Chapter 7: Public Utilities

INTRODUCTION

The City of North Mankato has a significant investment in its existing public utilities systems (water, wastewater, and stormwater). The continued expansion and development within the growth areas identified in this Comprehensive Plan will require the extension of public utilities into those areas. In general, the existing infrastructure system is well-positioned and of adequate size to support the required expansion into the growth areas. However, coordination will be required between community development and the required expansion of the utility system. In some cases, the cost of providing utility service may dictate where and when future growth will occur.

The following sections provide a general description of the existing water system, wastewater system and storm drainage system within the City of North Mankato. This Chapter is not intended to be a detailed infrastructure master plan, but rather a source of information that will assist stakeholders (citizens, City staff, and potential developers) with the information about these systems and factors that may impact decision-making regarding development strategies.

PREVIOUS AND ONGOING PLANNING INITIATIVES

Water Supply Plan (2017)

Public water suppliers serving more than 1,000 people are required to prepare and submit a water supply plan. The goal of the WSP is to help water suppliers implement long-term water sustainability and conservation measures, develop critical emergency preparedness measures. A water crisis or emergency can be avoided or mitigated if the long-term sustainability measures of a WSP are implemented.

Wellhead Protection Plan (2017)

This plan identifies the land area around the wellhead infrastructure, the vulnerability of the land to contamination, impact of land and water use changes on the water supply wells, and a contingency strategy to address a water supply interruption.

WATER SYSTEM

Existing Systems

The City of North Mankato operates an extensive water treatment and supply system, serving residential, commercial, and industrial users in two pressure zones: the upper system and the lower system.

Under normal circumstances, the two systems operate independently, each with their own supply, treatment, storage, and distribution systems. However, there is a connection between the two systems to facilitate the transfer of water between systems in the event of an emergency.

Water supply in the lower system is provided by two groundwater wells, Well No. 5 and Well No. 6, both located near Water Treatment Plant No. 1 at the intersection of Belgrade Avenue and Nicollet Avenue. Both Wells and No.5 and No.6 as shown in **Table 7-A** below, are multi-aquifer wells. Minnesota Department of Health (MDH) requires any multi-aquifer well to be converted to a single aquifer well if and when the well undergoes a major rehabilitation (pump replacement is exempted). Converting wells 5 and 6 to single aquifer wells will significantly reduce the pumping capacity of these wells. Therefore,

the city needs to have a long-term plan with respect to future of Wells No. 5 and No. 6 and the Water Treatment Plant No.1. This is briefly discussed under Future Improvement section below. The upper system is currently provided by three groundwater wells, Well No. 7, Well No. 8. and Well 9. Well No. 7 is located within the Water Treatment Plant No. 2 on Howard Drive. Well No. 8 is located in the Caswell Park complex, just east of Water Treatment Plant No. 2. A third well, Well No. 9, is located east of the Water Treatment Plant No.2 and south of the volleyball courts.

Table 7-A below shows a summary of the well characteristics:

Table 7-A: Well Data

Well No.	5-Lower	6-Lower	7-Upper	8-Upper	9-Upper
Year Constructed	1950	1959	1975	1986	2015
Year Last Rehab	2020	2021	2016	2018	
Well Depth (ft)	680	687	860	845	845
Casing Diameter (in)	16	24/20	24/20	30/24/18	30/24/18
Water Bearing Foundation	Ironton / Galesville / Mt. Simon	Ironton / Galesville / Mt. Simon	Franconia / Mt. Simon	Mt. Simon	Mt. Simon
Pump Type	Vertical Turbine	Vertical Turbine	Vertical Turbine	Vertical Turbine	Vertical Turbine
Capacity (gal/min)	1000	1440	1100	1100	1100

As mentioned previously, two water treatment plants treat the well water before it is pumped into the distribution system. Treated water for the lower system is provided by Water Treatment Plant No. 1, located at the intersection of Belgrade Avenue and Nicollet Avenue. This facility was initially constructed in 1959 with rehabilitation work completed most recently in 2017. The facility consists of a steel gravity filter which treats the raw water for iron and manganese and has a capacity of 1440 gallons per minute (gpm). The Water Treatment Plant No.1 is operated at flow rate of 1300 gpm. Treated water for the upper system is provided by Water Treatment Plant No. 2, located on Howard Drive just east of the Caswell Park athletic complex. This facility was constructed in 1975 and expanded in 2001 to increase the treatment capacity to 2,200 gpm.

The existing treated water storage for the City of North Mankato consists of five reservoirs. Three ground- level storage reservoirs provide a total of 750,000 gallons of water storage for the lower system. One of the ground storage reservoirs (500,000 gallons) is located at Water Treatment Plant No. 1. The other two reservoirs for the lower system with a combined capacity of 250,000 gallons are located in the hillside bluff overlooking the lower North Mankato area and thus act as elevated reservoirs for the lower system. The upper system is served by two 500,000-gallon elevated water towers, one located on Tower Drive, constructed in 2011 and one located on Carlson Drive, constructed in 1993. In addition, a 750,000-gallon ground storage reservoir is located adjacent to Water Treatment Plant No. 2.

High service pumps are utilized to pump water from the two ground storage reservoirs located at the water treatment plants. Two high service pumps at Water Treatment Plant No. 1 are capable of pumping 1,200 gpm each and approximately 2,000 gpm when operating together. In addition, the pumps at this plant are capable of transferring water from the lower system to the upper system at a rate of approximately 1,000 gpm. All high service pumps at Water Treatment Plant No. 2 are provided

with variable speed drives and are capable of delivering 2,200 gpm from the ground storage reservoir at Water Treatment Plant No. 2. Each high service pump at this location is capable of delivering up to 1,100 gpm to the distribution system.

The existing water distribution system consists of 4-inch diameter through 16-inch diameter mains. The oldest watermains are in the lower North Mankato area. Those that have not been replaced with ductile iron or polyvinyl chloride (PVC) pipe within the past 20 to 25 years are cast iron pipe. Most of the upper system is ductile iron or PVC pipe. Dead end mains have, in general, been minimized, which provides for adequate circulation and very few areas of stagnant water throughout the lower and upper systems. The City's water department staff flushes the system on a regular basis in order to clean sediment and rust from the system. Numerous reconstruction projects over the past 25 to 30 years, primarily in the lower system, have greatly improved the water supply and pressure, and have increased the reliability of the system.

The existing water system in North Mankato is shown on **Figure 7-1**.

Future Improvements

The following table shows the current and projected water usage demands for the City of North Mankato:

Table 7-B: Water Usage

	Lower System			Upper System			Overall System		
	Annual Water Use	Peak Day Water Use		Annual Water Use	Peak Day Water Use		Annual Water Use	Peak Day Water Use	
		without flushing	with flushing		without flushing	with flushing		without flushing	with flushing
Year	(mg)	(mgd)	(mgd)	(mg)	(mgd)	(mgd)	(mg)	(mgd)	(mgd)
2020	123	0.6	0.9	351	1.7	1.8	474	2.2	2.3
2025	123	0.6	0.9	366	1.8	1.9	123.9	2.3	2.4
2030	123	0.6	0.9	377	1.9	2.0	123.9	2.4	2.5
2040	123	0.6	0.9	400	2.0	2.1	123.9	2.5	2.6

Since the water used for watermain flushing can significantly impact the pumping rates for the wells and the water treatment plants, **Table 7-B** shows the actual peak daily water use during flushing and estimates of the peak daily water usage with no flushing.

Firm peak day capacity, calculated over 24 hours with the largest well in each system out of service is 1.4 million gallons per day (mgd) in the lower system and 3.2 mgd in the upper system. With the addition of the new Well No. 9 in the upper system in 2015, the well capacity is adequate to meet the projected water demands throughout the planning period. The City will continue to implement an on-going well maintenance program in order to maximize the useful lives of the well casings, pumps, piping and equipment. Periodic repairs and replacements will be performed as required.

The capacity of the water treatment plants and high service pumping should equal the maximum day demands for the planning period. The projected future peak day demands for the planning period are 0.9 mgd in the lower system and 2.1 mgd in the upper system. Treatment capacity of Plant No. 1 is 1.8 mgd and the treatment capacity of Plant No. 2 is 2.6 mgd. Since the capacity of each treatment plant

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City of North Mankato, Minnesota

Figure 7.1 Existing Water System

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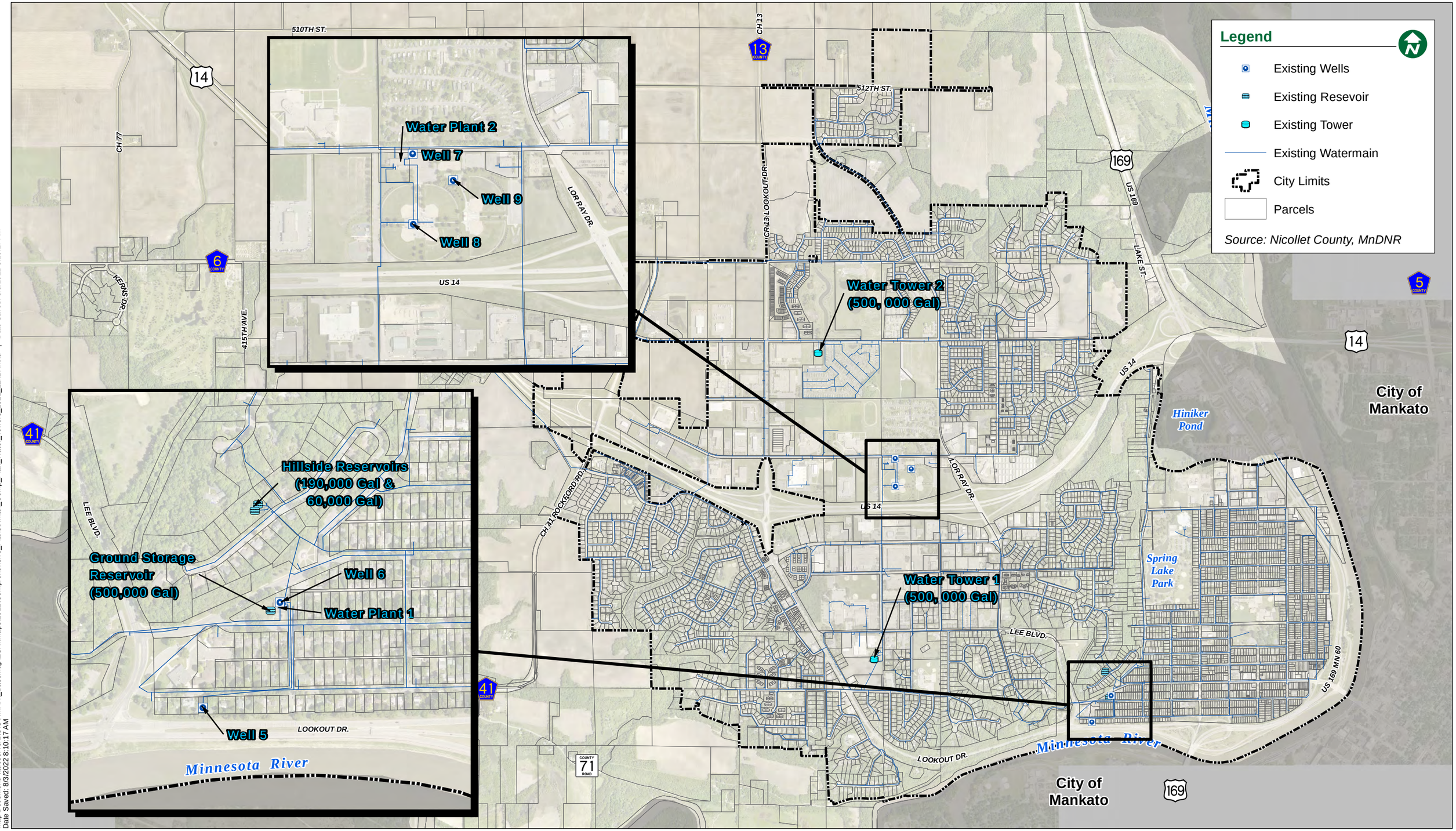

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exceeds the projected peak day demand for each facility, the capacity of both plants is adequate for the planning period. Water Treatment Plant No. 1 was refurbished most recently in 2017 and is good condition. Water Treatment Plant No. 2 is scheduled for a rehabilitation project in 2022, but no further expansion of treatment capacity is proposed with that project. After the rehabilitation project on Water Treatment Plant No. 2, is completed, water treatment facilities will be adequate in capacity and condition for the foreseeable future.

Water storage for the City of North Mankato is located in both the upper and lower distribution zones. Storage adequacy can be assessed in several ways. The recommended water storage volume is based on fire demand, emergency reserve and equalization. Based on average day demand, a worst case fire event, and equalization volume equal to 20 percent of the average daily flow, an analysis indicates that the water storage provided in the upper area by the ground storage/high service pumps and the two elevated water towers is adequate to meet the projected storage requirements through the planning period. A similar analysis indicates that the lower system is currently deficient in storage by approximately 200,000 gallons. Since water demand in the lower system is not expected to increase significantly during the planning period, the lower system will be approximately 200,000 deficient in storage at the end of the planning period. However, water from the upper system can be diverted to the lower system without limiting services in the upper system, so the need to add storage in the lower system is not anticipated. The two hillside ground storage reservoirs in the lower system were rehabilitated in 2019. The Carlson Drive water tower on the upper system received an interior re-painting/rehabilitation in 2013 and exterior repainting/rehabilitation in 2020. The Tower Boulevard water tower on the upper system received an exterior repainting/rehabilitation in 2020. It is anticipated that both elevated water towers will require interior repainting/rehabilitation within the planning period. It is recommended that the reservoirs continue to be drained, inspected and maintained every 3 to 5 years.

The adequacy of the City's water supply, treatment and storage systems throughout the planning period assumes that industrial development in undeveloped areas within the current City limits and industrial development within the projected growth areas will continue to have relatively low water demands. Future industrial developments having high water usage may require that the capacity of the water supply, treatment and/or storage be increased, either by adding new facilities or expanding existing facilities.

If industrial development with high water usage in the upper system requires the city to expand the supply (wells) and the treatment capacity in the upper system, then City should consider abandoning Wells No.5 and No.6 and Water Treatment Plant No.1 and move the entire water treatment to the upper system. Abandoning Well No.5 and No.6 will make obtaining the required Minnesota Department of Natural Resources (DNR) and MDH permits to drill two new wells in the Mt. Simon aquifer much easier. Since the peak day demand for the for the Water Treatment Plant No.1 is only 0.9 mgd, any new treatment facility proposed for industrial development could be expanded to include this demand very cost effectively.

In general, the water distribution system for the City of North Mankato is well maintained and well managed. Although much of the old cast iron watermain system has been replaced through numerous reconstruction projects in the lower system in recent years, portions of the old system still remain. These segments should be replaced and, where required, increased in size as street construction projects are implemented. As previously noted, most of the upper system is much newer (relatively speaking) than the lower system and consists primarily of ductile iron and cast-iron pipe. As with the lower area, the existing watermain system in the upper system should be evaluated for improvement and/or replacement when the City is contemplating street reconstruction projects.

Most of the water system improvements in the upper area will be driven by residential, commercial and/or industrial development in the undeveloped areas within the City limits and the projected growth areas beyond the City limits. A system of trunk watermains ranging in size from 10 to 16 inches in diameter will be extended into these growth areas as they develop.

WATER SYSTEM GOALS, OBJECTIVES, AND POLICIES

The following section outlines the primary goals for the water system followed by a series of objectives and policies intended to influence future development efforts that align with the community visions in this plan.

GOAL 1: Expand existing water system infrastructure to meet the demands generated by continued development.

Objective 1.1: Expand the trunk watermain system into future growth areas.

Policy 1.1.1: Implement the expansion of the trunk watermain system as areas outside the limits of the existing water distribution system are developed.

Policy 1.1.2: The trunk watermain system within the future growth areas will be based on the type, location, configuration and sequence of the future development. Final trunk watermain sizes and locations should be based on detailed engineering studies as more information regarding future development becomes available.

Policy 1.1.3.: Develop a financing strategy for funding the expansion of the trunk watermain system.

Objective 1.2: Expand the water supply, water treatment, and water storage systems as required to accommodate future development demands.

Policy 1.2.1: As future development occurs, detailed engineering studies should be performed to evaluate the capacity of the existing water supply, water treatment, and water storage systems considering new water demands and to determine required improvements.

Policy 1.2.2.: Develop a financing strategy for funding the expansion of the trunk watermain system.

GOAL 2: Monitor, evaluate and improve the condition of the City's existing water system infrastructure.

Objective 2.1: Replace aging water distribution system infrastructure.

Policy 2.1.1: Prepare a study to document the condition of deficient watermains based on age, materials and history of breaks, leaks, freezing and other deficiencies.

Policy 2.1.2: Utilize the information from the watermain condition study, in conjunction with the condition information for other infrastructure elements, to develop, expand and prioritize projects to be included in the capital improvements.

Objective 2.2: Monitor the condition of existing water supply, treatment, and storage infrastructure and replace as required.

Policy 2.2.1: Monitor changes in drinking water quality standards and identify possible changes to the treatment processes currently utilized by the City's two water treatment facilities.

Policy 2.2.4: Monitor the condition of the existing wells and related equipment and continue with regular inspections, maintenance and miscellaneous equipment replacement as required.

Policy 2.2.5: Monitor the condition of the water storage facilities and related equipment and continue with regular inspections, maintenance and miscellaneous equipment replacement as required.

WASTEWATER SYSTEM

Existing Systems

The existing wastewater collection system within the City of North Mankato consists of a network of sanitary sewers ranging in size from 8 inches to 24 inches in diameter. There are also 12 lift stations located throughout the City that collect and pump the wastewater from those areas which cannot be served by gravity sewers. The sanitary sewers and lift stations throughout the City collect into four main trunk sewers. Most of the trunk sewers flow to the City's Main Lift Station complex (Lift Station No. 1 and Lift Station No. 2) located on the east side of Trunk Highway (T.H.) 169 at Pierce Avenue. The two lift stations making up the Main Lift Station complex operate in tandem to pump all of the wastewater generated within the City North Mankato, across the Minnesota River to the City of Mankato's wastewater treatment facility. The following Table provides a summary of the existing trunk sanitary sewers within the City.

Figure No. 7-2 shows the three trunk sewers as well as with the areas served by each.

Table 7-C: Existing Trunk Sanitary Sewers

Trunk Sanitary Sewer Designation	Service Area			Pumps to	Pipe Size(s)	Pipe Material	Year(s) Constructed/ Replaced
	Region	Area Served (Existing)	Service Area Fully Developed?				
Trunk Sanitary Sewer 1	Lower and Upper Area	1240	Yes	Main Lift Station Complex	12" to 18"	Clay, PVC	1950's, 1970's, 2010's
Trunk Sanitary Sewer 2	Lower and Upper Area	1360	Yes	Main Lift Station Complex	18"	Clay, PVC	1970's, 2000's
Trunk Sanitary Sewer 3	Upper North Mankato	1250	No	Main Lift Station Complex	27"	PVC	1990's

The existing trunk sewer that runs along Cross Street and Pierce Avenue is a clay pipe that ranges in size from 24 inches to 27 inches in diameter that was constructed in the 1950's. This trunk sewer collects wastewater from most of the lower North Mankato area and transports the wastewater across Highway 169 at Pierce Avenue to the Main Lift Station complex. One of the manholes on this trunk sewer experienced a failure during the extreme high-water condition in the Minnesota River in 2019, resulting in the pipe being plugged with sand and causing back-ups in portions of the sanitary sewer system. This problem area was repaired, and the trunk sewer resumed functioning adequately. Considering the age of the pipe, it is generally good condition, but it is recommended that the sewer be rehabilitated by re-lining within the next several years.

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Figure 7.2 Existing Sanitary Trunk Sewer & Service Areas

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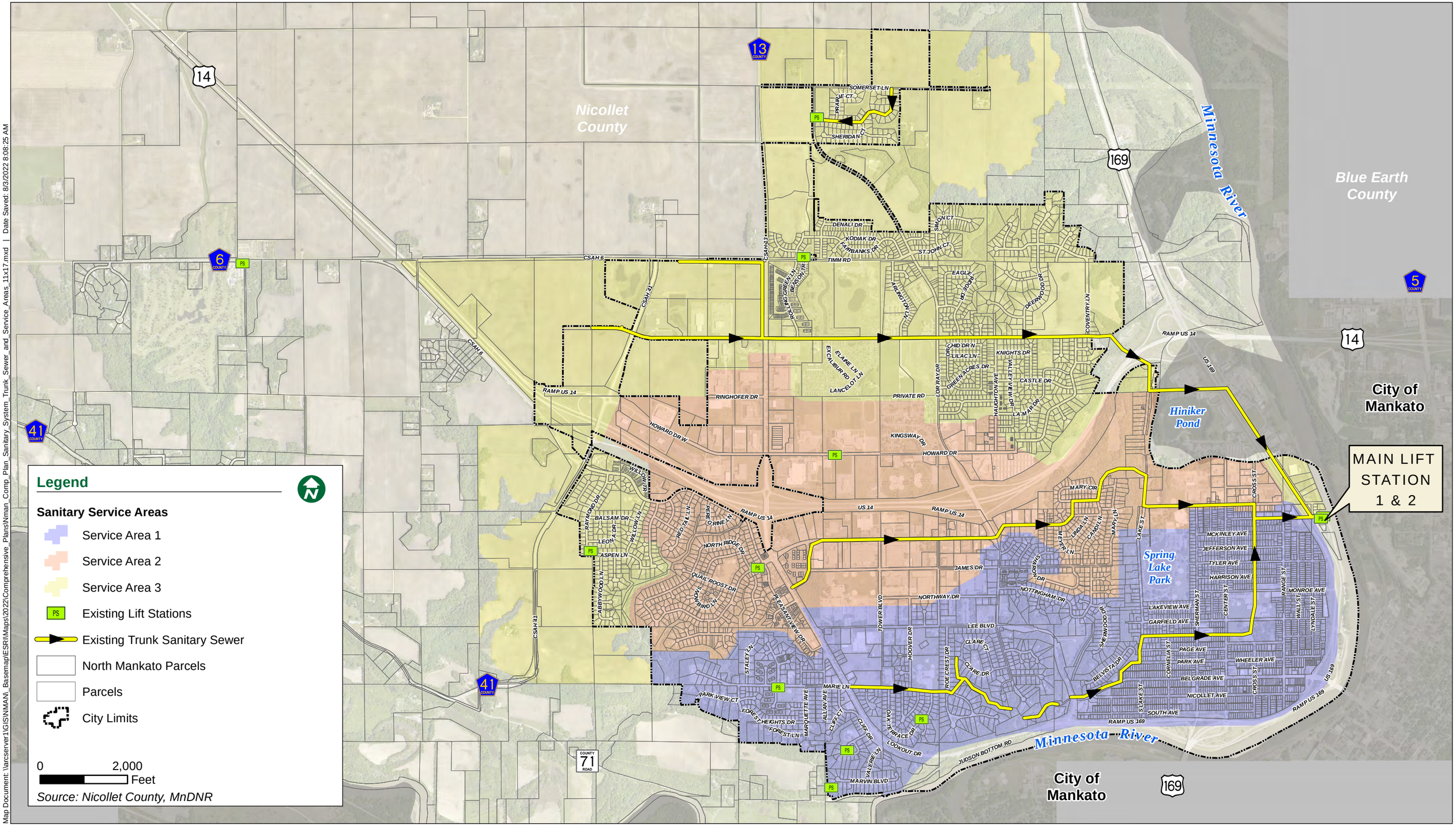

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The capacity of the existing wastewater collection system is controlled, for the most part, by the capacity of the existing lift stations and trunk sewers. The sanitary sewer system and the lift stations within the City of North Mankato are well maintained and well managed. The sanitary sewers are cleaned and televised on a regular basis, and the lift stations are also inspected and maintained regularly. Although much of the old clay sanitary sewer systems in the lower North Mankato area have been replaced through numerous reconstruction projects in recent years, portions of the old system still remain. These segments should be replaced as street construction projects are implemented using newer materials less susceptible to inflow and infiltration of ground water and surface water into the system. Most of the sanitary sewer system in the upper North Mankato area is newer and consists primarily of plastic pipe. However, as with the lower area, the existing sanitary sewers in the upper system should also be evaluated for improvement and/or replacement when the City is contemplating street reconstruction projects.

The City will continue to implement an on-going maintenance and equipment replacement program to maximize the useful lives of the lift stations. Periodic repairs and replacements will be performed as required.

Future Improvements

Table 7-D shows the current and projected wastewater flows from the City of North Mankato:

The average daily wastewater flow is the total annual volume of wastewater collected within the City of North Mankato and pumped to the Mankato Wastewater Treatment Plant divided by 365 days. The average wet weather wastewater flow is average daily flow for the 30 consecutive days that have the highest total flow during that 30-day period in each year.

Table 7-D: Current and Projected Wastewater Flows

Year	Total Projected Average Daily Wastewater Flow (mgd)	Total Projected Average Wet Weather Wastewater Flow (mgd)
2020	1.50	1.86
2025	1.54	1.90
2030	1.58	1.94
2040	1.66	2.02

The City completed a major rehabilitation project on Lift Station No.1 in 2015. With this improvement, the wastewater collection system has adequate capacity to accommodate the projected wastewater flows from residential, commercial and industrial development within a 20-year planning period. Most of the areas projected for future development are located within or adjacent to the existing city limits in the upper North Mankato area. The trunk sewer line on Carlson Drive and Countryside Drive will serve these future development areas. This trunk sewer line and Lift Station No. 2 were constructed in the mid-1990's and have capacity for the projected wastewater flows within the planning period of this Comprehensive Plan.

A system of sanitary sewers will be extended from the trunk sewers into the development areas in the upper north Mankato area. These sewers will range in size from 8 inches to 15 inches in diameter. The exact size and configuration of the sanitary sewer system will be dependent on the type and density of development, existing and proposed topography, and in the case of commercial and industrial areas, the extent of water usage/wastewater discharged. As the development expands beyond the limits of gravity sanitary sewer service, additional lift stations will need to be added to the system. **Figure 7-3** shows the limits of the existing trunk sewer and lift station service areas, as well as the service areas to be served by future lift stations.

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City of North Mankato

Figure 7.3 Future Trunk Sanitary Sewer and Lift Station Areas

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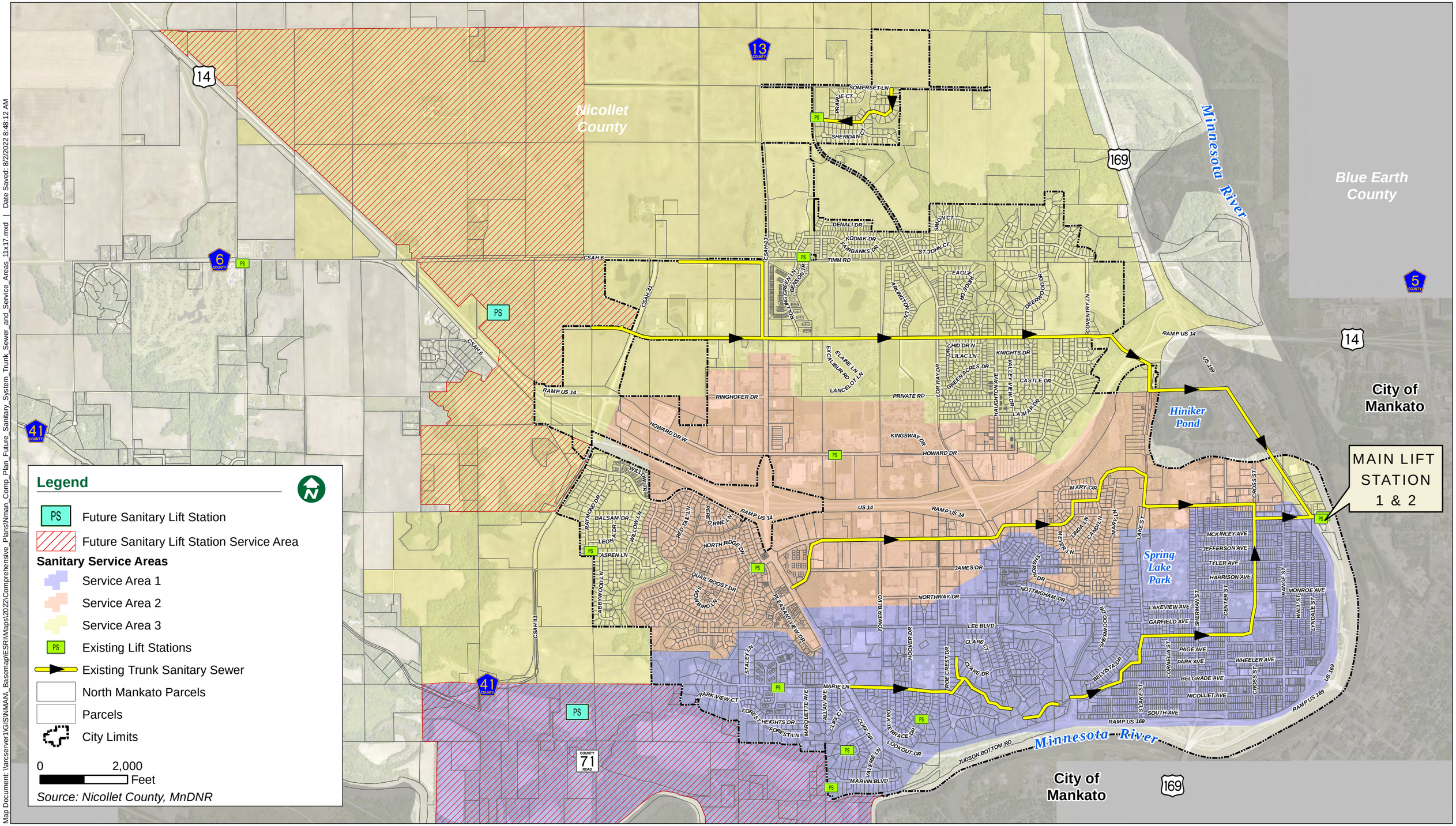

Legend

- PS — Future Sanitary Lift Station
- Future Sanitary Lift Station Service Area

Sanitary Service Areas

- Service Area 1
- Service Area 2
- Service Area 3
- PS — Existing Lift Stations
- Existing Trunk Sanitary Sewer
- North Mankato Parcels
- Parcels
- City Limits

0 2,000 Feet

Source: Nicollet County, MnDNR

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WASTEWATER SYSTEM GOALS, OBJECTIVES, AND POLICIES

The following section outlines the primary goals for the wastewater system followed by a series of objectives and policies intended to influence future development efforts that align with the community visions in this plan.

GOAL 1: Expand existing wastewater system infrastructure to meet the demands generated by continued development.

Objective 1.1: Expand the trunk wastewater system into future growth areas.

Policy 1.1.1: Implement the expansion of the trunk sanitary sewer system as areas outside the limits of the sanitary sewer collection system are developed. Final trunk sanitary sewer sizes, locations, and depths should be based on detailed engineering studies as more information regarding future development becomes available.

Policy 1.1.2: Construct new lift stations as areas outside the limits of the existing lift station service areas are developed. Final lift station sizes, locations, and depths should be based on detailed engineering studies as more information regarding future development becomes available.

Policy 1.1.3.: Develop a financing strategy for funding the expansion of the trunk sanitary sewer system and lift stations.

GOAL 2: Monitor, evaluate and improve the condition of the City's existing wastewater system infrastructure.

Objective 2.1: Replace aging sanitary sewer system infrastructure.

Policy 2.1.1: Prepare a study to document the condition of deficient sanitary sewers and collection system lift stations based on age, materials and deficiencies identified in sewer televising reports.

Policy 2.1.2: Utilize the information from the sanitary sewer condition study, in conjunction with the condition information for other infrastructure elements, to develop, expand and prioritize projects to be included in the capital improvements.

Objective 2.2: Monitor the condition of existing wastewater pumping and treatment infrastructure and replace as required

Policy 2.2.1: Monitor changes wastewater quality standards and identify possible changes to the treatment processes currently utilized by the City of Mankato's wastewater treatment facility and potential impacts to the treatment costs paid by the City of North Mankato.

Policy 2.2.2: Monitor the condition of the City's two main lift stations (Lift Station No. 1 and Lift Station No. 2) continue with regular inspections, maintenance and miscellaneous equipment replacement as required.

STORMWATER SYSTEM

General

The goal of the plan is to maintain and improve surface water quality and minimize the impacts of increased water quantity through appropriate planning, policy enforcement, and capital improvement projects.

Most Minnesota cities have existing pipe networks that were designed to relieve ponding within the original platted city limits. When these systems were designed, the concern for the downstream properties was not a consideration. The goal was the efficient and cost-effective removal of stormwater runoff from developed areas. In North Mankato's case, this meant the construction of direct pipelines to the Minnesota River.

Since 2007, the City of North Mankato has been required to obtain a permit for its Minnesota Small Municipal Separate Storm Sewer Systems General Permit (MS4). The MS4 permit is renewed every 5 years and the permit rules continue to evolve. The MS4 and the Minnesota Construction Stormwater General Permit (CSW) require consideration of the impacts to downstream properties of rate and volume increases due to development as well as the water quality of stormwater runoff leaving the City.

Development and redevelopment construction projects are required to provide for to volume reduction when the amount of impervious in the project is 1.0 or more acres. Stormwater conveyance systems are recommended to be designed to handle the 10-year 24-hour storm event. Stormwater treatment facilities such as basins are recommended to be designed to handle the 100-year 24-hour storm and have engineered overflow spillway routes to prevent property damage for larger storms.

In addition to rate and volume standards, the City of North Mankato is required to meet water quality requirements. The City has been assigned waste load allocations (WLAs) that are based on adopted standards for the Total Maximum Daily Loads (TMDLs) for regional watersheds.

One of the best methods of mitigating the effects of growth is through the construction of stormwater treatment facilities. These facilities are designed to encourage volume reduction through infiltration and provide water quality treatment and discharge rate control.

Stormwater treatment facilities require ongoing maintenance to function efficiently. Typically, the most efficient and economical option is to construct regional facilities instead of several smaller localized options throughout the City. Regional ponds cannot be located in an existing wetland without the costly mitigation of the impacted wetland. They are also not recommended in floodplains. This comprehensive plan considers these factors when recommending Best Management Practices (BMPs). It also considers information from residents of North Mankato and City staff regarding the observation of the natural ponding associated with heavy rainfalls when siting regional basins.

One drawback associated with regional stormwater treatment planning is finding a funding mechanism to purchase the land needed and finding ways to have new development assist in their construction. Ideally, the costs to construct and maintain stormwater facilities should be paid using funds generated by area charges and stormwater utility fees for the area being served by the facilities. Two challenges are that the stormwater treatment facilities typically must be completed before the area served is fully developed and high area charges and stormwater utility fees may be a concern when trying to attract new businesses and development to the area.

Construction projects that include the construction or reconstruction of 1.0-acre or more of impervious surfacing must take all appropriate measures to reduce the additional runoff volume created by the impervious surfaces (roofs and pavement).

Typically the most cost-effective way of accomplishing the required volume reduction is through infiltration or rainwater harvesting. Infiltration practices reduce runoff volumes by taking a portion of the runoff and recharging the groundwater. As such, they are often touted by surface water management agencies and review authorities. However, they must also be strategically placed to prevent the potential for contamination of drinking water wells. Infiltration practices within the drinking water wellhead protection area or well capture zone require a higher level of engineering review and may only be constructed if the review shows that the treatment system does not pose a risk for adverse impacts to groundwater.

Filtration practices, such as filtration basins, biofilters, iron-infused sand filters, etc., are similar to the more common infiltration practices but are designed so that the stormwater filters through plants and filter media before draining into a storm sewer. Filtration basins are recommended to manage stormwater runoff and improve water quality within the 1-year Wellhead Protection Area (WHPA) where infiltration methods are not advised. Filtration basins are recommended wherever they will fit into the designs and should be encouraged wherever local private property owners might request retrofitting them into their landscaping. Any private filtration basins that are installed will help lessen the load on the existing storm sewer system, reduce regional pond maintenance costs, and improve water quality.

Lower North Mankato is conducive to infiltration because the underlying soils are predominately sandy. Upper North Mankato soils are predominately clay soils that are not conducive to infiltration. The city may need to consider planning additional infiltration opportunities in lower North Mankato to account for the general inability for infiltration in upper North Mankato.

Rainwater harvesting is the storing and use of rainwater for irrigation or other non-potable uses. Rainwater harvesting should be encouraged wherever practicable.

Because of water quality regulations, it may be advantageous to plan regional ponds for flood prevention associated with extreme rainfall events, while planning smaller water quality BMPs on a neighborhood or individual development scale.

As part of the ongoing MS4 permit requirements, the City will need to consider new opportunities to retrofit water quality measures associated with its reconstruction projects. Because retrofitting to add water infiltration on linear projects such as street reconstructions is often more difficult, the MS4 permit requires less water volume to be infiltrated than is required for new projects.

Wetlands

In 1991, the Minnesota Legislature passed the Wetlands Conservation Act (WCA). The WCA is administered according to Minnesota Rules Chapter 8420 to implement the purpose of the Act, which is to:

1. Achieve no net loss in the quantity, quality, and biological diversity of Minnesota's existing wetlands;
2. Increase the quantity, quality, and biological diversity of Minnesota wetlands by restoring or enhancing diminished or drained wetlands;
3. Avoid direct and indirect impacts from activities that destroy or diminish the quantity, quality, or biological diversity of wetlands;
4. Replace wetland values where avoidance of activities is not feasible and prudent.

Pretreatment of all stormwater from new developments is required before discharge into any wetlands. Wetlands may be and are currently being used for stormwater storage for larger rainfall events. They

may continue to be used for this purpose even after upstream development, provided that:

1. There is acceptable Best Management Practice pretreatment of the runoff as required by the CSW and MS4 permits, and
2. The bounce from the normal water level to the high water level does not exceed two feet.

The Minnesota Wetland Conservation Act (WCA) requires the designated Local Governmental Unit (LGU) in charge of administering the WCA to generate a Notice of Wetland Conservation Act Decision for any impact on wetlands. The designated LGU for projects located within the City of North Mankato is the City of North Mankato.

In all but minor decisions, the LGU will call for a Technical Evaluation Panel (TEP) review of the application or impact before issuing a decision. The LGU must give notice of proposed actions affecting wetlands to all of the following:

1. The Minnesota Board of Water and Soil Resources
2. The Soil and Water Conservation District
3. The Minnesota Department of Natural Resources
4. The U.S. Army Corps of Engineers
5. Interested citizens requesting notification of such actions

If a TEP meeting is required, all listed parties are invited to review the proposed action. However, it is not uncommon for a TEP meeting to consist of only a small contingent of this list, as some invitees may have no jurisdiction over the proposed action.

NPDES Phase II Considerations

G. General City Permits

In 1987, the US Congress amended the Clean Water Act to include stormwater pollution and directed the Environmental Protection Agency (EPA) to initiate rulemaking. The first round of EPA rules was implemented in 1991 when NPDES Phase I permits were required for all cities exceeding 100,000 in population. Phase II was implemented in 2003 and targeted all cities with populations exceeding 10,000. In 2008, the Phase II rulemaking expanded the list of targeted cities to include cities with populations exceeding 5,000 and that discharge into impaired waters. The Minnesota Pollution Control Agency (MPCA) assumed responsibility for implementing the rules and issuing all Phase II permits. The NPDES Phase II rules apply to all construction disturbances of 1.0- acres or more.

The City of North Mankato has been assigned WLAs for impaired waters like the Minnesota River that have approved TMDLs. The City is required by federal and state regulations to facilitate correcting the impairments by implementing water quality standards to meet the assigned WLAs.

The primary targets of TMDL requirements are urban runoff and construction runoff. This is because urban runoff carries pollutants from cars, lawn fertilizers, pesticide spills, and other contaminants into our lakes, wetlands, and streams without entering wastewater treatment systems. Construction runoff is often laden with sediment caused by large areas of open, exposed soil that is loosened by excavation and grading.

The federal mandates are intended to regulate these sources of continued environmental degradation. New developments have become increasingly targeted. All new developments, creating more than one acre of impervious surfacing, are required to have some form of stormwater treatment. In general, this need can be satisfied by properly designed stormwater

treatment facilities.

The following is a listing of the available stormwater quality and quantity systems currently being designed to handle the water quality/quantity issue:

Regional Wet Retention Basins

Numerous studies have been done on the water quality treatment afforded by wet retention basins, most notably one by William Walker Jr. for the Vadnais Lake Area Water Management Area (1987). The Walker study found that properly sized wet retention basins can effectively remove pollutants through sediment removal. When properly sized, these ponds can significantly reduce the contaminant levels, including phosphorus, commonly found in urban stormwater runoff. According to the MPCA's Stormwater Manual, on average wet retention basins can remove 84% of suspended solids, 50% of total phosphorus, and 30% of total nitrogen. Wet retention basins also provide flood storage. Wet retention basins are also well known for their stormwater quantity handling capabilities and work well for areas with Hydrologic Soil Group Type D (clay) soils.

Bioretention Systems

Another method of managing stormwater runoff is to install bioretention practices in strategic locations where stormwater will be collected and allowed to filtrate through the planting media or be taken up by vegetation before entering the storm sewer.

Infiltration/Filtration Bioretention Basins

According to the MPCA's Stormwater Manual, bioretention facilities capture rainwater runoff to be filtered through a prepared soil medium. Pollutants are removed by several processes including adsorption, filtration, volatilization, ion exchange, and decomposition (Prince George's County, MD, 1993). Filtered runoff from bioretention basins can either be allowed to infiltrate into the surrounding soil (functioning as an infiltration basin or rainwater garden) or be collected by an under-drain system and discharged to the storm sewer system or directly to receiving waters ("filtration only" bioretention basin). Due to the groundwater vulnerability and the WHPA covering a portion of lower North Mankato, lined filtration basins are recommended for the areas of North Mankato within the 1-year WHPA. Runoff from larger storms is generally allowed to bypass the filled bioretention basin and flow directly to the storm drain system. Infiltration/filtration basins are typically designed for treating the water quality and not for the water quantity of urban stormwater runoff. That is, the MPCA requirement for water quality is to treat the first 1 inch of runoff from a site (water quality volume). This is in contrast to the larger amount of runoff that may be leaving the site for a 3 to 6-inch rainfall (water quantity). Because stormwater quality has become a greater issue, bioretention basins have become a significant design tool for municipal stormwater systems. Bioretention basins can remove 85% of suspended solids, 100% of total phosphorus, and 50% of total nitrogen.

NPDES/SDS Construction Stormwater General Permit

A State construction permit is required for any disturbance of 1.0-acres or more. This permit is in addition to any permits required by the City of North Mankato. The permit process is best summarized in the following table:

Table 7-E - Construction Stormwater Permit Requirements

Item	Requirement
Agency	MN Pollution Control Agency (MPCA)
Disturbance Triggering a permit	1.0-acres or more
Connected actions	
(i.e. new homes)	Smaller construction sites, such as a single-family home, require a permit if they are part of a larger development that is 1.0-acres or more.
Application Process	1. Application is made online to the MPCA. There is a permit fee set by MPCA that must be paid to obtain a permit. A properly designed Construction Stormwater Pollution Prevention Plan is required to apply for a permit.
Permittee	The property owner and the construction contractor are joint permittees.
Responsibility for compliance	All permittees are responsible for compliance.

1. *Inspection reports and certifications are required.*

Stormwater Pollution Prevention Plan (SWPPP)

As an MS4, the City must review the SWPPP for any project that is 1.0-acres or more to ensure it meets the requirements detailed in the CSW.

Permanent Stormwater BMPs

If 1.0-acres or more of impervious surface is constructed, then permanent stormwater BMPs are required. If the filtration or infiltration alternatives listed above are not possible, a permanent wet retention basin is the most utilized method of meeting the requirements.

The stormwater volume reduction requirements are:

1. For construction activity (excluding linear projects):

The water quality volume must be calculated as one (1) inch times the sum of the new and the fully reconstructed impervious surface.

2. For linear projects:

The water quality volume must be calculated as the larger of one (1) inch times the new impervious surface or one-half (0.5) inch times the sum of the new and the fully reconstructed impervious surface. Where the entire water quality volume cannot be treated within the existing right-of-way, a reasonable attempt to obtain additional right-of-way, easement, or other permission to treat the stormwater during the project planning process must be made.

Volume reduction practices must be considered first when designing the permanent BMPs. The CSW does not consider wet sedimentation basins and filtration systems to be volume reduction practices. If the General Permit prohibits infiltration or other volume reduction practices, a wet sedimentation basin, or filtration basin may be considered.

Offsite permanent stormwater BMPs must be selected in the following order of preference:

1. Locations that yield benefits to the same receiving water that receives runoff from the original construction activity;

locations within the same Department of Natural Resource (DNR) catchment area as the original construction activity;

locations in the next adjacent DNR catchment area up-stream; or

locations anywhere within the permittee's jurisdiction.

All permanent stormwater BMPs must be constructed in compliance with the requirements outlined in CSW and have maintenance access.

Regional Pond Considerations

An area regional pond may be used provided that:

1. The regional pond is not a wetland.
2. Must be designed to meet the treatment pond criteria for all impervious surfaces.
3. The regional pond owner's authorization must be secured as part of the permitting process.

Municipally Separate Storm Sewer System (MS4)

The City of North Mankato is a Municipally Separate Storm Sewer System (MS4). The City of North Mankato ultimately drains to the Minnesota River. The City of North Mankato operates an extensive stormwater treatment system, serving residential, commercial, and industrial users in two zones: the upper system and the lower system. Several ravines drain water from the upper system. Spring Lake, in the lower system, receives stormwater from North Mankato, and it is not impaired water. There are also several stormwater ponds in the City's stormwater system. The majority of stormwater ponds are in the upper system, as that area was developed later when stormwater treatment was required and there was more space and flexibility to incorporate stormwater ponds into the development plans. There is also a difference in soils between the upper and lower systems; generally, the lower system has soils that have higher infiltration rates and the upper system has soils that have lower infiltration rates.

All areas served by public ditches are subject to the rules governed by Minnesota Statute 103E and under the governance of Nicollet County. Minnesota Statute 103E states that all connections to the ditch, or in this case, the County Tile, must be petitioned to the County Auditor.

There is no other record that the City has entered into any water resource management-related agreements with its neighboring cities, the county, watershed district, lake associations, or the state of Minnesota. The City of North Mankato has been responsible for construction, maintenance, and other projects in or along the City's stormwater collection systems outside of the mainline County ditch and tile systems.

Total Maximum Daily Load Limits (TMDL)

The current 303d list of impaired waters on the MPCA website shows the following:

1. The Minnesota River is the ultimate receiving water for both the upper and lower stormwater systems. Two segments of the river receive stormwater from the City of North Mankato. Both the Minnesota River segment 07020007-504 (upstream of the confluence with the Blue Earth River) and segment 07020007-502 (downstream of the confluence with the Blue Earth River) are impaired and have a US Environmental Protection Agency (EPA)

approved Total Maximum Daily Load (TMDL) for Mercury in Fish Tissue. These river segments require a TMDL plan to be written for:

a. Polychlorinated biphenyl (PCB) in Fish Tissue

b. Turbidity

These impairments affect Aquatic Consumption and Aquatic Life.

2. North Mankato is subject to the established Lower Minnesota River's Dissolved Oxygen TMDL, which has a waste load allocation of 30.5 lbs/day or a 30% reduction in phosphorus loading from the City's existing impervious surfacing as of the year 2000. This level is finite, meaning that, if the City grows, the impervious area grows as well, but the level of phosphorus loading is not allowed to increase.

To meet this requirement, the City has had P8 phosphorus modeling performed to establish the baseline phosphorus loading in the year 2000 and the current phosphorus loading associated with the current development conditions. The MPCA and the model also considered the phosphorus removal rates of its existing BMPs to determine the level of retrofitting needed to meet the TMDL requirements.

The City has a list of recommended retrofitting projects that will help it meet the TMDL requirements. In addition, volume reduction through infiltration as required by the CSW also results in phosphorus reduction.

Additional TMDL restrictions can be may anticipated in the future as the Minnesota River is tested for other impairments. It is hoped that the measures taken to limit turbidity and phosphorus will automatically remove other impairments as well.

Future Improvements

Generally, the City will work to ensure erosion control and surface water quality standards are met through enforcement of the City's permitting requirements and implementation of Best Management Practices (BMPs) such as regional stormwater ponds. The City will ensure compliance with the National Pollutant Discharge Elimination System (NPDES) Phase II permits for municipal operations and construction activity greater than 1 acre. City cooperation with the Minnesota Pollution Control Agency (MPCA) and Nicollet County is key to maintaining the relevance of the City's plan.

This comprehensive plan covers several growth areas. Stormwater treatment facilities and new storm sewer pipes will be provided in these areas as they develop. The storm sewer system and stormwater treatment systems will be based on the type, location, configuration, and sequence of the future development. The sizes and locations of storm sewer and stormwater treatment facilities within the growth areas should be based on detailed engineering studies as more information regarding future development becomes available. In addition to those BMPs, the City of North Mankato will implement stormwater treatment BMPs within the existing developed portion of the City as opportunities arise. These will comply with the MPCA's requirements for stormwater treatment at the time they are constructed.

STORMWATER SYSTEM GOALS, OBJECTIVES, AND POLICIES

The following section outlines the primary goals for the stormwater system followed by a series of objectives and policies intended to influence future development efforts that align with the community visions in this plan.

GOAL 1: Expand existing stormwater management system infrastructure to meet the demands generated by continued development.

Objective 1.1: Expand the stormwater collection, treatment, and outfall system into future growth areas.

Policy 1.1.1: Implement the expansion of the stormwater collection, treatment, and outfall system as areas outside the limits of the existing stormwater collection system are developed, with a focus on regional stormwater ponds, where possible.

Policy 1.1.2: The stormwater collection, treatment, and outfall system within the future growth areas will be based on the type, location, configuration, and sequence of the future development. The sizes and location of the final storm sewer and stormwater treatment facilities should be based on detailed engineering studies as more information regarding future development becomes available.

Policy 1.1.3.: Develop a financing strategy for funding the expansion of the stormwater collection, treatment and outfall system.

GOAL 2: Monitor, evaluate and improve the condition of the City's existing stormwater system infrastructure.

Objective 2.1: Replace aging storm sewer system infrastructure.

Policy 2.1.1: Prepare a study to document the condition of deficient storm sewers and ponds based on age, materials, and other known deficiencies.

Policy 2.1.2: Utilize the information from the storm sewer condition study, in conjunction with the condition information for other infrastructure elements, to develop, expand and prioritize projects to be included in the capital improvements.

Objective 2.2: Address sedimentation issues in the City's existing stormwater treatment ponds.

Policy 2.2.1: Develop a study to determine the levels and characteristics of sediment in the City's existing stormwater ponds.

Policy 2.2.2: Develop a plan for cleaning sediment from ponds and for disposal of sediment.

Objective 2.3: Incorporate BMPs to Meet TMDL Limits.

Policy 2.3.1 Implement the recommended retrofitting projects that will help it meet the TMDL requirements, targeting the current phosphorus TMDL and the future turbidity removal needs.

Policy 2.3.2 Develop a BMP strategy for undeveloped areas that are based on existing area soils and targets the current phosphorus TMDL and the future turbidity removal needs.