Water System Asset Management Plan

City of Grosse Pointe Park

December 11, 2020

Prepared for:

City of Grosse Pointe Park
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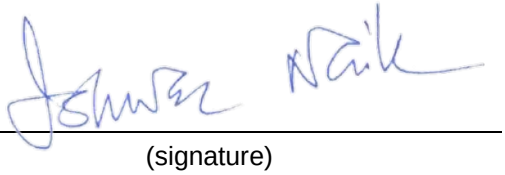
Approved by 
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Executive Summary

The City of Grosse Pointe Park (City) is a community water supply that serves a population greater than 1,000 and is therefore subject to Rule 1606 of Act 399; the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Safe Drinking Water Act. This rule requires such communities to develop an Asset Management Program (AMP) for their water system. The City retained Stantec Consulting Michigan Inc. (Stantec) to compile major elements of its AMP within an Asset Management Plan (Plan).

1. Asset Inventory
2. Criticality/Risk Assessment
3. Level of Service (LOS)
4. Capital Improvement Plan (CIP)
5. Revenue Structure (will be completed in the future)

City Asset Management Team

This Plan was developed in cooperation with the City Asset Management Team (AMT) which included:

- Nick Sizeland; City Manager
- Pat Thomas; Public Works Supervisor
- Stantec; Asset Management Consultant

Asset Inventory

The City utilizes ESRI's ArcGIS for their asset inventory which includes a record of the City owned water mains, valves, and hydrants as well as other appurtenances which are partially populated, such as curb stops, laterals, fittings, etc. It should be noted that while the service laterals have not been digitized in the GIS, the City does have an inventory of laterals with their service address and material type.

List of Major Assets Being Tracked

- Approximately 186,260 feet of water main pipes from 2- to 16-inches in diameter, assumed to be majority cast iron material type
- Approximately 345 hydrant assemblies
- Approximately 260 system valves
- Approximately 4,058 water service leads

The number of assets and parameters being tracked for each asset type are summarized in the following table:

Water Main 100% of total		Hydrants 100% of total		Valves 100% of total	
466		345		260	
Facility ID	100%	Facility ID	100%	Facility ID	100%
Install Date	100%	Install Date	100%	Install Date	100%
Diameter	100%	Location Description	100%	Diameter	100%
Length	100%	Data Source	100%	Location Description	100%
Material	100%			Data Source	100%
Location Description	100%				
Data Source	100%				

Inventory Sustainability

There are a few areas of possible improvement in the inventory. The City could work toward ensuring completeness in service lead information by field-locating and digitizing curb stops, digitizing service leads, and including a common identifier with the City's billing system. The City may also wish to work towards 100% population of the asset attributes including, but not limited to, those listed above.

The City will also endeavor to periodically update its GIS as water system improvements are implemented. That will ensure that future decisions are made using the best and most current information.

Risk Assessment

Risk can be described as a function of the probability of failure and the consequences of failure, and is typically represented using the following formula:

Risk = [Probability of Failure] x [Consequence of Failure]

The condition assessment that was completed as part of this effort helps to define the probability of failure for the water main pipes and their associated hydrants and valves. The examination of several factors, such as pipe size, number of customers served, customer type, and location led to an assessment of the consequence of failure (criticality).

Condition Ratings

As part of the AMP development, a condition rating was assigned to each of the tracked assets in the City's water system. Condition assessment ratings were used to determine the likelihood of failure for each asset and were assigned to the assets based on a scale from 1-5:

- 1 = Excellent: New or Excellent Condition - Only normal maintenance required.
- 2 = Good: Minor Deterioration - Minor maintenance required.
- 3 = Average: Moderate Deterioration - Significant maintenance required.

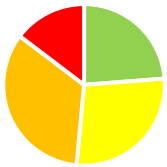
- 4 = Fair: Significant Deterioration - Significant renewal/upgrade required.
- 5 = Poor: Asset Unserviceable - Replacement required OR asset poses safety risk.

Desktop Analysis

Linear infrastructure (i.e., pipes, valves, hydrants, service laterals) make up the entirety of the City's water system assets, and while it is possible to physically inspect those underground elements, the procedures are invasive and cost prohibitive for many local distribution systems. Therefore, the City elects to track these items via desktop analysis methods. To assign a condition assessment rating to the water mains, a condition score of 1-5 (with 5 being the worst condition) was assigned based on several factors including:

- Age of the water main;
- Hydraulic capacity;
- Break history; and,
- Material type.

The condition assessment occurs in a two-stage process: The first stage employs a pairwise comparison technique to determine the relative importance, or weighting for several key criteria as identified above. The second stage then uses these criteria and relative weightings to estimate the condition by summing them for each asset. This weighted condition scoring method was applied to better differentiate the condition of the water mains throughout the City. To simplify the AMP processes, the City elects to assume the valves and hydrants have the same condition rating and replacement schedule because their replacement typically occurs during construction of new water main. A summary of the condition criteria as well as the assigned condition ratings assigned is presented below. Condition ratings are also displayed graphically on the attached map, and detailed condition tables are available for review upon request.

Condition Rating	Length	%	Summary
1	0	0%	
2	44,269	24%	
3	51,654	28%	
4	63,014	34%	
5	27,327	15%	
Total	186,264	100%	

Criticality Ratings

A criticality rating system was developed to analyze the consequence of failure for the water system assets and to determine the relative importance of the assets for the prioritization of future capital expenses. Criticality is assigned on a scale of 1-5, with 1 being the least critical and 5 being the most critical. Several key risk criteria were identified:

- Potential system impact as a function of PIPE SIZE;
- Potential impact to the CUSTOMER TYPE served;
- Potential population impacted based on CUSTOMER ACCOUNTS served; and,
- Potential difficulties presented by WATER MAIN LOCATION

As with the condition assessment, the criticality assessment occurs in a two-stage process: The first stage employs a pairwise comparison technique to determine the relative importance, or weighting for several key criteria. The second stage then uses these criteria and relative weightings to determine the relative consequence of failure (or criticality) for each asset. The consequence of failure for each asset was evaluated within this framework based on the qualities they possess, and an overall criticality rating was assigned by summing the weighted criticality scores for each of the risk criteria.

A map of the City's water system with the overall criticality of the water mains is attached. Further detail on the development of the criticality scores for the water mains and the system facilities is available for review upon request.

Risk Summary

The risk to the City associated with failure of an asset was estimated based on the product of the condition rating and the criticality rating, with higher scores indicating greater risk. The heat map below summarizes the City's risk based on the condition/criticality of the water mains.

Water Mains

Probability of Failure

Consequence of Failure	1	2	3	4	5
1	0	67	29	19	7
2	0	62	40	48	18
3	0	37	37	26	4
4	0	31	8	3	0
5	0	21	3	4	2

Risk Assessment Sustainability

To ensure the sustainability of the AMP, the City plans to track the condition of their assets and update their condition ratings, as necessary. The inventory will need to be updated if water mains are replaced,

repaired, or added to the system. Hydraulic analysis results will also be updated after completion of model updates as part of the water system reliability study (updates are required every five years).

Moving forward, the City plans to track service lateral/curb stop condition, as well as material type, and install date.

Level of Service

Based on discussion with the City's AMT, the following Level of Service (LOS) goals have been identified as desirable:

- Maintain all critical assets as well as some less critical assets to provide enhanced reliability;
- Strive to meet the regulatory requirements set by EGLE; and,
- Reduce the time and resources spent on emergency repairs.

Level of Service Sustainability

The City plans to review and update their stated LOS goals periodically and assess the performance of their system against those goals to identify any areas that may need improvement. In the future, the City intends to engage in public outreach efforts to ensure that the LOS being provided meets the expectations of the customers. This may include questionnaires, surveys, and/or public meetings.

Capital Improvement Plan (CIP)

A CIP has been developed using the result of the AMP analysis (and previous Drinking Water Revolving Fund planning efforts) and is divided into Short-Term (0-5 year), and Long-Term/ongoing (20 year) initiatives. A preliminary summary is provided below with initial conceptual cost opinions using present day (2020) dollars. The source of the CIP recommendation is included in the description within parentheses. The project list below may be subject to change based upon the rate evaluation phase which requires approval by the City Council to secure funding. A map of the water main upgrade projects is also attached for reference.

CIP Sustainability

To maintain the sustainability of the AMP, the City plans to revisit the CIP periodically to update the project list as work is completed or new pertinent information is available (e.g., condition assessment and LOS updates).

Timeframe	Project Name	Details	Justification	Year	Conceptual Opinion of Cost	Funding Source
Short Term (0-5 years)	Phase 1	Replace revenue meters, approx. 300 lead service leads, and 15,300 LF of water main	End of service life/Lead-Copper Rule Compliance	2021	$6,775,000	TBD
	Phase 2	Replace approx. 400 lead service leads, and 21,400 LF of water main	End of service life/Lead-Copper Rule Compliance	2022	$6,550,000	TBD
	Phase 3	Replace approx. 250 lead service leads and 20,000 LF of water main	End of service life/Lead-Copper Rule Compliance	2023	$5,750,000	TBD
	Phase 4	Replace approx. 125 lead service leads and 22,600 LF of water main	End of service life/Lead-Copper Rule Compliance	2024	$6,025,000	TBD
	Phase 5	Develop alternate source with Grosse Pointe Farms, including 21,000 LF of 21-inch transmission main, 2,000 LF of water main, bulk flow water meters, and WTP improvements	Resiliency	2025	$11,000,000	TBD
Long Term (5-20 years) and ongoing	Routine Maintenance and Replacement	Estimated at 2% or present-day replacement cost	End of service life/Lead-Copper Rule Compliance	2026-2040	$1,000,000 annually	TBD

Funding Structure and Rate Methodology

The rate study and evaluation of the City's funding structure will be performed separately by others and included as an attachment to this report. The document will need to address the following:

- Annual operating budget
- Current approved rate structure
- Documentation of legal authority for setting rates
- Discussion of anticipated costs (operations and capital) against revenue
- Documentation showing no funding gap, or a remedy to close gap if one exists.

Funding Structure and Rate Methodology Sustainability

It is our understanding that to maintain the sustainability of the AMP, the City plans to revisit the funding structure and rate methodology to ensure that the funding is available to meet the requirements of the water system.

System Resiliency

An important consideration for any community water supply is whether the system can still service its customers in the event of an emergency. The City's water system infrastructure consists of only the pipe network and appurtenances, so resiliency is provided locally by water main looping, and City-wide by having three separate connections to the GLWA system. In addition to the three (3) existing connections, the City has also been exploring the possibility of accessing a redundant supply of water from the City of Grosse Pointe Farms.

Abbreviations

AMP	Asset Management Program
AMSAT	Asset Management Supplemental Analysis Tool
AMT	Asset Management Team
CIP	Capital Improvement Plan
City	City of Grosse Pointe Park
DWRF	Drinking Water Revolving Fund
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EOPC	Engineer's Opinion of Probable Costs
GIS	Geographic Information System
GLWA	Great Lakes Water Authority
LOS	Level of Service
O&M	Operation and Maintenance
Stantec	Stantec Consulting Michigan Inc.

1.0 INTRODUCTION

The City of Grosse Pointe Park (City) is a community water supply that serves a population greater than 1,000 and is therefore subject to Rule 1606 of Act 399; the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Safe Drinking Water Act. This rule requires such communities to develop an Asset Management Program (AMP) for their water system. The City retained Stantec Consulting Michigan Inc. (Stantec) to compile major elements of its AMP within an Asset Management Plan (Plan).

Included in this report is a description of the process undertaken by Stantec, using a combination of field investigations and data analysis, to evaluate the condition and criticality of the City's assets, and develop a comprehensive Plan to assist in guiding future capital expenditures and maintenance activities.

1.1 ASSET MANAGEMENT TEAM

This plan was developed in cooperation with the City's Asset Management Team (AMT), which included:

- Nick Sizeland; City Manager
- Pat Thomas; Public Works Supervisor
- Stantec; Asset Management Consultant

1.2 SYSTEM DESCRIPTION

The City of Grosse Pointe Park is located in Wayne County, Michigan. It is bounded by the City of Detroit on the north (Mack Avenue) and west (Alter Road), the City of Grosse Pointe on the east (Cadieux Road) and Lake St. Clair on the south (Windmill Pointe Drive). The City currently receives its water supply from the Great Lakes Water Authority (GLWA), formerly known as the Detroit Water and Sewerage Department (DWSD). The original water distribution system for the City was constructed in the 1930's, and most sections of the original system are still in use today. Over the years, as Grosse Pointe Park grew, numerous additions and modifications were made to the original system, which is currently assumed to be at build-out conditions.

The three major GLWA feed points which transmit water from the GLWA system into the City's water system are located as follows:

1. Intersection of Kercheval Avenue and Maryland Street on Kercheval Avenue (16-inch).
2. Intersection of Jefferson Avenue and Barrington Road on Jefferson Avenue (8-inch).
3. Intersection of Barrington Road and Essex Drive on Essex Drive (12-inch).

A depiction of the City's water system is provided in **Figure 1.0 in Appendix A.**

1.3 AMP SCOPE OF WORK

The overall scope of work for this project was to improve upon the baseline inventory, conduct condition assessments and a criticality analysis of the water system assets and provide a capital improvement plan (CIP). A rate study will be completed separately by the City's rate consultant and included in **Appendix E** once complete. The City's AMP addresses the following five core components:

1. Asset Inventory
2. Criticality/Risk Assessment
3. Level of Service (LOS)
4. Capital Improvement Plan (CIP)
5. Revenue Structure

1.4 ASSET MANAGEMENT SUPPLEMENTAL ANALYSIS TOOL

Available to the City along with this Plan is the Asset Management Supplemental Analysis Tool (AMSAT). This AMSAT is a spreadsheet based analytical tool developed to facilitate the AMP development. It provides a repository for the inventory, as well as a method of updating condition assessment ratings, criticality ratings, and rehabilitation or replacement costs. That information is then used to project estimated expenditures over a 20-year planning period. This tool will be referred to throughout this report.

2.0 ASSET INVENTORY

The City, utilizes ESRI's ArcGIS for their asset inventory and geographic information system (GIS), and it includes a record of the City owned water mains, valves, and hydrants as well as other appurtenances which are partially populated, such as curb stops, laterals, fittings, etc. It should be noted that while the service laterals have not been digitized in the GIS, the City does have an inventory of laterals with their service address and material type.

List of Major Assets Being Tracked

- Approximately 186,260-feet of water main pipes from 2- to 16-inches in diameter, assumed to be majority cast iron material type
- Approximately 345 hydrant assemblies
- Approximately 260 system valves
- Approximately 4,058 water service leads

2.1 WATER MAINS

The City owns and operates approximately 186,260 feet (35.3 miles) of water mains that range from 2- to 16-inches in diameter, with approximately 345 fire hydrant assemblies and 260 system valves. As previously indicated, most of this system was constructed 1930's, with some limited repair and replacement continuing through the present day. A summary of the water distribution system is presented in **Tables 2-1.**

Table 2-1 - Water Main Size Summary

Diameter (in.)	Length (ft)	Length (%)
2"	352	<1%
6"	122,885	66%
8"	48,339	26%
12"	8,028	4%
16"	6.660	4%
TOTAL	**186,264**	**100%**

For each of the water main assets considered in this Plan, the following attributes were populated in the GIS to the extent indicated in **Table 2-2**. Note that the GIS may contain additional informational attribute data that has a limited impact on asset management activities.

Table 2-2 - Water System Attribute Data Statistics

Water Main 100% of total		Hydrants 100% of total		Valves 100% of total	
466		**345**		**260**	
Facility ID	100%	Facility ID	100%	Facility ID	100%
Install Date	100%	Install Date	100%	Install Date	100%
Diameter	100%	Location Description	100%	Diameter	100%
Length	100%	Data Source	100%	Location Description	100%
Material	100%			Data Source	100%
Location Description	100%				
Data Source	100%				

2.2 WATER SERVICE LEADS

As might be expected with a water system of this era, there are a significant number of customers in the City that are supplied by lead service leads. Recent updates to the EGLE Lead and Copper Regulations require that the City work to eliminate all lead service leads in the City by the year 2040. The material types for the service leads are shown in **Table 2-3**.

Table 2-3 - Service Lead Material Types

Material	Number
Copper	2,110
Lead	1,940
Plastic	1
Cast Iron	2
Unknown	5
TOTAL	**4,058**

2.3 AMP SUSTAINABILITY – INVENTORY

There are a few areas of possible improvement in the inventory. The City could work toward ensuring completeness in service lead information by field-locating and digitizing curb stops, digitizing service leads, and including a common identifier with the City's billing system. The City may also wish to work towards 100% population of the asset attributes including, but not limited to, those listed in **Table 2-2**.

The City will also endeavor to periodically update its GIS as water system improvements are implemented. That will ensure that future decisions are made using the best and most current information.

3.0 RISK ASSESSMENT

Risk can be described as a function of the probability of failure and the consequences of failure, and is typically represented using the following formula:

Risk = [Probability of Failure] x [Consequence of Failure]

The condition assessment that was completed as part of this effort helps to define the probability of failure for the water main pipes and their associated hydrants and valves. The examination of several factors, such as pipe size, number of customers served, customer type, and location led to an assessment of the consequence of failure (criticality).

3.1 CONDITION ASSESSMENT

For an AMP and the resultant CIP to be successful and economically prudent, it is critical to understand not only the extent of the component inventory, but what condition those components are in. As part of the AMP development, a condition rating was assigned to each of the tracked assets in the City's water system. Condition assessment ratings were used to determine the likelihood of failure for each asset and were assigned to the assets based on a scale from 1-5:

- 1 = Excellent: New or Excellent Condition- Only normal maintenance required.
- 2 = Good: Minor Deterioration- Minor maintenance required.
- 3 = Average: Moderate Deterioration- Significant maintenance required.
- 4 = Fair: Significant Deterioration- Significant renewal/upgrade required.
- 5 = Poor: Asset Unserviceable- Replacement required OR asset poses safety risk.

3.1.1 Approach

Linear infrastructure (i.e., pipes, valves, hydrants, service laterals) make up the entirety of the City's water system assets, and while it is possible to physically inspect those underground elements, the procedures are invasive and cost prohibitive for many local distribution systems. Therefore, the City elects to track these items via desktop analysis methods. To assign a condition assessment rating to the water mains, a condition score of 1-5 was assigned based on several factors including the age of the water main, hydraulic capacity, break history, and material type.

The condition assessment occurs in a two-stage process: The first stage employs a pairwise comparison technique to determine the relative importance, or weighting for several key criteria, and the second stage then uses these criteria and relative weightings to estimate the condition for each asset. This weighted condition scoring method was applied to better differentiate the condition of the pipes throughout the City. Condition is assigned on a scale of 1-5 as noted above. The following subsections describe the condition assessment model, assumptions made, and results.

3.1.2 Condition Assessment Model

The condition assessment model for the water system assets contains four (4) condition categories:

1. Likelihood of failure due to historical NUMBER OF BREAKS;
2. Likelihood of fire flow CAPACITY DEFICIENCY;
3. Likelihood of failure based on CONSUMED SERVICE LIFE; and,
4. Likelihood of failure based on PIPE MATERIAL,

Each risk category was assigned a weighting factor, based on the relative importance of one category versus the others. A pair-wise evaluation approach was used in establishing the weighting factors with input from the City's AMT. Results of the pair-wise comparison and a breakdown of the graduated scoring for each condition category are provided in **Table 3-1.**

Table 3-1 - Condition Model Summary

Condition Category	Weighting Factor		
Number of Breaks	0.31	**Number of Breaks**	**Score**
		0	1
		1	3
		>1	5
Capacity Deficiency	0.31	**Available Fire Flow (gpm)**	**Score**
		>1,500	1
		1,250-1,500	2
		1000-1,250	3
		500-1,000	4
		<500	5
Consumed Service Life	0.25	**Consumed Service Life (%)**	**Score**
		0-45	1
		45-70	2
		70-85	3
		85-95	4
		95-100+	5
Pipe Material	0.14	**Pipe Material**	**Score**
		Ductile Iron	1
		Cast Iron	4
Total Weight	1.00		

3.1.3 Condition Assessment Process

This section contains a summary of the process of assigning condition scores for the water system assets, and ultimately assigning a condition rating.

3.1.3.1 Condition Category 1 – Break History

With much of the infrastructure having exceeded its expected service life, the City experiences water main breaks frequently. The City has kept records of these breaks and the locations of those that have occurred in the last 20 years have been associated with the water main assets in the AMSAT and GIS. The scores for number of breaks are assigned as shown in **Table 3-2**. The score for each is multiplied by the relative weighting factor for the NUMBER OF BREAKS category listed in **Table 3-1** (i.e., 0.31), yielding a possible maximum weighted score of 1.55 (i.e., 5 x 0.31).

Table 3-2 - Break History Condition

Number of Breaks	Assigned Condition Rating
0	1
1	3
>1	5

3.1.3.2 Condition Category 2 – Capacity Deficiency

The City's latest Water Reliability Study was completed in 2016. When calibrating the model to field observed conditions, there were several areas in the system that had to be assigned very low C-factors (a factor representing pipe roughness). This indicates that those pipes have either significant tuberculation, or there are valves closed or partially closed in the network, or both. The increased pipe roughness, as well as several long dead-end water mains, lead to some areas in the City experiencing lower than desirable available fire flow. The benchmark for single-family residential homes is usually 1,500 gpm.

Condition ratings were assigned to the pipes based on their hydraulic capacity deficiency according to the schedule shown in **Table 3-3**. The score for each is multiplied by the relative weighting factor for the CAPACITY DEFICIENCY category listed in **Table 3-1** (i.e., 0.31), yielding a possible maximum weighted score of 1.55 (i.e., 5 x 0.31). move table next page if still split

Table 3-3 - Capacity Deficiency Condition

Available Flow (gpm)	Assigned Condition Rating
>1,500	**1**
1,250-1,500	**2**
1000-1,250	**3**
500-1,000	**4**
<500	**5**

3.1.3.3 Condition Category 3 – Age and Condition

The majority of the City's water mains have been in the ground for quite some time, and a condition score of 1-5 was assigned based on the age of the water main. To streamline AMP processes, the City elects to assume the valves and hydrants have the same condition rating and replacement schedule since replacement typically occurs during construction of new water main.

Per EGLE's Drinking Water Revolving Fund (DWRF) Project Plan Preparation Guidance, the useful life of water supply conveyance structures (e.g., distribution and transmission mains) should be considered to be 50-years. While the actual service life of the water main pipes may be greater (often 80-years or more), the 50-year lifespan offers a conservative estimate of replacement needs.

Since the water mains were not physically inspected, the condition rating was estimated by comparing the elapsed time since the install date to the expected service life, and using the condition rating deterioration curve depicted in **Figure 3-1** to estimate the age based condition between 1 and 5. As shown in the curve below, the expectation is that new assets will deteriorate slowly through most of their lifespan, with the deterioration occurring more rapidly towards the end of life.

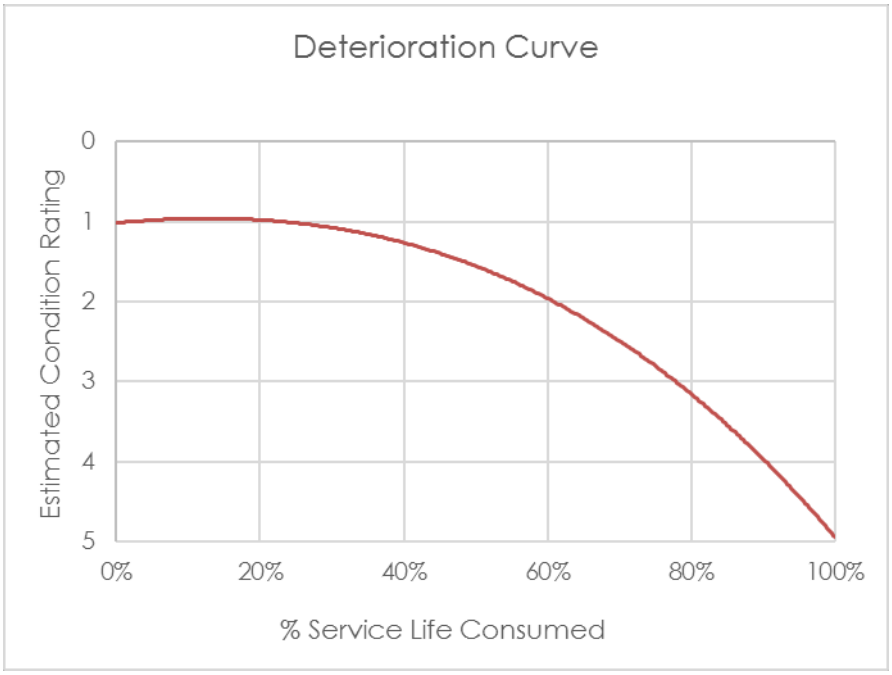


Figure 3-1 - Condition Deterioration Curve

Condition ratings were assigned to the pipes based on their consumed service life according to the schedule shown in **Table 3-4**. The score for each is multiplied by the relative weighting factor for the CONSUMED SERVICE LIFE category listed in **Table 3-1** (i.e., 0.25), yielding a possible maximum weighted score of 1.25 (i.e., 5 x 0.25).

Table 3-4 - Consumed Service Life Condition

Consumed Service Life (%)	Assigned Condition Rating
0-45	**1**
45-70	**2**
70-85	**3**
85-95	**4**
95-100+	**5**

3.1.3.4 Material Type

Different pipe materials offer differing characteristics regarding strength, longevity, and ability to withstand various soil conditions, to name a few. Most of the water mains in the City are constructed of cast iron, with several areas of ductile iron. Cast Iron has fallen out of favor in modern times since it tends to be more brittle and is generally considered less desirable than modern cement lined ductile iron.

Condition ratings were assigned to the pipes based on their material type as shown in **Table 3-5**. The score for each is multiplied by the relative weighting factor for the PIPE MATERIAL category listed in **Table 3-1** (i.e., 0.14), yielding a possible maximum weighted score of 0.7 (i.e., 5 x 0.14).

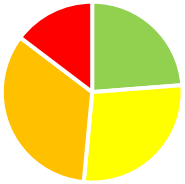
Table 3-5 - Pipe Material Condition

Pipe Material	Assigned Condition Rating
Ductile Iron	**1**
Cast Iron	**4**

3.1.4 Condition Assessment – Water Mains

Based on the methodology described in **Section 3.1.1 and 3.1.2**, the results of the water main condition assessment show that the water system is in fair to poor condition overall. Condition ratings are summarized in **Table 3-6** and depicted in **Figure 2.0 in Appendix A**. Further detail is also provided in the AMSAT tables in **Appendix B**.

Table 3-6 - Water Main Condition Summary

Condition Rating	Length	%	Summary
1	0	0%	
2	44,269	24%	
3	51,654	28%	
4	63,014	34%	
5	27,327	15%	
Total	186,264	100%	

As mentioned previously, condition ratings were not assigned for the individual hydrants and valves in the system. After discussion with the AMT, it was determined that any valve or hydrant replacements would typically only happen during a water main replacement project, and the occasional hydrant or valve maintenance activity would most likely be funded as Operations and Maintenance (O&M).

3.2 CRITICALITY ASSESSMENT

3.2.1 Overview of Asset Criticality

Criticality is essentially a measure of risk tolerance related to the failure of a particular asset. In the case of water system infrastructure, the argument can be made that all of these assets and the function they provide are critical in nature. However, even though that may be true, this point of view does not provide any clear guidance to the AMT on how to prioritize capital expenditures for replacement or rehabilitation of these assets.

The objective of this AMP component is to develop a strategy for assessing the relative importance, or criticality of the assets within the City's system. The criticality developed for each of the water system assets is used to form the basis for the prioritization of future capital expenditures, as identified during the condition assessment.

3.2.2 Approach

The criticality assessment approach begins with the collection and review of existing data to first build an understanding of the City's system; water mains and their operation, location, service areas, install dates, etc. This data, combined with institutional knowledge and City staff input, provide a good basis for understanding and establishing the criteria that can be used to assess the criticality of the City's assets.

The criticality assessment occurs in a two-stage process: The first stage employs a pairwise comparison technique to determine the relative importance, or weighting for several key criteria. The second stage then uses these criteria and relative weightings to determine the relative consequence of failure (or criticality) for each asset. Criticality is assigned on a scale of 1-5, with 1 being the least critical and 5 being the most critical. The following subsections describe the criticality model, assumptions made, and results.

3.2.3 Criticality Assessment Model

The criticality assessment model for the water system assets contains four risk categories:

1. Potential system impact as a function of PIPE SIZE;
2. Potential impact to the CUSTOMER TYPE served;
3. Potential population impacted based on CUSTOMER ACCOUNTS served; and,
4. Potential difficulties presented by WATER MAIN LOCATION,

Each risk category was assigned a weighting factor, based on the relative importance of one category versus the others. A pair-wise evaluation approach was used in establishing the weighting factors with

input from the City's AMT. Results of the pair-wise comparison and a breakdown of the graduated scoring for each risk category are provided in **Table 3-7.**

Table 3-7 - Criticality Model Summary

Risk Category	Weighting Factor		
Pipe Size	0.17	**Pipe Size**	**Score**
		2-inch	1
		6-inch	2
		8-inch	3
		12-inch	4
		16-inch	5
Customer Type	0.33	**Customer Type**	**Score**
		General User	1
		Sensitive User	3
		Critical User	5
Customer Accounts	0.28	**Customer Accounts**	**Score**
		0	1
		1-35	2
		36-71	3
		72-107	4
		108-140	5
Water Main Location	0.22	**Water Main Location**	**Score**
		Greenbelt or R.O.W.	1
		River/Wetland Crossing	3
		Major Road/RR Crossing	5
Total Weight	1.00		

3.2.4 Criticality Assessment Process

This section contains a summary of the process of assessing the criticality scores for the water system assets, and ultimately assigning a criticality rating.

3.2.4.1 Risk Category 1 – Pipe Size

With increasing service areas, the diameter of the water pipes will generally increase to accommodate the increasing flow. For that reason, the PIPE SIZE risk category is used as an indicator of the magnitude of flow in assessing the potential risk of disruption to customers and the system overall. The scores for pipe diameters are assigned as shown in **Table 3-8**. The score for each is multiplied by the relative weighting

factor for the PIPE SIZE category listed in **Table 3-7** (i.e., 0.17), yielding a possible maximum weighted score of 0.85 (i.e., 5 x 0.17).

Table 3-8 – Water Main Risk Category 1 Scoring

Pipe Size	Score
2-inch	1
6-inch	2
8-inch	3
12-inch	4
16-inch	5

3.2.4.2 Risk Category 2 – Customer Type

The assessment of the potential risk of disruption of service to customer type is based upon the category of customer being served. The customer types, and relative scores, are assigned as shown in **Table 3-9**. In this category, sensitive users are those spaces where there are large gatherings of the public, such as schools, or major water users as identified by the City. Critical users are considered to be health care facilities, assisted living facilities, and any other users identified by the City's AMT.

The score representing the customer type for the parcel's land use is multiplied by the relative weighting factor of the CUSTOMER TYPE risk category listed in **Table 3-7** (i.e., 0.33), yielding a possible maximum weighted score of 1.65 (i.e., 5 x 0.33).

Table 3-9 - Water Main Risk Category 2 Scoring

Pipe Size	Score
General User	**1**
Sensitive User	**3**
Critical User	**5**

3.2.4.3 Risk Category 3 – Customers Served

The CUSTOMERS SERVED risk category is used as an indicator of the population served when assessing the potential risk of disruption to customers. The scores for parcels served are assigned as shown in **Table 3-10**. The score for each is multiplied by the relative weighting factor for the PIPE SIZE category listed in **Table 3-7** (i.e., 0.28), yielding a possible maximum weighted score of 1.40 (i.e., 5 x 0.28).

Table 3-10 - Water Main Risk Category 3 Scoring

Customer Accounts	Score
0	1
1-35	2
36-71	3
72-107	4
108-140	5

3.2.4.4 Risk Category 4 – Water Main Location

This risk category is essentially an assessment of the potential difficulty of repair based on a review of the location of the sewer and its proximity to major roads and rivers/watercourses or other significant bodies of water. The scores associated with the water main location are assigned as shown in **Table 3-11**. The score is multiplied by the relative weighting factor of the WATER MAIN LOCATION category listed in **Table 3-7** (i.e., 0.22), yielding a possible maximum weighted score of 1.10 (i.e., 5 x 0.22).

Table 3-11 - Water Main Risk Category 4 Scoring

Water Main Location	Score
Greenbelt or R.O.W.	**1**
River/Wetland Crossing	**3**
Major Road/RR Crossing	**5**

3.2.4.5 Single Feeds, Major Supply, and Dead-end Lines

Because of the elevated importance of single feeds (i.e., feed point for a local network with no redundant feed), major supply lines, and dead-end lines, for those water main pipe segments, the overall criticality rating was doubled from the calculated amount.

3.2.5 Assigning Criticality Ratings

When the analysis of the risk categories is completed, the scores assigned to each category are summed to provide a total score for each asset, and adjusted as needed to account for single feeds, major supply lines, and dead-end lines. As described earlier in the document, the higher the criticality score associated with the asset in question, the more critical the asset.

It should be noted that, while the criticality analysis process described in **Section 3.2.4** provides a starting point for assigning criticality ratings, human intervention is invaluable, especially as concerns computations made within GIS. The AMT can apply professional judgement to alter certain ratings, from their originally computed values, to better conform with the City's institutional knowledge as decisions are made in the future.

Reference can be made to **Appendix A, Figure 1.1** for a depiction of the overall water main criticality graphically. A detailed list of water main pipe segments and the criticality scoring that is applied is provided in **Appendix B**.

3.3 RISK SUMMARY

A risk summary for the City is provided with the heat map below. The number of water main assets are indicated for each combination of Probability of Failure (condition) and Consequence of Failure (criticality) score.

Table 3-12 - Risk Summary

Water Mains

Probability of Failure

Consequence of Failure	1	2	3	4	5
1	0	67	29	19	7
2	0	62	40	48	18
3	0	37	37	26	4
4	0	31	8	3	0
5	0	21	3	4	2

3.4 AMP SUSTAINABILITY – RISK ASSESSMENT

To ensure the sustainability of the AMP, the City plans to track the condition of their assets and update their condition ratings, as necessary. The inventory will need to be updated if water mains are replaced, repaired, or added to the system. Hydraulic analysis results will also be updated after completion of model updates as part of the water system reliability study (updates are required every five (5) years).

Moving forward, the City plans to track service lateral/curb stop condition, as well as material type, and install date.

4.0 LEVEL OF SERVICE

4.1 LEVEL OF SERVICE GOALS

LOS can be described as a qualitative measure of the requirements placed on a system or facility by a variety of entities that may be external (e.g. customers, legislators), or internal (management staff). Based on discussions with the City's AMT, the LOS goal is to maintain all critical assets as well as some less critical assets to provide enhanced reliability, with an emphasis on meeting the regulatory requirements set by EGLE. The City has also been responding to a number of water main breaks in recent years and is eager to reduce the time and resources spent on emergency repairs. This goal was identified by the AMT as the starting point for guiding CIP and maintenance expenditures.

Qualitatively, LOS can be described in three tiers: Low, Medium, and High. With a Low LOS, only the most critical components in the system, or those with the highest risk, would be proactively maintained, and with a High LOS, every asset would be maintained proactively. The City consistently endeavors to offer a High LOS. Therefore, for the purposes of projecting CIP expenditures, a High LOS has been assumed. Quantitatively, this correlation between LOS and criticality, is defined within the AMSAT and the City's LOS selection has an impact on the projected CIP expenditures. The City will continue to review and refine their LOS goals moving forward.

4.2 LEVEL OF SERVICE & CRITICALITY RELATIONSHIP

For an asset to meet the desired LOS, it must maintain its design functionality and deliver its related level of operational performance. For this reason, LOS is very closely related to criticality. The range of criticality scores available to the water mains is 1-5. The maximum criticality score that was assigned in the City's water system evaluation was 5, and the average criticality overall was 2 for water mains. Based on the distribution of criticality scores, the relationship between criticality and LOS was set as shown in **Table 4-1** below. As indicated by this relationship, maintaining, or replacing the least critical items in the system is considered providing a high level of service, whereas maintaining nothing but the most critical items is considered providing a low level of service.

Table 4-1 - Level of Service by Criticality Score

Maintaining or Replacing if Criticality is:	Level of Service is:
1	High
2-3	Medium
4-5	Low

In light of the above, and taking into consideration City's needs, and costs for the CIP implementation, a High LOS has been initially selected as the basis for inclusion in the asset management projection.

Therefore, the AMSAT and CIP projections will consider all components without filtering out low criticality items.

4.3 RISK THRESHOLD

While the LOS selection in the AMSAT tool provides a high-level filtering option, there is also a customizable risk threshold which operates in much the same way but provides a more fine-tuned approach. The risk threshold does this by taking into account the probability of failure (condition) as well as the consequence of failure (criticality). In the AMSAT, each asset has a risk score assigned to it that is a product of the condition rating and the criticality score. Both criteria have a scale of 1 to 5 (with 1 being excellent condition/low criticality, and 5 being poor condition/high criticality), so the range of possible values is then 1 to 25. The AMSAT allows the user to select a risk threshold below which the risk is considered "acceptable". Then any asset with a risk rating below that value would not be counted in the 20-year cost projections.

4.4 AMP SUSTAINABILITY – LEVEL OF SERVICE

The City plans to review and update their stated LOS goals periodically and assess the performance of their system against those goals to identify any areas that may need improvement. In the future, the City intends to engage in public outreach efforts to ensure that the LOS being provided meets the expectations of the customers. This may include questionnaires, surveys, and/or public meetings.

5.0 CAPITAL IMPROVEMENT PLAN

Essential to the development of a CIP and AMP, is the balancing between acceptable risk and budget constraints. To this end, the next step in the process is to evaluate the apparent condition and the criticality of the system components to understand the risk associated with each asset, and thus prioritize the needs of the City's system. The estimated replacement/rehabilitation costs as well as the life cycle of each component are also considered to understand the remaining service life and a magnitude for the capital expenditures. The resulting timeframe for component upgrades and magnitude of capital expenditures will be discussed in more detail throughout this Section.

The analysis of the needs and projected costs for the City was performed using the AMSAT customized analytical model. The AMSAT is set up to allow for the manipulation of several of the parameters described in this plan (such as LOS selection, and Risk Threshold as described in **Section 4**) to help in managing risk and budget, and to allow for ongoing updates and evaluation of funding level options in the future. The AMSAT and its output and can be referenced in **Appendix E** for further detail on the needs and costs for the water system assets.

5.1 LIFE CYCLE ANALYSIS

5.1.1 Consumed Service Life

Each asset is assigned a component life expectancy to reflect its expected service life. These values are based on useful life ranges presented by EGLE's *Drinking Water Revolving Fund Project Plan Preparation Guidance* document, as well as industry standards and formed the baseline for the life cycle analysis.

Since the water mains in the City's system are uninspected, the consumed service life is one of the primary indicators of asset condition, as described in **Section 3.1**. A deterioration curve provides the method of estimating the remaining life of a component. As the deterioration curve in **Figure 3-1** depicts, an asset tends to maintain a good condition, deteriorating slowly throughout a large portion of its useful life, with the rate of deterioration increasing near the end of its life. The end of an asset's service life occurs when it can no longer adequately perform its intended function. Based on this deterioration curve, the apparent condition ratings are equated with a percentage of consumed service life. **Table 5-1** summarizes the range of consumed service life that is associated with each condition rating.

Table 5-1 - Consumed Service Life

Rating	Condition	Consumed Service Life (%)
5	Poor	95-100
4	Fair	85-95
3	Average	70-85
2	Good	45-70
1	Excellent	0-45

As shown in **Table 5-1**, the consumed, and conversely, the remaining service life for each condition rating is presented as a range of possible values. This range allows for the additional consideration of risk tolerance reflected by the criticality score (and LOS) for each component when estimating the remaining service life. The attempt was made to relate the remaining life to the criticality score ranges that were used in the LOS designations. For example, following the LOS ranges: for items with a criticality = 1, the remaining service life is estimated to be the maximum of the range of remaining life for the given condition rating, for a criticality of 4 or 5 the remaining life is the minimum of the range, and for criticality of 2 or 3, the remaining life is estimated as the average**.**

5.1.2 Projected Upgrade Date

Since the condition evaluation of the water mains all occurred via desktop analysis methods, the projected upgrade date is estimated by adding the expected remaining service life to the date of the evaluation.

5.2 REHABILITATION AND REPLACEMENT COST ESTIMATING

The costs for rehabilitation and/or replacement of the water system assets are estimated using recently tendered works in Michigan, supplier quotes, and industry experience.

As discussed in previously, the costs for valves and hydrants were added to the cost of the water mains when estimating the replacement and/or rehabilitation expense. Reference can be made to **Appendix C** for a complete list of the cost estimates used.

5.3 CAPITAL FUNDING REQUIREMENTS

5.3.1 Overall Cost Projections

Included in AMSAT that is provided in the **Appendices B, C and D**, are the details for the current (2020) overall 20-year estimated cost projections for City expenditures. The costs that are displayed represent Engineer's Opinion of Probable Costs (EOPCs) associated with replacing the existing water mains, hydrants, and valves, using 2020 dollars. It should be noted that while the AMSAT recommendations formed the basis of the budget projections, judgement was exercised by the AMT to bundle upgrades into

the desired capital improvement projects**.** A summary of the upgrades associated with each project, along with estimated costs, is included in **Table 5-2**.

5.3.2 Additional Capital Improvements

It should be noted that the analysis presented in this report and the financial expenditures that are summarized in the AMSAT are limited to the existing assets. For new capital expenses, including, but not limited to, major construction or expansion projects, the City will plan to update the inventory accordingly with any new assets.

5.3.3 Additional Operating Expenses

It should be noted that this report and CIP does not include an analysis of the general operating expenses that the City incurs in providing water services to its customers. Such expenses include, but are not limited to, employee salaries, utilities, pass-through costs, and other operational expenses. The City's AMT will need to factor in those expenses in the development of future budgets.

The City may also factor into the budget the need for both routine and unexpected O&M activities. To estimate the funding needed for these activities, an annual amount equal to 2% of the estimated system replacement value is often used. The estimated annual funding requirement (at 2%) for these activities would be approximately $1M.

In order to develop a comprehensive AMP, the City will need to take all the above referenced expenses/items into consideration during the Rate Study Evaluation process.

5.4 SUMMARY OF FINDINGS

A CIP has been developed using the results of the AMP analysis (and previous Drinking Water Revolving Fund planning efforts) and is divided short-term (0-5 year) and long-term (20 year), and ongoing initiatives. A summary is provided in **Table 5-2**, with initial conceptual cost opinions in 2020 dollars. It should be noted that the funding source (shown as TBD in the table) for the proposed CIP projects will be determined during the Rate Study Evaluation process. The City will continue to review and refine these findings moving forward.

Table 5-2 - 20-year CIP Projections

Timeframe	Project Name	Details	Justification	Year	Conceptual Opinion of Cost	Funding Source
Short Term (0-5 years)	Phase 1	Replace revenue meters, approx. 300 lead service leads, and 15,300 LF of water main	End of service life/Lead-Copper Rule Compliance	2021	$6,775,000	TBD
	Phase 2	Replace approx. 400 lead service leads, and 21,400 LF of water main	End of service life/Lead-Copper Rule Compliance	2022	$6,550,000	TBD
	Phase 3	Replace approx. 250 lead service leads and 20,000 LF of water main	End of service life/Lead-Copper Rule Compliance	2023	$5,750,000	TBD
	Phase 4	Replace approx. 125 lead service leads and 22,600 LF of water main	End of service life/Lead-Copper Rule Compliance	2024	$6,025,000	TBD
	Phase 5	Develop alternate source with Grosse Pointe Farms, including 21,000 LF of 21-inch transmission main, 2,000 LF of water main, bulk flow water meters, and WTP improvements	Resiliency	2025	$11,000,000	TBD
Long Term (5-20 years) and ongoing	Routine Maintenance and Replacement	Estimated at 2% or present-day replacement cost	End of service life/Lead-Copper Rule Compliance	2026-2040	$1,000,000 annually	TBD

5.5 AMP SUSTAINABILITY – CAPITAL IMPROVEMENT PLAN

To maintain the sustainability of the AMP, the City plans to revise the CIP project list periodically as system improvements are completed or new pertinent information is available (e.g., condition assessment, and LOS updates).

While this AMP presents a description of the City's infrastructure at this moment in time, the true value of an AMP is fully realized when it is treated and utilized as a living document. Over time, assets will continually wear, deteriorate, and be replaced or rehabilitated. As described throughout this document, the City plans to periodically update its inventory, condition assessment, criticality, LOS determination, CIP, and rate structure, as needed to reflect the most current conditions.

Sustainability of the CIP can be achieved with systematic updates as follows:

- Water Mains, Hydrants, and Valves
  - Update GIS inventory as needed when existing infrastructure is replaced, or new assets are added to the water system.
  - Update the rehabilitation and replacement costs as new quotes/contracts become available.

- Generally
  - Assets should be added or deleted as needed to reflect the most current system configuration.
  - The level of service provided can be adjusted based on City preference if needed.

In addition to inventory and condition updates, the City is also encouraged to collaborate with other local stakeholders, such as the Wayne County Road Commission, to coordinate their respective CIPs. When any major construction activity is planned in the area, such as the replacement of a road, the City may wish to re-evaluate or re-prioritize CIP activities to improve efficiency by aligning projects.

6.0 FUNDING STRATEGY

The rate study and evaluation of the City's funding structure will be performed separately by others and included as an attachment to this report. The document will address the following:

- Annual operating budget.
- Current approved rate structure.
- Documentation of legal authority for setting rates.
- Discussion of anticipated costs (operations and capital) against revenue.
- Documentation showing no funding gap, or a remedy to close gap if one exists.

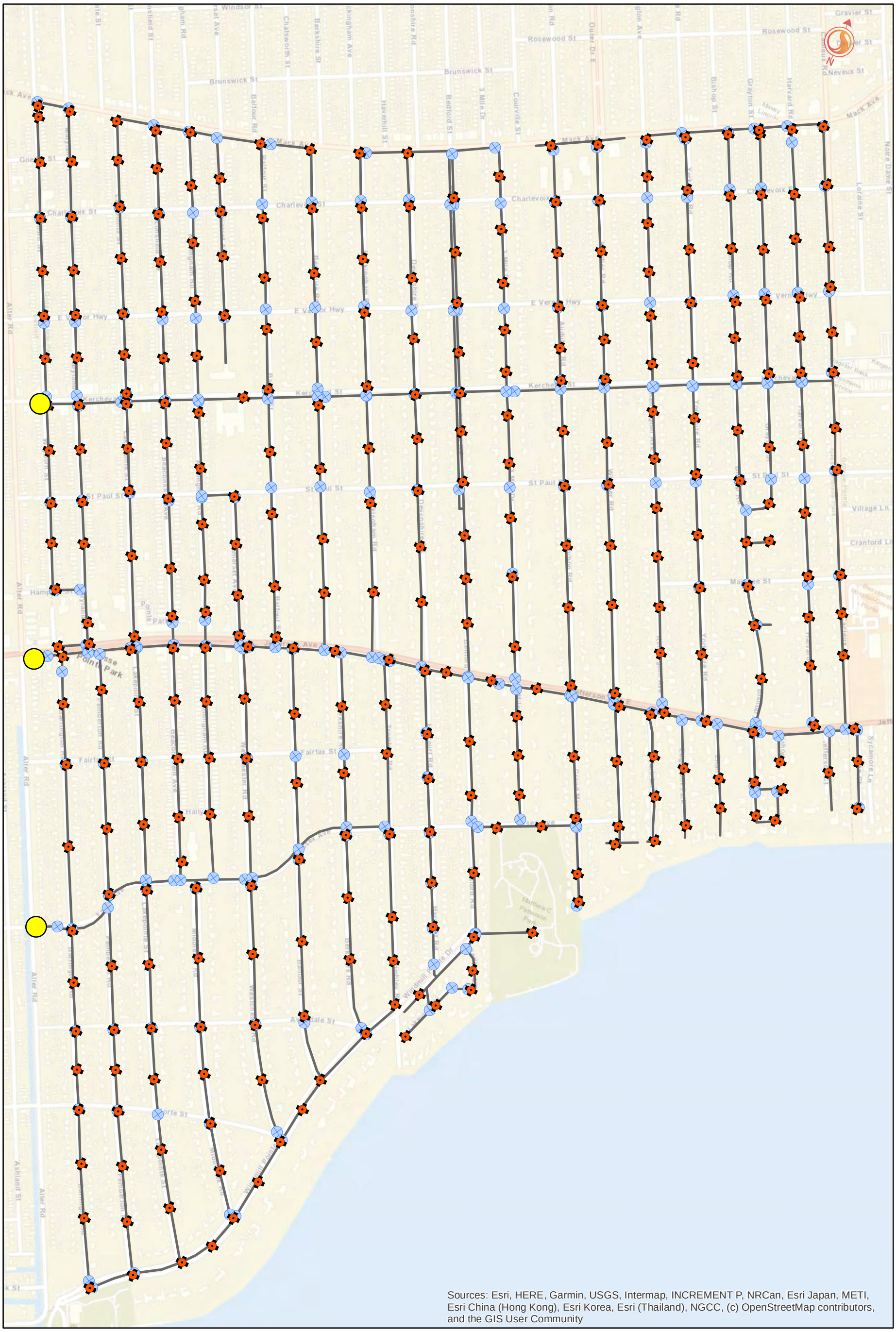
6.1 FUNDING STRUCTURE AND RATE METHODOLOGY SUSTAINABILITY

To maintain the sustainability of the AMP, the City plans to revisit the funding structure and rate methodology to ensure that the funding is available to meet the requirements of the water system.

7.0 SYSTEM RESILIENCY

An important consideration for any community water supply is whether the system can still service its customers in the event of an emergency. The City's water system infrastructure consists of only the pipe network and appurtenances, so resiliency is provided locally by water main looping, and City-wide by having three (3) separate connections to the GLWA system. In addition to the three (3) existing connections, the City has also been exploring the possibility of accessing a redundant supply of water from the City of Grosse Pointe Farms.

Appendix A FIGURES



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August, 2020
2075149900

Meter Station **Valve**

Water Hydrant **Watermain**

0 400 800 Feet
1:10000

Client/Project
GROSSE POINTE PARK
WATER SYSTEM AMP
CRITICALITY

Figure No.
1.0

Title
Watermain System

Stantec
3754 Ranchero Drive, Ann Arbor, Michigan 48108
Stantec does not certifythe accuracy of the data.
This map is for reference only and should not be used for construction.

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August, 2020
2075149900

Meter Station

Watermain Score

- 1 (Least Critical)
- 2
- 3
- 4
- 5 (Most Critical)

0 400 800 Feet

1:10000

Stantec
3754 Ranchero Drive, Ann Arbor, Michigan 48108
Stantec does not certifythe accuracy of the data.
This map is for reference only and should not be used for construction.

Client/Project
GROSSE POINTE PARK
WATER SYSTEM AMP
CRITICALITY

Figure No.
1.1

Title
Overall Criticality Score

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20751499900

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Apparent Condition 1 2 3 4 5

Client/Project
GROSSE POINTE PARK
WATER SYSTEM AMP

Figure No.
2.0

Title
Watermain Apparent Condition

Stantec

3754 Ranchero Drive, Ann Arbor, Michigan 48108
Stantec does not certifythe accuracy of the data.
This map is for reference only and should not be used for construction.

1:10000 0 400 800 Feet

Legend

Description	Quantity	Unit
<5 years	65	Count
>10 years	183	Count
5-10 years	45	Count

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March, 2020
2075149900

1:10202 0 500 1,000 Feet

Water Main Breaks and Year

- > 10 years
- 5-10 years
- < 5 years

Proposed Phasing

- phase 1
- phase 2
- phase 3
- phase 4

Stantec

3754 Ranchero Drive, Ann Arbor, Michigan 48108

Stantec does not certifythe accuracy of the data.
This map is for reference only and should not be used for construction.

Client/Project

Grosse Pointe Park
Water System

Title

Proposed Phasing

Appendix B AMSAT INVENTORY AND RISK ASSESSMENT

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Condition Evaluation and Needs Prioritization
Water Mains

Level of Service	High	1
Condition Filter	1	
Risk Threshold	0	

Directions:

Update condition and inspection date as inspections are performed or items replaced.

Update cost estimates as needed on 'Pipe Rehab Costs' tab when items are replaced/rehabilitated

See notes tab for additional information about the column heading references.

Pipe ID	Diam. (in)	Length (ft)	Apparent Condition[1]	Life Expectancy (yrs)[2]	Age (yrs)	Estimated Service Life (yrs)[3]			Install Year	Last Upgrade Year	Consumed Life (%)	Estimated Condition Rating (Age)	Break History (# of breaks)	Break Condition	Available Fire Flow - 2018 Water Model nearest node (gpm)	Estimated Condition Rating (Capacity/ FireFlow)	Material Type	Estimated Condition Rating (Material Type)	Anticipated Year of Upgrade (yr)				Criticality[5]	Risk[6]	# of Valves Assoc. w/ this pipe segment	# of Hydrants Assoc. w/ this pipe segment	Rehab Type	Asset Rehab Cost[7]	Level of Service[8]
						Min.	Avg.	Max.											Life Cycle basis[4]	Est. Years Left	Upgrade Year	Upgrade #2 Year							
WM-001	6	233.4	5	50	100	0	1	3	1920		200%	5	2	5	755	4	Cast Iron	4	Avg.	1	2021	2071	2	10	1	0	Dig & Replace	$62,900	2
WM-002	6	387.4	3	50	100	8	11	15	1920		200%	5	0	1	755	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$96,900	2
WM-003	6	27.4	3	50	100	8	11	15	1920		200%	5	0	1	572	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$6,900	2
WM-004	6	322.0	4	50	100	3	5	8	1920		200%	5	1	3	390	5	Cast Iron	4	Avg.	5	2025	2075	2	8	1	0	Dig & Replace	$85,000	2
WM-005	8	243.8	4	50	100	3	5	8	1920		200%	5	0	1	318	5	Cast Iron	4	Min.	3	2023	2073	5	20	0	0	Dig & Replace	$61,000	3
WM-006	6	392.0	4	50	100	3	5	8	1920		200%	5	0	1	318	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	0	Dig & Replace	$98,000	3
WM-007	6	160.1	4	50	100	3	5	8	1920		200%	5	0	1	241	5	Cast Iron	4	Min.	3	2023	2073	5	20	0	1	Dig & Replace	$45,000	3
WM-008	6	387.8	4	50	100	3	5	8	1920		200%	5	1	3	463	5	Cast Iron	4	Min.	3	2023	2073	3	12	1	0	Dig & Replace	$101,400	3
WM-009	6	20.4	4	50	100	3	5	8	1920		200%	5	0	1	463	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	0	Dig & Replace	$5,100	2
WM-010	6	401.9	4	50	100	3	5	8	1920		200%	5	0	1	438	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	1	Dig & Replace	$105,500	3
WM-011	6	363.6	5	50	100	0	1	3	1920		200%	5	2	5	580	4	Cast Iron	4	Avg.	1	2021	2071	2	10	1	0	Dig & Replace	$95,400	2
WM-012	6	398.1	4	50	100	3	5	8	1920		200%	5	1	3	518	4	Cast Iron	4	Min.	3	2023	2073	3	12	0	0	Dig & Replace	$99,500	3
WM-013	6	3.8	3	50	100	8	11	15	1920		200%	5	0	1	591	4	Cast Iron	4	Min.	8	2028	2078	3	9	1	0	Dig & Replace	$5,400	3
WM-014	6	300.4	3	50	100	8	11	15	1920		200%	5	0	1	572	4	Cast Iron	4	Min.	8	2028	2078	4	12	0	0	Dig & Replace	$75,100	3
WM-015	6	938.0	4	50	100	3	5	8	1920		200%	5	1	3	366	5	Cast Iron	4	Min.	3	2023	2073	3	12	2	3	Dig & Replace	$258,500	3
WM-016	6	938.4	4	50	100	3	5	8	1920		200%	5	0	1	372	5	Cast Iron	4	Avg.	5	2025	2075	2	8	2	3	Dig & Replace	$258,600	2
WM-017	6	950.1	4	50	100	3	5	8	1920		200%	5	0	1	374	5	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$256,500	2
WM-018	6	946.1	4	50	100	3	5	8	1920		200%	5	0	1	373	5	Cast Iron	4	Min.	3	2023	2073	3	12	2	3	Dig & Replace	$260,500	3
WM-019	6	942.4	3	50	100	8	11	15	1920		200%	5	0	1	506	4	Cast Iron	4	Avg.	11	2031	2081	2	6	2	2	Dig & Replace	$254,600	2
WM-020	6	945.5	5	50	70	0	1	3	1950		140%	5	5	5	178	5	Cast Iron	4	Min.	0	2020	2070	5	25	2	3	Dig & Replace	$260,400	3
WM-021	6	940.4	5	50	100	0	1	3	1920		200%	5	3	5	510	4	Cast Iron	4	Avg.	1	2021	2071	2	10	2	2	Dig & Replace	$254,100	2
WM-022	8	939.6	3	50	100	8	11	15	1920		200%	5	0	1	880	4	Cast Iron	4	Avg.	11	2031	2081	2	6	2	2	Dig & Replace	$253,900	2
WM-023	6	947.1	4	50	100	3	5	8	1920		200%	5	0	1	351	5	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$255,800	2
WM-024	6	995.6	4	50	100	3	5	8	1920		200%	5	0	1	370	5	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$267,900	2
WM-025	6	945.4	4	50	100	3	5	8	1920		200%	5	0	1	366	5	Cast Iron	4	Max.	8	2028	2078	1	4	2	0	Dig & Replace	$245,400	1
WM-026	6	939.8	5	50	100	0	1	3	1920		200%	5	4	5	366	5	Cast Iron	4	Max.	3	2023	2073	1	5	2	2	Dig & Replace	$254,000	1
WM-027	8	943.4	3	50	100	8	11	15	1920		200%	5	0	1	649	4	Cast Iron	4	Avg.	11	2031	2081	2	6	2	2	Dig & Replace	$254,900	2
WM-028	6	940.0	5	50	100	0	1	3	1920		200%	5	2	5	336	5	Cast Iron	4	Avg.	1	2021	2071	2	10	2	2	Dig & Replace	$254,000	2
WM-029	8	942.4	3	50	100	8	11	15	1920		200%	5	0	1	550	4	Cast Iron	4	Avg.	11	2031	2081	2	6	2	2	Dig & Replace	$254,600	2
WM-030	6	933.3	4	50	100	3	5	8	1920		200%	5	1	3	361	5	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$252,300	2
WM-031	6	941.6	3	50	100	8	11	15	1920		200%	5	0	1	611	4	Cast Iron	4	Avg.	11	2031	2081	2	6	2	1	Dig & Replace	$249,400	2
WM-032	8	949.7	3	50	100	8	11	15	1920		200%	5	0	1	1028	3	Cast Iron	4	Avg.	11	2031	2081	2	6	2	2	Dig & Replace	$256,400	2
WM-033	6	943.8	5	50	100	0	1	3	1920		200%	5	6	5	587	4	Cast Iron	4	Avg.	1	2021	2071	2	10	2	2	Dig & Replace	$254,900	2
WM-034	6	1345.3	4	50	100	3	5	8	1920		200%	5	1	3	551	4	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$355,300	2
WM-035	16	383.2	4	50	100	3	5	8	1920		200%	5	2	5	9363	1	Cast Iron	4	Min.	3	2023	2073	4	16	1	0	Dig & Replace	$146,100	3
WM-036	16	282.1	2	50	100	15	21	28	1920		200%	5	0	1	11922	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$98,700	3
WM-037	16	51.0	4	50	100	3	5	8	1920		200%	5	2	5	11922	1	Cast Iron	4	Min.	3	2023	2073	4	16	1	0	Dig & Replace	$29,900	3
WM-038	6	863.5	3	50	100	8	11	15	1920		200%	5	1	3	11922	1	Cast Iron	4	Avg.	11	2031	2081	2	6	2	2	Dig & Replace	$234,900	2
WM-039	12	849.1	2	50	100	15	21	28	1920		200%	5	0	1	3843	1	Cast Iron	4	Avg.	21	2041	2091	2	4	2	1	Dig & Replace	$271,700	2
WM-040	12	496.4	2	50	100	15	21	28	1920		200%	5	0	1	4345	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	2	Dig & Replace	$158,900	3
WM-041	12	3.1	2	50	100	15	21	28	1920		200%	5	0	1	5344	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$900	3
WM-042	12	72.1	2	50	100	15	21	28	1920		200%	5	0	1	5344	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$21,600	3
WM-043	8	127.1	4	50	100	3	5	8	1920		200%	5	2	5	3161	1	Cast Iron	4	Min.	3	2023	2073	4	16	1	0	Dig & Replace	$36,300	3
WM-044	8	234.1	2	50	100	15	21	28	1920		200%	5	0	1	3161	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$58,500	3
WM-045	6	798.2	4	50	100	3	5	8	1920		200%	5	3	5	7044	1	Cast Iron	4	Avg.	5	2025	2075	2	8	2	3	Dig & Replace	$223,500	2
WM-046	8	880.9	3	50	100	8	11	15	1920		200%	5	0	1	1124	3	Cast Iron	4	Avg.	11	2031	2081	2	6	2	3	Dig & Replace	$244,200	2
WM-047	6	847.9	2	50	100	15	21	28	1920		200%	5	0	1	5560	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	2	Dig & Replace	$226,500	2
WM-048	6	1098.2	4	50	100	3	5	8	1920		200%	5	1	3	1080	3	Cast Iron	4	Avg.	5	2025	2075	2	8	2	3	Dig & Replace	$298,500	2
WM-049	8	1238.9	4	50	70	3	5	8	1950		140%	5	2	5	2984	1	Cast Iron	4	Min.	3	2023	2073	3	12	2	3	Dig & Replace	$333,700	3
WM-050	6	795.1	4	50	100	3	5	8	1920		200%	5	2	5	4677	1	Cast Iron	4	Avg.	5	2025	2075	2	8	1	1	Dig & Replace	$208,300	2
WM-051	8	800.4	2	50	100	15	21	28	1920		200%	5	0	1	4295	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	2	Dig & Replace	$214,600	2
WM-052	6	858.6	3	50	100	8	11	15	1920		200%	5	0	1	848	4	Cast Iron	4	Max.	15	2035	2085	1	3	2	1	Dig & Replace	$228,600	1
WM-053	6	856.6	5	50	100	0	1	3	1920		200%	5	3	5	595	4	Cast Iron	4	Max.	3	2023	2073	1	5	2	2	Dig & Replace	$233,200	1
WM-054	6	1508.4	3	50	100	8	11	15	1920		200%	5	0	1	732	4	Cast Iron	4	Min.	8	2028	2078	3	9	1	3	Dig & Replace	$396,600	3
WM-055	6	862.8	2	50	100	15	21	28	1920		200%	5	0	1	3334	1	Cast Iron	4	Max.	28	2048	2098	1	2	2	0	Dig & Replace	$224,700	1
WM-056	6	1036.0	4	50	100	3	5	8	1920		200%	5	2	5	3334	1	Cast Iron	4	Avg.	5	2025	2075	2	8	1	3	Dig & Replace	$278,500	2
WM-057	6	848.2	3	50	100	8	11	15	1920		200%	5	0	1	547	4	Cast Iron	4	Max.	15	2035	2085	1	3	1	2	Dig & Replace	$226,500	1
WM-058	8	873.7	3	50	100	8	11	15	1920		200%	5	1	3	2774	1	Cast Iron	4	Avg.	11	2031	2081	2	6	1	2	Dig & Replace	$232,900	2
WM-059	8	71.2	2	50	100	15	21	28	1920		200%	5	0	1	2774	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$17,800	2
WM-060	6	858.6	3	50	100	8	11	15	1920		200%	5	0	1	678	4	Cast Iron	4	Max.	15	2035	2085	1	3	2	2	Dig & Replace	$233,600	1
WM-061	6	854.4	5	50	100	0	1	3	1920		200%	5	2	5	665	4	Cast Iron	4	Max.	3	2023	2073	1	5	2	2	Dig & Replace	$232,600	1
WM-062	8	662.7	3	50	100	8	11	15	1920		200%	5	1	3	1488	2	Cast Iron	4	Avg.	11	2031	2081	2	6	1	1	Dig & Replace	$175,200	2
WM-063	8	861.7	3	50	100	8	11	15	1920		200%	5	1	3	1501	1	Cast Iron	4	Avg.	11	2031	2081	2	6	2	1	Dig & Replace	$229,400	2
WM-064	6	861.1	5	50	100	0	1	3	1920		200%	5	3	5	957	4	Cast Iron	4	Max.	3	2023	2073	1	5	2	1	Dig & Replace	$229,300	1
WM-065	6	862.5	3	50	100	8	11	15	1920		200%	5	0	1	628	4	Cast Iron	4	Max.	15	2035	2085	1	3	2	1	Dig & Replace	$229,600	1
WM-066	6	1378.4	3	50	37	8	11	15	1983		74%	3	3	5	1091	3	Ductile Iron	1	Avg.	11	2031	2081	2	6	2	2	Dig & Replace	$363,600	2
WM-067	6	147.8	3	50	100	8	11	15	1920		200%	5	0	1	1091	3	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$37,000	3
WM-068	6	146.1	3	50	100	8	11	15	1920		200%	5	0	1	1221	3	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$36,500	3
WM-069	8	310.8	3	50	100	8	11	15	1920		200%	5	0	1	1221	3	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$77,700	3
WM-070	8	165.1	3	50	100	8	11	15	1920		200%	5	1	3	1436	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$41,300	3
WM-071	8	35.1	3	50	100	8	11	15	1920		200%	5	0	1	1436	2	Cast Iron	4	Min.	8	2028	2078	3	9	1	0	Dig & Replace	$13,300	3
WM-072	8	328.1	3	50	100	8	11	15	1920		200%	5	0	1	1447	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$82,000	3
WM-073	8	143.7	3	50	100	8	11	15	1920		200%	5	0	1	1469	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$40,900	3
WM-074	8	173.6	2	50	100	15	21	28	1920		200%	5	0	1	1553	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$43,400	3

						Estimated Service Life (yrs)[3]												Anticipated Year of Upgrade (yr)										
Pipe ID	Diam. (in)	Length (ft)	Apparent Condition[1]	Life Expectancy (yrs)[2]	Age (yrs)	Min.	Avg.	Max.	Install Year	Last Upgrade Year	Consumed Life (%)	Estimated Condition Rating (Age)	Break History (# of breaks)	Break Condition	Available Fire Flow - 2018 Water Model nearest node (gpm)	Estimated Condition Rating (Capacity/ FireFlow)	Material Type	Estimated Condition Rating (Material Type)	Life Cycle basis[4]	Est. Years Left	Upgrade Year	Upgrade #2 Year	Criticality[5]	Risk[6]	# of Valves Assoc. w/ this pipe segment	# of Hydrants Assoc. w/ this pipe segment	Rehab Type	Asset Rehab Cost[7]	Level of Service[8]
WM-075	8	179.9	2	50	100	15	21	28	1920		200%	5	0	1	1637	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	1	Dig & Replace	$50,000	3
WM-076	8	94.2	2	50	100	15	21	28	1920		200%	5	0	1	1637	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$28,000	3
WM-077	8	317.0	3	50	100	8	11	15	1920		200%	5	1	3	1825	1	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$84,200	3
WM-078	8	4.8	2	50	100	15	21	28	1920		200%	5	0	1	1825	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$1,200	3
WM-079	8	382.6	2	50	100	15	21	28	1920		200%	5	0	1	1946	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$95,700	3
WM-080	8	3.3	2	50	100	15	21	28	1920		200%	5	0	1	1953	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$800	3
WM-081	8	5.8	2	50	100	15	21	28	1920		200%	5	0	1	1825	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$5,900	3
WM-082	8	491.4	2	50	100	15	21	28	1920		200%	5	0	1	2009	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	1	Dig & Replace	$127,800	3
WM-083	8	12.1	2	50	100	15	21	28	1920		200%	5	0	1	1953	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$7,500	3
WM-084	8	282.2	2	50	100	15	21	28	1920		200%	5	0	1	2210	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	1	Dig & Replace	$80,000	3
WM-085	8	391.5	4	50	100	3	5	8	1920		200%	5	3	5	2512	1	Cast Iron	4	Min.	3	2023	2073	3	12	0	1	Dig & Replace	$102,900	3
WM-086	8	31.6	2	50	100	15	21	28	1920		200%	5	0	1	2513	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$7,900	3
WM-087	8	292.7	2	50	100	15	21	28	1920		200%	5	0	1	2513	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$77,700	3
WM-088	8	60.9	2	50	100	15	21	28	1920		200%	5	0	1	2648	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$19,700	3
WM-089	8	282.6	2	50	100	15	21	28	1920		200%	5	0	1	2640	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$70,700	3
WM-090	8	148.2	3	50	100	8	11	15	1920		200%	5	1	3	2703	1	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$42,000	3
WM-091	8	286.0	2	50	100	15	21	28	1920		200%	5	0	1	2687	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	1	Dig & Replace	$76,500	3
WM-092	8	154.9	4	50	100	3	5	8	1920		200%	5	2	5	2724	1	Cast Iron	4	Min.	3	2023	2073	3	12	0	0	Dig & Replace	$38,700	3
WM-093	8	239.3	2	50	100	15	21	28	1920		200%	5	0	1	2944	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$64,300	3
WM-094	8	28.1	2	50	100	15	21	28	1920		200%	5	0	1	2984	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$7,000	3
WM-095	8	305.1	2	50	100	15	21	28	1920		200%	5	0	1	3337	1	Cast Iron	4	Min.	15	2035	2085	5	10	1	0	Dig & Replace	$80,800	3
WM-096	8	281.3	3	50	100	8	11	15	1920		200%	5	1	3	3456	1	Cast Iron	4	Min.	8	2028	2078	5	15	1	0	Dig & Replace	$74,800	3
WM-097	8	326.0	2	50	100	15	21	28	1920		200%	5	0	1	3625	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$81,500	3
WM-098	8	383.6	2	50	100	15	21	28	1920		200%	5	0	1	5344	1	Cast Iron	4	Min.	15	2035	2085	4	8	1	0	Dig & Replace	$100,400	3
WM-099	6	232.7	3	50	100	8	11	15	1920		200%	5	0	1	1350	2	Cast Iron	4	Min.	8	2028	2078	3	9	1	1	Dig & Replace	$67,700	3
WM-100	8	74.3	3	50	100	8	11	15	1920		200%	5	0	1	709	4	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$23,600	3
WM-101	8	196.8	3	50	100	8	11	15	1920		200%	5	0	1	744	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$49,200	2
WM-102	6	730.9	3	50	100	8	11	15	1920		200%	5	0	1	744	4	Cast Iron	4	Max.	15	2035	2085	1	3	2	2	Dig & Replace	$201,700	1
WM-103	6	523.2	4	50	100	3	5	8	1920		200%	5	1	3	1035	3	Cast Iron	4	Max.	8	2028	2078	1	4	2	1	Dig & Replace	$144,800	1
WM-104	6	998.3	4	50	100	3	5	8	1920		200%	5	3	5	1469	2	Cast Iron	4	Min.	3	2023	2073	3	12	1	2	Dig & Replace	$264,100	3
WM-105	8	1053.0	2	50	100	15	21	28	1920		200%	5	0	1	1553	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	2	Dig & Replace	$277,800	3
WM-106	6	47.6	4	50	100	3	5	8	1920		200%	5	0	1	363	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	1	Dig & Replace	$16,900	3
WM-107	6	49.7	4	50	100	3	5	8	1920		200%	5	0	1	363	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	0	Dig & Replace	$12,400	3
WM-108	6	1166.6	4	50	100	3	5	8	1920		200%	5	0	1	363	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	3	Dig & Replace	$306,600	3
WM-109	6	160.8	4	50	100	3	5	8	1920		200%	5	0	1	343	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	0	Dig & Replace	$40,200	3
WM-110	6	119.6	4	50	100	3	5	8	1920		200%	5	0	1	343	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	1	Dig & Replace	$34,900	3
WM-111	6	1235.4	2	50	100	15	21	28	1920		200%	5	0	1	1825	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	2	Dig & Replace	$323,400	3
WM-112	6	709.3	3	50	100	8	11	15	1920		200%	5	0	1	908	4	Cast Iron	4	Min.	8	2028	2078	3	9	2	2	Dig & Replace	$196,300	3
WM-113	6	1153.0	5	50	100	0	1	3	1920		200%	5	2	5	908	4	Cast Iron	4	Avg.	1	2021	2071	2	10	1	2	Dig & Replace	$302,800	2
WM-114	6	14.4	3	50	100	8	11	15	1920		200%	5	0	1	908	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$3,600	2
WM-115	6	494.0	5	50	100	0	1	3	1920		200%	5	2	5	908	4	Cast Iron	4	Max.	3	2023	2073	1	5	1	1	Dig & Replace	$133,000	1
WM-116	6	1283.3	4	50	100	3	5	8	1920		200%	5	8	5	2210	1	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$339,800	2
WM-117	6	949.7	3	50	100	8	11	15	1920		200%	5	1	3	1492	2	Cast Iron	4	Max.	15	2035	2085	1	3	1	1	Dig & Replace	$246,900	1
WM-118	6	340.3	4	50	100	3	5	8	1920		200%	5	0	1	423	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	1	Dig & Replace	$90,100	3
WM-119	6	283.2	3	50	100	8	11	15	1920		200%	5	0	1	1476	2	Cast Iron	4	Max.	15	2035	2085	1	3	0	1	Dig & Replace	$75,800	1
WM-120	6	284.1	2	50	100	15	21	28	1920		200%	5	0	1	2135	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	1	Dig & Replace	$76,000	3
WM-121	6	141.3	3	50	100	8	11	15	1920		200%	5	0	1	1476	2	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$35,300	1
WM-122	6	361.4	3	50	100	8	11	15	1920		200%	5	1	3	1476	2	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$90,400	1
WM-123	8	497.9	4	50	100	3	5	8	1920		200%	5	4	5	2102	1	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$143,500	2
WM-124	8	644.5	2	50	100	15	21	28	1920		200%	5	0	1	2048	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	3	Dig & Replace	$176,100	2
WM-125	8	15.9	2	50	100	15	21	28	1920		200%	5	0	1	2048	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$4,000	2
WM-126	8	782.0	2	50	100	15	21	28	1920		200%	5	0	1	2048	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	2	Dig & Replace	$210,000	2
WM-127	8	10.0	2	50	100	15	21	28	1920		200%	5	0	1	2087	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$2,500	2
WM-128	8	654.7	2	50	100	15	21	28	1920		200%	5	0	1	2145	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	2	Dig & Replace	$178,200	2
WM-129	8	562.5	2	50	100	15	21	28	1920		200%	5	0	1	2210	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$145,100	2
WM-130	8	1576.5	4	50	100	3	5	8	1920		200%	5	7	5	2193	1	Cast Iron	4	Avg.	5	2025	2075	2	8	1	4	Dig & Replace	$418,600	2
WM-131	6	911.1	4	50	100	3	5	8	1920		200%	5	3	5	2640	1	Cast Iron	4	Max.	8	2028	2078	1	4	2	1	Dig & Replace	$241,800	1
WM-132	6	1457.8	5	50	100	0	1	3	1920		200%	5	3	5	920	4	Cast Iron	4	Avg.	1	2021	2071	2	10	2	2	Dig & Replace	$383,400	2
WM-133	6	1242.6	4	50	100	3	5	8	1920		200%	5	2	5	4496	1	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$329,600	2
WM-134	12	974.0	2	50	100	15	21	28	1920		200%	5	0	1	5344	1	Cast Iron	4	Avg.	21	2041	2091	2	4	2	1	Dig & Replace	$309,200	2
WM-135	6	1058.1	4	50	100	3	5	8	1920		200%	5	2	5	1314	2	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$283,500	2
WM-136	6	2099.8	4	50	100	3	5	8	1920		200%	5	7	5	3456	1	Cast Iron	4	Min.	3	2023	2073	3	12	1	5	Dig & Replace	$554,500	3
WM-137	6	2076.3	3	50	100	8	11	15	1920		200%	5	1	3	3337	1	Cast Iron	4	Min.	8	2028	2078	3	9	2	4	Dig & Replace	$548,100	3
WM-138	6	865.6	4	50	100	3	5	8	1920		200%	5	4	5	2087	1	Cast Iron	4	Max.	8	2028	2078	1	4	2	2	Dig & Replace	$235,400	1
WM-139	6	191.9	3	50	100	8	11	15	1920		200%	5	0	1	1076	3	Cast Iron	4	Max.	15	2035	2085	1	3	1	0	Dig & Replace	$52,500	1
WM-140	6	1547.7	4	50	100	3	5	8	1920		200%	5	3	5	1076	3	Cast Iron	4	Avg.	5	2025	2075	2	8	1	3	Dig & Replace	$406,400	2
WM-141	6	830.5	2	50	100	15	21	28	1920		200%	5	0	1	4011	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	1	Dig & Replace	$217,100	1
WM-142	6	93.1	2	50	100	15	21	28	1920		200%	5	0	1	4011	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	1	Dig & Replace	$28,300	1
WM-143	8	900.7	4	50	100	3	5	8	1920		200%	5	2	5	7889	1	Cast Iron	4	Avg.	5	2025	2075	2	8	2	2	Dig & Replace	$244,200	2
WM-144	12	1180.4	2	50	100	15	21	28	1920		200%	5	0	1	5081	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	3	Dig & Replace	$369,100	2
WM-145	12	5.8	2	50	100	15	21	28	1920		200%	5	0	1	6578	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$1,700	3
WM-146	8	1463.1	2	50	100	15	21	28	1920		200%	5	0	1	2187	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	3	Dig & Replace	$385,300	2
WM-147	6	1340.4	3	50	100	8	11	15	1920		200%	5	1	3	2081	1	Cast Iron	4	Avg.	11	2031	2081	2	6	1	2	Dig & Replace	$349,600	2
WM-148	8	425.1	2	50	100	15	21	28	1920		200%	5	0	1	2081	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$110,800	2
WM-149	8	378.8	2	50	100	15	21	28	1920		200%	5	0	1	2187	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	1	Dig & Replace	$104,200	2
WM-150	12	390.3	2	50	100	15	21	28	1920		200%	5	0	1	6578	1	Cast Iron	4	Min.	15	2035	2085	4	8	1	0	Dig & Replace	$123,100	3
WM-151	12	141.0	3	50	100	8	11	15	1920		200%	5	1	3	7889	1	Cast Iron	4	Min.	8	2028	2078	4	12	0	0	Dig & Replace	$42,300	3
WM-152	12	360.3	2	50	100	15	21	28	1920		200%	5	0	1	5500	1	Cast Iron	4	Min.	15	2035	2085	4	8	1	0	Dig & Replace	$114,100	3
WM-153	12	248.8	3	50	100	8	11	15	1920		200%	5	1	3	5500	1	Cast Iron	4	Min.	8	2028	2078	4	12	1	0	Dig & Replace	$80,700	3
WM-154	12	134.1	2	50	100	15	21	28	1920		200%	5	0	1	5484	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$40,200	3
WM-155	12	161.7	3	50	100	8	11	15	1920		200%	5	1	3	5470	1	Cast Iron	4	Min.	8	2028	2078	5	15	0	0	Dig & Replace	$48,500	3
WM-156	12	278.5	2	50	100	15	21	28	1920		200%	5	0	1	5075	1	Cast Iron	4	Min.	15	2035	2085	5	10	1	0	Dig & Replace	$89,500	3
WM-157	6	329.0	2	50	100	15	21	28	1920		200%	5	0	1	3624	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$86,700	3
WM-158	12	187.2	2	50	100	15	21	28	1920		200%	5	0	1	10169	1	Cast Iron	4	Min.	15	2035	2085	4	8	2	0	Dig & Replace	$68,200	3
WM-159	12	134.1	2	50	100	15	21	28	1920		200%	5	0	1	5484	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$40,200	3
WM-160	12	248.8	2	50	100	15	21	28	1920		200%	5	0	1	5500	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$74,700	3

						Estimated Service Life (yrs)[3]													Anticipated Year of Upgrade (yr)											
Pipe ID	Diam. (in)	Length (ft)	Apparent Condition[1]	Life Expectancy (yrs)[2]	Age (yrs)	Min.	Avg.	Max.	Install Year	Last Upgrade Year	Consumed Life (%)	Estimated Condition Rating (Age)	Break History (# of breaks)	Break Condition	Available Fire Flow - 2018 Water Model nearest node (gpm)	Estimated Condition Rating (Capacity/ FireFlow)	Material Type	Estimated Condition Rating (Material Type)	Life Cycle basis[4]	Est. Years Left	Upgrade Year	Upgrade #2 Year	Criticality[5]	Risk[6]	# of Valves Assoc. w/ this pipe segment	# of Hydrants Assoc. w/ this pipe segment	Rehab Type	Asset Rehab Cost[7]	Level of Service[8]
WM-161	8	1469.5	4	50	100	3	5	8	1920		200%	5	5	5	7889	1	Cast Iron	4	Avg.	5	2025	2075	2	8	1	2	Dig & Replace	$381,900	2
WM-162	8	14.2	2	50	100	15	21	28	1920		200%	5	0	1	7889	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$3,600	2
WM-163	8	827.6	2	50	100	15	21	28	1920		200%	5	0	1	3161	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	1	Dig & Replace	$216,400	2
WM-164	6	1237.6	3	50	100	8	11	15	1920		200%	5	0	1	1221	3	Cast Iron	4	Avg.	11	2031	2081	2	6	2	2	Dig & Replace	$328,400	2
WM-165	8	1488.3	4	50	100	3	5	8	1920		200%	5	6	5	2694	1	Cast Iron	4	Avg.	5	2025	2075	2	8	1	2	Dig & Replace	$386,600	2
WM-166	8	64.6	2	50	100	15	21	28	1920		200%	5	0	1	2677	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$16,100	2
WM-167	6	1079.4	3	50	100	8	11	15	1920		200%	5	1	3	4496	1	Cast Iron	4	Avg.	11	2031	2081	2	6	1	2	Dig & Replace	$284,300	2
WM-168	6	69.1	2	50	100	15	21	28	1920		200%	5	0	1	3570	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$21,800	1
WM-169	6	728.7	2	50	100	15	21	28	1920		200%	5	0	1	5560	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	1	Dig & Replace	$187,200	2
WM-170	6	408.8	4	50	70	3	5	8	1950		140%	5	0	1	172	5	Cast Iron	4	Min.	3	2023	2073	5	20	0	0	Dig & Replace	$102,200	3
WM-171	6	661.9	4	50	100	3	5	8	1920		200%	5	0	1	366	5	Cast Iron	4	Avg.	5	2025	2075	2	8	1	1	Dig & Replace	$175,000	2
WM-172	6	657.4	5	50	100	0	1	3	1920		200%	5	3	5	372	5	Cast Iron	4	Avg.	1	2021	2071	2	10	1	1	Dig & Replace	$173,900	2
WM-173	6	720.8	4	50	100	3	5	8	1920		200%	5	0	1	374	5	Cast Iron	4	Avg.	5	2025	2075	2	8	1	2	Dig & Replace	$194,700	2
WM-174	6	722.8	5	50	100	0	1	3	1920		200%	5	7	5	510	4	Cast Iron	4	Avg.	1	2021	2071	2	10	1	2	Dig & Replace	$195,200	2
WM-175	8	727.1	4	50	100	3	5	8	1920		200%	5	1	3	880	4	Cast Iron	4	Avg.	5	2025	2075	2	8	1	1	Dig & Replace	$191,300	2
WM-176	6	798.1	4	50	100	3	5	8	1920		200%	5	1	3	351	5	Cast Iron	4	Max.	8	2028	2078	1	4	0	2	Dig & Replace	$209,500	1
WM-177	6	2.3	2	50	100	15	21	28	1920		200%	5	0	1	3893	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$600	1
WM-178	6	745.7	3	50	100	8	11	15	1920		200%	5	1	3	3608	1	Cast Iron	4	Max.	15	2035	2085	1	3	0	1	Dig & Replace	$191,400	1
WM-179	6	2.5	2	50	100	15	21	28	1920		200%	5	0	1	3608	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$600	1
WM-180	6	660.9	4	50	100	3	5	8	1920		200%	5	0	1	336	5	Cast Iron	4	Avg.	5	2025	2075	2	8	1	2	Dig & Replace	$179,700	2
WM-181	8	659.3	3	50	100	8	11	15	1920		200%	5	0	1	550	4	Cast Iron	4	Avg.	11	2031	2081	2	6	1	2	Dig & Replace	$179,300	2
WM-182	6	751.4	3	50	100	8	11	15	1920		200%	5	1	3	2618	1	Cast Iron	4	Max.	15	2035	2085	1	3	0	2	Dig & Replace	$197,800	1
WM-183	6	3.4	2	50	100	15	21	28	1920		200%	5	0	1	2618	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$800	1
WM-184	6	5.0	2	50	100	15	21	28	1920		200%	5	0	1	2485	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,300	1
WM-185	6	744.5	4	50	100	3	5	8	1920		200%	5	2	5	2485	1	Cast Iron	4	Max.	8	2028	2078	1	4	0	2	Dig & Replace	$196,100	1
WM-186	8	792.0	4	50	100	3	5	8	1920		200%	5	1	3	1028	3	Cast Iron	4	Avg.	5	2025	2075	2	8	0	3	Dig & Replace	$213,000	2
WM-187	8	2.5	2	50	100	15	21	28	1920		200%	5	0	1	2368	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$600	2
WM-188	6	799.7	5	50	100	0	1	3	1920		200%	5	8	5	587	4	Cast Iron	4	Avg.	1	2021	2071	2	10	0	2	Dig & Replace	$209,900	2
WM-189	6	1.7	2	50	100	15	21	28	1920		200%	5	0	1	2333	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$400	2
WM-190	6	799.0	4	50	100	3	5	8	1920		200%	5	1	3	551	4	Cast Iron	4	Max.	8	2028	2078	1	4	0	3	Dig & Replace	$214,700	1
WM-191	6	2.3	2	50	100	15	21	28	1920		200%	5	0	1	2275	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$600	1
WM-192	6	1038.5	5	50	100	0	1	3	1920		200%	5	3	5	359	5	Cast Iron	4	Min.	0	2020	2070	3	15	1	3	Dig & Replace	$279,100	3
WM-193	12	794.8	2	50	100	15	21	28	1920		200%	5	0	1	4345	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	2	Dig & Replace	$248,400	3
WM-194	6	1386.4	5	50	100	0	1	3	1920		200%	5	2	5	545	4	Cast Iron	4	Min.	0	2020	2070	3	15	1	2	Dig & Replace	$361,100	3
WM-195	8	1088.1	4	50	100	3	5	8	1920		200%	5	3	5	1124	3	Cast Iron	4	Min.	3	2023	2073	3	12	1	2	Dig & Replace	$286,500	3
WM-196	6	1431.4	5	50	100	0	1	3	1920		200%	5	3	5	651	4	Cast Iron	4	Min.	0	2020	2070	3	15	1	3	Dig & Replace	$377,300	3
WM-197	8	1464.1	3	50	100	8	11	15	1920		200%	5	0	1	1273	2	Cast Iron	4	Min.	8	2028	2078	3	9	1	2	Dig & Replace	$380,500	3
WM-198	6	1477.6	3	50	100	8	11	15	1920		200%	5	0	1	848	4	Cast Iron	4	Min.	8	2028	2078	3	9	1	2	Dig & Replace	$383,900	3
WM-199	6	1581.2	5	50	100	0	1	3	1920		200%	5	2	5	595	4	Cast Iron	4	Min.	0	2020	2070	3	15	1	3	Dig & Replace	$414,800	3
WM-200	6	936.0	2	50	100	15	21	28	1920		200%	5	0	1	2009	1	Cast Iron	4	Max.	28	2048	2098	1	2	2	2	Dig & Replace	$253,000	1
WM-201	6	1870.6	4	50	100	3	5	8	1920		200%	5	2	5	1953	1	Cast Iron	4	Min.	3	2023	2073	3	12	2	3	Dig & Replace	$491,700	3
WM-202	8	1879.8	3	50	100	8	11	15	1920		200%	5	0	1	1291	2	Cast Iron	4	Avg.	11	2031	2081	2	6	1	3	Dig & Replace	$489,500	2
WM-203	6	1970.5	5	50	100	0	1	3	1920		200%	5	3	5	678	4	Cast Iron	4	Avg.	1	2021	2071	2	10	1	4	Dig & Replace	$517,100	2
WM-204	6	1191.6	2	50	100	15	21	28	1920		200%	5	0	1	1518	1	Cast Iron	4	Min.	15	2035	2085	3	6	2	2	Dig & Replace	$316,900	3
WM-205	8	279.3	3	50	100	8	11	15	1920		200%	5	0	1	1488	2	Cast Iron	4	Avg.	11	2031	2081	2	6	0	1	Dig & Replace	$74,800	2
WM-206	6	444.2	4	50	100	3	5	8	1920		200%	5	2	5	1488	2	Cast Iron	4	Max.	8	2028	2078	1	4	1	1	Dig & Replace	$120,500	1
WM-207	6	805.3	4	50	100	3	5	8	1920		200%	5	1	3	602	4	Cast Iron	4	Min.	3	2023	2073	3	12	1	2	Dig & Replace	$215,800	3
WM-208	6	972.8	5	50	100	0	1	3	1920		200%	5	5	5	336	5	Cast Iron	4	Avg.	1	2021	2071	2	10	0	2	Dig & Replace	$253,200	2
WM-209	6	797.0	5	50	100	0	1	3	1920		200%	5	2	5	521	4	Cast Iron	4	Avg.	1	2021	2071	2	10	0	3	Dig & Replace	$214,300	2
WM-210	6	332.0	3	50	100	8	11	15	1920		200%	5	0	1	521	4	Cast Iron	4	Min.	8	2028	2078	3	9	1	0	Dig & Replace	$87,500	3
WM-211	6	804.5	2	50	37	15	21	28	1983		74%	3	0	1	2203	1	Ductile Iron	1	Max.	28	2048	2098	1	2	1	2	Dig & Replace	$215,600	1
WM-212	6	74.3	2	50	37	15	21	28	1983		74%	3	1	3	2203	1	Ductile Iron	1	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$18,600	1
WM-213	6	944.0	4	50	37	3	5	8	1983		74%	3	2	5	695	4	Ductile Iron	1	Max.	8	2028	2078	1	4	2	2	Dig & Replace	$255,000	1
WM-214	6	286.7	4	50	100	3	5	8	1920		200%	5	0	1	390	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	0	Dig & Replace	$71,700	2
WM-215	8	331.6	2	50	100	15	21	28	1920		200%	5	0	1	2193	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	1	Dig & Replace	$87,900	2
WM-216	2	193.7	3	50	100	8	11	15	1920		200%	5	0	1	1488	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$53,400	3
WM-217	6	1166.4	2	50	100	15	21	28	1920		200%	5	0	1	2009	1	Cast Iron	4	Max.	28	2048	2098	1	2	2	3	Dig & Replace	$315,600	1
WM-218	2	129.4	4	50	100	3	5	8	1920		200%	5	0	1	0	5	Cast Iron	4	Min.	3	2023	2073	3	12	1	0	Dig & Replace	$36,900	3
WM-219	6	727.9	5	50	100	0	1	3	1920		200%	5	2	5	591	4	Cast Iron	4	Avg.	1	2021	2071	2	10	0	1	Dig & Replace	$187,000	2
WM-220	6	662.3	5	50	70	0	1	3	1950		140%	5	2	5	518	4	Cast Iron	4	Min.	0	2020	2070	5	25	1	1	Dig & Replace	$175,100	3
WM-221	6	543.9	5	50	100	0	1	3	1920		200%	5	4	5	587	4	Cast Iron	4	Avg.	1	2021	2071	2	10	0	1	Dig & Replace	$141,000	2
WM-222	6	9.6	3	50	70	8	11	15	1950		140%	5	0	1	518	4	Cast Iron	4	Min.	8	2028	2078	4	12	0	0	Dig & Replace	$2,400	3
WM-223	6	85.8	3	50	100	8	11	15	1920		200%	5	0	1	587	4	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$21,400	3
WM-224	8	478.7	4	50	100	3	5	8	1920		200%	5	1	3	580	4	Cast Iron	4	Avg.	5	2025	2075	2	8	0	1	Dig & Replace	$124,700	2
WM-225	6	427.7	4	50	100	3	5	8	1920		200%	5	1	3	340	5	Cast Iron	4	Max.	8	2028	2078	1	4	0	1	Dig & Replace	$111,900	1
WM-226	6	481.0	4	50	100	3	5	8	1920		200%	5	0	1	463	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	0	Dig & Replace	$120,200	2
WM-227	6	453.7	4	50	100	3	5	8	1920		200%	5	1	3	453	5	Cast Iron	4	Max.	8	2028	2078	1	4	1	1	Dig & Replace	$122,900	1
WM-228	8	501.0	4	50	100	3	5	8	1920		200%	5	1	3	451	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	1	Dig & Replace	$130,300	2
WM-229	6	736.7	4	50	100	3	5	8	1920		200%	5	2	5	3334	1	Cast Iron	4	Max.	8	2028	2078	1	4	0	1	Dig & Replace	$189,200	1
WM-230	6	3.9	2	50	100	15	21	28	1920		200%	5	0	1	3334	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,000	1
WM-231	6	725.5	2	50	37	15	21	28	1983		74%	3	0	1	2203	1	Ductile Iron	1	Max.	28	2048	2098	1	2	1	2	Dig & Replace	$195,900	1
WM-232	6	535.6	3	50	37	8	11	15	1983		74%	3	0	1	376	5	Ductile Iron	1	Max.	15	2035	2085	1	3	1	2	Dig & Replace	$148,400	1
WM-233	6	147.2	5	50	100	0	1	3	1920		200%	5	4	5	390	5	Cast Iron	4	Avg.	1	2021	2071	2	10	0	1	Dig & Replace	$41,800	2
WM-234	6	534.1	4	50	100	3	5	8	1920		200%	5	0	1	499	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	2	Dig & Replace	$143,500	2
WM-235	8	507.9	4	50	100	3	5	8	1920		200%	5	1	3	755	4	Cast Iron	4	Avg.	5	2025	2075	2	8	1	1	Dig & Replace	$136,500	2
WM-236	6	520.0	4	50	100	3	5	8	1920		200%	5	1	3	572	4	Cast Iron	4	Max.	8	2028	2078	1	4	1	1	Dig & Replace	$139,500	1
WM-237	6	494.0	4	50	100	3	5	8	1920		200%	5	0	1	390	5	Cast Iron	4	Max.	8	2028	2078	1	4	1	1	Dig & Replace	$133,000	1
WM-238	6	464.1	5	50	100	0	1	3	1920		200%	5	3	5	284	5	Cast Iron	4	Avg.	1	2021	2071	2	10	1	1	Dig & Replace	$125,500	2
WM-239	6	58.0	2	50	100	15	21	28	1920		200%	5	0	1	7044	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$14,500	2
WM-240	6	23.7	2	50	100	15	21	28	1920		200%	5	0	1	7044	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$5,900	2
WM-241	6	75.4	2	50	100	15	21	28	1920		200%	5	0	1	9363	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$18,800	1
WM-242	6	781.8	5	50	100	0	1	3	1920		200%	5	2	5	547	4	Cast Iron	4	Max.	3	2023	2073	1	5	1	1	Dig & Replace	$205,000	1
WM-243	6	946.4	3	50	100	8	11	15	1920		200%	5	0	1	665	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	1	Dig & Replace	$241,600	2
WM-244	8	885.4	3	50	100	8	11	15	1920		200%	5	1	3	1447	2	Cast Iron	4	Min.	8	2028	2078	3	9	1	1	Dig & Replace	$230,900	3
WM-245	8	372.2	3	50	100	8	11	15	1920		200%	5	0	1	1488	2	Cast Iron	4	Avg.	11	2031	2081	2	6	0	2	Dig & Replace	$103,100	2
WM-246	6	97.4	4	50	100	3	5	8	1920		200%	5	1	3	1221	3	Cast Iron	4	Avg.	5	2025	2075	2	8	0	1	Dig & Replace	$29,300	2

						Estimated Service Life (yrs)[3]													Anticipated Year of Upgrade (yr)										
Pipe ID	Diam. (in)	Length (ft)	Apparent Condition[1]	Life Expectancy (yrs)[2]	Age (yrs)	Min.	Avg.	Max.	Install Year	Last Upgrade Year	Consumed Life (%)	Estimated Condition Rating (Age)	Break History (# of breaks)	Break Condition	Available Fire Flow - 2018 Water Model nearest node (gpm)	Estimated Condition Rating (Capacity/ FireFlow)	Material Type	Estimated Condition Rating (Material Type)	Life Cycle basis[4]	Est. Years Left	Upgrade Year	Upgrade #2 Year	Criticality[5]	Risk[6]	# of Valves Assoc. w/ this pipe segment	# of Hydrants Assoc. w/ this pipe segment	Rehab Type	Asset Rehab Cost[7]	Level of Service[8]
WM-247	8	73.2	3	50	100	8	11	15	1920		200%	5	1	3	1447	2	Cast Iron	4	Avg.	11	2031	2081	2	6	1	0	Dig & Replace	$22,800	2
WM-248	8	2.0	3	50	100	8	11	15	1920		200%	5	0	1	1447	2	Cast Iron	4	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$500	2
WM-249	6	32.4	3	50	100	8	11	15	1920		200%	5	0	1	744	4	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$8,100	1
WM-250	6	24.0	3	50	100	8	11	15	1920		200%	5	0	1	744	4	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$6,000	1
WM-251	6	24.6	3	50	100	8	11	15	1920		200%	5	0	1	709	4	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$6,100	1
WM-252	6	943.3	4	50	100	3	5	8	1920		200%	5	1	3	628	4	Cast Iron	4	Max.	8	2028	2078	1	4	0	2	Dig & Replace	$245,800	1
WM-253	6	935.7	4	50	37	3	5	8	1983		74%	3	9	5	695	4	Ductile Iron	1	Max.	8	2028	2078	1	4	0	1	Dig & Replace	$238,900	1
WM-254	6	5.0	3	50	100	8	11	15	1920		200%	5	0	1	908	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$1,200	2
WM-255	6	63.1	3	50	100	8	11	15	1920		200%	5	0	1	1492	2	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$15,800	1
WM-256	6	19.2	2	50	100	15	21	28	1920		200%	5	0	1	2009	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$4,800	1
WM-257	8	563.3	2	50	100	15	21	28	1920		200%	5	0	1	2513	1	Cast Iron	4	Avg.	21	2041	2091	2	4	2	1	Dig & Replace	$154,800	2
WM-258	8	4.6	2	50	100	15	21	28	1920		200%	5	0	1	2513	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$1,100	2
WM-259	6	2.7	2	50	100	15	21	28	1920		200%	5	0	1	2210	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$700	1
WM-260	8	153.3	3	50	100	8	11	15	1920		200%	5	1	3	2009	1	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$38,300	3
WM-261	8	19.9	2	50	100	15	21	28	1920		200%	5	0	1	1668	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$5,000	3
WM-262	6	5.0	3	50	100	8	11	15	1920		200%	5	0	1	1350	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$1,300	3
WM-263	6	99.3	2	50	100	15	21	28	1920		200%	5	0	1	1637	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$24,800	2
WM-264	8	77.4	4	50	100	3	5	8	1920		200%	5	3	5	1825	1	Cast Iron	4	Avg.	5	2025	2075	2	8	1	0	Dig & Replace	$23,900	2
WM-265	6	77.5	2	50	100	15	21	28	1920		200%	5	0	1	2009	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$19,400	2
WM-266	6	13.7	2	50	100	15	21	28	1920		200%	5	0	1	2513	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$3,400	1
WM-267	6	3.0	2	50	100	15	21	28	1920		200%	5	0	1	2648	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$800	1
WM-268	8	4.2	2	50	100	15	21	28	1920		200%	5	0	1	2694	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,000	1
WM-269	8	52.5	2	50	100	15	21	28	1920		200%	5	0	1	2694	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	1	Dig & Replace	$18,100	3
WM-270	8	5.9	2	50	100	15	21	28	1920		200%	5	0	1	2703	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$1,500	2
WM-271	6	4.5	2	50	100	15	21	28	1920		200%	5	0	1	2724	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,100	1
WM-272	8	47.6	2	50	100	15	21	28	1920		200%	5	0	1	2944	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	1	Dig & Replace	$16,900	3
WM-273	6	227.3	2	50	100	15	21	28	1920		200%	5	0	1	3337	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$56,800	3
WM-274	6	2.8	2	50	100	15	21	28	1920		200%	5	0	1	3337	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$700	2
WM-275	6	0.2	2	50	100	15	21	28	1920		200%	5	0	1	3625	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$4,500	2
WM-276	6	47.9	2	50	100	15	21	28	1920		200%	5	0	1	4345	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$16,500	3
WM-277	6	220.4	4	50	100	3	5	8	1920		200%	5	3	5	4345	1	Cast Iron	4	Avg.	5	2025	2075	2	8	0	1	Dig & Replace	$60,100	2
WM-278	6	1021.8	4	50	100	3	5	8	1920		200%	5	3	5	3625	1	Cast Iron	4	Avg.	5	2025	2075	2	8	0	1	Dig & Replace	$260,500	2
WM-279	6	58.6	2	50	100	15	21	28	1920		200%	5	0	1	5500	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$19,200	1
WM-280	6	1243.6	4	50	100	3	5	8	1920		200%	5	6	5	5500	1	Cast Iron	4	Avg.	5	2025	2075	2	8	1	2	Dig & Replace	$325,400	2
WM-281	8	1113.4	3	50	100	8	11	15	1920		200%	5	1	3	6578	1	Cast Iron	4	Avg.	11	2031	2081	2	6	1	1	Dig & Replace	$287,900	2
WM-282	6	1241.9	4	50	100	3	5	8	1920		200%	5	4	5	3570	1	Cast Iron	4	Avg.	5	2025	2075	2	8	0	2	Dig & Replace	$320,500	2
WM-283	6	981.6	3	50	100	8	11	15	1920		200%	5	1	3	2087	1	Cast Iron	4	Max.	15	2035	2085	1	3	1	2	Dig & Replace	$259,900	1
WM-284	6	539.1	4	50	100	3	5	8	1920		200%	5	2	5	2145	1	Cast Iron	4	Max.	8	2028	2078	1	4	0	0	Dig & Replace	$134,800	1
WM-285	6	167.2	3	50	100	8	11	15	1920		200%	5	0	1	959	4	Cast Iron	4	Max.	15	2035	2085	1	3	0	1	Dig & Replace	$46,800	1
WM-286	6	10.4	3	50	100	8	11	15	1920		200%	5	0	1	959	4	Cast Iron	4	Min.	8	2028	2078	3	9	1	0	Dig & Replace	$7,100	3
WM-287	6	440.8	3	50	100	8	11	15	1920		200%	5	0	1	959	4	Cast Iron	4	Max.	15	2035	2085	1	3	1	2	Dig & Replace	$124,700	1
WM-288	6	194.8	3	50	100	8	11	15	1920		200%	5	0	1	1476	2	Cast Iron	4	Max.	15	2035	2085	1	3	1	0	Dig & Replace	$53,200	1
WM-289	8	1537.1	3	50	100	8	11	15	1920		200%	5	1	3	1857	1	Cast Iron	4	Avg.	11	2031	2081	2	6	2	3	Dig & Replace	$408,300	2
WM-290	8	63.1	2	50	100	15	21	28	1920		200%	5	0	1	1857	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	1	Dig & Replace	$20,800	1
WM-291	8	724.4	2	50	100	15	21	28	1920		200%	5	0	1	7889	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	2	Dig & Replace	$191,100	2
WM-292	6	773.7	3	50	100	8	11	15	1920		200%	5	1	3	2048	1	Cast Iron	4	Max.	15	2035	2085	1	3	0	2	Dig & Replace	$203,400	1
WM-293	6	884.7	2	50	100	15	21	28	1920		200%	5	0	1	2048	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	2	Dig & Replace	$235,700	1
WM-294	6	96.8	2	50	100	15	21	28	1920		200%	5	0	1	2087	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$24,200	1
WM-295	6	67.4	2	50	100	15	21	28	1920		200%	5	0	1	2210	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$16,900	1
WM-296	6	53.6	4	50	100	3	5	8	1920		200%	5	0	1	340	5	Cast Iron	4	Avg.	5	2025	2075	2	8	1	0	Dig & Replace	$17,900	2
WM-297	6	34.8	4	50	100	3	5	8	1920		200%	5	0	1	451	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	0	Dig & Replace	$8,700	2
WM-298	6	50.7	4	50	100	3	5	8	1920		200%	5	0	1	284	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	0	Dig & Replace	$12,700	2
WM-299	6	60.5	4	50	100	3	5	8	1920		200%	5	1	3	390	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	1	Dig & Replace	$20,100	2
WM-300	6	53.4	3	50	100	8	11	15	1920		200%	5	0	1	572	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	1	Dig & Replace	$18,400	2
WM-301	8	17.9	3	50	100	8	11	15	1920		200%	5	0	1	755	4	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$4,500	3
WM-302	6	5.5	2	50	100	15	21	28	1920		200%	5	0	1	1518	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,400	1
WM-303	8	44.0	2	50	100	15	21	28	1920		200%	5	0	1	3625	1	Cast Iron	4	Min.	15	2035	2085	5	10	1	1	Dig & Replace	$20,500	3
WM-304	8	153.4	2	50	100	15	21	28	1920		200%	5	0	1	3161	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	1	Dig & Replace	$43,300	2
WM-305	6	12.7	2	50	100	15	21	28	1920		200%	5	0	1	2984	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$7,700	1
WM-306	6	2.6	2	50	100	15	21	28	1920		200%	5	0	1	2687	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$5,200	1
WM-307	6	8.2	2	50	100	15	21	28	1920		200%	5	0	1	2640	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$2,100	1
WM-308	8	21.3	2	50	100	15	21	28	1920		200%	5	0	1	1553	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$5,300	3
WM-309	6	3.6	3	50	100	8	11	15	1920		200%	5	0	1	1469	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$900	3
WM-310	6	4.2	3	50	100	8	11	15	1920		200%	5	0	1	1436	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$1,000	3
WM-311	6	981.4	3	50	100	8	11	15	1920		200%	5	1	3	2944	1	Cast Iron	4	Avg.	11	2031	2081	2	6	0	1	Dig & Replace	$250,400	2
WM-312	6	962.3	4	50	100	3	5	8	1920		200%	5	5	5	2687	1	Cast Iron	4	Max.	8	2028	2078	1	4	0	1	Dig & Replace	$245,600	1
WM-313	6	648.8	2	50	100	15	21	28	1920		200%	5	0	1	3624	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	1	Dig & Replace	$167,200	1
WM-314	6	71.0	3	50	100	8	11	15	1920		200%	5	1	3	3624	1	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$17,700	1
WM-315	8	701.5	2	50	100	15	21	28	1920		200%	5	0	1	7889	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	2	Dig & Replace	$185,400	2
WM-316	8	15.1	2	50	100	15	21	28	1920		200%	5	0	1	1857	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$3,800	1
WM-317	8	123.7	3	50	100	8	11	15	1920		200%	5	1	3	1476	2	Cast Iron	4	Avg.	11	2031	2081	2	6	1	0	Dig & Replace	$35,400	2
WM-318	8	450.7	3	50	100	8	11	15	1920		200%	5	1	3	2102	1	Cast Iron	4	Avg.	11	2031	2081	2	6	1	1	Dig & Replace	$122,200	2
WM-319	12	59.1	2	50	100	15	21	28	1920		200%	5	0	1	5484	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$17,700	3
WM-320	12	23.1	2	50	100	15	21	28	1920		200%	5	0	1	6578	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$6,900	3
WM-321	12	85.3	3	50	100	8	11	15	1920		200%	5	1	3	6578	1	Cast Iron	4	Min.	8	2028	2078	4	12	1	0	Dig & Replace	$31,600	3
WM-322	6	5.7	2	50	100	15	21	28	1920		200%	5	0	1	5484	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$1,400	2
WM-323	12	54.3	2	50	100	15	21	28	1920		200%	5	0	1	4496	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$16,300	3
WM-324	12	14.5	2	50	100	15	21	28	1920		200%	5	0	1	4496	1	Cast Iron	4	Min.	15	2035	2085	4	8	1	0	Dig & Replace	$10,300	3
WM-325	8	202.8	2	50	100	15	21	28	1920		200%	5	0	1	3456	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$55,200	3
WM-326	6	5.4	4	50	100	3	5	8	1920		200%	5	0	1	463	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	0	Dig & Replace	$1,400	2
WM-327	2	20.3	3	50	100	8	11	15	1920		200%	5	0	1	1488	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	0	Dig & Replace	$5,100	3
WM-328	6	212.4	3	50	100	8	11	15	1920		200%	5	0	1	732	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$53,100	2
WM-329	6	13.9	2	50	100	15	21	28	1920		200%	5	0	1	5560	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$3,500	1
WM-330	8	322.0	3	50	100	8	11	15	1920		200%	5	1	3	1472	2	Cast Iron	4	Avg.	11	2031	2081	2	6	1	0	Dig & Replace	$85,000	2
WM-331	6	17.0	2	50	100	15	21	28	1920		200%	5	0	1	5075	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$4,300	2
WM-332	8	16.3	2	50	100	15	21	28	1920		200%	5	0	1	2187	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	1	Dig & Replace	$9,100	2

						Estimated Service Life (yrs)[3]													Anticipated Year of Upgrade (yr)										
Pipe ID	Diam. (in)	Length (ft)	Apparent Condition[1]	Life Expectancy (yrs)[2]	Age (yrs)	Min.	Avg.	Max.	Install Year	Last Upgrade Year	Consumed Life (%)	Estimated Condition Rating (Age)	Break History (# of breaks)	Break Condition	Available Fire Flow - 2018 Water Model nearest node (gpm)	Estimated Condition Rating (Capacity/ FireFlow)	Material Type	Estimated Condition Rating (Material Type)	Life Cycle basis[4]	Est. Years Left	Upgrade Year	Upgrade #2 Year	Criticality[5]	Risk[6]	# of Valves Assoc. w/ this pipe segment	# of Hydrants Assoc. w/ this pipe segment	Rehab Type	Asset Rehab Cost[7]	Level of Service[8]
WM-333	8	123.7	2	50	100	15	21	28	1920		200%	5	0	1	3160	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$30,900	3
WM-334	8	13.2	2	50	100	15	21	28	1920		200%	5	0	1	3625	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$3,300	3
WM-335	6	0.4	2	50	100	15	21	28	1920		200%	5	0	1	3625	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$100	2
WM-336	8	1.1	2	50	100	15	21	28	1920		200%	5	0	1	3456	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$300	3
WM-337	8	4.3	2	50	100	15	21	28	1920		200%	5	0	1	3456	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$1,100	3
WM-338	8	6.1	2	50	100	15	21	28	1920		200%	5	0	1	3337	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$1,500	3
WM-339	6	61.1	2	50	100	15	21	28	1920		200%	5	0	1	4496	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$15,300	2
WM-340	8	89.9	3	50	70	8	11	15	1950		140%	5	1	3	2984	1	Cast Iron	4	Min.	8	2028	2078	4	12	1	0	Dig & Replace	$27,000	3
WM-341	8	0.7	3	50	70	8	11	15	1950		140%	5	0	1	1080	3	Cast Iron	4	Avg.	11	2031	2081	2	6	1	0	Dig & Replace	$4,700	2
WM-342	8	321.0	3	50	70	8	11	15	1950		140%	5	0	1	1080	3	Cast Iron	4	Avg.	11	2031	2081	2	6	0	1	Dig & Replace	$85,300	2
WM-343	6	1.4	2	50	100	15	21	28	1920		200%	5	0	1	5560	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$4,900	1
WM-344	8	46.6	2	50	100	15	21	28	1920		200%	5	0	1	2694	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$11,700	3
WM-345	8	395.3	2	50	100	15	21	28	1920		200%	5	0	1	2102	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	1	Dig & Replace	$103,800	2
WM-346	6	420.0	4	50	100	3	5	8	1920		200%	5	1	3	438	5	Cast Iron	4	Max.	8	2028	2078	1	4	0	0	Dig & Replace	$105,000	1
WM-347	6	1.5	2	50	100	15	21	28	1920		200%	5	0	1	2210	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$400	1
WM-348	6	2.0	2	50	100	15	21	28	1920		200%	5	0	1	1825	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$500	3
WM-349	2	9.0	4	50	100	3	5	8	1920		200%	5	0	1	0	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	0	Dig & Replace	$2,200	3
WM-350	6	10.3	3	50	100	8	11	15	1920		200%	5	0	1	1488	2	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$2,600	1
WM-351	6	19.4	3	50	37	8	11	15	1983		74%	3	0	1	376	5	Ductile Iron	1	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$4,900	2
WM-352	6	271.7	2	50	100	15	21	28	1920		200%	5	0	1	2203	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$67,900	3
WM-353	6	1.1	2	50	100	15	21	28	1920		200%	5	0	1	2275	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$300	1
WM-354	6	282.8	4	50	100	3	5	8	1920		200%	5	0	1	448	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	0	Dig & Replace	$70,700	3
WM-355	6	3.8	4	50	100	3	5	8	1920		200%	5	0	1	448	5	Cast Iron	4	Min.	3	2023	2073	5	20	1	0	Dig & Replace	$5,400	3
WM-356	6	65.5	2	50	100	15	21	28	1920		200%	5	0	1	11922	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$16,400	1
WM-357	16	4.6	2	50	100	15	21	28	1920		200%	5	0	1	11922	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$1,600	3
WM-358	8	8.0	2	50	70	15	21	28	1950		140%	5	0	1	2984	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$2,000	3
WM-359	6	4.5	2	50	100	15	21	28	1920		200%	5	0	1	7044	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$5,600	1
WM-360	6	9.1	2	50	100	15	21	28	1920		200%	5	0	1	4677	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$6,800	2
WM-361	6	2.5	2	50	100	15	21	28	1920		200%	5	0	1	4677	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$600	1
WM-362	8	4.8	2	50	100	15	21	28	1920		200%	5	0	1	4295	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$5,700	2
WM-363	8	3.7	2	50	100	15	21	28	1920		200%	5	0	1	4295	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$900	2
WM-364	6	198.2	3	50	100	8	11	15	1920		200%	5	0	1	1476	2	Cast Iron	4	Max.	15	2035	2085	1	3	1	0	Dig & Replace	$54,000	1
WM-365	6	5.0	2	50	100	15	21	28	1920		200%	5	0	1	2135	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,300	1
WM-366	8	405.2	3	50	100	8	11	15	1920		200%	5	0	1	959	4	Cast Iron	4	Avg.	11	2031	2081	2	6	0	1	Dig & Replace	$106,300	2
WM-367	6	1.6	3	50	100	8	11	15	1920		200%	5	0	1	959	4	Cast Iron	4	Min.	8	2028	2078	3	9	1	0	Dig & Replace	$4,900	3
WM-368	6	509.1	3	50	100	8	11	15	1920		200%	5	0	1	959	4	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$132,300	3
WM-369	8	739.1	2	50	100	15	21	28	1920		200%	5	0	1	3125	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	2	Dig & Replace	$194,800	2
WM-370	8	1.6	2	50	100	15	21	28	1920		200%	5	0	1	3125	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$400	2
WM-371	8	3.2	2	50	100	15	21	28	1920		200%	5	0	1	3125	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$5,300	2
WM-372	8	3.4	2	50	100	15	21	28	1920		200%	5	0	1	3125	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$800	2
WM-373	16	406.7	2	50	100	15	21	28	1920		200%	5	0	1	2925	1	Cast Iron	4	Min.	15	2035	2085	4	8	1	0	Dig & Replace	$154,300	3
WM-374	16	12.9	2	50	100	15	21	28	1920		200%	5	0	1	2618	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$4,500	3
WM-375	16	435.8	2	50	100	15	21	28	1920		200%	5	0	1	2774	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$152,500	3
WM-376	16	390.1	2	50	100	15	21	28	1920		200%	5	0	1	2925	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$136,500	3
WM-377	6	9.6	2	50	100	15	21	28	1920		200%	5	0	1	2925	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$6,900	1
WM-378	6	3.6	2	50	100	15	21	28	1920		200%	5	0	1	2925	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$900	1
WM-379	8	10.9	2	50	100	15	21	28	1920		200%	5	0	1	2774	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$7,200	2
WM-380	8	4.9	2	50	100	15	21	28	1920		200%	5	0	1	2774	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$1,200	2
WM-381	6	1.3	2	50	100	15	21	28	1920		200%	5	0	1	2618	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$4,800	1
WM-382	6	0.6	2	50	100	15	21	28	1920		200%	5	0	1	2618	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$200	1
WM-383	6	11.3	2	50	100	15	21	28	1920		200%	5	0	1	2485	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$7,300	1
WM-384	6	4.6	2	50	100	15	21	28	1920		200%	5	0	1	2485	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,200	1
WM-385	8	28.1	3	50	100	8	11	15	1920		200%	5	0	1	1447	2	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$12,000	3
WM-386	6	4.4	3	50	100	8	11	15	1920		200%	5	0	1	1091	3	Cast Iron	4	Min.	8	2028	2078	3	9	1	0	Dig & Replace	$5,600	3
WM-387	6	706.5	3	50	100	8	11	15	1920		200%	5	0	1	1091	3	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$181,600	3
WM-388	6	108.0	3	50	100	8	11	15	1920		200%	5	0	1	1091	3	Cast Iron	4	Min.	8	2028	2078	3	9	1	1	Dig & Replace	$36,500	3
WM-389	6	10.5	2	50	37	15	21	28	1983		74%	3	0	1	1091	3	Ductile Iron	1	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$2,600	1
WM-390	6	696.7	3	50	100	8	11	15	1920		200%	5	0	1	1090	3	Cast Iron	4	Min.	8	2028	2078	3	9	1	1	Dig & Replace	$183,700	3
WM-391	6	11.2	3	50	100	8	11	15	1920		200%	5	0	1	1090	3	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$7,800	3
WM-392	16	41.5	3	50	100	8	11	15	1920		200%	5	1	3	7044	1	Cast Iron	4	Min.	8	2028	2078	5	15	0	0	Dig & Replace	$14,500	3
WM-393	16	346.6	2	50	100	15	21	28	1920		200%	5	0	1	7044	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$121,300	3
WM-394	16	298.7	2	50	100	15	21	28	1920		200%	5	0	1	6172	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$104,500	3
WM-395	16	625.4	2	50	100	15	21	28	1920		200%	5	0	1	5560	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	1	Dig & Replace	$223,900	3
WM-396	16	444.4	2	50	100	15	21	28	1920		200%	5	0	1	4295	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$155,500	3
WM-397	16	70.3	2	50	100	15	21	28	1920		200%	5	0	1	4295	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	0	Dig & Replace	$24,600	3
WM-398	6	7.7	2	50	100	15	21	28	1920		200%	5	0	1	6172	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$6,400	2
WM-399	6	1.6	2	50	100	15	21	28	1920		200%	5	0	1	6172	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$400	2
WM-400	6	6.5	2	50	100	15	21	28	1920		200%	5	0	1	5560	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$1,600	2
WM-401	16	363.4	2	50	100	15	21	28	1920		200%	5	0	1	3893	1	Cast Iron	4	Min.	15	2035	2085	4	8	1	0	Dig & Replace	$139,200	3
WM-402	6	4.0	2	50	100	15	21	28	1920		200%	5	0	1	3893	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$5,500	1
WM-403	6	1.8	2	50	100	15	21	28	1920		200%	5	0	1	3893	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$400	1
WM-404	16	436.3	2	50	100	15	21	28	1920		200%	5	0	1	3608	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$152,700	3
WM-405	6	1.8	2	50	100	15	21	28	1920		200%	5	0	1	3608	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$5,000	1
WM-406	6	2.1	2	50	100	15	21	28	1920		200%	5	0	1	3608	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$500	1
WM-407	16	406.0	2	50	100	15	21	28	1920		200%	5	0	1	3334	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$142,100	3
WM-408	6	2.6	2	50	100	15	21	28	1920		200%	5	0	1	3334	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$5,200	1
WM-409	6	739.8	2	50	100	15	21	28	1920		200%	5	0	1	3334	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$184,900	1
WM-410	16	410.5	2	50	100	15	21	28	1920		200%	5	0	1	2925	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$143,700	3
WM-411	16	77.4	2	50	100	15	21	28	1920		200%	5	0	1	3125	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$27,100	3
WM-412	16	391.0	2	50	100	15	21	28	1920		200%	5	0	1	2485	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$136,800	3
WM-413	16	162.1	2	50	100	15	21	28	1920		200%	5	0	1	2333	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$56,700	3
WM-414	16	279.3	2	50	100	15	21	28	1920		200%	5	0	1	2368	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$97,700	3
WM-415	16	340.8	2	50	100	15	21	28	1920		200%	5	0	1	2618	1	Cast Iron	4	Min.	15	2035	2085	4	8	1	0	Dig & Replace	$131,300	3
WM-416	8	2.9	2	50	100	15	21	28	1920		200%	5	0	1	2368	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$5,200	2
WM-417	8	4.5	2	50	100	15	21	28	1920		200%	5	0	1	2368	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$1,100	2
WM-418	6	2.5	2	50	100	15	21	28	1920		200%	5	0	1	2333	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$5,100	1

						Estimated Service Life (yrs)[3]													Anticipated Year of Upgrade (yr)										
Pipe ID	Diam. (in)	Length (ft)	Apparent Condition[1]	Life Expectancy (yrs)[2]	Age (yrs)	Min.	Avg.	Max.	Install Year	Last Upgrade Year	Consumed Life (%)	Estimated Condition Rating (Age)	Break History (# of breaks)	Break Condition	Available Fire Flow - 2018 Water Model nearest node (gpm)	Estimated Condition Rating (Capacity/ FireFlow)	Material Type	Estimated Condition Rating (Material Type)	Life Cycle basis[4]	Est. Years Left	Upgrade Year	Upgrade #2 Year	Criticality[5]	Risk[6]	# of Valves Assoc. w/ this pipe segment	# of Hydrants Assoc. w/ this pipe segment	Rehab Type	Asset Rehab Cost[7]	Level of Service[8]
WM-419	6	5.4	2	50	100	15	21	28	1920		200%	5	0	1	2333	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$1,300	2
WM-420	6	4.1	2	50	100	15	21	28	1920		200%	5	0	1	2275	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$5,500	1
WM-421	6	8.1	2	50	100	15	21	28	1920		200%	5	0	1	2275	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$2,000	1
WM-422	6	151.5	4	50	100	3	5	8	1920		200%	5	2	5	2275	1	Cast Iron	4	Min.	3	2023	2073	3	12	1	0	Dig & Replace	$42,400	3
WM-423	6	244.9	4	50	100	3	5	8	1920		200%	5	0	1	498	5	Cast Iron	4	Avg.	5	2025	2075	2	8	1	0	Dig & Replace	$65,700	2
WM-424	6	49.6	4	50	100	3	5	8	1920		200%	5	0	1	499	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	0	Dig & Replace	$12,400	2
WM-425	6	37.3	4	50	100	3	5	8	1920		200%	5	0	1	390	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	0	Dig & Replace	$9,300	2
WM-426	12	2.5	2	50	100	15	21	28	1920		200%	5	0	1	6578	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$800	3
WM-427	6	15.3	3	50	100	8	11	15	1920		200%	5	1	3	11922	1	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$3,800	1
WM-428	6	11.5	2	50	100	15	21	28	1920		200%	5	0	1	5344	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$7,400	3
WM-429	6	17.2	2	50	100	15	21	28	1920		200%	5	0	1	9363	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	1	Dig & Replace	$9,300	1
WM-430	6	7.2	2	50	100	15	21	28	1920		200%	5	0	1	7044	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$1,800	2
WM-431	6	790.0	5	50	100	0	1	3	1920		200%	5	5	5	572	4	Cast Iron	4	Avg.	1	2021	2071	2	10	0	2	Dig & Replace	$207,500	2
WM-432	6	726.6	4	50	100	3	5	8	1920		200%	5	2	5	6172	1	Cast Iron	4	Min.	3	2023	2073	3	12	0	1	Dig & Replace	$186,600	3
WM-433	6	13.8	2	50	100	15	21	28	1920		200%	5	0	1	6172	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$3,500	3
WM-434	6	19.9	3	50	100	8	11	15	1920		200%	5	0	1	572	4	Cast Iron	4	Min.	8	2028	2078	4	12	0	0	Dig & Replace	$5,000	3
WM-435	6	252.6	3	50	100	8	11	15	1920		200%	5	0	1	591	4	Cast Iron	4	Min.	8	2028	2078	3	9	0	1	Dig & Replace	$68,100	3
WM-436	6	12.5	3	50	100	8	11	15	1920		200%	5	0	1	1080	3	Cast Iron	4	Avg.	11	2031	2081	2	6	0	0	Dig & Replace	$3,100	2
WM-437	6	78.0	2	50	100	15	21	28	1920		200%	5	0	1	4677	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$19,500	2
WM-438	8	76.3	2	50	100	15	21	28	1920		200%	5	0	1	4295	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$19,100	2
WM-439	6	364.4	4	50	100	3	5	8	1920		200%	5	0	1	438	5	Cast Iron	4	Min.	3	2023	2073	3	12	0	0	Dig & Replace	$91,100	3
WM-440	6	3.7	2	50	100	15	21	28	1920		200%	5	0	1	3334	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$900	1
WM-441	8	2.7	2	50	100	15	21	28	1920		200%	5	0	1	2210	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$700	3
WM-442	6	869.0	5	50	100	0	1	3	1920		200%	5	2	5	638	4	Cast Iron	4	Max.	3	2023	2073	1	5	0	2	Dig & Replace	$227,200	1
WM-443	6	72.6	2	50	100	15	21	28	1920		200%	5	0	1	2925	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$18,200	1
WM-444	8	479.4	4	50	100	3	5	8	1920		200%	5	0	1	319	5	Cast Iron	4	Avg.	5	2025	2075	2	8	1	1	Dig & Replace	$129,400	2
WM-445	8	53.5	4	50	100	3	5	8	1920		200%	5	0	1	318	5	Cast Iron	4	Avg.	5	2025	2075	2	8	0	1	Dig & Replace	$18,400	2
WM-446	6	381.0	3	50	100	8	11	15	1920		200%	5	0	1	1492	2	Cast Iron	4	Max.	15	2035	2085	1	3	1	1	Dig & Replace	$104,800	1
WM-447	6	52.8	3	50	100	8	11	15	1920		200%	5	1	3	1492	2	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$13,200	1
WM-448	6	38.2	2	50	100	15	21	28	1920		200%	5	0	1	2677	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$9,600	3
WM-449	12	514.0	2	50	100	15	21	28	1920		200%	5	0	1	4496	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$154,200	3
WM-450	6	18.0	2	50	100	15	21	28	1920		200%	5	0	1	3624	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$9,000	1
WM-451	6	5.5	2	50	100	15	21	28	1920		200%	5	0	1	3624	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,400	1
WM-452	6	15.0	2	50	100	15	21	28	1920		200%	5	0	1	4011	1	Cast Iron	4	Max.	28	2048	2098	1	2	1	0	Dig & Replace	$8,200	1
WM-453	6	2.8	2	50	100	15	21	28	1920		200%	5	0	1	4011	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$700	1
WM-454	8	4.8	2	50	100	15	21	28	1920		200%	5	0	1	7889	1	Cast Iron	4	Avg.	21	2041	2091	2	4	1	0	Dig & Replace	$5,700	2
WM-455	8	2.6	2	50	100	15	21	28	1920		200%	5	0	1	7889	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$600	2
WM-456	6	24.2	2	50	100	15	21	28	1920		200%	5	0	1	5500	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$6,100	1
WM-457	12	117.9	3	50	100	8	11	15	1920		200%	5	1	3	5344	1	Cast Iron	4	Min.	8	2028	2078	4	12	1	0	Dig & Replace	$41,400	3
WM-458	8	1.8	2	50	100	15	21	28	1920		200%	5	0	1	5344	1	Cast Iron	4	Min.	15	2035	2085	3	6	1	0	Dig & Replace	$4,900	3
WM-459	8	3.0	2	50	100	15	21	28	1920		200%	5	0	1	5344	1	Cast Iron	4	Min.	15	2035	2085	3	6	0	0	Dig & Replace	$700	3
WM-460	6	55.1	3	50	100	8	11	15	1920		200%	5	1	3	1492	2	Cast Iron	4	Max.	15	2035	2085	1	3	0	0	Dig & Replace	$13,800	1
WM-461	8	2.1	2	50	100	15	21	28	1920		200%	5	0	1	1825	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$500	2
WM-462	6	6.9	2	50	100	15	21	28	1920		200%	5	0	1	1953	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$1,700	1
WM-463	6	0.6	2	50	100	15	21	28	1920		200%	5	0	1	1953	1	Cast Iron	4	Max.	28	2048	2098	1	2	0	0	Dig & Replace	$200	1
WM-464	12	494.7	2	50	100	15	21	28	1920		200%	5	0	1	3624	1	Cast Iron	4	Min.	15	2035	2085	4	8	0	0	Dig & Replace	$148,400	3
WM-465	6	251.4	2	50	100	15	21	28	1920		200%	5	0	1	3161	1	Cast Iron	4	Min.	15	2035	2085	5	10	0	1	Dig & Replace	$67,800	3
WM-466	12	2.3	2	50	100	15	21	28	1920		200%	5	0	1	10169	1	Cast Iron	4	Avg.	21	2041	2091	2	4	0	0	Dig & Replace	$700	2

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Condition Weighting Factors
Pair Wise Comparison Water Mains

	Consumed Service Life (%)	Number of Breaks	Capacity Deficiency - Available Fire Flow (gpm)	Pipe Material	Total	Weighted
Consumed Service Life (%)		3	3	3	9.0	25%
Number of Breaks	3		3	5	11.0	31%
Capacity Deficiency - Available Fire Flow (gpm)	3	3		5	11.0	31%
Pipe Material	3	1	1		5.0	14%

In order to establish the relative importance of each criterion, and assign weights to each, the pair-wise comparison analysis of the criteria is conducted. The pair-wise comparison is based on successively comparing each pair of criteria and assessing their relative importance against one another on the basis of a total score of 6 where the following scores are assigned:

- 5 vs. 1 if one criterion is deemed to be much more important than the other;
- 4 vs. 2 if one criterion is deemed to be somewhat more important than the other; and;
- 3 and 3 if both criteria are deemed to be equally important.

Prioritized Ranking of Criteria and Weightings

Criteria	Rank	Weight
Number of Breaks	1	31%
Capacity Deficiency - Available Fire Flow (gpm)	2	31%
Consumed Service Life (%)	3	25%
Pipe Material	4	14%

Weighting Factors & Risk Categories

Consumed Service Life (%)	0.25	Number of Breaks	0.31	Capacity Deficiency - Available Fire Flow (gpm)	0.31	Pipe Material	0.14
0-45	1	0	1	>1,500	1	Ductile Iron	1
45-70	2	1	3	1,250-1,500	2	Cast Iron	4
70-85	3	>1	5	1000-1,250	3		
85-95	4			500-1,000	4		
95-100+	5			<500	5		

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-001	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-002	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-003	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-004	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	0	0.28	2
WM-005	No	Yes	Sensitive User	0.99	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-006	No	No	Sensitive User	0.99	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	3
WM-007	No	Yes	Sensitive User	0.99	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-008	No	No	Sensitive User	0.99	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	3
WM-009	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-010	No	No	Sensitive User	0.99	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	3
WM-011	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-012	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	3
WM-013	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	3
WM-014	No	No	Sensitive User	0.99	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	4
WM-015	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	3
WM-016	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-017	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-018	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	3
WM-019	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-020	No	Yes	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	5
WM-021	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-022	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-023	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-024	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-025	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-026	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-027	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-028	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-029	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-030	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-031	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-032	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-033	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-034	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-035	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-036	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-037	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-038	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-039	No	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-040	No	No	Sensitive User	0.99	12"	0.68	Major Road/RR Crossing	1.1	36-55	1.12	4
WM-041	Yes	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	5

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-042	No	No	Sensitive User	0.99	12"	0.68	Major Road/RR Crossing	1.1	1-22	0.56	3
WM-043	Yes	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	0	0.28	4
WM-044	Yes	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-045	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-046	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-047	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-048	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-049	No	No	Critical User	1.65	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	3
WM-050	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-051	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-052	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-053	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-054	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	3
WM-055	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-056	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-057	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-058	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-059	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-060	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-061	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-062	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-063	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-064	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-065	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-066	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-067	Yes	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-068	Yes	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-069	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-070	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-071	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-072	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-073	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-074	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-075	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-076	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-077	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-078	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-079	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-080	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-081	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-082	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-083	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-084	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-085	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-086	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-087	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-088	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-089	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-090	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-091	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-092	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-093	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-094	Yes	No	Critical User	1.65	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-095	Yes	No	Critical User	1.65	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-096	Yes	No	Critical User	1.65	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-097	Yes	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-098	Yes	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	0	0.28	4
WM-099	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-100	No	Yes	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-101	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-102	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-103	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-104	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-105	No	Yes	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-106	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-107	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-108	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-109	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	3
WM-110	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	3
WM-111	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	3
WM-112	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-113	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-114	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-115	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-116	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-117	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-118	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-119	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-120	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-121	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-122	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-123	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-124	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-125	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-126	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-127	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-128	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-129	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-130	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-131	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-132	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-133	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-134	No	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-135	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-136	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	55-84	1.4	3
WM-137	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	55-84	1.4	3
WM-138	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-139	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-140	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-141	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-142	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-143	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-144	No	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-145	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	22-36	0.84	4
WM-146	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-147	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-148	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-149	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-150	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-151	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-152	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-153	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-154	Yes	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	5
WM-155	Yes	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	5
WM-156	Yes	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	5
WM-157	Yes	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-158	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-159	Yes	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	5
WM-160	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-161	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-162	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-163	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-164	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-165	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-166	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-167	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-168	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-169	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-170	No	Yes	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	5
WM-171	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-172	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-173	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-174	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-175	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-176	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-177	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-178	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-179	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-180	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-181	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-182	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-183	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-184	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-185	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-186	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-187	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-188	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-189	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-190	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-191	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-192	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	3
WM-193	No	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	36-55	1.12	3
WM-194	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	55-84	1.4	3
WM-195	No	No	Sensitive User	0.99	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	3
WM-196	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	22-36	0.84	3
WM-197	No	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	22-36	0.84	3
WM-198	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	22-36	0.84	3
WM-199	No	No	General User	0.33	12"	0.68	Major Road/RR Crossing	1.1	22-36	0.84	3
WM-200	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-201	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	3

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-202	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-203	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-204	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	22-36	0.84	3
WM-205	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-206	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-207	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	3
WM-208	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-209	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-210	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	3
WM-211	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-212	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-213	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-214	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-215	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-216	No	Yes	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-217	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-218	No	Yes	General User	0.33	2"	0.17	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-219	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-220	No	Yes	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	5
WM-221	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-222	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	4
WM-223	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	3
WM-224	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-225	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-226	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-227	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-228	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-229	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-230	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-231	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-232	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-233	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-234	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-235	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-236	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-237	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-238	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-239	No	No	Critical User	1.65	6"	0.34	Greenbelt or R.O.W.	0.22	0	0.28	2
WM-240	No	No	Critical User	1.65	6"	0.34	Greenbelt or R.O.W.	0.22	0	0.28	2
WM-241	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-242	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-243	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-244	No	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	3
WM-245	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-246	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-247	No	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	0	0.28	2
WM-248	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-249	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-250	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-251	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-252	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-253	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-254	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-255	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-256	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	0	0.28	1
WM-257	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-258	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-259	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-260	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-261	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-262	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-263	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-264	No	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	0	0.28	2
WM-265	No	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	0	0.28	2
WM-266	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-267	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-268	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	0	0.28	1
WM-269	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	0	0.28	3
WM-270	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-271	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-272	Yes	No	Critical User	1.65	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-273	No	No	Critical User	1.65	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	4
WM-274	No	No	Critical User	1.65	6"	0.34	Greenbelt or R.O.W.	0.22	0	0.28	2
WM-275	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-276	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	3
WM-277	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-278	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-279	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-280	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-281	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-282	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-283	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-284	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-285	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-286	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-287	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-288	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-289	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-290	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	0	0.28	1
WM-291	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-292	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-293	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-294	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-295	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-296	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-297	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-298	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-299	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	0	0.28	2
WM-300	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-301	No	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	3
WM-302	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-303	Yes	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-304	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-305	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-306	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-307	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-308	No	Yes	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-309	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-310	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-311	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-312	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-313	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-314	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-315	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-316	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	0	0.28	1
WM-317	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-318	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-319	Yes	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	5
WM-320	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	22-36	0.84	4
WM-321	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	22-36	0.84	4

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-322	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-323	Yes	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	0	0.28	4
WM-324	Yes	No	Sensitive User	0.99	12"	0.68	Greenbelt or R.O.W.	0.22	0	0.28	4
WM-325	No	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	3
WM-326	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-327	No	Yes	General User	0.33	2"	0.17	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-328	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-329	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-330	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-331	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-332	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-333	Yes	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-334	Yes	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-335	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	0	0.28	2
WM-336	No	No	Sensitive User	0.99	8"	0.51	Greenbelt or R.O.W.	0.22	55-84	1.4	3
WM-337	Yes	No	General User	0.33	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-338	Yes	No	Critical User	1.65	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-339	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-340	No	No	Critical User	1.65	8"	0.51	Major Road/RR Crossing	1.1	0	0.28	4
WM-341	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-342	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-343	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-344	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	0	0.28	3
WM-345	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-346	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-347	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-348	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-349	No	Yes	General User	0.33	2"	0.17	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-350	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-351	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-352	Yes	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-353	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-354	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	3
WM-355	No	Yes	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	5
WM-356	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	0	0.28	1
WM-357	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-358	No	No	Critical User	1.65	8"	0.51	Major Road/RR Crossing	1.1	1-22	0.56	4
WM-359	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	0	0.28	1
WM-360	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-361	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-362	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-363	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-364	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-365	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-366	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-367	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-368	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-369	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-370	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-371	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-372	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-373	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-374	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-375	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-376	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-377	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-378	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-379	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-380	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-381	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-382	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-383	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-384	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-385	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-386	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-387	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-388	Yes	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-389	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-390	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-391	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-392	Yes	No	Critical User	1.65	16"	0.85	Greenbelt or R.O.W.	0.22	22-36	0.84	5
WM-393	Yes	No	Critical User	1.65	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	5
WM-394	Yes	No	Critical User	1.65	16"	0.85	Greenbelt or R.O.W.	0.22	22-36	0.84	5
WM-395	Yes	No	Critical User	1.65	16"	0.85	Greenbelt or R.O.W.	0.22	22-36	0.84	5
WM-396	Yes	No	Critical User	1.65	16"	0.85	Greenbelt or R.O.W.	0.22	22-36	0.84	5
WM-397	Yes	No	Critical User	1.65	16"	0.85	Greenbelt or R.O.W.	0.22	22-36	0.84	5
WM-398	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-399	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-400	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-401	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-402	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-403	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-404	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-405	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-406	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-407	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-408	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-409	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-410	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-411	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-412	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-413	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-414	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-415	Yes	No	General User	0.33	16"	0.85	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-416	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-417	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-418	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-419	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-420	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-421	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-422	Yes	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-423	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-424	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-425	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	2
WM-426	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	22-36	0.84	4
WM-427	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	0	0.28	1
WM-428	No	Yes	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-429	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	0	0.28	1
WM-430	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-431	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-432	No	No	Critical User	1.65	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	3
WM-433	No	No	Critical User	1.65	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	3
WM-434	No	No	Sensitive User	0.99	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	4
WM-435	No	No	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	36-55	1.12	3
WM-436	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	22-36	0.84	2
WM-437	No	No	Sensitive User	0.99	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-438	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-439	No	No	Sensitive User	0.99	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	3
WM-440	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-441	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Rating Matrix
Watermain

Facility ID	Single Feed, or Major Supply Line?1	Dead end?	Customer Type	Weighted Score	Pipe Size	Weighted Score	Watermain Location	Weighted Score	Number of Customer Accounts	Weighted Score	Total Weighted Score
WM-442	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-443	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-444	No	No	Sensitive User	0.99	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-445	No	No	Sensitive User	0.99	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-446	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-447	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-448	Yes	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	36-55	1.12	4
WM-449	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-450	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-451	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-452	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-453	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-454	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-455	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	36-55	1.12	2
WM-456	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-457	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-458	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	0	0.28	3
WM-459	Yes	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	3
WM-460	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-461	No	No	General User	0.33	8"	0.51	Greenbelt or R.O.W.	0.22	1-22	0.56	2
WM-462	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-463	No	No	General User	0.33	6"	0.34	Greenbelt or R.O.W.	0.22	1-22	0.56	1
WM-464	Yes	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	1-22	0.56	4
WM-465	No	Yes	General User	0.33	6"	0.34	Major Road/RR Crossing	1.1	1-22	0.56	5
WM-466	No	No	General User	0.33	12"	0.68	Greenbelt or R.O.W.	0.22	0	0.28	2

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Criticality Criteria Weighting Factors
Pair Wise Comparison Water Mains

	Customer Type	Pipe Size	Watermain Location	Number of Customer Accounts	Total	Weighted
Customer Type		4	4	4	12.0	33%
Pipe Size	2		4	2	8.0	22%
Watermain Location	2	2		2	6.0	17%
Number of Customer Accounts	2	4	4		10.0	28%

In order to establish the relative importance of each criterion, and assign weights to each, the pair-wise comparison analysis of the criteria is conducted. The pair-wise comparison is based on successively comparing each pair of criteria and assessing their relative importance against one another on the basis of a total score of 6 where the following scores are assigned:

- 5 vs. 1 if one criterion is deemed to be much more important than the other;
- 4 vs. 2 if one criterion is deemed to be somewhat more important than the other; and;
- 3 and 3 if both criteria are deemed to be equally important.

Prioritized Ranking of Criteria and Weightings

Criteria	Rank	Weight
Customer Type	1	33%
Number of Customer Accounts	2	28%
Pipe Size	3	22%
Watermain Location	4	17%

Weighting Factors & Risk Categories

Single Feed, or Major Supply Line?[1]	Dead End?	Customer Type[2]	0.33	Pipe Size	0.17	Watermain Location	0.22	Customer Accounts	0.28
Yes	Yes	General User	1	2"	1	Greenbelt or R.O.W.	1	0	1
No	No	Sensitive User	3	6"	2	River/Wetland Crossing	3	1-22	2
		Critical User	5	8"	3	Major Road/RR Crossing	5	22-36	3
				12"	4			36-55	4
				16"	5			55-84	5

1. If the pipe is a single feed or major supply Line,or is a dead end, the overall criticality score is double the calculated amount.
2. Customer Type Impact assessments were determined by the proximity (<500') of the water main to the parcel type. Sensitive User incudes schools, churches, and other public gathering places TBD. Critical Users are medical facilities.

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Condition Evaluation and Needs Prioritization

NOTES:

1. Apparent Condition (based on age or inspection as applicable)

   Each asset is rated per the following criteria:

Rate	Condition	Consumed Service Life (%)	Condition Multiplier*
5	Poor	95-100	98
4	Fair	85-95	90
3	Average	70-85	78
2	Good	45-70	58
1	Excellent	0-45	23

2. Asset life expectancy (yrs): assumed total engineering service life of each asset
3. Remaining service life (yrs):
   Min. Remaining service life = asset life expectancy X (1-max. consumed service life (%) at the rated condition)
   Max. Remaining service life = asset life expectancy X (1-min. consumed service life (%) at the rated condition)
   Avg. Remaining service life = (Min. Remaining service life + Max. Remaining service life) ÷ 2

Rate	Condition	Remaining Service Life		
		Min	Max	Avg.
5	Poor	0%	5%	3%
4	Fair	5%	15%	10%
3	Average	15%	30%	23%
2	Good	30%	55%	43%
1	Excellent	55%	100%	78%

4. The life cycle basis is related to the criticality as shown on the CIP Dashboard tab.
   Low Criticality=Max. Service Life, Medium Criticaltiy=Avg. Service Life; High Criticality=Min. Service Life
5. Criticality: the total weighted score for each asset.
6. Risk = Apparent Condition Rating X Criticality Score
7. Asset Rehabilitation Cost:
   For watermain, the cost to rehabilitate is based upon recent bid tabs and industry standards
   as summarized on the WM Valve & Hydrant Costs tab.
8. The default level of service (LOS) determination for the system assets is based on the criticality score as shown in the table below (and on the CIP Dashboard).

Level of Service is:	If criticality is:	
High	less than	2
Medium	in between	---
Low	greater than	3

Appendix C AMSAT REHABILITATION COSTS

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Rehabilitation Cost References - Watermain, Hydrants, Valves

Pipe Rehab - Trenchless*		
Pipe Diameter (in)	Unit Cost ($/ft)	Depth (ft)
2	$ 200.00	rehab costs did not consider pipe depth
6	$ 200.00	
8	$ 200.00	
12	$ 240.00	
16	$ 280.00	

**Trenchless is currently estimated as 80% of the Dig and Replace cost.*

Water Main ~ Dig and Replace/Open Cut (DIP)		
Pipe Diameter (in)	Pipe Material	Unit Cost ($/LF)**
2	DIP	$ 250.00
6	DIP	$ 250.00
8	DIP	$ 250.00
12	DIP	$ 300.00
16	DIP	$ 350.00

***includes approx. $30/LF for services, abandonments, and connections to existing, plus a 35% contingency for restoration, traffic control, and other.*

Valves and Hydrants - Replace			
Description	Size (in.)	Unit	Cost ($/unit)***
Valve - 2"	2	ea.	$ 4,500.00
Valve - 6"	6	ea.	$ 4,500.00
Valve - 8"	8	ea.	$ 4,500.00
Valve - 12"	12	ea.	$ 6,000.00
Valve - 16"	16	ea.	$ 12,000.00
Hydrant Assembly	HYD	ea.	$ 5,000.00

****Assumes gate valve in well. Valves in boxes would cost less.*

Appendix D AMSAT DASHBOARD

Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
Needs and Costs Analysis - Summary

Shaded cells may be manipulated on this sheet to alter analysis.

Analysis Tools

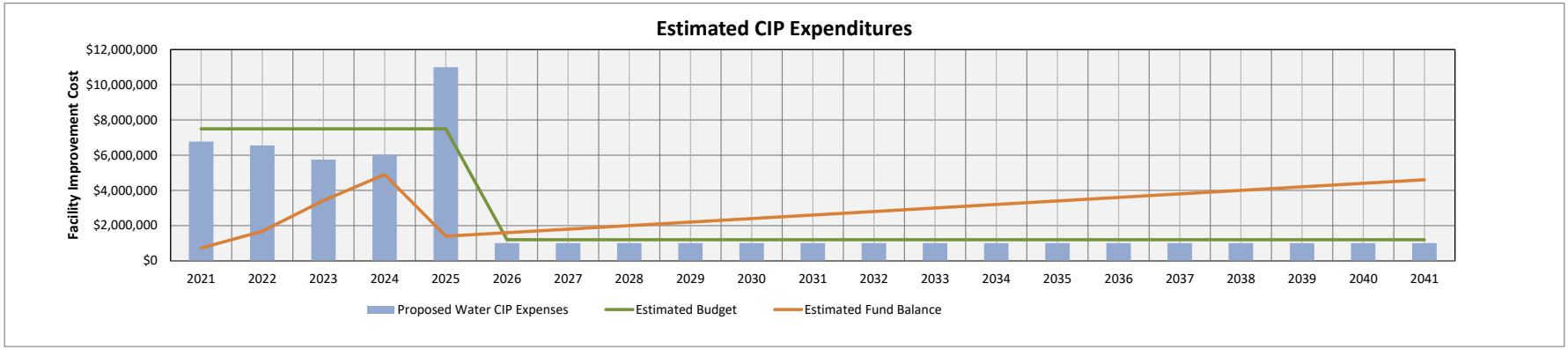
Beginning Year of 20-yr Planning Period	2021
Level of Service	High
Condition Rating Filter (Water Main only)	Score of 1 or more
Risk Threshold	0

Estimated 20-year Financial Outlay (present day dollars)	
Total - Water Main	**$43,462,300**

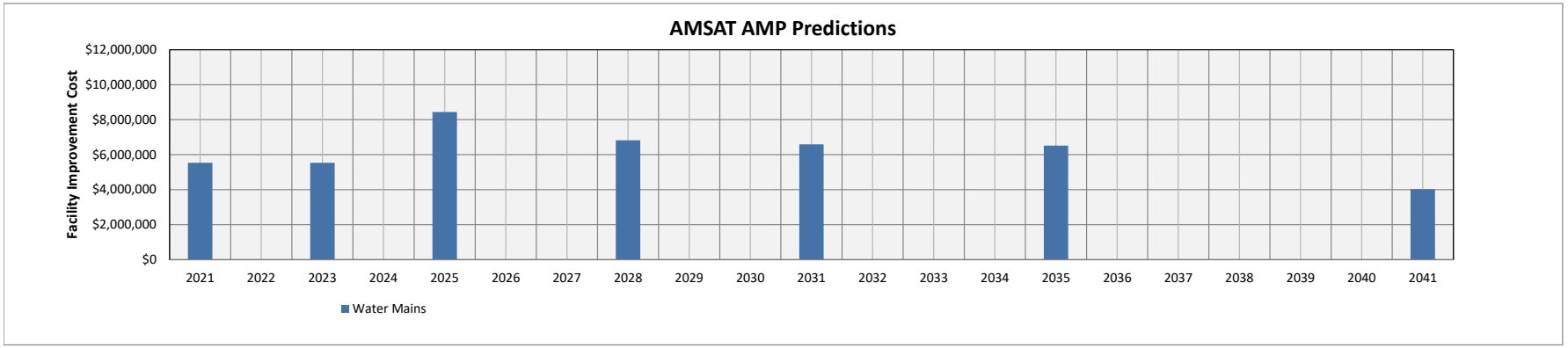
Estimated System Replacement Value $50,584,800

Level of Service Base Criteria

If criticality is:		Level of Service is:	Est. Service Life
less than (0 min.)	2	High	Maximum
in between these limits	---	Medium	Average
greater than or equal to (5 max.)	3	Low	Minimum



RAW AMSAT OUTPUT BELOW



Grosse Pointe Park Asset Management & Capital Improvement Plan
Water System
CIP & Funding Requirements
Water Mains

**subject to periodic review and update by City staff*

$1,012,000 = 2% of estimated replacment value annually

Budget Forecast

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Estimated Budget*	$7,500,000	$7,500,000	$7,500,000	$7,500,000	$7,500,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000
Planned Expenditures*	$6,775,000	$6,550,000	$5,750,000	$6,025,000	$11,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Balance	$725,000	$1,675,000	$3,425,000	$4,900,000	$1,400,000	$1,600,000	$1,800,000	$2,000,000	$2,200,000	$2,400,000	$2,600,000	$2,800,000	$3,000,000	$3,200,000	$3,400,000	$3,600,000	$3,800,000	$4,000,000	$4,200,000	$4,400,000	$4,600,000

Project List																						
Short Term Projects (0-5 years)	Phase 1	Replace revenue meters, approx. 300 lead service leads, and 15,300 LF of water main	$6,775,000																			
	Phase 2	Replace approx. 400 lead service leads, and 21,400 LF of water main		$6,550,000																		
	Phase 3	Replace approx. 250 lead service leads and 20,000 LF of water main			$5,750,000																	
	Phase 4	Replace approx. 125 lead service leads and 22,600 LF of water main				$6,025,000																
	Phase 5	Develop alternate source with Grosse Pointe Farms, including 21,000 LF of 21-inch transmission main, 2,000 LF of water main, bulk flow water meters, and WTP improvements					$11,000,000															
Long Term Projects (5-20 years) and ongoing	Routine Maintenance and Replacement	Estimated at 2% or present day replacement cost						$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000