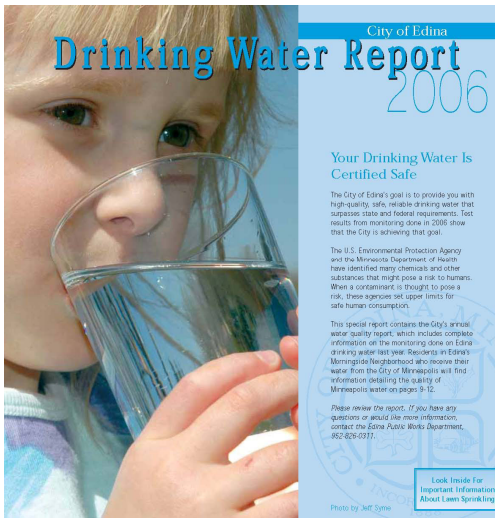
The City of Edina and its residents value the surface water resources within the City. To protect the quality of the city's waters, the City has established water quality management policies and design standards. As part of the *Comprehensive Water Resource Management Plan*, a water quality computer model was used to simulate the generation and transport of pollutants through the water bodies within the City. Recommendations for upgrades to storm water detention ponds throughout the city to maintain and improve the pollutant removal efficiency by these ponds are summarized in the City's *Comprehensive Water Resource Management Plan*. In addition to

pursuing the recommended pond improvements, the City will also protect its surface water resources by implementing the NPDES MS4 Storm Water Pollution Prevention Plan (SWPPP) and related non-degradation requirements. The City will also work with the local watershed districts to comply with revised water quality management rules and standards, address water quality impairments and implement water quality improvement projects.

8.3 WATER SUPPLY PLAN

INTRODUCTION

Although several events have occurred during the past several years affecting Edina's long term sustainable supply, the City has ample production capacity to meet existing demand and has begun planning to address some of the existing concerns. Edina's water system is currently providing good and reliable service to its residents and businesses. The combination of 18 wells, three inactive due to vinyl chloride or radium), and five storage facilities have been able to meet maximum day demands in the past. The current storage reservoirs provide sufficient storage volume as well as additional volume for emergencies such as short term power outages or available fire flow. The current size and location of the elevated towers allow for turnover and mixing of the stored water. Water production relies on filtered water to remove iron during the low demand periods of the year while additional unfiltered wells pump to the system during high demand periods when a significant portion of water is used for lawn irrigation.



CURRENT CONDITIONS

During the past five years, Edina has completed various studies pertaining to water supply sources and the distribution system. Some of these studies used to complete this portion of the comprehensive report include:

- Wellhead Protection Plan. Completed May 2001. Plan outlines vulnerabilities of aquifers to potential as well as known contaminant sources and outlines plans to protect sources of water for the City's long term sustainability.
- Water Distribution System Analysis. Completed August 2002 Plan includes a computer model of the City's water distribution system to identify deficiencies in pressure and available fire flow. The plan also identifies capital improvements to address future growth of the City and how best to serve the growth.

The City of Edina provides water service to the majority of the residents and businesses located in the City. Several smaller residential and commercial areas in Edina are served by the cities of Bloomington, Eden Prairie, Minneapolis, and St. Louis Park, based on geographic boundaries depicted in Figure 1. Through these areas, the City of Edina has the ability to interconnect in the event of emergency with water supplied by the cities of Bloomington, Eden Prairie and Minneapolis, and vice versa. Absent an emergency, should the City of Edina seek to shift any or all of these areas to water supplied by and from the City of Edina, it first will conduct full public public process, including written notice to, and written survey of, all affected residents and property owners, public hearings, and City Council approval.

The Edina water system is comprised of water mains ranging in size from four inches to 16 inches in diameter. In addition, five storage facilities provide water to the distribution system as identified in Table 1. The locations of these distribution facilities are shown in Figure 2.

Table 1 Storage

Facility Name	Location	Year Constructed	Type	Storage Capacity (MG)	Usable Storage Capacity (MG)
Dublin Reservoir	700 Dublin Road	1960	Ground	4.0	0
Gleason Road Tank	6001 Gleason Road	1970	Elevated	1.0	0.5
Community Center Tank	5901 Ruth Drive	1955	Elevated	0.5	0.5
Van Valkenburg Tank	4949 Malibu Drive	1989	Elevated	1.0	0.5
Southdale Tank	6853 France Avenue S	1956	Elevated	0.5	0.5
			Total	**7.0**	**2.0**

Eighteen Wells shown in Table 2 supply water directly to either water treatment plants or to the distribution system during periods of high demand. In total, eight of the existing wells are treated by oxidation and filtration, seven provide unfiltered water and three are currently inactive. The inactive wells include: #7 (Vinyl Chloride), #9 (Radium) and #15 (Radium). These three inactive wells currently exceed the EPA's Maximum Contaminant Level (MCL), for the contaminants identified and are being studied to address the best course of action including either treatment or abandonment. The supply and treatment facilities are shown in Figure 3.

Table 2 Existing Supply Wells

	Status	Treated	Supply Capacity (gpm)	Supply Capacity (MGD)
Well #2	Active	WTP 1	1000	1.44
Well #3	Active	NA	680	0.98
Well #4	Active	WTP 2	720	1.04
Well #5	Active	NA	1000	1.44
Well #6	Active	WTP 2	960	1.38
Well #7	Inactive (Vinyl Chloride)	NA	680	0.98
Well #8	Active	NA	825	1.19
Well #9	Inactive (Radium)	NA	840	1.21
Well #10	Active	WTP 3	450	0.65
Well #11	Active	WTP 3	1,100	1.58
Well #12	Active	WTP 4	900	1.30
Well #13	Active	WTP 4	900	1.30
Well #14	Active	NA	750	1.08
Well #15	Inactive (Radium)	NA	2000	2.88
Well #16	Active	NA	1,000	1.44
Well #17	Active	NA	950	1.37
Well #18	Active	NA	1000	1.44
Well #19	Active	NA	1,000	1.44
		Total	**16,755**	**20.18**

In 2006, the average daily demand (AD) of the City's water system was 7.62 million gallons per day (MGD). This demand has varied during the past five years from 6.78 to 8.16 MGD as shown on Table 3. In addition, the maximum daily demand (MD) has varied from 14.54 to 21.78. This ratio of the AD to the MD is referred to as the water use peaking factor and typically ranges from 2.5 to 3.0 for suburban communities. While Edina's peaking factor of 3.0 is on the high side of this range, it is not surprising given Edina's location as a metropolitan suburb.

Table 3 Existing Demands			
Year	**AD Demand (MGD)**	**MD Demand (MGD)**	**MD Peaking Factor**
2002	6.78	12.87	1.90
2003	8.16	21.78	2.67
2004	7.26	14.54	2.00
2005	7.14	21.21	2.97
2006	7.62	19.07	2.50

TRENDS AND CHALLENGES

Future water demands shown in Table 4 are based on Metropolitan Council projections and indicate no additional need for storage. In this scenario, an additional two wells are needed beyond the existing wells to meet the Metropolitan Council maximum day demand of 2030, if the existing peaking factor of 3.0 stays the same. If the peaking factor is reduced, the City may meet demands with one additional well.

Based on ultimate build out of the City including significant areas of redevelopment, Edina could experience a significant increase in water demands. Based on a historical peaking factor of 3.0, it may be necessary to significantly decrease water demand by conservation water use changes or major capital improvements. If peaking factors are reduced in phases from 3.0 in 2005 to 2.75 by ultimate development, an additional five new wells in addition to proposed wells 20 and 21 may be needed.

Table 4 Ultimate Water Demand Projections				
Year	**Met Council Population**	**AD Demand (MGD)**	**MD Demand (MGD)**	**MD Peaking Factor**
2005	47,425	7.35	12.87	3.00
2010	48,500	7.6	22.7	3.0
2020	49,100	7.7	23.0	3.0
2030	50,000	7.8	23.4	3.0
Ultimate	70,149	10.9	30.1	2.75

Figures 4 and 5 include Average Day Pressures and Maximum Day Fire Flow contours respectively. The figures were calculated with the aid of the computer model and generally show satisfactory results throughout the majority of the City. The City has

begun to provide looping of water main where feasible to aid in providing higher available fire flow.

GOALS AND POLICIES: WATER SUPPLY PLAN

1. Provide the City's water customers with safe, high quality potable water.

    - Meet or exceed all Federal and State drinking water standards.
    - Provide treatment or replace existing wells with contaminants that exceed EPA Maximum Contaminant Levels.

2. Provide sustainability of the city's water system through preservation and conservation.

    - Protect the City's existing sources of supply by implementation of the Wellhead Protection Plan.
    - Continue to implement a conservation oriented water rate system that charges increasing fees for increasing use of water.
    - Continue to provide education regarding conservation through mailings, website, newspaper and public involvement.

3. Provide a reliable water system that can provide a safe supply of water during emergencies.

    - Continue the relationship with adjacent communities to provide interconnections for emergency needs.
    - Continue to complete water main looping of dead ends to improve available fire flow to customers.

4. Continue to improve the quality of water throughout the distribution system by aggressively pursuing solutions to water quality complaints.

    - Implement an aggressive unidirectional flushing program throughout the system.
    - Continue to replace sections of aging water mains in areas with water quality and/or hydraulic deficiencies.
    - Implement new technologies including pipe bursting and cleaning and lining to limit full reconstruction of utilities.

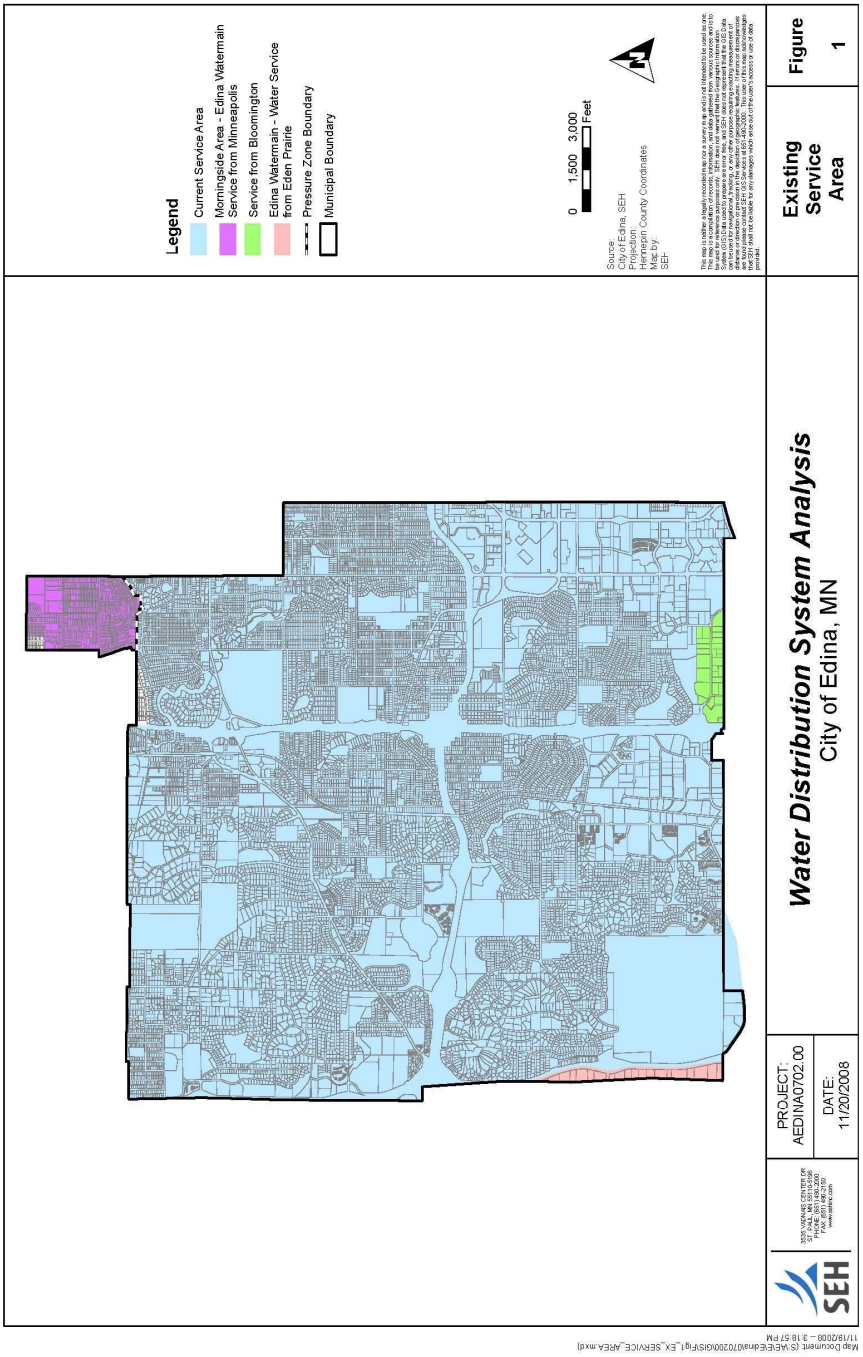
IMPLEMENTATION

The City currently has an excellent distribution system with well looped trunk watermain throughout the City. Several sources of supply and storage placed strategically throughout the City continue to strengthen the demand of the existing customer base. However, improvements to treatment are needed to allow the use of these wells. The City is currently proposing two additional filter plants to improve the use of these wells as well as reduce unfiltered water pumped into the system during peak demands.

This unfiltered water in part contributes to aesthetic problems including red and/or brown water complaints from high concentrations of iron and manganese. Another factor in contributing to these colored water complaints are old unlined cast iron mains throughout various portions of the City. In the past few years, the City has aggressively pursued replacing these unlined mains with new water mains in the worst areas of town. The City has also recently begun to investigate the use of pipe lining technology to reduce red water complaints in the future.

While the City's potential growth may require additional sources of water supply, the remainder of the distribution system including storage and water mains should remain capable of providing excellent service to the City's residents and businesses. These portions of the system are initially sized with providing fireflow so increases in domestic flow typically have minimal impacts. This is especially true for the area near the Southdale area which includes a large network of 12 inch trunk water mains for this generally commercial area.

In total five additional wells will be needed to meet the proposed future maximum day demands for ultimate buildout. However, as previously indicated, a reduction in water demand may reduce the overall need for future wells if effective conservation measures are implemented. The City has taken effective initial steps by implementing a tiered inclining block rate structure. Other measures have been identified in the City's recently completed Water Supply Plan to encourage a reduction in water demand. This Plan has been submitted separately to both the Metropolitan Council and the Minnesota Department of Natural Resources.


Legend
Current Service Area
Morningside Area - Edina Watermain Service from Minneapolis
Service from Bloomington
Edina Watermain - Water Service from Eden Prairie
Pressure Zone Boundary
Municipal Boundary
0 1,500 3,000 Feet
N
Source:
City of Edina, SEH
Projection:
Hennepin County Coordinates
Map by:
SEH
Existing Service Area
Figure 1
Water Distribution System Analysis
City of Edina, MN
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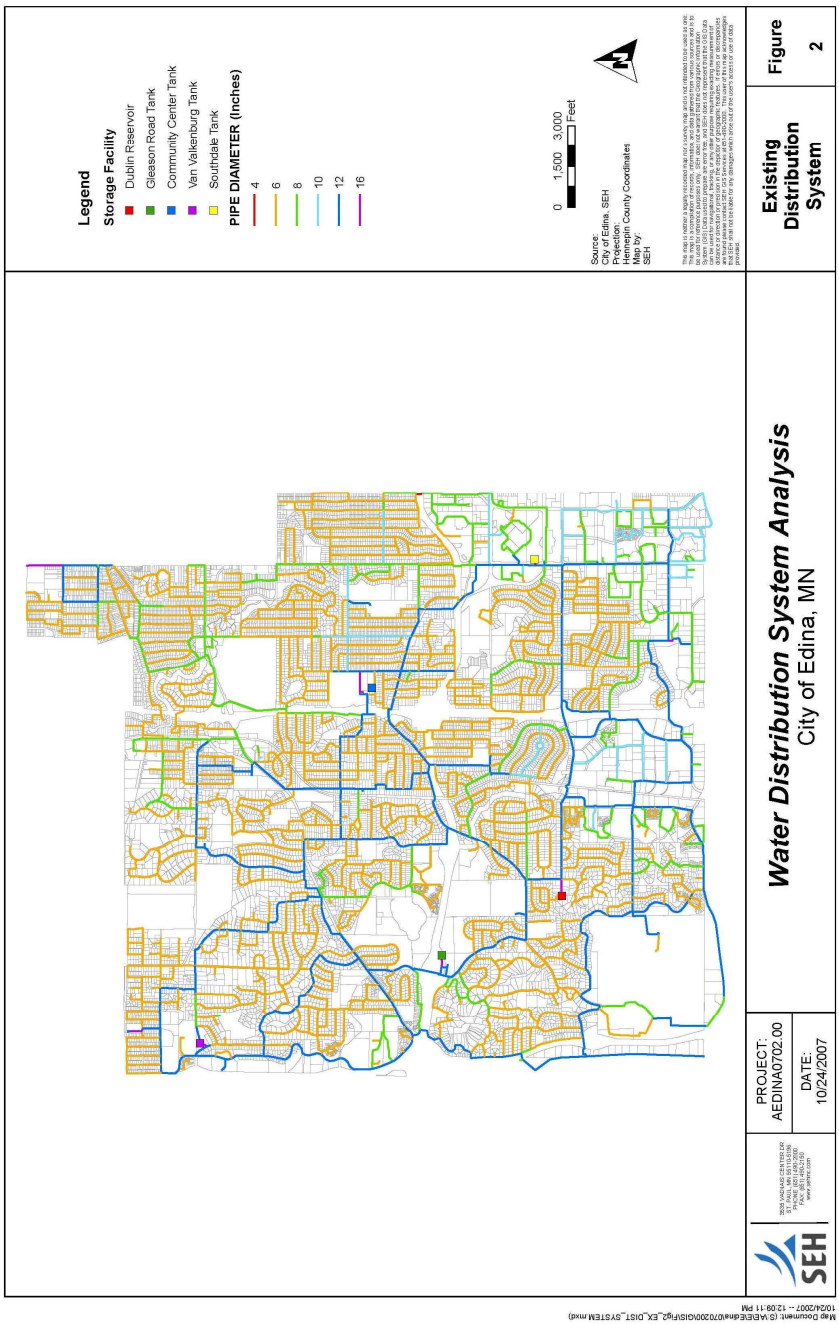
Legend
Storage Facility
Dublin Reservoir
Gleason Road Tank
Community Center Tank
Van Valkenburg Tank
Southdale Tank
PIPE DIAMETER (Inches)
4
6
8
10
12
16
0 1,500 3,000 Feet
Source:
City of Edina, SEH
Projection
Hennepin County Coordinates
Map By:
SEH
Existing Distribution System
Figure 2
Water Distribution System Analysis
City of Edina, MN
PROJECT:
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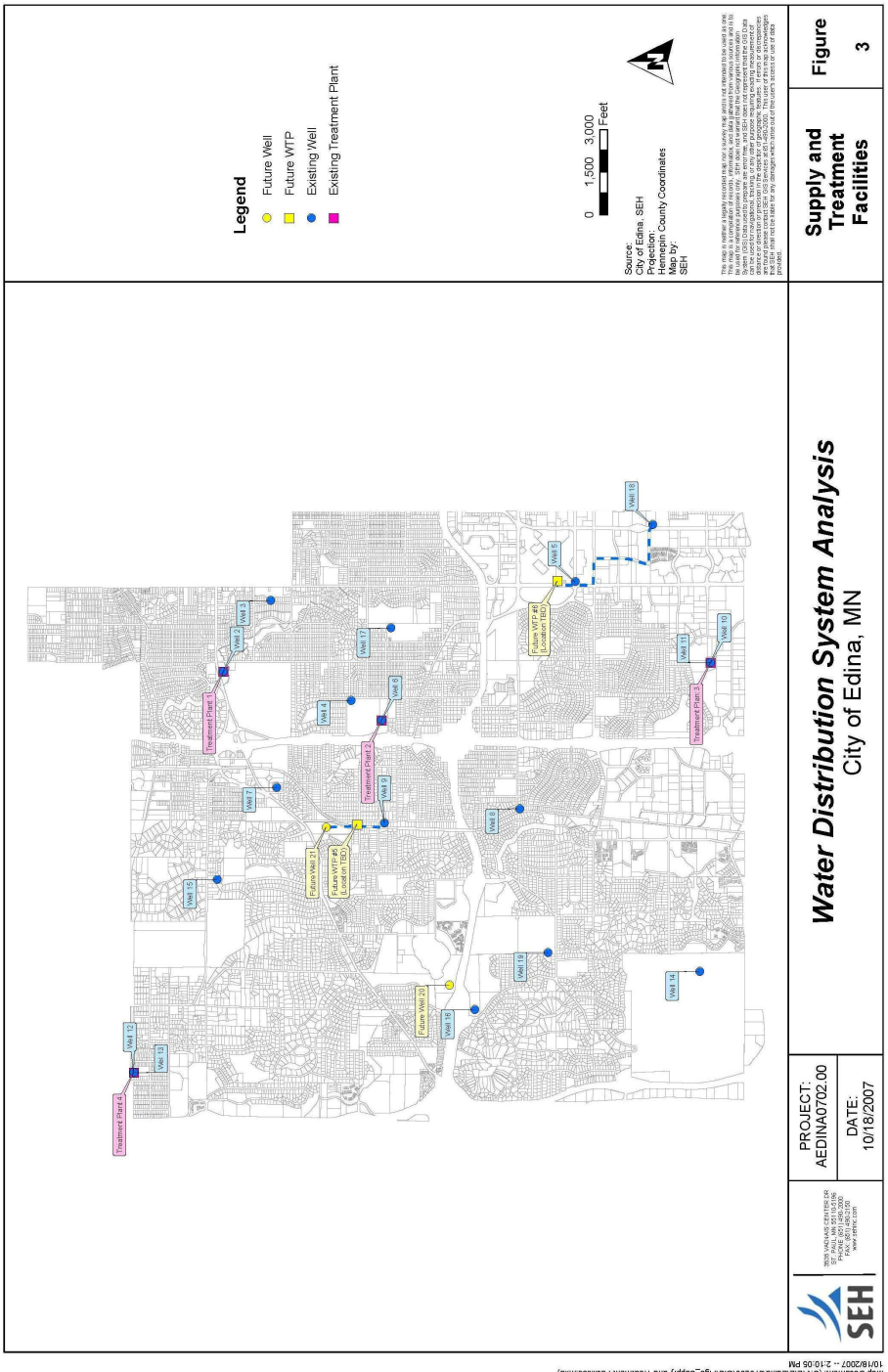
SEH


Legend
Future Well
Future WTP
Existing Well
Existing Treatment Plant
0 1,500 3,000 Feet
Source:
City of Edina, SEH
Projection:
Hennepin County Coordinates
Map by:
SEH
Water Distribution System Analysis
City of Edina, MN
Supply and Treatment Facilities
Figure 3
PROJECT: AEDINA0702.00
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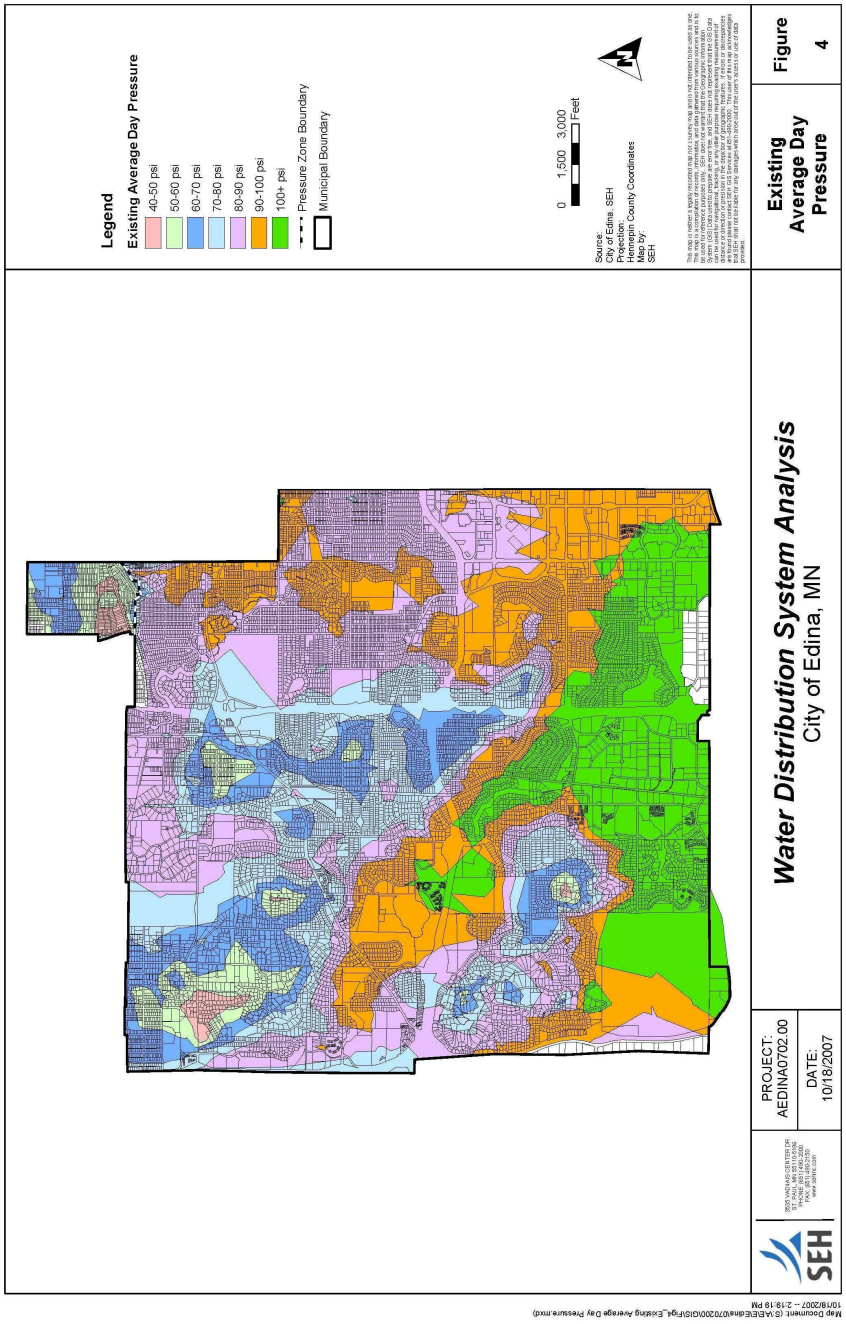
Legend
Existing Average Day Pressure
40-50 psi
50-60 psi
60-70 psi
70-80 psi
80-90 psi
90-100 psi
100+ psi
Pressure Zone Boundary
Municipal Boundary
0 1,500 3,000 Feet
Source:
City of Edina, SEH
Projection:
Hennepin County Coordinates
Map by:
SEH
Existing Average Day Pressure
Figure 4
Water Distribution System Analysis
City of Edina, MN
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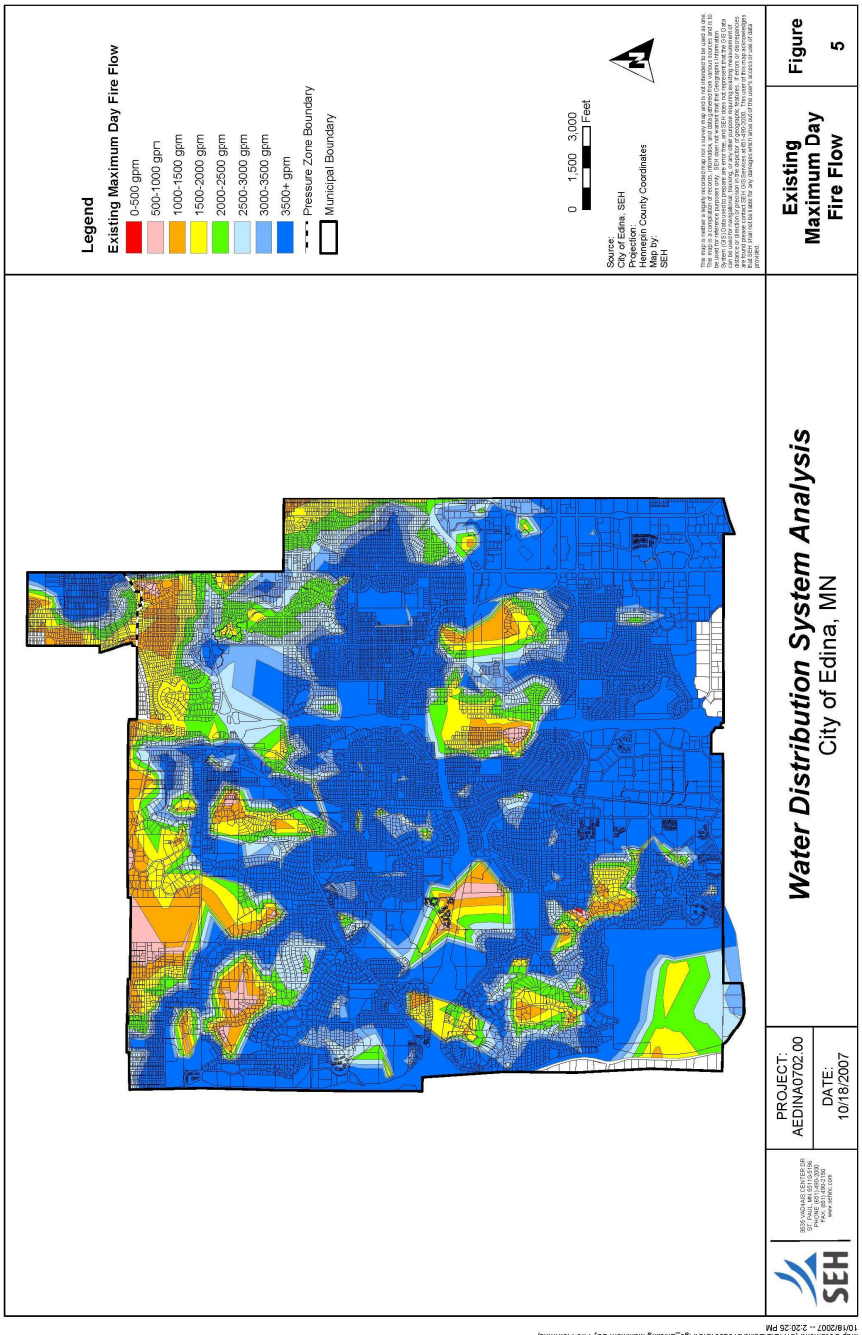
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Existing Maximum Day Fire Flow
0-500 gpm
500-1000 gpm
1000-1500 gpm
1500-2000 gpm
2000-2500 gpm
2500-3000 gpm
3000-3500 gpm
3500+ gpm
Pressure Zone Boundary
Municipal Boundary
0 1,500 3,000 Feet
N
Source:
City of Edina, SEH
Projection:
Hennepin County Coordinates
Map by:
SEH
Existing Maximum Day Fire Flow
Figure 5
Water Distribution System Analysis
City of Edina, MN
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