



# 2040 COMPREHENSIVE PLAN

## MEDINA COMPREHENSIVE SANITARY SEWER PLAN

HENNEPIN COUNTY | MEDINA, MINNESOTA

Adopted October 2, 2018

Prepared for:  
City of Medina  
2052 County Road 24  
Medina, MN 55340

WSB PROJECT NO. 2712-53



## TABLE OF CONTENTS

<b>INTRODUCTION .....</b>	<b>1</b>
<b>CITY DESCRIPTION .....</b>	<b>2</b>
<b>EXISTING SANITARY SEWER SYSTEM.....</b>	<b>3</b>
Public Collection Systems .....	3
Public Treatment Systems .....	3
Private Treatment Systems.....	3
Population.....	7
Land Use.....	8
Wastewater Flows .....	8
Private Systems.....	8
<b>SANITARY SEWER DESIGN CRITERIA.....</b>	<b>9</b>
Land Use.....	9
Estimated Average Flows – Existing.....	9
Estimated Average Flows – 2040 Build Out.....	9
Peak Flow Factors .....	10
Intercommunity Flows .....	11
<b>SANITARY SEWER TRUNK RECOMMENDATIONS .....</b>	<b>12</b>
Elm Creek District.....	12
Maple Plain District.....	15
Morningside District.....	16
Plymouth District .....	16
Individual Sewage Treatment Systems .....	16
<b>INFLOW AND INFILTRATION.....</b>	<b>17</b>
General.....	17
I/I Analysis.....	18
Municipal I/I Reduction.....	21
I/I Cost Analysis.....	22
I/I Mitigation Plan .....	23
<b>COST ESTIMATES AND FINANCING .....</b>	<b>24</b>
<b>SUMMARY AND OUTCOMES.....</b>	<b>24</b>

# INTRODUCTION

The City of Medina is required to prepare a Comprehensive Plan that aligns with the Metropolitan Council's Metropolitan System Plan every ten years per Minnesota Rule 473.858. An important part of the Comprehensive Plan is the Sanitary Sewer Plan, which describes the existing sewer system and outlines the timing and sequence of future projects. The Sanitary Sewer Plan allows the City and Metropolitan Council to build and improve their sanitary sewer collection and treatment systems so that development can occur in the most efficient and cost-effective manner. This document serves as the sanitary sewer component for the City of Medina's 2040 Comprehensive Plan.

The City of Medina's Sanitary Sewer Plan was developed to align with the Metropolitan Council's Thrive MSP 2040 Water Resources Policy Plan. The Thrive MSP 2040 Plan was approved in May 2015 and outlines regional goals for the wastewater system, including environmental sustainability; water reuse; and water conservation. Additionally, the Thrive MSP 2040 Plan includes population, household, and employment projections alongside projected wastewater flows.

As a result of projected population increases and land use changes in Medina, the City estimates wastewater flows will increase significantly between 2010 and 2040. This Sanitary Sewer Plan outlines the locations in which the Metropolitan Council can expect to see increased wastewater flows, allowing the Council to determine if capacity upgrades will be required at regional wastewater treatment plants and interceptors. It is also a guiding document for City infrastructure improvements and expansion.

## **CITY DESCRIPTION**

The City of Medina is located in western Hennepin County and is bordered by Plymouth on its east, Corcoran on its north, Independence and Maple Plain on its west, and Orono on its south. Wastewater flows from Greenfield and Independence are also conveyed through Medina. The City of Loretto is 185 acres and is completely contained within Medina. The City of Medina is primarily residential and agricultural, though approximately 38% of the City is covered by lakes, wetlands, and floodplains.

Medina has been designated primarily as a diversified rural community. This designation indicates that the Metropolitan Council expects that the majority of Medina will maintain a “rural lifestyle” and may become urbanized after 2040. The northeast area of the City is designated as an emerging suburban edge, signifying that it is in the early stages of transitioning into urbanized development. For the last decade, Medina’s emerging suburban edge has been a region of focus in regards to the expansion and maintenance of municipal services. Thus, the Comprehensive Sewer Plan will focus heavily on the needs and future plans of the northeast region of Medina.

# EXISTING SANITARY SEWER SYSTEM

## Public Collection Systems

The existing sanitary sewer system of Medina has four service districts: Elm Creek, Maple Plain, Morningside, and Plymouth. The largest service area is the Medina Elm Creek system. This system is located in the northeast region of the city surrounding Highway 55 and discharges to the Elm Creek Interceptor, which then leads to the Metropolitan Wastewater Treatment Plant (WWTP) in St. Paul. The other three service areas of Medina are significantly smaller than the Medina Elm Creek system and are located on the west, south, and east borders of the city. A map of the existing sanitary sewer system is shown in **Figure 1**.

The service area located on the western border of Medina is the Maple Plain district, located along the eastern shore of Lake Independence. This system discharges to Metropolitan Council Environmental Services (MCES) Interceptor 8352 via MCES lift station L63 in Maple Plain and is ultimately served by the Blue Lake WWTP in Shakopee.

The third sewage service district is Morningside, located on the southern border of Medina. The Morningside system discharges to Interceptor 8352 via MCES lift station L60 in Orono. From Interceptor 8352, the sewage from the Maple Plain and Morningside districts is directed to the Blue Lake WWTP in Shakopee.

The fourth, and smallest, sewer district is the Plymouth district, located on the eastern border of Medina along Holy Name Lake. The Plymouth district sewage is connected to the City of Plymouth sewer system, which is fed to the Metropolitan WWTP.

The four sewer service areas as well as their subsewersheds are illustrated in **Figure 2**.

## Public Treatment Systems

Within the City, there is one on-site treatment system that serves the City of Loretto. Medina does not have involvement with the operations of Loretto's sanitary sewer system; it is operated entirely by Loretto.

## Private Treatment Systems

There are currently 702 known individual sewage treatment systems (ISTs or septic systems) within the City of Medina, as shown in **Figure 3**. This value has stayed constant since the 2008 Comprehensive Plan development: there were 705 septic systems in the City in 2008. The City Code addresses septic systems in Section 720. The ordinance mandates that septic systems meet Minnesota Pollution Control Agency requirements. Defined in the provisions are sizing requirements, technical standards, abandonment requirements, solids removal frequency, and floodplain and groundwater avoidance. A permit is required to install a new system, replace an existing system, or repair a system when the original function, capacity, or location will be altered. ISTS owners must submit an Assessment and Maintenance Report Form every three years.

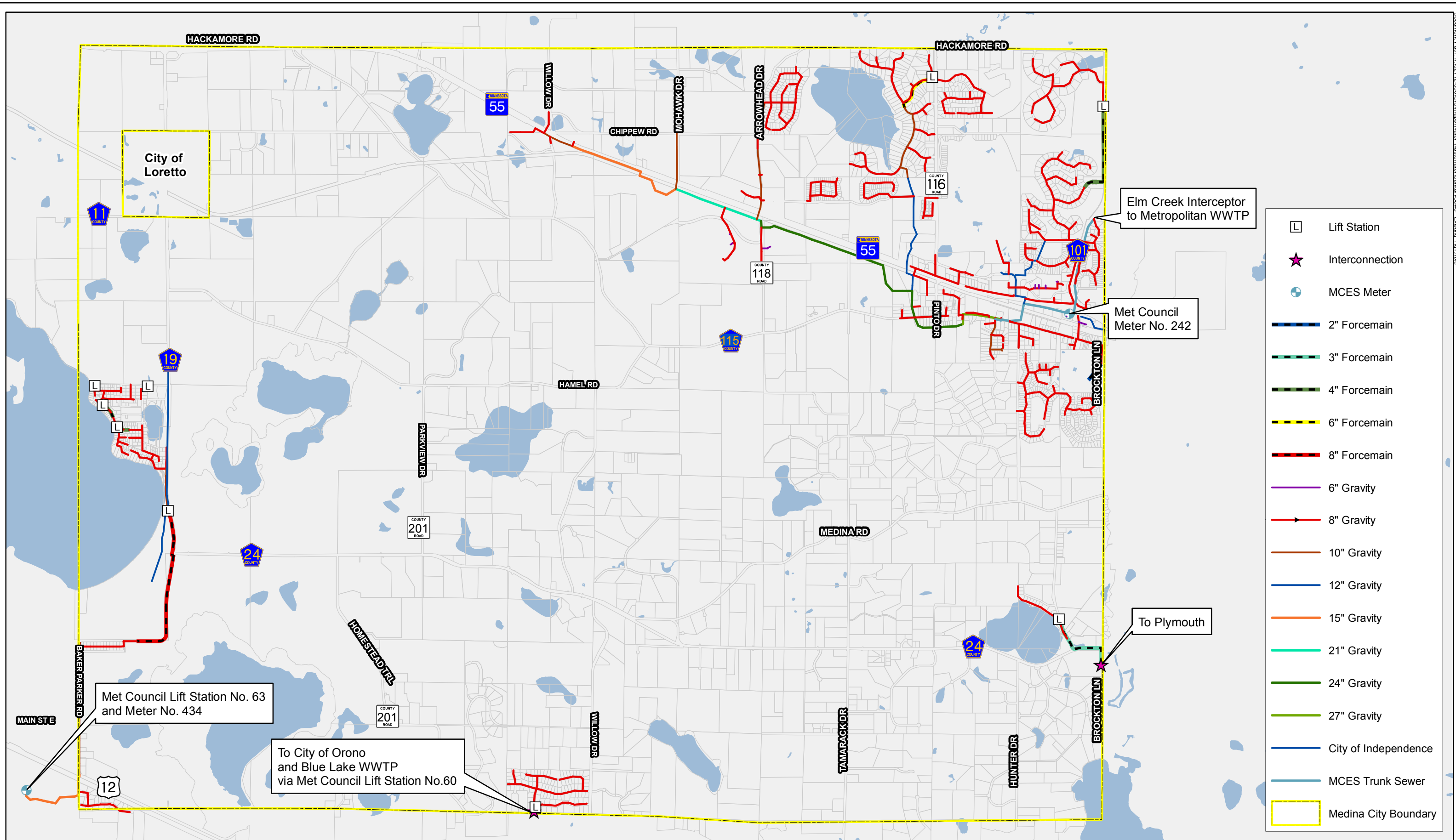
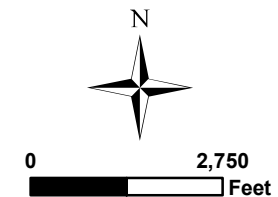
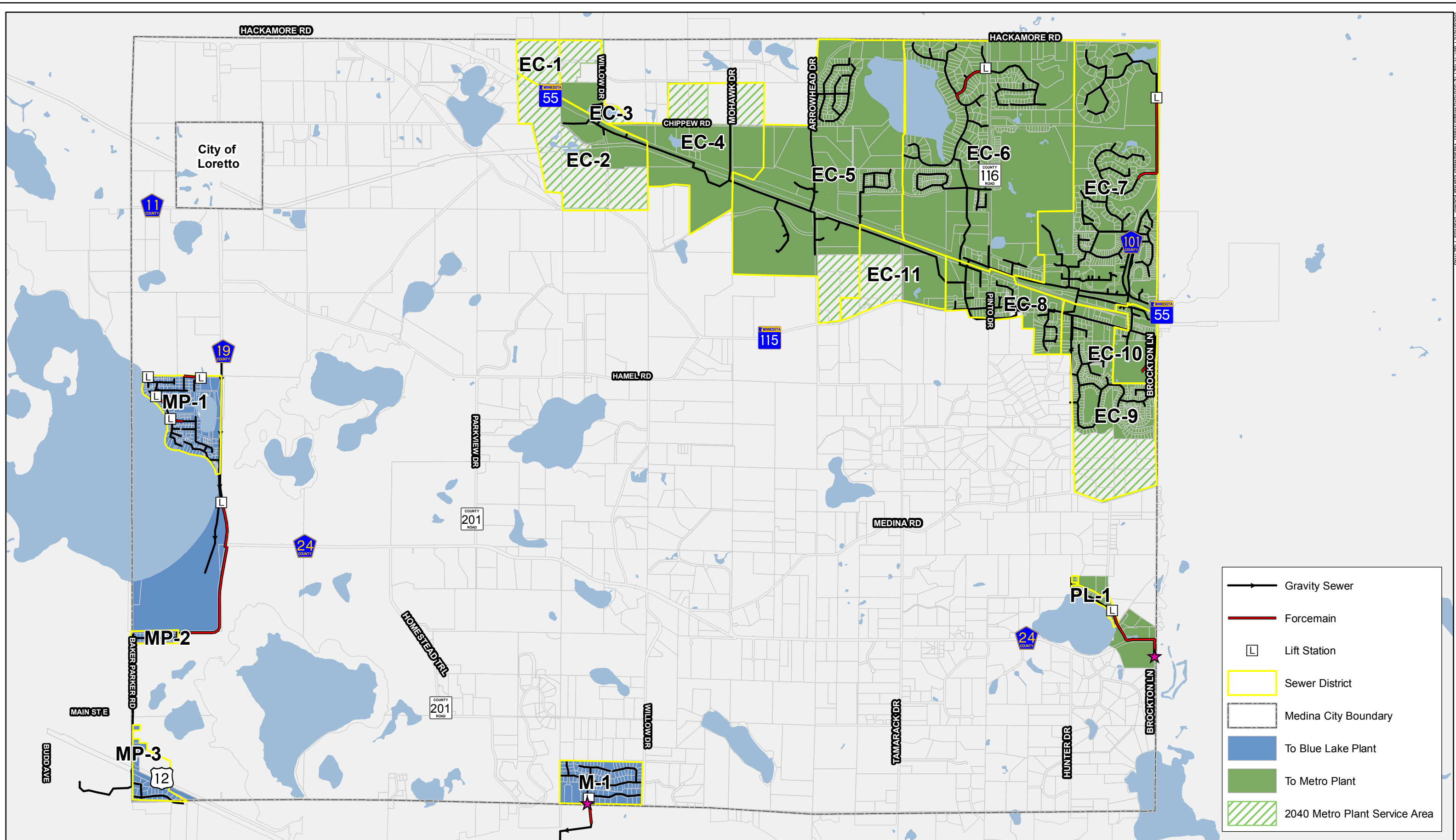


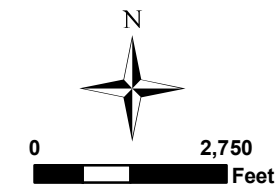
Figure 1: Existing Sanitary Sewer System  
Medina Sanitary Sewer Plan  
Medina, MN

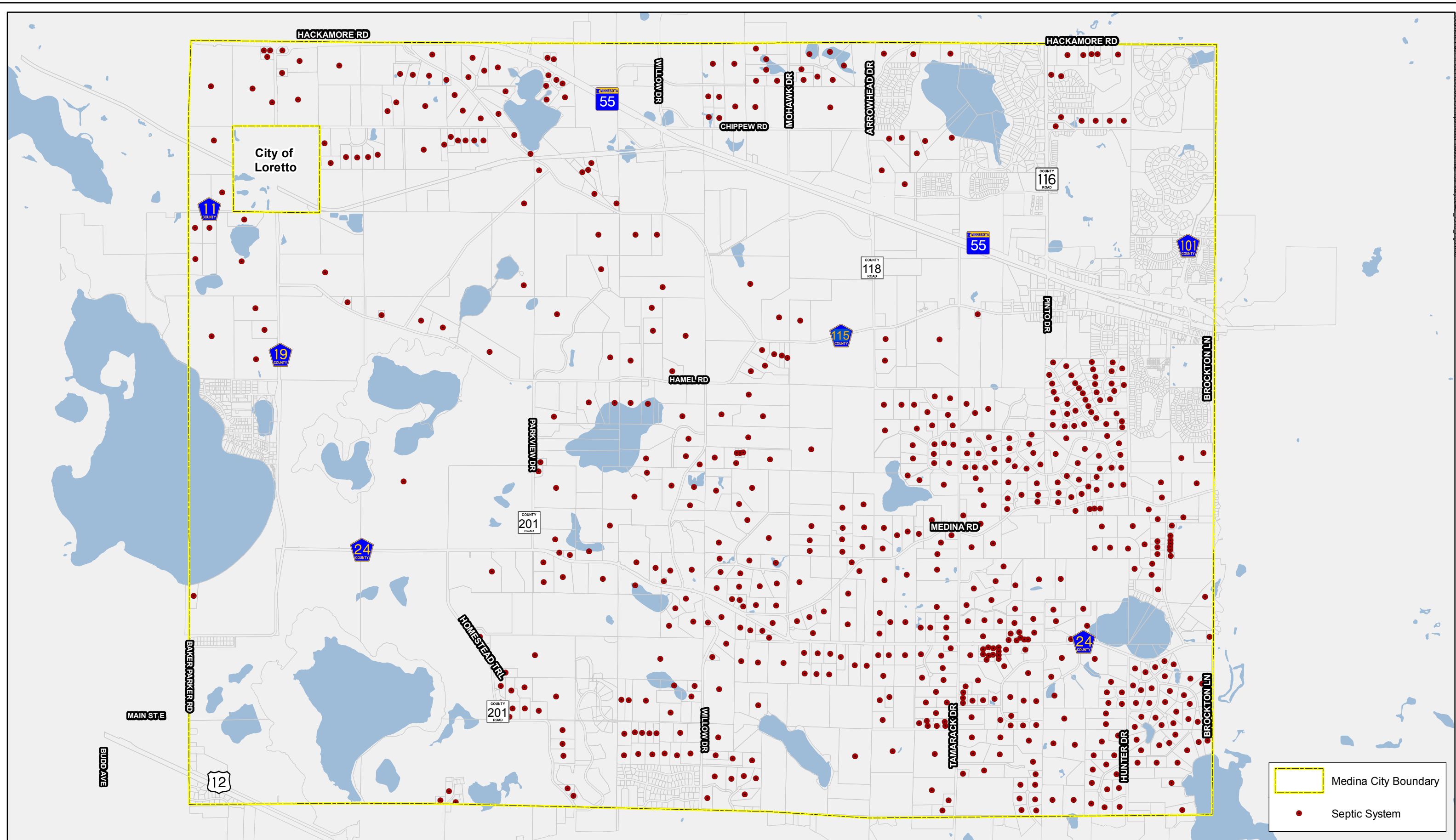




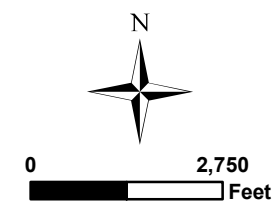


**Figure 2: Existing and 2040 WWTP Boundaries**  
**Medina Sanitary Sewer Plan**  
**Medina, MN**





**Figure 3: Individual Sewage Treatment Systems (ISTS)**  
**Medina Sanitary Sewer Plan**  
**Medina, MN**





# FORECASTS

## Population

The Metropolitan Council publishes population and sewer usage forecasts for each city in the Metropolitan Area. These forecasts serve to help cities prepare infrastructure for growth and to promote continued maintenance of municipal infrastructure. The forecast data in Tables 1 and 2 is from the Metropolitan Council's Local Planning Handbook Community Page for Medina. Table 1 forecasts the City population and Table 2 forecasts sewered and unsewered populations in the City. Table 3 forecasts the sewered populations based on MCES WWTP and Interceptor. The data shown in Table 3 in the tables was developed using the City's population projections in conjunction with the future land use map. For sanitary sewer infrastructure planning, the midpoint of density ranges for each land use type were used rather than the minimum in order to be conservative.

**Table 1. Population Projections, City of Medina**

Year	Total			Sewered		
	Population	Households	Employment	Population	Households	Employment
2010	4,892	1,702	3,351	2,965	1,032	3,146
2020	6,600	2,300	4,980	4,500	1,570	4,780
2030	7,700	2,840	5,300	5,660	2,090	5,100
2040	8,900	3,400	5,500	6,880	2,630	5,300

From the data in Table 1, it can be observed that from 2010 to 2040, the households population is expected to almost double. Furthermore, the employment population is projected to grow by approximately 64% by 2040. The Metropolitan Council's forecasts show that the number of sewered households is anticipated to more than double by 2040. The sewered employment population is anticipated to increase by approximately 68% by 2040. The sewered projections by MCES Interceptor and WWTP shown below are taken from the Metropolitan Council's forecasts and altered to reflect the locations in the City where Medina is expecting to develop.

**Table 2. Sewered Projections by WWTP Service**

Year	Metropolitan WWTP Interceptor 9004-2			Blue Lake WWTP Interceptor 8352		
	Population	Households	Employment	Population	Households	Employment
2010	2,355	877	3,056	610	155	90
2020	3,450	1,255	4,750	1,050	315	30
2030	4,620	1,775	5,070	1,040	315	30
2040	5,840	2,315	5,270	1,040	315	30

From Table 2, it can be observed that the largest increase in service to the WWTPs from 2020 to 2040 will occur in the Metropolitan WWTP service area in the northeast area of the City. It is projected that the population served will increase by approximately 2,400 individuals from 2020 to 2040. The residential area served by the Blue Lake WWTP is expected to add 160 high density residential units,

which account for the population increase in this area from the existing 610 individuals served. This development will replace existing commercial property, thereby decreasing the number of employees in the Blue Lake WWTP service area.

## Land Use

Currently, the City of Medina has four general land use regions: park/recreational/preserve, undeveloped/agricultural, mixed use retail/commercial/industrial, and residential.

The Baker Park Reserve, operated by the Three Rivers Park District, incorporates the majority of the southwestern region of Medina. Regions of undeveloped land alongside agricultural land exist through the majority of the central and southeastern region of the city. Many of these land-type users have private sewage systems. The two land uses of mixed use retail/commercial/industrial and housing are located in the northeastern region of the city and are the most populous users of the public sewage system.

## Wastewater Flows

Table 3 shows the wastewater flow projections by wastewater treatment plant. The forecasts are based on 75 gallons per day (gpd) per person and 25 gpd per employee. The Metropolitan Council initially planned to serve the northwestern part of Medina, as well as Loretto and Corcoran, via the Elm Creek Interceptor northeast of the City boundary. The Metropolitan Council now plans to serve this portion of Medina, along with the two other communities, with the Blue Lake Plant via Maple Plain. Therefore, Medina is not planning to receive wastewater flows from Corcoran in its future system, while flows from Loretto are assumed in the future calculations to allow for flexible timing with the connection to the Blue Lake Plant.

**Table 3. Wastewater Flow Projections by WWTP**

Year	Blue Lake WWTP (MGD)*	Metropolitan WWTP (MGD)	Total (MGD)
Existing	0.071	0.300	0.371
2020	0.175	0.605	0.780
2030	0.175	0.736	0.911
2040	0.175	0.749	0.924
*Medina is also planning to serve Loretto through its system. These flows are included in Table 3 along with existing flows from Greenfield and Independence.			

## Private Systems

A significant area of Medina falls under the designation of diversified rural communities. Diversified rural communities are characterized by farm use, large-lot residential, clustered housing, and regional parks. These communities are often located adjacent to emerging suburban edges, as is the case in Medina. The Metropolitan City Council “discourages urbanized levels of residential development in diversified rural communities to avoid the premature demand for expansion of metropolitan systems and other urban public services” (Thrive MSP 2040). Thus, the majority of Medina’s diversified rural community continues to use private treatment systems.

# SANITARY SEWER DESIGN CRITERIA

## Land Use

The City's existing and 2040 land-use maps were used in the development of this plan. Detailed information and figures regarding Medina's land use is included in the City's 2040 Comprehensive Plan in Chapter 5: Land Use and Growth. Using existing land-use, metering data, and future land use information, current and ultimate flows were calculated and divided by subsewershed as described below.

## Estimated Average Flows – Existing

To estimate the flows in trunk mains throughout the City, metering data was retrieved from the Metropolitan Council. The Elm Creek Area of the City is metered by the Metropolitan Council via meter number 242. To more precisely evaluate flows within the Elm Creek sewershed, flows were assigned within each subsewershed based on development. Flows were assigned proportionally based on the number of residences, businesses, and industrial establishments connected to the sanitary sewer system.

## Estimated Average Flows – 2040 Build Out

Once average flows were estimated, future flows were projected based on the 2040 land use map. Parcels that are planned to be developed were assigned wastewater flow rates in accordance to their land use type. The assigned flows are shown and include design considerations for inflow and infiltration (I/I). See the Inflow and Infiltration Section for more information about I/I as it relates to Medina's sanitary sewer system.

**Table 4. Assumed Gallons Wastewater Generation by Land Use Type**

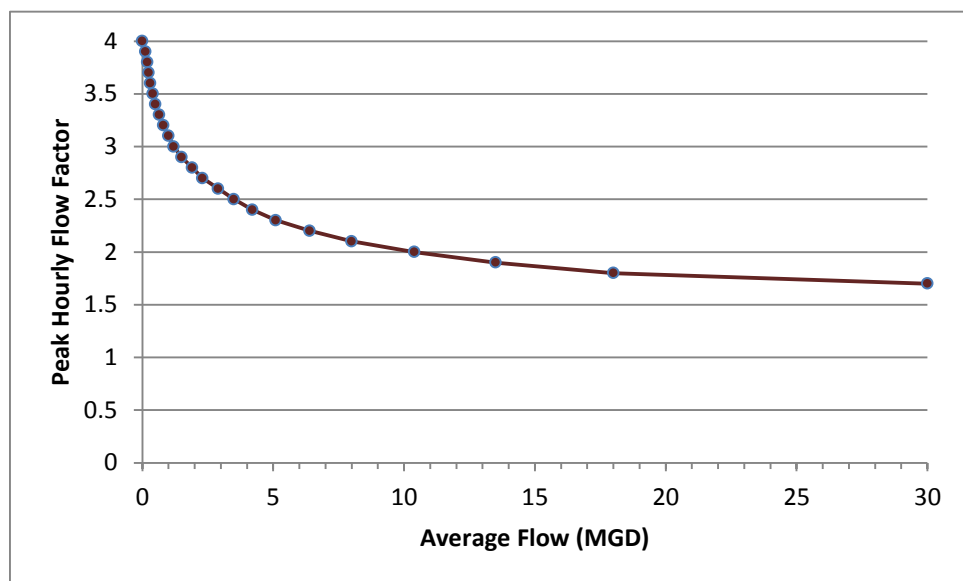
Land Use	Units per Acre	Average Flow (gallons per acre per day)
Agriculture	N/A	0
Business	N/A	800
Commercial	N/A	800
Institutional	N/A	800
Low Density Residential	2.5	550
Medium Density Residential	5.0	1,100
High Density Residential	13.5	3,000
Mixed Residential	3.75	825
Private Recreation	N/A	0
Rural Commercial	N/A	0
Right-of-Way	N/A	0
Rural Residential	N/A	0
Closed Sanitary Landfill	N/A	0
Lakes/Open Water	N/A	0

Future flows were added to existing flows to determine if pipe capacity will be sufficient. In locations in which development will lead to pipes that are under capacity, recommendations are made to address the issue. Areas that will need to be served in the future were evaluated to determine the required sewer diameter.

## Peak Flow Factors

To ensure that the sanitary sewer system is capable of handling flow fluctuations throughout the day, peak flow factors are assigned based on average flows. The peak factors are outlined by the Metropolitan Council and are based on average flow volumes. Pipes that serve small generator customers are more likely to experience large fluctuations in flows. Therefore, the peak factor decreases as average flow increases. The Metropolitan Council peak flow factors for sanitary sewer design are shown in **Figure 4** below.

**Figure 4. MCES Peak Factors for Sanitary Sewer Design.**



## **Intercommunity Flows**

### ***Into Medina***

Wastewater from the City of Independence and, indirectly, the City of Greenfield is transported through Medina's collection system. There is also one business in Plymouth that is served by Medina's sanitary sewer system. During the 2030 Comprehensive Planning cycle, the Metropolitan Council was planning to serve Loretto and southwest Corcoran with the Elm Creek interceptor in eastern Medina. At this time, the Council has altered its plans so that these areas will be served via Maple Plain and the Blue Lake WWTP. The existing flow estimates for Medina include sewage discharge from these communities. However, the ultimate design flows do not plan for any increases through the neighboring Cities because of the aforementioned change in Council plans. Because the timing of this change is unknown, the design flows for Medina include the existing flows as a base for conservative design.

### ***Out of Medina***

In addition to the interceptor in Maple Plain that receives flows from the western portion of the City, Medina sends wastewater to Orono and Plymouth as well. The Morningside sewer district, consisting of approximately 104 residential lots, sends its wastewater south to Orono. Plymouth serves 16 homes, a church, and a school on the eastern side of Medina. The connection is unmetered.



## SANITARY SEWER TRUNK RECOMMENDATIONS

The proposed future sewer system for the City of Medina, including subsewersheds, gravity mains and forcemains, and required lift stations, is shown in **Figure 5**. The required infrastructure additions were determined based on the areas the City is planning to develop by 2040. By evaluating topography and existing sewer invert elevations, the locations of future lift stations were approximated. The length of forcemain was minimized to the greatest extent possible to reduce construction costs. This report includes only oversized sewer lines (greater than 8") and does not depict lateral lines. The design and siting for lateral lines should be completed in conjunction with development plans and platting. The location of such lines will be dependent on parcel layout and the design of new roads. It is possible that small scale lift stations will be required within developments.

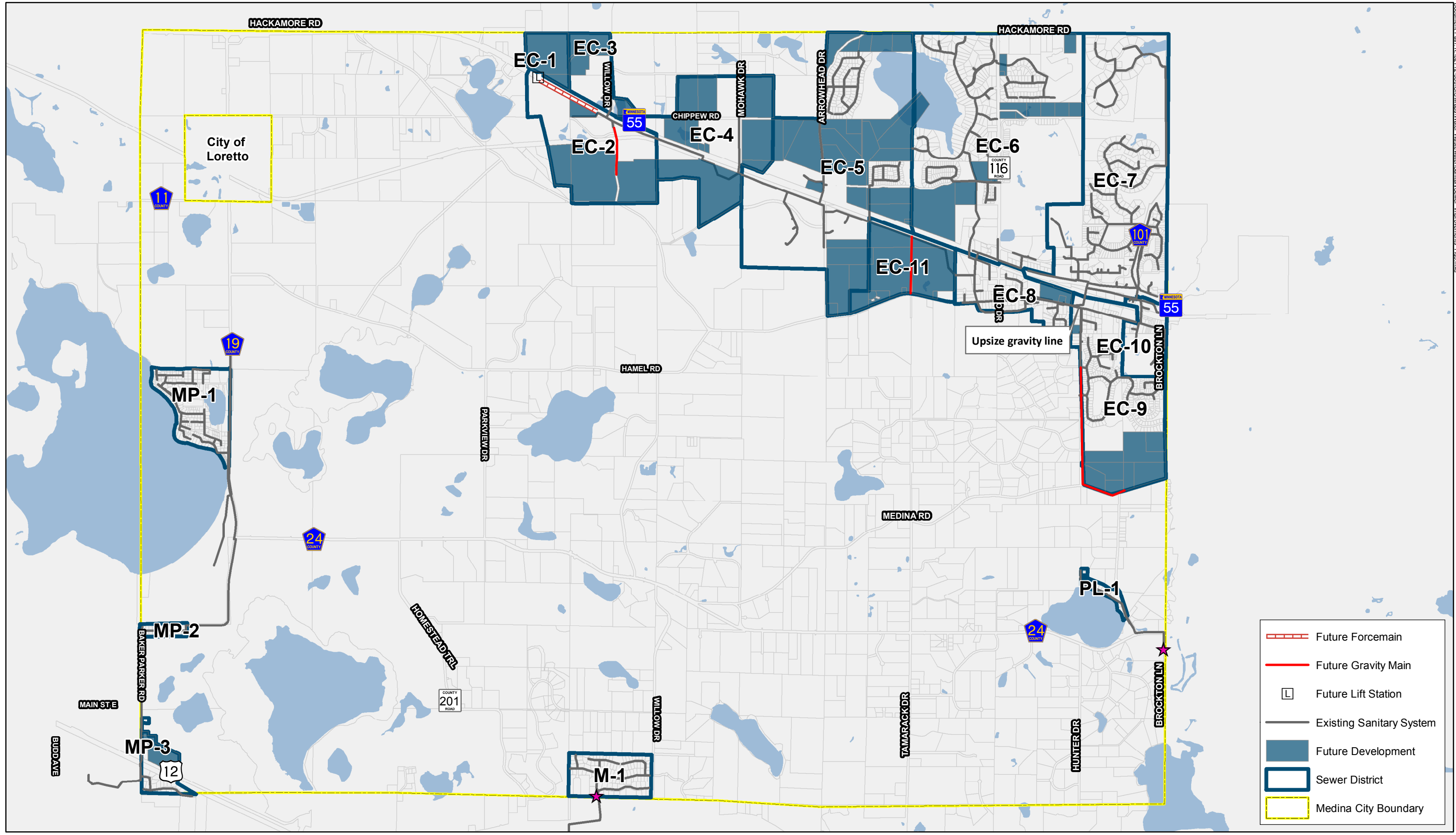
The exact alignment of the proposed mains and lift stations may change during the design phase of each project. The purpose of this report is to provide the City with a document that can be used to plan for large infrastructure additions and replacements.

### Elm Creek District

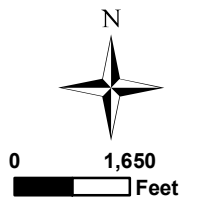
The Elm Creek District is the area along Highway 55 that is ultimately served by the Metropolitan WWTP. This interceptor collects sewage from the area of the City that is primarily expected to develop. The estimated 2040 flows are shown in Table 5. The land-use types and acreages of the properties expected to develop are shown in **Figure 6**.

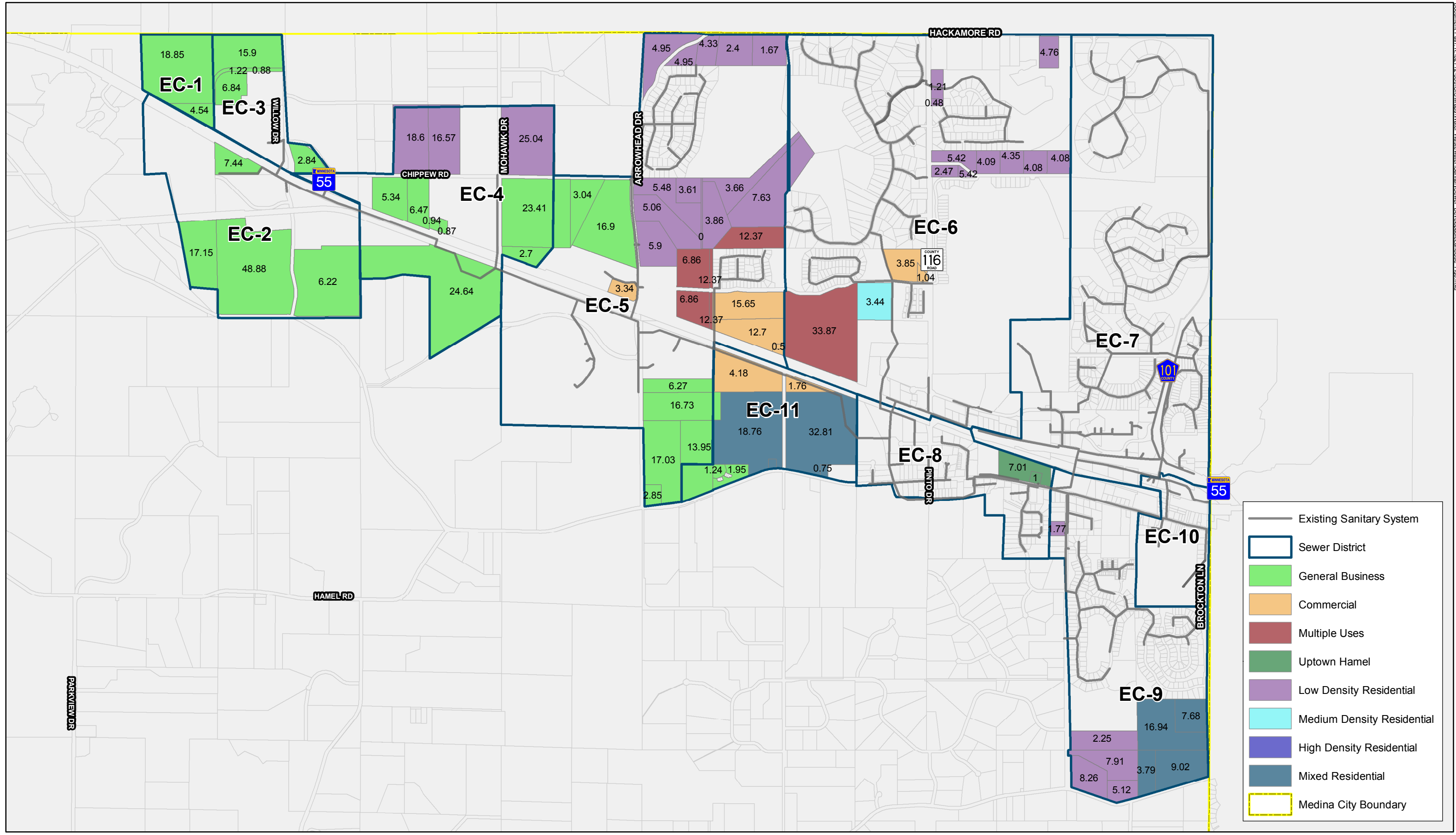
**Table 5. Projected 2040 Flows for Elm Creek Sewer District Based on Development**

Sewershed	Existing Flows (gpd)	Added Flows (gpd)	2040 Flows – Average Day (gpd)
EC-1	0	18,719	18,719
EC-2	14,285	63,751	78,036
EC-3	10,349	21,438	31,787
EC-4	6,787	84,619	91,406
EC-5	34,508	128,365	162,873
EC-6	42,292	60,880	103,172
EC-7	66,214	0	66,214
EC-8	26,224	6409	32,633
EC-9	49,714	70,558	120,272
EC-10	5,128	0	5,128
EC-11	0	64,031	64,031
<b>TOTAL</b>	<b>255,500</b>	<b>518,770</b>	<b>774,270</b>

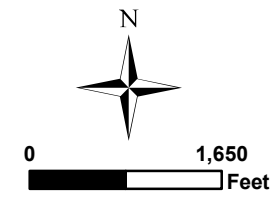


**Figure 5: Sanitary Sewer Improvements**  
**Medina Wastewater Plan**  
**Medina, MN**





**Figure 6: Developable Land Acreage**  
**Medina Sanitary Sewer Plan**  
**Medina, MN**



It is anticipated that one new municipal lift station will be required to serve the western portion of the Elm Creek District, as shown in **Figure 5**. The lift station is expected to be required on Highway 55 near Rolling Hills Road. It is likely that a second lift station will be required to serve the property Willow Drive north of Cates Ranch Drive. However, this will be a private lift station that the developer will be responsible for funding.

The remainder of the trunk system that will be required to serve future development is planned to consist of approximately 1,600 feet of city-funded gravity main, 1.8 miles of overdepth pipe, and 700 feet of forcemain. The timing and estimated cost of future improvements are tabulated in the “Cost Estimates and Financing” section.

In the eastern area of the Elm Creek District, just upstream of the Metropolitan Council interceptor, exists a bottleneck in which a 350 feet long 8” diameter pipe serves 382 homes as well as 5 acres of business development. To address capacity issues and ensure that future development in the southern part of the Elm Creek District can be served, this pipe should be upsized to at least a 10” diameter main, or a parallel 8” main should be installed.

In the City’s 2030 Comprehensive Plan, it was anticipated that a parallel pipe would be required along Highway 55. Because the City did not develop as predicted and because the City is no longer planning to receive flow from Loretto and Corcoran through this pipe, it is not expected that the City will need to install a parallel main on Highway 55 between Willow Drive and Chippewa Drive.

## **Maple Plain District**

The Maple Plain district is located on the western edge Medina. The district includes the Independence Beach, Sycamore Trail, and Park Ridge Acres neighborhoods, as well as the property at the northeast corner of Highway 12 and County Road 29. The cities of Independence and Greenfield also currently discharge flow into this district through a Tri-City Agreement with Medina.

The Metropolitan Council intends to extend an interceptor along County Road 19 to serve the cities of Independence, Greenfield, Loretto, and Corcoran. It is anticipated that flows from northwest Medina will also be served through this interceptor. The City has designated 367 net acres as Future Development Area in this area for potential development after the timeframe contemplated by this Plan.

The City of Loretto, Minnesota Pollution Control Agency, and Metropolitan Council seek to phase out Loretto’s WWTP. The Metropolitan Council and cities of Medina, Independence, and Loretto have been collaborating on finding a solution to allow Loretto to connect to the Tri-City system prior to the extension of the Metropolitan Council interceptor. As a result, this plan considers an estimated flow of 70,000 gpd from Loretto in its calculations. It is expected that the City’s collection system would be capable of adding Loretto’s flows at this time, subject to certain capacity and operational upgrades that would need to be provided and paid for by others.

While the Metropolitan Council has projected that the employment population will increase between 2020 and 2040, it has not projected a population increase. However, the City’s land use plan proposes to change approximately 13.5 acres at the northeast corner of Highway 12 and County Road 29 from Commercial to High Density Residential. This would result in an addition of approximately 160 residential units and a reduction in employment of approximately 60. In addition, there are several lots

that have been platted but on which homes have not yet been constructed. Therefore, the wastewater flows from these parcels will need to be accounted for in the future condition. The existing and future flows are estimated below:

**Table 6. Projected 2040 Flows for Maple Plain District Based on Development**

Timeframe	Average Flow (gpd)*
Existing Flow	61,380
2020	175,220
2030	175,220
2040	175,220
*Increased flows are due to high density residential development in MP-3. Future flows include flows from approximately 700 individuals in Loretto (70,000 gpd).	

### **Morningside District**

The Morningside District is located on the southern edge of Medina and consists mainly of small lateral lines. At this time, approximately 104 homes are in the Morningside District, which send their flows through an unmetered interconnection with Orono. It is estimated that 25,000 gpd flow through the Morningside District to Orono on an average day. It is not anticipated that there will be any new growth or land-use changes in the Morningside District that would require the City to plan for increased discharges.

### **Plymouth District**

The Plymouth District, located on the eastern side of Medina, consists of 16 homes and one church and is fully built out, with the exception of a few single-family residential parcels. It is not anticipated that there will be any substantial increase in the flows that Medina will send through Plymouth by 2040. If the City wishes to develop the area adjacent to the existing Plymouth subsewershed after 2040, Plymouth staff have indicated that they may have capacity to accept some additional flows from Medina.

### **Individual Sewage Treatment Systems**

As development continues to occur throughout Medina, it is recommended that the City encourages homeowners to connect to the municipal sanitary sewer system as it becomes available. Having residents abandon ISTS's will promote groundwater quality and will reduce the risks associated with noncompliant systems.



# INFLOW AND INFILTRATION

## General

Infiltration is water that enters the sanitary sewer system through defects in the sewer pipes, joints, manholes, and service laterals, or by deliberate connection of building foundation drains. Water that enters the sewer system from cross connections with storm sewer, sump pumps, roof drains, or manhole covers is considered inflow.

Water from inflow and infiltration (I/I) can consume available capacity in the wastewater collection system and increase the hydraulic load on the treatment facility. In extreme cases, the added hydraulic load can cause bypasses or overflows of raw wastewater. This extra hydraulic load also requires a larger capacity in the city's collection and treatment components, which results in increased capital, operation and maintenance, and replacement expenses. As sewer systems age and deteriorate, I/I can become an increasing burden on a City's system. Therefore, it is imperative that I/I be reduced whenever it is cost effective to do so.

In February 2006, the MCES adopted the Ongoing I/I Program which requires communities within their service area to eliminate excessive I/I. The MCES establishes annual I/I goals for each community discharging wastewater into the Metropolitan Disposal System (MDS) based on adjusted 10-year rolling average daily flows and I/I mitigation peaking factors. The City of Medina was identified by the MCES as a community with excessive I/I due to peak flow events in 2013, 2014, and 2016.

## I/I Analysis

The majority of the sanitary sewer system in the City is above the water table. The system currently consists of approximately 40 miles of sanitary main and nine (9) lift stations, of which a majority was built within the last 40 years. All pipes are located in drained urban areas. Approximately 198 of the residential housing units in the City were constructed prior to the year 1970. However, nearly all of these properties were served by ISTS and did not receive sanitary sewer service until after 1970. These sanitary sewer service connections were new connections made in the front of the property, while the ISTS were generally located in the rear of the property. The nine (9) pre-1970 era private services are located in the northeast corner of the City along Highway 55 and have not been evaluated for I/I susceptibility. A breakdown of the residential housing stock served by the City sanitary sewer system is shown in **Figure 7**.

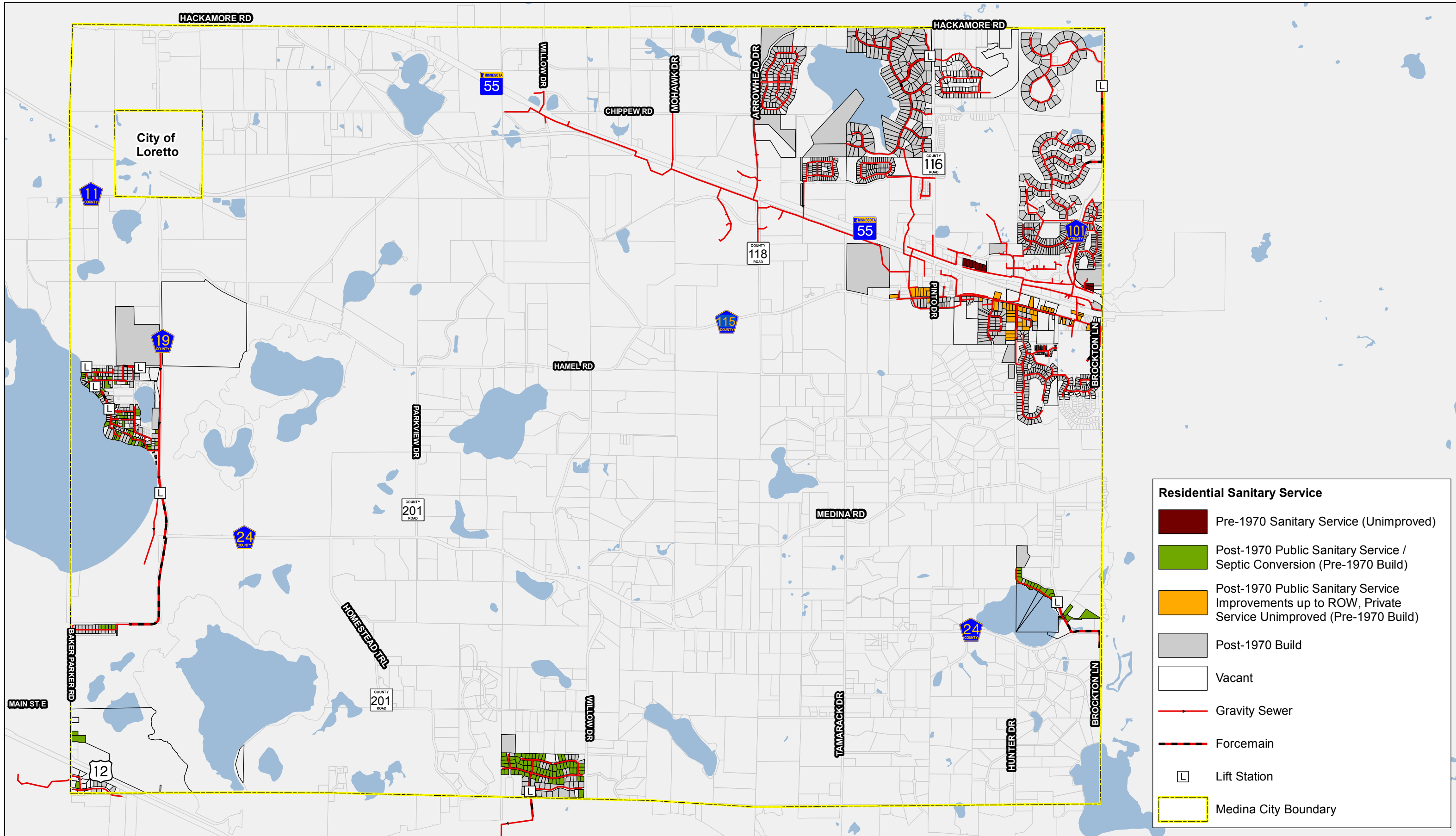
The City has begun and will continue efforts to identify the sources of I/I in its system. The City performs televising as part of its street reconstruction projects and when flow exceedances are detected, as in the fall of 2016. At that time, televising helped locate improper discharge of clearwater to the sanitary sewer system. In April 2017, the City began monitoring flows at four strategic locations to determine the provenance of excessive flows. This monitoring assisted in the identification and correction of two misaligned manhole castings. The City plans to continue flow monitoring in an effort to identify additional I/I sources. The pre-1970 era private services mentioned above and shown in **Figure 7** are a potential source of I/I. Additionally, based on the estimated I/I percentages in **Table 7** below, the Independence Beach area shows greater susceptibility to I/I. Given the I/I identification and reduction work completed to date, it is preliminarily estimated that 60% of the I/I is from public sources and 40% from private sources. This estimate will be refined as I/I identification activities continue, as outlined in the I/I Mitigation Plan that follows.

The amount of clearwater flow generated within each metershed was estimated by calculating the average annual and peak month I/I rates, equal to the average wastewater flow minus the base wastewater flow, using data from 2010-2017. The average flow for each metershed, both annual and monthly, was calculated from MCES meter data. The peak month flow was determined for each year from 2010-2017, and then those peak month flows were averaged to give the value listed in **Table 7**. The base flow for each metershed was approximated as the winter water usage, which was calculated as the average water pumped in December through February, from 2010-2017, times a historical ratio of water used to water pumped (presented as Total Water Delivered divided by Total Water Pumped in the City's Water Supply Plan), also from 2010-2017. These values for each metershed are presented in **Table 7** below.

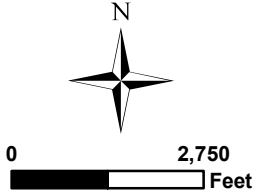
**Table 7. Estimated I/I Rate**

<b>Service Area</b>	<b>Hamel (M242)</b>	<b>Independence Beach (M434*)</b>
Average Flow [MGD]	0.290	0.043
Peak Month Flow [MGD]	0.376	0.072
Base Flow [MGD] (Winter Water Usage)	0.228	0.020
<b>Average Annual I/I Rate [MGD (%)]</b>	<b>0.062 (21%)</b>	<b>0.023 (53%)</b>
<b>Peak Month I/I Rate [MGD (%)]</b>	<b>0.148 (39%)</b>	<b>0.052 (72%)</b>

\*Meter M434 also measures flow from Metershed M433, so the data used to calculate the flows in **Table 7** was the flow metered at M434 minus that metered at M433. In addition, Metershed M434 does not correspond directly to the Independence Beach water service area, so these flows were further scaled to reflect just the Independence Beach area.



**Figure 7: Housing Stock and Sanitary Service Age**  
**Medina Sanitary Sewer Plan**  
**Medina, MN**



## Municipal I/I Reduction

The City's strategy for preventing excess I/I is based on requiring new development to conform to City standards and ongoing maintenance. The City's construction standards include prohibiting the connection of sump pumps, rain leaders, and passive drain tiles to the sanitary sewer system. All future developments are designed and constructed as public improvement projects; therefore, projects must conform to the City's construction standards. In addition, projects are observed during construction to verify they are constructed in accordance with the plans and City standards.

All newly constructed sanitary sewers are televised and pressure tested to confirm they have been constructed in accordance with City standards. In addition, the City has enacted a proactive program directed at recognizing and correcting I/I, which includes the following activities:

- In preparation of its street reconstruction projects, Medina televises the project area sewer systems and addresses any identified issues. Manhole structures are also routinely repaired, grouted, and sealed. As of 2000, all new manholes require chimney seals.
- During the City's annual sewer system maintenance activities, selected segments are televised to locate service connections with continuous flows. If found, these are investigated to determine possible illegal connections. Appropriate corrective measures are then initiated with the affected property owner.
- In 2006, the Maple Plain District inspected all basements in the area to identify and remove any direct sump pump connections. The City continues to follow up on this program.
- The City has an ongoing annual review of flows and discussions with consulting engineers to develop the next stage of improvement plans.
- The City has an ordinance in place prohibiting the connection of sump pumps, foundation drainage, or other surface water, copied below. The ordinance will continue to be followed and will be amended within six months of the adoption of this plan to include the disconnection of existing clearwater sources.

*Section 701.01. Use of Public Sewers; Surface Waters. No person shall discharge or cause to be discharged any storm water, surface water, ground water, roof runoff, subsurface drainage including water from a sump pump, cooling water or unpolluted industrial process waters to any sanitary sewer. Discharge of water from a sump pump shall be accomplished in a manner consistent with regulations adopted by the City Council.*

- The City has sent out educational information pertaining to I/I and how residents can redirect sump pumps and foundation drains to meet the City's ordinances.



## I/I Cost Analysis

The presence of I/I in the sanitary sewer system represents an added expense to the City because it must pay for conveyance and treatment of this excess flow through the Metropolitan Council system, as well as for any otherwise unnecessary upsizing in the City's collection system. Because the City of Medina's sanitary sewer system is largely composed of 8-inch sanitary sewers serving residential developments, the expense of I/I in terms of trunk oversizing is thought to be minimal.

Based on a City-wide average annual I/I percentage of 27% (see **Table 7**) and the historical municipal wastewater charges (MWC) that the City pays the Metropolitan Council for service through their regional collection and treatment system, the City spent approximately \$782,000 to convey and treat I/I from 2004-2017. This equates to an annual expense of approximately \$56,000, which may be used as a rough guide for annual I/I mitigation investment. The City plans to allocate \$50,000 annually to I/I mitigation activities.

The funds invested to date by the City of Medina toward identifying and rehabilitating I/I sources are summarized as follows:

- I/I analysis completed by Independence in May of 2004: \$120,000
- Removal of 54 leaking septic tanks at an average cost of \$5,000 per tank from May 2004 through August 2008: \$270,000
- Inspection of 19,050 linear feet of sewer in April of 2006: \$30,000
- Engineering assistance for I/I reduction program from March of 2006 through August of 2006: \$6,000
- Staff expense for sump pump inspection of 194 buildings at \$75 each in the summer of 2006: \$14,550
- Inspection of sanitary sewer and sanitary sewer improvements on Tower Drive & Hamel Road in 2014 to current: ~\$165,000
- Televising and analysis in 2016: \$5,000
- Cleaning, televising, inspection, lining, and repair work in 2017: \$48,240

The total expenditure from 2004 to 2017 is approximately \$663,890.

## I/I Mitigation Plan

The City recently submitted and received MCES approval for an I/I work plan proposing mitigation activities to be completed by the end of 2021. The work plan includes investigation of I/I sources and rehabilitation work to reduce I/I from both public and private sources. The estimated costs of these activities are listed in **Table 8**.

**Table 8. I/I Mitigation Plan**

Estimated Timeframe	Metershed	Description	Cost
2018	M242	Investigation <ul style="list-style-type: none"> <li>• Inspections</li> <li>• Metering</li> </ul> Public <ul style="list-style-type: none"> <li>• Sewer lining</li> <li>• Manhole repair</li> <li>• Castings and chimney seals</li> </ul> Private <ul style="list-style-type: none"> <li>• Service lining</li> <li>• Lateral connection repair</li> <li>• Service cleanouts</li> </ul>	\$319,731
	M434	Investigation <ul style="list-style-type: none"> <li>• Inspections</li> <li>• Metering</li> </ul> Public <ul style="list-style-type: none"> <li>• Manhole repair</li> <li>• Castings and chimney seals</li> </ul>	\$30,400
2019	M242	Investigation <ul style="list-style-type: none"> <li>• Inspections</li> </ul> Public <ul style="list-style-type: none"> <li>• Sewer lining</li> <li>• Manhole replacement</li> </ul> Private <ul style="list-style-type: none"> <li>• Service lining</li> <li>• Lateral connection repair</li> </ul>	\$290,726
	M434	Public <ul style="list-style-type: none"> <li>• Manhole repair</li> <li>• Castings and chimney seals</li> </ul>	\$20,400
Annual (2020 Onward)	TBD	TBD – Pending Investigation	\$50,000

The City of Medina will continue to proactively work to identify I/I sources and take corrective actions. The rehabilitation that has been completed to date has resulted in a reduction of I/I; however, the remaining I/I continues to be a concern and is being addressed.

## COST ESTIMATES AND FINANCING

**Table 9** shows the estimated costs for the improvements discussed in this plan, including contingency and indirect costs. In the City of Medina, historically, sanitary sewer system improvements within new developments have been installed at the cost of the developer. Portions of the trunk sewer main included in **Table 9** will be located within future development, and the City will determine which portion of the cost of the improvement will be the responsibility of the developer at the time of development. The trunk sewer costs listed included only sanitary sewer costs, assuming that improvements will be timed with street improvement projects to minimize the cost of surface restoration. It should also be noted that these costs do not include acquisition of land, right of way, or easements, nor do they include the cost of oversizing infrastructure to serve Loretto or Corcoran.

**Table 9. Sanitary Sewer Capital Improvements**

Estimated Year	Item	Length (feet)	Sewer District	Cost
2020	Highway 55 Lift Station	690	EC-1	\$575,000
2020	Highway 55 Gravity Line	1,175	EC-1	\$115,000
2020	Willow Drive (South) Trunk Sewer	1,500	EC-2	\$168,000
2025	Tamarack Drive Trunk Sewer	1,800	EC-11	\$244,000
2025	Hunter Drive Trunk Sewer	5,000	EC-9	\$532,000
2025	Upsize Hamel Road	400	EC-9	\$200,000

## SUMMARY AND OUTCOMES

The analysis provided in this Sanitary Sewer Comprehensive Plan is aimed to provide the City of Medina and Metropolitan Council assistance in planning for wastewater collection and treatment. It is anticipated that the design flows and criteria outlined will be used for utility planning as development continues within the City. Tables and figures can be utilized to create budget-level estimates and schematic representations of infrastructure improvements, with specific sizing and routing to be determined during the design phase.