Future wastewater infrastructure needs and capital costs

Fiscal Year 2018 Biennial Survey of Wastewater Collection and Treatment
Legislative charge

Minnesota Stat. §115.03, subd. 9. Future costs of wastewater treatment; report.

The commissioner shall, by January 15, 1998, and each even-numbered year thereafter, provide the chairs of the house and senate committees with primary jurisdiction over the agency's budget with the following information: (1) an updated list of all wastewater treatment upgrade and construction projects the agency has identified to meet existing and proposed water quality standards and regulations; (2) an estimate of the total costs associated with the projects listed in clause (1), and the projects' priority ranking under Minnesota R. ch. 7077. The costs of projects necessary to meet existing standards must be identified separately from the costs of projects necessary to meet proposed standards; (3) the commissioner's best estimate, developed in consultation with the commissioner of employment and economic development and affected permittees, of the increase in sewer service rates to the residents in the municipalities required to construct the projects listed in clause (1) resulting from the cost of these projects; and (4) a list of existing and proposed state water quality standards which are more stringent than is necessary to comply with federal law, either because the standard has no applicable federal water quality criteria, or because the standard is more stringent than the applicable federal water quality criteria.

HIST: 1945 c 395 s 3; 1969 c 9 s 21; 1969 c 931 s 6; 1973 c 374 s 7-9; 1973 c 412 s 12; 1976 c 76 s 1; 1979 c 147 s 1; 1984 c 597 s 41; 1985 c 248 s 70; 1Sp1985 c 13 s 229; 1986 c 444; 1987 c 186 s 15; 1989 c 335 art 1 s 127; art 4 s 33; 1992 c 601 s 2; 1993 c 87 s 1; 1993 c 186 s 8; 1996 c 437 s 9,10; 1996 c 462 s 38; 1997 c 216 s 93; 2000 c 370 s 1; 1Sp2001 c 2 s 120; 2003 c 128 art 1 s 120,121; 1Sp2003 c 4 s 1

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The staff team that compiled this legislative report gratefully acknowledges the time and effort that local elected officials, municipal engineers, staff contacts, and consulting engineers dedicated to completing the 2017 Wastewater Infrastructure Needs Survey (WINS).

Estimated cost of preparing this report (as required by Minn. Stat. § 3.197)

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Document number: lrwq-wwtp-1sy18
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Executive summary

This report was prepared as required by Minn. Stat. § 115.03 subd.9 to biennially document all identified wastewater treatment upgrade and construction projects and associated costs, project priority rankings, and residential sewer services charges for each community. This report also discusses whether any state water quality standards are more stringent than necessary to comply with federal law.

For the first time, the Wastewater Infrastructure Needs Survey (WINS) was conducted electronically using Snap Survey. While this new procedure did generate many user questions, we believe it was a success in terms of resource saving and overall compatibility with previous year WINS reporting.

It should be noted that observed trends could be impacted by the understanding and comfort level of communities completing the new electronic survey rather than actual changes in “needs.” Over the coming years, we will monitor these trends to gain better understanding in what they mean.

Statewide future infrastructure needs

Responding to the Minnesota Pollution Control Agency (MPCA) 2017 survey of future wastewater treatment and sewer system needs, Minnesota’s communities identified over 1,050 wastewater infrastructure projects at a cost of $4.99 billion dollars. These projects are necessary to rehabilitate, expand, and improve wastewater sewer systems and treatment facilities and to extend sewer systems to newly developed or existing unsewered areas. The distribution of costs by type of project can be found in Chart 1.

Chart 1: Statewide wastewater infrastructure needs by project type (millions)
WINS Data Summary

Some observations in the data submitted in June 2017 include:

- Total projected statewide 20-year future infrastructure need increased from $4.2 billion in 2015 to almost $5 billion in 2017.
- The need for sewer system rehabilitation and upgrade ($3.43 billion) is much more significant than wastewater treatment infrastructure work ($1.57 billion).
- The Metropolitan Council Environmental Services (MCES) and MCES Service Areas reported a significant increase ($1 billion) in infrastructure need in comparison to the 2016 WINS report.
- There was a 32% reduction in the number of infrastructure projects completed during this period in comparison to the 2016 WINS report.
- Small communities more frequently struggle with affordability of infrastructure improvements.
- The age of sewer and wastewater treatment infrastructure continues to be a significant issue. A high percentage of sewer and wastewater treatment systems are near the limit of their expected useful life.
- Of the 715 communities that submitted WINS, 221 (31%) reported that they have an Asset Management Plan.

Introduction

The purpose and scope of this report

In keeping with Minn. Stat. § 115.03 subd.9 the MPCA has prepared this report on:

- Future infrastructure needs and capital costs of rehabilitating, improving, and expanding publicly owned wastewater treatment and sewer systems estimated over the next 20 years.
- Cost analysis of residential sewer service charges as a percentage of median household income of the community.
- The affordability of wastewater infrastructure needs and residential costs.

Minnesota’s publicly owned wastewater treatment systems are operated according to National Pollution Discharge Elimination System (NPDES) and State Disposal System (SDS) permits issued by the MPCA. The ownership and operation of publicly owned wastewater treatment and sewer systems is the work of approximately 800 Minnesota cities and sanitary districts. Of the latter, MCES and Western Lake Superior Sanitary District are the most prominent in the extent of services provided.

This report does not address:

- Privately owned NPDES or SDS permitted wastewater treatment facilities (e.g., industrial and commercial dischargers that do not discharge to publicly owned wastewater treatment facilities).
- Privately owned Subsurface Sewage Treatment Systems (SSTS), which account for approximately 25% of the domestic wastewater discharged by Minnesota residences.
- Stormwater collection systems, management, and treatment practices. Based primarily on population, approximately 200 of Minnesota’s municipalities are responsible for stormwater management according to the conditions of NPDES stormwater permits. Stormwater in communities not subject to stormwater permits is managed according to nonpoint source best management practices.
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- Publicly owned wastewater treatment facilities with flows less than 10,000 gallons per day (approximately 30 households) and land based disposal. These facilities are not issued NPDES or SDS permits.
- Unsewered communities, which are typically very small rural communities without sewer and wastewater treatment systems.
- Under-sewered communities defined by the MPCA as communities with inadequate or deteriorated sewer systems and substandard or non-existent wastewater treatment with direct discharges. These are typically very small rural communities. (For a discussion of the wastewater needs of unsewered and under-sewered Minnesota communities see: Small Community Wastewater Needs in Minnesota issued by the MPCA in June 2008 and available at: https://www.pca.state.mn.us/sites/default/files/q-wwp1-06.pdf.)

New survey format

For the first time, WINS was conducted electronically using Snap Survey. Eight hundred forty five (845) Communities and Sanitary Districts were emailed links to complete the survey on June 1, 2017, and approximately 85% of these communities submitted a completed survey by July 26, 2017. The electronic format of the survey significantly reduced cost and staff time needed to print, mail, and manually manage data. Many cities contacted MPCA staff requesting assistance with completing the Snap Survey, suggesting that the survey format was challenging for some first time users. As Snap Survey is used for future WINS, user comfort should increase.

Data sources

The data in this report have been acquired from sources including:

The 2017 Wastewater Infrastructure Needs Survey (WINS)

The 2017 WINS survey was emailed to communities and sanitary districts in June 2017 and 715 communities completed the survey. A total of 1,050 projects were identified by those communities that completed the survey. The list of all projects reported in the 2017 WINS are provided in Appendix 1.

The State Fiscal Year 2018 Project Priority List September 2018

The Clean Water Project Priority List (PPL) consists of project proposals submitted to the MPCA by communities and sanitary districts seeking financial assistance, generally within the next five years, for sewer and wastewater treatment construction projects, as well as stormwater projects. The MPCA prepares the PPL annually by ranking project proposals according to environmental criteria defined by Minn. R. ch. 7077. The PPL is then used by the Public Facilities Authority (PFA) to award grants and low-interest loans. The State Fiscal Year (SFY) 2018 PPL is included as Appendix 2 of this Report. For information regarding PFA grants and loans, see http://mn.gov/deed/government/public-facilities/funds-programs/.

It should be noted that 221 projects were identified on the 2018 PPL that did not appear to be reported in the 2017 WINS. The majority of these projects were for unsewered communities that were not sent WINS, or communities that did not complete their WINS. The combined list of WINS and PPL projects used for this report can be found in Appendix 1.

Needs addressed by the 2018 PPL for wastewater projects represent approximately 32% of the number of proposed projects and 40% of project costs for Minnesota as reported in WINS. Needs represented on the 2018 PPL by number of projects and costs are both higher than those numbers reported in 2015.
(22% and 30%, respectively), possibly indicating a better understanding by communities about our financial assistance programs in relation to their infrastructure needs.

**Basics of wastewater and wastewater treatment**

Wastewater treatment processes range from relatively simple (stabilization ponds) to very complex (activated sludge treatment facilities), but all require careful operation and management to ensure the protection of the receiving water. The wastewater treatment process screens out debris and separates suspended solids and greases from the wastewater. One or more biological treatment processes are then used to remove dissolved organic matter from wastewater. Together this series of processes is referred to as secondary treatment. Depending on the need to address specific pollutants or improve conditions in receiving waters, advanced treatment may also be required. Advanced treatment typically focuses on one pollutant, such as phosphorous.

For more information on wastewater treatment basics, see any previous WINS Reports or visit the MPCA website on Wastewater: [https://www.pca.state.mn.us/water/wastewater](https://www.pca.state.mn.us/water/wastewater).

**State water quality standards**

Minnesota Stat. § 115.03, subd. 9(4) requires the listing of “…existing and proposed state water quality standards which are more stringent than is necessary to comply with federal law, either because the standard has no applicable federal water quality criteria, or because the standard is more stringent than the applicable federal water quality criteria.” While the federal Clean Water Act (CWA) establishes the requirements to develop and implement standards and the procedures for doing so, the details of water quality protection are left up to the states. This recognizes the “place-based” nature of water quality protection – water bodies in different areas have different characteristics, support different uses, and react differently to pollutants. Therefore, different standards are needed to protect those diverse water bodies. Minnesota’s standards are developed to protect the uses of Minnesota’s waters in conformance with the federal CWA requirements.

Often, the U.S. Environmental Protection Agency (EPA) develops national numeric water quality criteria, and the MPCA adopts water quality standards based on these national criteria by tailoring them to local conditions. Where federal criteria do not exist, states may still need to adopt numeric standards to meet the federal requirement of protecting designated uses.

For example, in Minnesota where wild rice is an important component of the aquatic life community of many waters and is a resource of cultural significance, the state has adopted a standard to protect wild rice from impacts due to excess sulfate. Such a numeric standard does not exist at the federal level, but it fulfills the federal requirement of protecting existing and designated uses. Similarly, Minnesota has adopted nutrient standards to protect lakes and rivers from nutrient enrichment, which affects recreational suitability and aquatic life. Minnesota’s standards are based on Minnesota-specific conditions and considerations. For more information on sulfate standards, see: [https://www.pca.state.mn.us/water/protecting-wild-rice-waters](https://www.pca.state.mn.us/water/protecting-wild-rice-waters).

Additionally, the MPCA has proposed new limits for facilities that have the potential to contribute levels higher than allowed by adopted standards for phosphorus, chloride, and mercury. For more information on the development of eutrophication standards and phosphorus limits, see: [https://www.pca.state.mn.us/water/phosphorus-wastewater](https://www.pca.state.mn.us/water/phosphorus-wastewater). For more information on salty water problems, chloride standards, and solutions proposed by the Chloride Work Group (made up of
volunteers from municipalities), see: https://www.pca.state.mn.us/water/salty-water-growing-problem-minnesota. For information on the permitting strategy for addressing mercury, see: https://www.pca.state.mn.us/sites/default/files/wq-wwprm1-16.pdf.

Types of infrastructure costs: capital costs, operation, and maintenance costs

While this report focuses on future capital costs, publicly owned wastewater treatment and sewer systems are subject to both capital costs and operation and maintenance costs.

Capital cost increases result from one or more of the following factors:

- Infrastructure rehabilitation and replacement
- Community growth requiring infrastructure expansion
- Development of systems to address wastewater collection and treatment in unsewered and under-sewered communities
- Treatment facility upgrades to meet more restrictive wastewater discharge standards

Operation and maintenance cost increases are attributable to:

- Changes in operation and maintenance procedures resulting from capital changes
- Expansion of treatment facility systems and processes
- Sewer system expansion
- Increases in costs for personnel, chemicals, and supplies
- Changes in operation and maintenance to achieve more restrictive discharge standards

Capital projects are identified in the report as follows:

- Sewer System Projects – Projects involving the rehabilitation, construction and/or expansion of existing sewer and interceptor systems and projects to correct infiltration and inflow and/or combined sewer overflows. Infiltration and Inflow (I&I) is stormwater and ground water that enters sanitary sewers through leaks or through illegal connections. Combined Sewer Overflows (CSOs) are discharge points in a sewer system that are utilized to release untreated wastewater to surface waters when the combination of wastewater and stormwater exceeds the capacity of wastewater treatment facilities. Sewer systems constructed prior to the 1950s typically combined the collection of wastewater and stormwater. The primary solution to this problem is to construct separate sanitary and storm sewer systems.
- Wastewater Treatment Projects – The construction, improvement, and expansion of treatment facilities for the secondary and advanced treatment of wastewater to meet water quality standards.
Wastewater infrastructure needs and capital costs

This section provides summary information on future wastewater infrastructure needs and capital costs facing Minnesota communities and sanitary districts. The summary data is based on over 1,050 wastewater infrastructure projects identified as future needs in the 2017 WINS survey and/or listed on the 2018 PPL. Summaries are provided statewide according to project type, the contrasting needs of Greater Minnesota and the Twin Cities Metropolitan Area (TCMA), Minnesota’s Economic Development Regions, and the proposer’s projected time frame. The following charts and tables provide a basic overview of the projected $4.99 billion\(^1\) in wastewater infrastructure needs. The specific needs of individual communities as reported in the 2017 WINS survey and PPL are summarized in Appendix 1.

Project costs in WINS were required to be reported in the unit of millions of dollars. It should be noted that some projects were reported with an impossibly high cost, and likely the reported value was in dollars. For example, there were twelve projects with a cost reported as greater than $10,000 million that were assumed to be reported in dollars and were automatically converted to millions of dollars. MPCA staff attempted but was unable to confirm the correct value with some of these communities.

Additionally, some communities provided an overall cost of a project, but did not give data on the type of project (i.e. New Collection or Advanced Treatment). Therefore, these projects are categorized as Undefined Wastewater Treatment and Sewer System Projects.

The $4.99 billion dollars in project costs are distributed between wastewater treatment and sewer system projects as indicated in Chart 2:

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\(^1\) The reported $4.99 billion ($4,990 million) of overall need of the 2018 Report compares to reported needs of previous years (in millions) as follows: 2016 - $4,207.66; 2014 - $3,986.77; 2012 - $3,658; 2010 - $4,340; 2008 - $4,526.57; 2006 - $3,483.59 and 2004 - $2,539.28. The large increase in cost from 2004 to 2008 is thought to have been caused by an increase in the number of communities completing WINS and higher quality data.
The $1,565.63 million dollars in wastewater treatment project costs, which include rehabilitation, improvement, and expansion of wastewater treatment facilities, are distributed between secondary and advanced treatment as indicated in Chart 3:

**Chart 3: Statewide distribution of wastewater treatment facility needs according to secondary and advanced treatment (millions)**

Of the $3,427.86 million dollars of sewer system projects to rehabilitate, improve, and expand sewer and interceptor systems, costs are distributed as indicated in Chart 4:

**Chart 4: Statewide distribution of sewer system needs by type of sewer project (millions)**

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2 For descriptions of secondary and advanced treatment, please see page 4.
Greater Minnesota needs and MCES service area needs

This section provides summary information on future wastewater infrastructure needs and capital costs facing Greater Minnesota, as compared to the Metropolitan Twin Cities. Metropolitan area wastewater infrastructure needs and capital costs include those of MCES and MCES Service Area Communities.*

The distribution of need for Greater Minnesota as compared to the MCES and the approximately 112 communities served by MCES can be found in Chart 5:

Chart 5: Statewide wastewater infrastructure needs of Greater Minnesota, MCES, and MCES Service Area Communities (millions)

Greater Minnesota, $2,013.84, 40%
MCES Service Area, $405.17, 8%
MCES, $2,574.80, 52%

*The MCES service area encompasses approximately 112 communities serving a total population of: 2,608,072, 51% of the State’s total population (2010 US Census). See Appendix 3 for a list of MCES Service Area Communities.
The distribution of costs by type of project as reported by Greater Minnesota can be found in Chart 6:

Chart 6: Greater Minnesota wastewater infrastructure needs by treatment facilities and sewer system type -- total Greater Minnesota need = $2,013.53 (millions)

The distribution of costs by type of project as reported by MCES and MCES Service Area Communities can be found in Chart 7:

Chart 7: MCES and MCES Service Area Communities wastewater infrastructure needs by treatment facilities and sewer system type -- total need = $2979.98 (millions) *

* The comparatively low percentages for “New Collection” may be influenced by a widespread local community policy of requiring residential developers to incorporate wastewater collection construction into development projects. Consequently, such capital costs are not reported to the WINS survey, which only identifies public needs. Also, note that approximately 90% of the $83.15 million of New Interceptor needs is attributable to MCES.
### Needs by economic development region

Table 1 provides a summary of the total cost of projects as reported in the 2017 WINS for communities in each Economic Development Region (EDR). A map and list of counties located within each EDR are located in Table 1.

**Table 1: Projected wastewater infrastructure needs by Minnesota’s Economic Development Regions**

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* EDRs 7E & 7W include three Twin Cities Metro Counties: Chisago, Sherburne, and Wright

** TCMA includes MCES, MCES Service Area Communities, and a number of projects in communities being integrated into the MCES Service Area.

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* Future wastewater infrastructure needs and capital costs  •  January 2018  
  
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Statewide needs by timeframe

Chart 8 illustrates wastewater infrastructure needs by time frame. As indicated, the majority of costs are identified as current needs. Infrastructure costs of 5-10 years and 10-20 years may be underrepresented, in part because such costs are unanticipated. In addition, many communities, particularly smaller communities, lack the planning and fiscal resources to engage in strategic and comprehensive capital improvement planning.

It should be noted that in the 2017 WINS, communities were given a list of projects they previously submitted in the 2015 WINS, and asked to provide updates. In the resulting 2017 dataset, some of these projects have an outdated date of construction (prior to January 2018) and it is assumed that the survey user neglected to update the anticipated date of construction. These projects were added to the Current (0-5) Year Need group.

Chart 8: Wastewater infrastructure needs by time frame (millions)

Completed wastewater infrastructure projects 2016 - 2017

During the two-year period from January 1, 2016, through December 31, 2017, a total of 369 wastewater infrastructure projects were completed throughout Minnesota at a total cost of $1.03 billion. The distribution of costs and projects between Greater Minnesota, MCES, and MCES service area communities are as indicated on Chart 9. The number of completed projects dropped from what was reported in the 2015 WINS (541 projects), but the cost of the completed projects was similar ($1.19 billion).

It should be noted that errors in rolling data over to the new electronic survey format were noted by communities while the survey was being conducted. This may have reduced the number of projects reported as completed on the 2017 WINS (completed projects may have been marked as “discontinued” if incorrect data was displayed, discontinued projects are not included in the completed project count). Additionally, costs are overall project totals for projects completed during the time period indicated. Multi-year projects may have been initiated and costs incurred prior to January 1, 2016.
Chart 9: Distribution of $1,030.86 (millions) of completed projects between Greater Minnesota, MCES and MCES Service Area Communities

Chart 10 indicates that from January 2016 to December 2017, Greater Minnesota improvements focused on new collection system piping, sewer system rehabilitation (along with I&I correction), and improvement of secondary treatment.

Chart 10: Distribution of $440.36 (millions) of completed projects in Greater Minnesota

- **New Collection, $114.00, 26%**
- **New Interceptor, $13.30, 3%**
- **Combined Sewer Overflow (CSO), $0.40, 0%**
- **Secondary Treatment, $109.75, 25%**
- **Undefined Wastewater and Sewer, $26.70, 6%**
- **Sewer System Rehabilitation, $89.06, 20%**
- **Infiltration/Inflow, $47.91, 11%**
- **Advanced Treatment, $39.25, 9%**
Chart 11 indicates improvements by MCES Service Area Communities from January 2016 to December 2017 focused primarily on I&I correction and sewer rehabilitation.

**Chart 11: Distribution of $104.49 of completed projects in the MCES Service Area (in millions)**

- Sewer System Rehabilitation, $94.89, 53%
- Infiltration/Inflow, $29.56, 28%
- Undefined Wastewater and Sewer, $2.50, 2%
- New Collection, $15.54, 15%
- New Interceptor, $2.00, 2%

Chart 12 indicates construction activities by MCES from January 2016 to December 2017 focused on sewer rehabilitation and improvement of secondary treatment. It should be noted that the distribution of completed MCES projects from 2017 WINS information varies greatly from data submitted on the 2015 WINS. I&I projects decreased from 58% to 0% of the total, and Sewer System Rehabilitation projects increased from 17% to 49% of the total. This change is likely due to a small number of projects (15) being submitted as “completed” by MCES due to errors in rolling data over into the electronic survey format. In addition, the distinction between sewer I&I and rehabilitation projects is not clear and could have resulted in these reported changes.

**Chart 12: Distribution of $486 of completed MCES improvement projects (in millions)**

- Sewer System Rehabilitation, $234.00, 48%
- Undefined Wastewater and Sewer, $10.00, 2%
- New Interceptor, $24.00, 5%
- Secondary Treatment, $216.25, 45%
- Infiltration/Inflow, $1.00, 0%
- Advanced Treatment, $0.75, 0%
- Combined Sewer Overflow (CSO), $0.00, 0%
Wastewater infrastructure needs, household costs, and affordability

This section provides summary information on household costs and a comparative measure of affordability of wastewater infrastructure projects.

Less populous communities frequently struggle with the affordability of wastewater infrastructure and treatment – they lack the economies of scale that help keep costs down in cities with large populations. The Minnesota Public Facilities Authority (PFA) uses 1.4% of median household income as a wastewater costs affordability index for Minnesota communities.

Chart 13 shows the number of communities in each population group that reported household costs greater than 1.4% of median household income. Costs are based on annual average residential sewer services charges, which encompass a community’s infrastructure project costs and annual operation and maintenance costs. Household costs are presented as a percentage of annual median household income (2015 American Community Survey (ACS)). Sanitary sewer districts and other communities not listed in the 2015 ACS were not included in this analysis. As indicated, a greater number of smaller communities reported being above the affordability index. Of the 562 communities that provided usable sewer rate data, 19% (61 out of 329) of communities with populations less than 1,500 reported unaffordable rates in comparison to 8% (18 out of 233) being unaffordable for communities with populations greater than 1,500. The sewer charges of individual communities as reported in response to WINS and used to create Chart 13 are listed in Appendix 3.

Chart 13: Number of communities with wastewater costs greater than 1.4% of MHI, according to population
Age and condition of existing wastewater Infrastructure

The American Society of Civil Engineers (ASCE) released an Infrastructure Report Card in 2017, giving the nation a D+ score for wastewater. The report states, “It is expected that more than 56 million new users will be connected to centralized treatment systems over the next two decades, and an estimated $271 billion is needed to meet current and future demands.” It is projected that by 2032 there will be a 23% increase in demand for wastewater treatment connections to treatment plants as population grows.

Combined sewer overflows (CSO): In many areas of the U.S., particularly in major metropolitan areas around and east of the Mississippi River, sewer systems constructed prior to the 1950s combined the collection of wastewater and stormwater. During heavy rainfall, these combined systems generate flows that greatly exceed the capacity of treatment facilities. Consequently, releases to surface water are necessary to keep from overwhelming and damaging treatment facilities.

The EPA considers CSOs to be “a priority water pollution concern for the nearly 860 municipalities across the U.S. that have CSSs.” In many metropolitan areas and states, eliminating CSO discharges comprises a major share of infrastructure needs and costs. In contrast, Minnesota has acted effectively to address this problem. Thanks to a concerted funding effort during the 1980s and construction during the 1980s and 1990s, CSO elimination is now a relatively minor problem. Minnesota has only one remaining CSO permit, which has not reported discharge in many years.

Aged sewers and treatment facilities: The expected useful life of sewer piping is approximately 40-80 years. Factors including soils, geological conditions, flows, loadings, maintenance, and the deterioration of materials will determine the actual life of piping. The ongoing condition of sewers will vary, but performance can be enhanced and extended through effective programs of inspection, maintenance, repair, relining, and rehabilitation. Chart 14 presents the age of sewers in Greater Minnesota. As indicated, 42% of sewers in Greater Minnesota are less than 30 years old, 26% are 30-50 years old, and 32% of Greater Minnesota sewers were installed over 50 years ago.

Sewers installed over 50 years ago are frequently beyond their useful life because of their construction with vitrified clay tiles. Accordingly, substantial I&I, outflow, obstruction, and other performance problems tend to be pervasive. Based on current projects documented in WINS, it appears that the large percentage of aging sewer (58% are 30 years or older) correlates to a high percentage of sewer rehabilitation projects (31% of all projects) in Greater Minnesota.

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3 Available at the ASCE website: [http://www.infrastructurereportcard.org/factsheet/wastewater](http://www.infrastructurereportcard.org/factsheet/wastewater)

4 See EPA’s website on CSOs: [https://www.epa.gov/npdes/combined-sewer-overflows-csos](https://www.epa.gov/npdes/combined-sewer-overflows-csos). Combined Sewer System (CSS) refers to a combined stormwater and wastewater sewer.
While most wastewater treatment facilities were designed and built for 20 years of growth, the major structural components have an expected useful life of 40 years, dependent on operation and maintenance. As these structures deteriorate beyond their useful life, effectiveness declines, leading to a greater potential for permit violations, spills, unintended discharges, and operational and maintenance expenses. Currently, 20% of Greater Minnesota’s treatment facilities are over 40 years old. Without construction projects, infrastructure demands and costs will continue to increase significantly.

In the Twin Cities, local communities collect sewage from households, businesses, etc. and then route it to the appropriate MCES interceptors. MCES operates an extensive interceptor system, conveying wastewater to its treatment facilities. The age of sewers in the TCMA, excluding and including Minneapolis and St. Paul (MSP), is indicated in Chart 16.
The reason for presenting MCES service area data with and without the Twin Cities is as follows: a) Minneapolis and St. Paul themselves have a high percentage (85%) of sewers constructed over 50 years ago, but have Capital Improvement Plans in place to rehabilitate sewers that were not a part of the circa 1980s and 1990s CSO program and, b) While not minimizing the very substantial investments and the costs being incurred by Minneapolis and St. Paul, these communities have the economies of scale and the established financial resources to complete these projects and are making substantial progress in rehabilitating and replacing older sewers.

Accordingly, in the MCES Service Area, 20% (1,509 miles) of sewers were installed 50 or more years ago. On average, suburban MCES Service Area Communities have a comparatively small percentage of sewers constructed over 50 years ago. However, this average conceals large percentages of communities with sewers 50 years and older, including Richfield, St Louis Park, Crystal, Golden Valley, and Roseville. The age of the sewer systems and wastewater treatment facilities of specific communities as reported in the 2017 WINS survey are provided in Appendix 3.

Estimating future costs

WINS requests communities and sanitary districts to estimate costs for future needs by using the following time frames to better understand timing for future capital investments:

- Current needs (immediate needs up to 5 years)
- 5 – 10 year needs
- 10 – 20 year needs

The capability of survey responders to accurately estimate the future cost of infrastructure needs correlates with the availability of resources and expertise. The longer the timeframe from the initial estimate to actual construction and the availability of resources to accurately plan, design, and build for future needs will impact future costs. Asset Management Planning is one means of better recognizing and managing future needs. Asset Management Planning involves carefully maintaining and monitoring system components to gain the efficiencies of maximum useful life, as well as systematic replacement.
Smaller communities are less likely to have the resources required to have a robust Asset Management Plan. Of the 715 communities that submitted WINS, 221 (31%) reported that they have an Asset Management Plan.

Average monthly residential sewer charges

Responding to the 2017 WINS, 585 communities identified what they charged for sewer service for an average or typical residential connection at an assumed volume of 5,000 gallons per month. Table 2 provides various statistical parameters for average monthly residential sewer charges in Greater Minnesota and in the MCES Service Area. Greater Minnesota charges are reported by a series of population ranges. The sewer charges of individual communities as reported in response to WINS and used to create Table 2 are listed in Appendix 3.

It should be noted that some sewer service charges were reported as remarkably high or low in the 2017 WINS, and the reported value was likely a quarterly or annual rate, or a typing error. There were eight communities that reported a charge of $175 per month or greater and three that reported a charge of less than $5. These values were not used to create the following table. MPCA staff attempted but were unable to confirm the rate as correct for these 11 communities.

Table 2: Average monthly residential sewer charges for Greater Minnesota and the MCES Service Area, based on 5000 gal/day usage

<table>
<thead>
<tr>
<th>Greater Minnesota</th>
<th>Average</th>
<th>Median</th>
<th>High</th>
<th>Low</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 500</td>
<td>$35.00</td>
<td>$32.00</td>
<td>$94.00</td>
<td>$8.00</td>
<td>$86.00</td>
</tr>
<tr>
<td>500 to 999</td>
<td>$34.00</td>
<td>$32.00</td>
<td>$100.00</td>
<td>$10.00</td>
<td>$90.00</td>
</tr>
<tr>
<td>1,000 to 2,499</td>
<td>$41.00</td>
<td>$38.00</td>
<td>$98.00</td>
<td>$11.00</td>
<td>$87.00</td>
</tr>
<tr>
<td>2,500 to 4,999</td>
<td>$38.00</td>
<td>$37.75</td>
<td>$95.00</td>
<td>$10.00</td>
<td>$85.00</td>
</tr>
<tr>
<td>5,000 to 9,999</td>
<td>$41.00</td>
<td>$35.00</td>
<td>$90.00</td>
<td>$13.00</td>
<td>$77.00</td>
</tr>
<tr>
<td>10,000 to 24,999</td>
<td>$35.00</td>
<td>$33.00</td>
<td>$60.00</td>
<td>$19.00</td>
<td>$41.00</td>
</tr>
<tr>
<td>25,000 and over</td>
<td>$29.00</td>
<td>$27.00</td>
<td>$39.00</td>
<td>$20.00</td>
<td>$19.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MCES Service Area (all communities)</th>
<th>Average</th>
<th>Median</th>
<th>High</th>
<th>Low</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$26.00</td>
<td>$25.00</td>
<td>$54.00</td>
<td>$12.00</td>
<td>$42.00</td>
</tr>
</tbody>
</table>

Variability of residential sewer charges

The overall range of sewer charges collected by Minnesota communities is considerable. The City of Clear Lake, which has the highest reported residential sewer charges in the state (as reported in 2017 WINS) collected $100.00 monthly as compared to several communities that charge $10 or less monthly. Note that in the table, the smallest range of sewer charges (from highest to lowest) is that of Greater Minnesota communities with a population 25,000 and over and yet even for this group the highest charge is almost two times the lowest. This remarkable variability of costs can be both puzzling and a matter of significant concern to the residents of a community facing sewer charges that are several times those of a neighboring community – where the neighbor is otherwise quite similar in population and other characteristics. Here are a number of factors that help to account for the variability of charges:
• **Stage in the life cycle** – If Community #1 has recently constructed a treatment facility and made major improvements to its sewer system, its residential sewer charges are likely to be quite high, especially if compared to Community #2 that has fully retired the debt on its existing infrastructure. Such differences in stage of the life cycle can result in what are perhaps the most dramatic contrasts in sewer charges.

• **Economies of scale** – In constructing wastewater infrastructure, particularly treatment facilities, there are certain threshold costs that must be met to build, for example, treatment ponds serving a population of 500. Once these costs are met, it is incrementally less expensive to construct expanded ponds that will serve a population of 1,000 or 1,500. The costs of such expanded ponds in more populous communities can then be “spread out” over a large base of residential customers. As a result, residential customers in smaller communities will likely face higher sewer charges.

• **Population densities and the structure of communities** – In providing sewer services, population densities and the physical structure of a community can have a significant impact on capital costs, and, to a lesser extent, operation and maintenance costs. Consider, for example, an older, developed Minneapolis neighborhood where residential structures are adjacent on small lots and streets are laid out on a grid – as compared to a suburban community with very large lots, winding streets, or a community built up around a lake or a small town with scattered development. Clearly, the older city grid structure will have lower capital and maintenance costs, which should affect residential sewer charges.

• **Meeting permit requirements** – Treatment facilities that fail to meet NPDES or SDS discharge permit requirements – releasing insufficiently treated discharges and excessive volumes – can, at least in the short term, be less expensive to operate, resulting in lower sewer charges. Treatment facilities fail to meet discharge requirements because of an inadequate physical plant (deteriorated structures or insufficient capacities) or failure to operate and maintain the plant properly. Failure to meet permit requirements can also be brought about by a sewer system where excessive I&I results in unauthorized discharges from a treatment facilities overwhelmed by the volume of wastewater. The apparent cost “savings” of failing to meet permit requirements will actually result in higher overall costs because of fines and other penalties and because of costs of rehabilitating or replacing neglected treatment and sewer systems.

• **Advanced treatment** – Implementation of the EPA Total Maximum Daily Load program will result in permit requirements to reduce the discharge of specific pollutants into water resources and watersheds. These advanced treatment requirements, the costs of which are included in the report, result in additional capital and operation and maintenance expenditures and corresponding increases in residential sewer charges.

• **Asset management** – Asset management is the planned and systematic operation and maintenance of treatment facilities and sewer systems structures to ensure that structures and equipment will achieve their maximum service life. While proper asset management can have both short and long-term benefits, avoiding costly failures can result in somewhat increased ongoing operational and maintenance costs. Conversely, without effective asset management, the costs of reoccurring failures and emergencies can quickly increase residential sewer charges.

• **Recovering costs through assessments and property taxes** – Communities have the option of recovering all of their wastewater costs through sewer charges. Communities also choose to recover capital costs through property assessments and property taxes. Clearly, these choices can have a dramatic impact on residential sewer charges. Sewer charges can be much higher in a community that recovers all of its costs through the sewer charge, as compared to a community that makes use of property assessments and property taxes, even when the actual overall cost per residential connection is the same.
• **Subsidizing wastewater costs** – Although as a rule Minnesota communities operate wastewater utilities as dedicated funds (i.e., sewer service income through charges and sewer service expenses are kept separate from other municipal funds), communities may also subsidize wastewater costs from other city revenue (e.g., municipal liquors), resulting in residential sewer charges that are below what is required to cover costs.

• **Site availability and conditions for soil based systems** – For small communities where the cost of a conventional wastewater sewer and treatment system is too expensive, SSTS that serve individual residences, clusters of residences, or the full community may be the most practical alternative. Despite reduced costs of some of these systems, site-specific conditions, such as small residential lots, unsuitable soil types for treatment, or insufficient depth to high water table, may add significant costs. Cost increases may also be related to discharge standards necessary to protect groundwater and related public health.

Appendices to 2018 Future Wastewater Infrastructure Needs and Capital Costs are bound as a separate document available upon request. The table of contents above briefly describes the Appendices. The report and the appendices will also be available early 2018 at the following location on the MPCA website: [https://www.pca.state.mn.us/about-mpca/legislative-reports](https://www.pca.state.mn.us/about-mpca/legislative-reports)