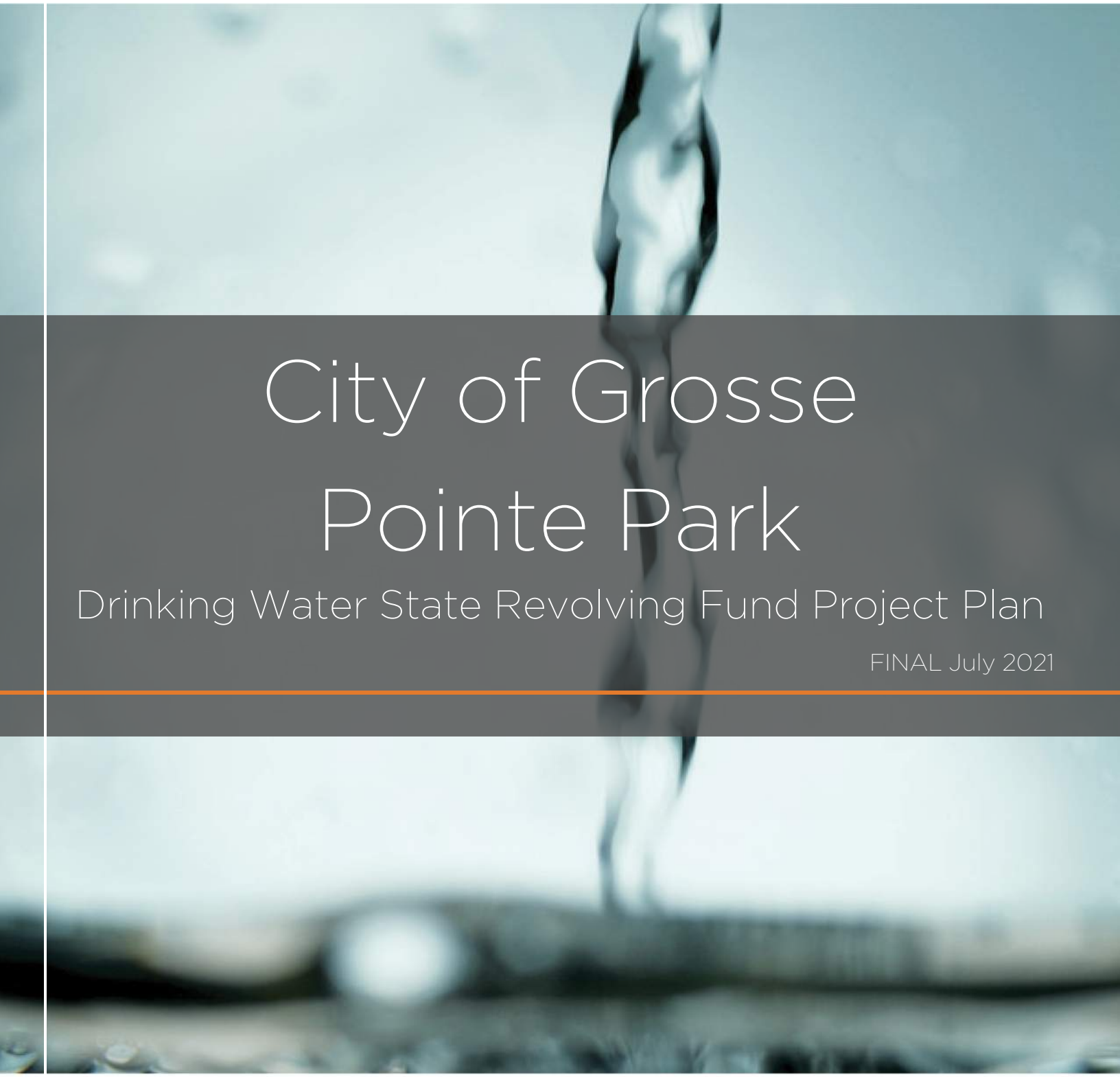

City of Grosse Pointe Park

Drinking Water State Revolving Fund Project Plan

FINAL July 2021

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ABBREVIATIONS

AMP	Asset Management Plan
CIP	Capital Improvement Plan
DWSD	Detroit Water and Sewerage Department
DWSRF	Drinking Water State Revolving Fund
EGLE	Michigan Department of Environment, Great Lakes, and Energy
GLWA	Great Lakes Water Authority
GPP	The City of Grosse Pointe Park
LUST	Leaky Underground Storage Tank
MG	Million Gallons
MGD	Million Gallons per Day
O&M	Operation and Maintenance
PVC	Polyvinyl Chloride
SEMCOG	Southeast Michigan Council of Governments
WAMR	Wholesale Automated Meter Reading
WTP	Water Treatment Plant

I. INTRODUCTION

The City of Grosse Pointe Park is submitting this Project Plan to apply for a Drinking Water State Revolving Fund (DWSRF) low interest loan to design and replace water main, water meters, and existing lead water service lines. The Project Plan has been developed using the Michigan Department of Environment, Great Lakes and Energy (EGLE), DWSRF Project Planning Guidance Document.

An Intent to Apply was submitted to EGLE on January 29, 2021. The Intent to Apply form included a description of the desired project and a preliminary cost. On March 5, 2021, a meeting was held between the City of Grosse Pointe Park and EGLE to discuss the goals of this project and to clarify the required level of detail for this Project Plan submission.

II. PROJECT BACKGROUND

A. DELINEATION OF STUDY AREA

The City of Grosse Pointe Park is a 2.2 square mile community located east of the City of Detroit in Wayne County. The City is bordered to the north and west by the City of Detroit, to the east by the City of Grosse Pointe, and to the south by Lake St. Clair. Generally, City drainage flows from north to south until reaching Lake St. Clair.

The City's public water supply is provided by the Great Lakes Water Authority (GLWA). There are no locations within the City where well water is drawn for public or private drinking water supply.

The study area focused on the entire water system for the City. The findings of the study were used to generate recommendations for a Capital Improvement Plan (CIP) to replace select areas of water main with poor condition scores, elevated number of breaks, and/or high criticality values. These recommendations were based on the Water System Asset Management Plan (AMP) for the City dated December 2020. The AMP is included as Appendix A.

Due to the age of the water distribution system, the City contains approximately 2,025 lead service lines, as well as seven locations with galvanized piping at the connection of the lead service line to the City main. In order to comply with the Michigan Lead and Copper Rule and to protect residents, the City plans to replace the identified lead service lines.

B. LAND USE

The City of Grosse Pointe Park is a well-established community and no substantial changes to land use are projected. The existing land uses based on the year 2015 data are shown in Table 1. The land cover data is detailed in Table 2 and is from 2010. The land use and cover data were obtained from the Southeast Michigan Council of Governments (SEMCOG).

Table 1: Land Use Values for the City of Grosse Pointe Park

SEMCOG 2015 Land Use	Acres	Percent
Single-Family Residential	931	67.0%
Multi-Family Residential	10.5	0.8%
Retail	4.9	0.3%
Office	5.2	0.4%
Hospitality	1.4	0.1%
Medical	1.5	0.1%
Institutional	16.7	1.2%
Industrial	0	0.0%
Agricultural	0	0.0%
Recreation / Open Space	39.1	2.8%
Cemetery	0	0.0%
Parking	3.1	0.2%
Extractive	0	0.0%
TCU	350.3	25.2%
Vacant	23.3	1.7%
Water	3.1	0.2%
Total	**1,390.1**	**100.0%**

Table 2: Land Cover Types and Areas in the City of Grosse Pointe Park

Land Cover Type	Description	Acres	Percent
Impervious	Buildings, roads, driveways, parking lots	542	39.0%
Trees	Woody vegetation, trees	394.8	28.4%
Open Space	Agricultural fields, grasslands, turfgrass	445.5	32.1%
Bare	Soil, aggregate piles, unplanted fields	4.7	0.3%
Water	Rivers, lakes, drains, ponds	3.1	0.2%
Total Acres		**1,390.1**	**100.00%**

C. POPULATION PROJECTIONS

The City of Grosse Pointe Park residential population was projected to be 12,320 as of July 2020, according to the SEMCOG Community Profile. The City's population declined by approximately 7.2% between the years 2000 and 2010. SEMCOG predicts the 2045 total population of the City will decline slightly to 12,201 residents. The 2041 projections are interpolated values based on the SEMCOG numbers from July 2020 and 2045. There is no substantial seasonal variance in population within the City of Grosse Pointe Park. Table 3 displays the population data obtained from SEMCOG for the City of Grosse Pointe Park.

Table 3: Present and Future Population Projections for the City of Grosse Pointe Park (SEMCOG)

Population and Households	Census 2010	SEMCOG July 2020	Change 2010-2020	Projection 2041	SEMCOG 2045
Total Population	11,553	12,320	767	12,220	12,201
Housing Units	4,996	5,257	261	--	--
Households (Occupied Housing Units)	4,515	4,894	379	4,964	4,977
Residential Vacancy Rate	9.60%	6.90%	-2.70%	--	--
Average Household Size	2.65	2.52	-0.13	2.46	2.45

Source: www.semcog.org, accessed on 3/11/2021

D. WATER DEMAND

The GLWA Wholesale Automated Meter Reading (WAMR) site was accessed to obtain water usage date for 2020 and is summarized in Table 4. The average residential water demand in 2020 was about 94.4 gallons per capita per day. Due to the fact that SEMCOG predicts a slight population decrease from 2021 to 2045, the City of Grosse Pointe Park's projected residential water demands are assumed to remain the same through 2041.

Table 4: Current and Future Projected Water Demand for Grosse Pointe Park

2020 Usage		2041 Projections	
Annual (MG)	Daily (MG)	Annual (MG)	Daily (MG)
425.58	1.16	425.58	1.16

GLWA determines a community's contract maximum day demand and peak hour demand rates based on usage. Table 5 lists the GLWA contract values for Grosse Pointe Park. These usage rates are applicable during the summer months of June 1 through August 31.

Table 5: GLWA Contract Maximum Day and Peak Hour Values for Grosse Pointe Park

Community	Contract Maximum Day (MGD)	Contract Peak Hour (MGD)
Grosse Pointe Park	3.23	5.31

E. EXISTING FACILITIES

Condition of Source Facilities

GLWA supplies potable water to the City of Grosse Pointe Park from the Water Works Park Water Treatment Plant (WTP). The Detroit River is the source of the water supply. There are no current concerns regarding the source water supply.

Water Treatment

The Water Works Park II Water Treatment Plant supplies the City of Grosse Pointe Park with drinking water, serving East Detroit and portions of Wayne County. The Water Works Park WTP was originally

constructed in 1879. In 2003 a new WTP was constructed at the site and is designated as Water Works Park II. The plant is a surface water filtration plant that has an intake on the Detroit River across from Belle Isle. The treatment facility's processes include rapid mix, coagulation, flocculation, sedimentation, ozone for primary disinfection, and filtration. Three reservoirs store water on-site prior to pumping to the distribution system. In addition, the sludge from the settling basins and solids from the filter backwash water are processed on-site in a residuals handling facility. The Water Work Park II WTP has a pumping capacity of 240 MGD. The Water Works Park II WTP has sufficient capacity to serve the City, particularly as little growth is anticipated over the next 20 years.

Storage Tank and Pump Station Facilities

Water is conveyed to the City of Grosse Pointe Park from the high lift pumps at the Water Works Park II WTP. There are no ancillary pumping or storage facilities after leaving the reservoirs at the Water Works Park II WTP.

Service Lines

The City has approximately 4,225 service lines. The results from the Preliminary Distribution System Materials Inventory are summarized in Table 6.

Table 6: Preliminary Distribution System Materials Inventory Results

Description	Number of Service Lines
Known Lead	2,025
Known Galvanized Previously Connected to Lead	7
Unknown – Likely Lead	0
Unknown – No Information	0
Unknown – Likely Not Lead	0
No Lead or Galvanized Previously Connected to Lead	2,193
Total Service Lines	**4,225**

More than half of the residential service lines in the City are copper services. However, the City still has a large number of residential services that are made of lead (47.8%). The City plans to replace many of these services over the next 5 years as part of a CIP aimed to improve the City's water supply system. All of the City's residential lead services will be replaced by the year 2040 in accordance with recent updates to the EGLE Lead and Copper Rule.

Condition of Transmission/Distribution System

The City's water distribution system is made up of water main ranging from 2-inches to 16-inches in diameter with approximately 186,260 feet or 35.3 miles of total water main. Over 90 percent of the water main is 8-inches or smaller. The 6-inch water main accounts for 66% of all the water main in the City's system. The 2-inch water main is less than 1% of the system. The existing Grosse Pointe Park water distribution system is shown in Figure 1.

Figure 1: Existing Water System

The City's water distribution system has aged well beyond its recommended service life, with many of the existing mains installed in the 1920s. Table 7 summarizes the age of the existing water mains.

Table 7: Water Main Age

Installation Date	Length of Water Main (ft)	Percent of System
1920	177,152	95.1%
1950	3,685	2.0%
1983	5,428	2.9%
Total Service Lines	**186,264**	**100%**

Over 95% of the water main is greater than 100 years in age and have not been properly maintained in that time. Due to the age of the infrastructure, the majority of the existing water main is assumed to be cast iron. Ductile iron is the only other pipe material present within the system. The system hydrants and valves are the same age as the mains, and exhibit wear expected of their age. The City frequently experiences breaks in the existing water mains due to the age of the infrastructure. The CIP in the AMP includes water main replacement in areas where excessive breaks have occurred.

The City is very concerned regarding their aging infrastructure and number of water main breaks that occur. It is believed that many of the older mains are no longer structurally sound and that they need to be replaced in order to provide a reliable source of water to their customers and reduce costs associated with emergency break repairs.

Residuals Handling

This section does not apply to this project.

Water Meters

There are three meters to Grosse Pointe Park from the GLWA system, as well as an emergency connection to the City of Detroit. These are shown in Figure 1. A summary of these meters is presented in Table 8.

Table 8: GLWA Meter Locations

GLWA Meter	Location
GK-01	On Kercheval Avenue, east of Wayburn
GK-02	On Jefferson Avenue, east of Barrington Road
GK-03	On Essex Drive, east of Barrington Road
Emergency Connection to the City of Detroit	Southwest corner of City

The City contains approximately 4,225 service meters. A majority of these meters serve residential customers. Commercial customers are primarily located along Mack Avenue, Kercheval Avenue, and East Jefferson Avenue.

Operation and Maintenance

To date, operation and maintenance of the City's water system has been focused on repairing breaks within the aging distribution system. Much of the existing system has not been repaired or replaced since being installed in the 1920s. Lack of maintenance to the system is one of the main contributing factors to the poor condition of the existing water system. The City has included an annual allowance in the CIP to promote ongoing improvements to the existing system.

The CIP recommendations include segments of new water main to increase the redundancy throughout the City's water supply system. The replacement of water mains is intended to reduce outages and boil water advisories for properties in the event of future breaks.

Design Capacity of Waterworks System

This section does not apply to this project.

Climate Resiliency

Because the existing and proposed water mains are buried, there is no more susceptibility to flooding due to climate changes. The primary objective of improving the condition of the system and replacing lead water services remains.

F. SUMMARY OF PROJECT NEED

The City of Grosse Pointe Park receives its potable water from the GLWA Water Works Park II WTP. No improvements are proposed at this treatment plant as part of this project plan. It is our understandings that the GLWA treatment facility is in compliance with the drinking water standards as defined in the administrative rules for Act 399.

The City recognizes the need to ensure a reliable water supply system for their customers and that major improvements are needed in the system to provide this reliability. The 2020 AMP was used as a guide in determining the most critical replacements to maximize the value of funding and reduce disruption to residents.

The City is interested in replacing and upgrading sections of water main that are old or that experience breaks frequently. These replacement recommendations were made in the Water Asset Management Plan (AMP) delivered to the City in December of 2020. Hydrants and valves located along the length of the water mains would also be replaced. Additionally, a large percentage of the City's residential water services are made of lead. The City is also interested in replacing these services to remain in compliance with the new EGLE Lead and Copper Rule. Over 95 percent of the existing water infrastructure is over 100 years in age and the City is concerned that it is quickly reaching its life expectancy. Numerous water main breaks have occurred, resulting in frequent losses of water and large costs associated with emergency repairs.

The 2020 AMP included a CIP, which identified four project areas where water system improvements have been recommended over the next five years. These project areas are shown in Figure 2.

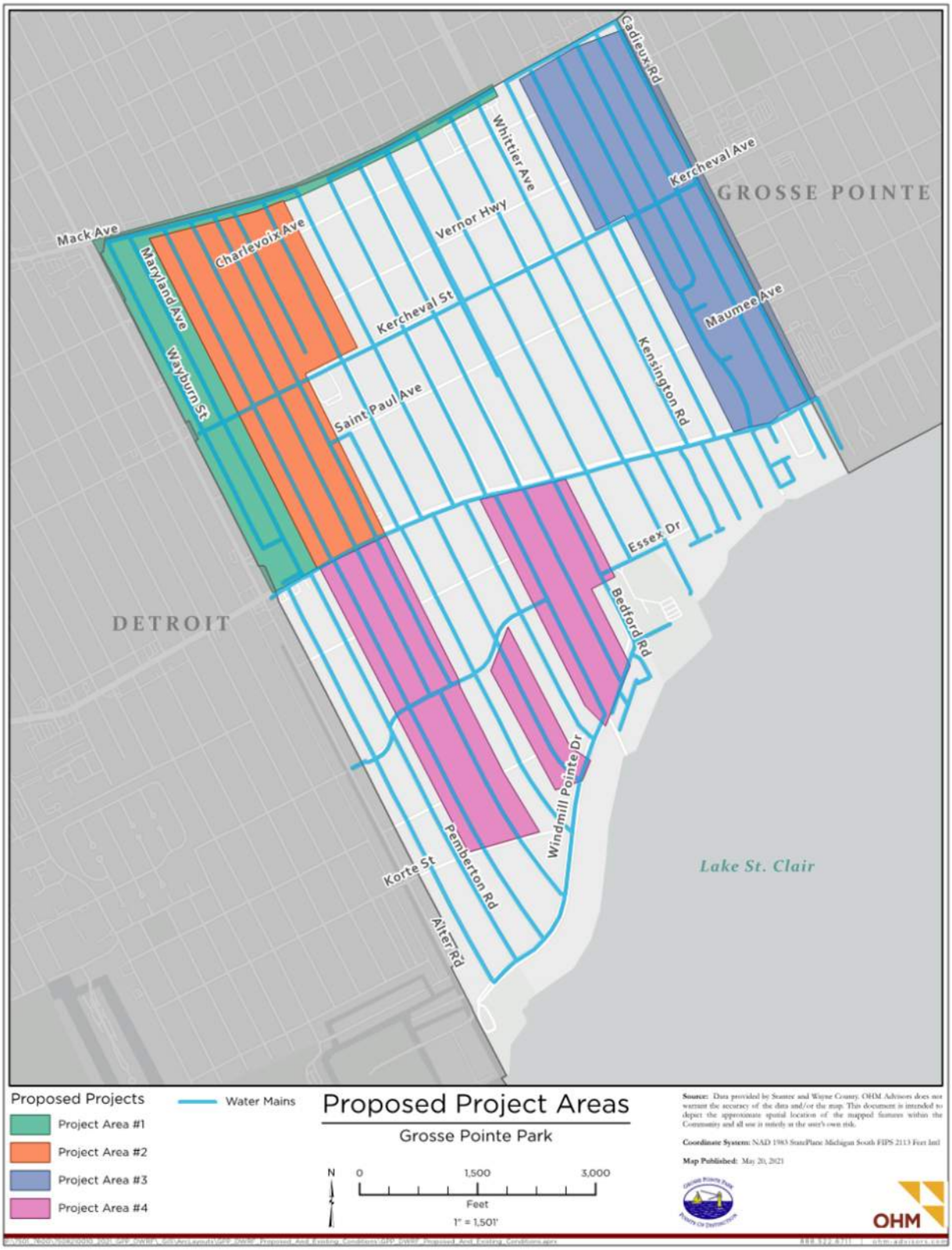


Figure 2: Proposed Project Areas

Although a variety of factors were considered in identifying these areas, frequency of breaks and pipe age were among the primary factors considered. Below is a summary of all the factors considered:

- Number of breaks
- Age and materials
- Hydraulic capacity
- Pipe size
- Water main location
- Customer Type
- Location of critical customers in the distribution system

The City has experienced at least 293 breaks in the last 20 years, as summarized in Table 9. Within the past five years, there have been 65 water main breaks.

Table 9: Summary of Water Main Breaks

Time Period	Number of Water Main Breaks
2017-2020	65
2011-2016	45
Before 2011	183
Total	**293**

Emergency repair of these breaks is the largest contributor to the City's operation and maintenance (O&M) costs for the water system. Additionally, the majority of the system is believed to consist of cast iron pipe due to the age of the infrastructure and visual observation during water main break repairs. Much of this pipe is old and prone to tuberculation. Replacing old, tuberculated, break-prone water main will improve transmission capacity and reduce frequency and cost of emergency system repairs. The prioritized areas were provided in order to guide the City on which areas to focus their resources.

Approximately 15,000 to 25,000 feet of water main are planned for replacement each year through 2026. These improvements will replace water mains of various diameters from 2-inch to 16-inch and the associated hydrants and valves. Approximately 1,225 residential lead water services and water meters are projected to be replaced over this time period. After this 5-year period, the City will commence with annual system maintenance aimed at improving the water system outside of the 4 main project areas.

G. EXPLORATORY WELL INVESTIGATIONS

This section does not apply to this project.

III. ANALYSIS OF ALTERNATIVES

This section includes a discussion of alternatives that were considered for the water system improvements in Grosse Pointe Park.

A. NO-ACTION

The first alternative to consider is no-action. It must be determined that no project is viable for the community to select this alternative. As the existing infrastructure ages, the likelihood of a system failure increases, which would leave users without water. In addition, replacement of lead service lines is required by the Michigan Lead and Copper Rule. In order to remain in compliance with the Rule, the lead service lines must be replaced. The No-action alternative will not be pursued because it will not lead to improved condition of the existing water system or protection of public health.

B. OPTIMUM PERFORMANCE OF EXISTING FACILITIES

The second alternative is to consider optimization of the existing system. Optimizing the performance of the existing facilities will not protect residents from broken water mains or possible lead exposure, therefore this alternative will not be pursued.

C. REGIONAL ALTERNATIVES

The third alternative is to consider joining a regional alternative. The City of Grosse Pointe Park is already part of the regional GLWA system. There are no other authorities nearby, therefore this alternative does not apply and will not be pursued.

D. REPLACEMENT OF EXISTING WATER MAINS PER CIP IN AMP

The City of Grosse Pointe Park owns an aging water distribution system (primarily cast iron) in which excessive water main breaks have occurred. Most of the City's assets are nearing or have reached the end of their useful life. The existing system also contains a large number of lead residential water service lines. Upgrades the distribution system to address the above issues would consist of the following:

- Replacing aging water mains that have outlived their expected service life.
- Replacing water mains with a history of breaking.
- Replacing lead residential water services to comply with EGLE Lead and Copper Rules.
- Looping dead-end water mains where feasible.

New mains will be more reliable than a main that is 100 years old or more, will reduce water main break frequency, reduce water lost from the system, and reduce the energy required to distribute compared to the existing mains which are very tuberculated. The new water main would be installed using directional drilling. Therefore, replacing the existing water main and lead services outlined in the 5-Year planning period of the 2020 Water Asset Management Plan CIP is a principal alternative.

There are two possible construction methods that were considered for the water main replacement. Alternative 1 would involve open trench construction using ductile iron pipe. Alternative 2 would us horizontal drilling to install polyvinyl chloride (PVC) piping.

IV. PRINCIPLE ALTERNATIVES

The two principal alternatives were considered to replace the existing lines. The first alternative would use horizontal directional drilling. The second alternative considered using open trench construction methods. Associated valves, valve boxes, fire hydrants, and appurtenances would also be replaced at the same time as the water mains. Existing 2-inch and 6-inch diameter water mains would be replaced with 8-inch diameter piping. Eight-inch diameter piping is the current standard sizing and has a smaller impact from tuberculation. In addition, existing dead-end mains will be looped, as possible. Ductile iron would be used at all locations where known contamination is present. The proposed improvements are shown in Figure 3.

Figure 3: Proposed Water Main Upgrades

A. MONETARY EVALUATION

The opinions of probable costs were prepared considering replacing and upgrading water mains with either ductile iron pipe installed using open trenches or PVC pipe installed via directional drilling. Either alternative would involve the replacement of hydrants, valves, and appurtenances. Ductile iron piping would be used in the vicinity of contaminated sites. Additional information on these locations is provided in Subsection G, Contamination. The projects also include replacing 1,225 lead service lines for the protection of public health and 1,225 service meters that have reached the end of their service life. These cost opinions are organized by construction area and are provided in Appendix B of this report. A summary of the costs by Project Area is presented in Table 10.

Table 10: Capital Cost Comparison

Category	Alternative 1: PVC Directional Drilled Installation	Alternative 2: Ductile Iron Using Open Trench
Area 1		
Water Main, Hydrants, Valves, Appurtenances, and Restoration	$2,848,000	$3,685,000
Lead Service Lines	$1,320,000	$1,200,000
Water Meters	$150,000	$150,000
Construction Contingency, 15%	$600,000	$760,000
Design Contingency (15%)	$700,000	$870,000
Legal Contingencies (5%)	$200,000	$290,000
Area 1 Total Capital Cost	**$5,800,000**	**$7,000,000**
Area 2		
Water Main, Hydrants, Valves, Appurtenances, and Restoration	$3,445,000	$3,850,000
Lead Service Lines	$1,760,000	$1,600,000
Water Meters	$150,000	$150,000
Construction Contingency, 15%	$800,000	$800,000
Design Contingency (15%)	$900,000	$1,000,000
Legal Contingencies (5%)	$300,000	$300,000
Area 2 Total Capital Cost	**$7,400,000**	**$7,700,000**
Area 3		
Water Main, Hydrants, Valves, Appurtenances, and Restoration	$3,811,000	$4,260,000
Lead Service Lines	$1,776,000	$1,600,000
Water Meters	$150,000	$150,000
Construction Contingency, 15%	$900,000	$1,000,000
Design Contingency (15%)	$1,000,000	$1,100,000
Legal Contingencies (5%)	$400,000	$400,000
Area 3 Total Capital Cost	**$8,100,000**	**$8,500,000**

Category	Alternative 1: PVC Directional Drilled Installation	Alternative 2: Ductile Iron Using Open Trench
Area 4		
Water Main, Hydrants, Valves, Appurtenances, and Restoration	$3,815,000	$4,263,000
Lead Service Lines	$550,000	$500,000
Water Meters	$150,000	$150,000
Construction Contingency, 15%	$700,000	$700,000
Design Contingency (15%)	$800,000	$900,000
Legal Contingencies (5%)	$300,000	$300,000
Area 4 Total Capital Cost	**$6,400,000**	**$6,800,000**
Total Capital Cost	**$27,700,000**	**$30,000,000**

As shown in Table 10, Alternative 1, replacing the water main with PVC via directional drilling appears to have the lower cost. Due to current market conditions, the City may choose to bid both PVC and ductile iron piping. Horizontal directional drilling would be used to install the piping, except in areas where open trench installation is required.

The basis for the replacements were described in the Asset Management Plan completed in 2020.

B. ENVIRONMENTAL EVALUATION

Construction impacts as a result of this alternative include dust, noise, and traffic disruption. More dust and traffic disruption would be anticipated with the open trench construction proposed in Alternative 2 compared to Alternative 1. City, County, and State regulations associated with these impacts will be addressed during design as well as in the construction contracts associated with the work.

Note that some water main replacements will be located in historical sites or districts known to exist in the City of Grosse Pointe Park. Discussion of these sites and the mitigation of impact to these sites is discussed under the Environmental Impact Section.

Water main replacements are scheduled to begin in year 2021. All construction activities will conclude in year 2025.

C. MITIGATION

Construction sites will be restored to their original condition following all construction activities.

D. IMPLEMENTABILITY AND PUBLIC PARTICIPATION

User fees associated with these alternatives include replacement costs, which may be of concern to the public. The proposed projects and user costs will be reviewed with residents during the public hearing on June 28, 2021. The costs were included in the public notice published in the Grosse Pointe News on May 27, 2021.

Adoption of this alternative would improve the reliability of the distribution system by replacing aging water mains and addressing dead-end mains. In addition, public health would be protected through the replacement of lead service lines.

E. TECHNICAL CONSIDERATIONS

Replacing water mains that have a history of breakage as well as eliminating dead-end water mains will increase reliability of service to residents and customers as noted in the 2020 Asset Management Plan. Both PVC and ductile iron meet EGLE requirements for water main. Water main in areas of contamination is discussed below. Water mains included in this project plan that are 6-inches or less in diameter will be upsized to 8-inches or larger. Any dead-end pipes that cannot be looped, will have necessary flushing equipment installed to maintain water quality.

Applicable EGLE procedures, Ten States Standards, as well as local ordinances shall be strictly adhered to during design and construction.

F. RESIDUALS

This section does not apply to this project, as no residuals are associated with the distribution system.

G. CONTAMINATION

According to EGLE's Inventory of Facilities accessible through the Remediation Information Data Exchange, there are nine Part 201 and Part 213 within the City of Grosse Pointe Park. Two of the sites are Part 201 Sites. One of these sites is also an open Part 213 site. The remaining seven are open Part 213 Leaky Underground Storage Tank Sites. A summary of the addresses is provided in Table 11. These locations are also shown in Figure 4.

Table 11: Part 201 and Part 213 Sites Located in Grosse Pointe Park

Facility Name	Address	Part 201 or Part 213
15316-15324 East Jefferson Avenue	15316-15324 East Jefferson Avenue	201
Whittier Cleaners Site, Former	15010 Charlevoix Street	201 and 213
R C Krausmann	16820 Kercheval Avenue	213
Abandoned Gas Station	15246 Kercheval Avenue	213
Brake Shop	15301 Kercheval Avenue	213
East Corp	17000 Mack Avenue	213
National Response Team Owner	15010 East Jefferson Avenue	213
Con	17108 Mack Avenue	213
Former Gasoline Service Station	15200 Kercheval Avenue	213

Figure 4: Contaminated Sites

The impact of Part 201 and Part 213 sites will require that water main piping placed in the vicinity of these sites will need to be reviewed for compatibility. Specifics on the exact pollutants are not always available; however, precautionary measures will be taken at each location to ensure that the new water main does not become contaminated, create further spread of contamination, or needlessly expose residents or workers to contamination.

Sites potentially containing volatile organic compounds in the vicinity of proposed water main replacement would preclude the use of PVC materials. Any new water main in the presence of potential contaminants will be installed via directional drilling with ductile iron pipe. This method of installation and material will eliminate any exposure to potential contaminants as well as reduce pipe failure due to a reaction with the pipe material. Specialized gaskets designed to withstand ground water contamination at water main joints will be proposed in this area to help prevent contaminants from entering the system.

H. NEW/INCREASED WATER WITHDRAWALS

This section does not apply to this project, as little growth is anticipated within the City.

V. SELECTED ALTERNATIVE

Alternative 1 was selected to replace the water mains with PVC piping using horizontal directional drilling.

A. DESIGN PARAMETERS

A list of all water mains to be replaced with the proposed diameter, along with details of the existing material, size, and condition, and break history can be found in Appendix B of the Water System AMP found in Appendix A. The mains to be replaced and looping of dead-end mains was shown in Figure 3. The selected material for water main replacement will be C-900 PVC with ductile iron valves, hydrants, fittings, and other appurtenances.

The following types of problems will be addressed during replacement.

- Service leads will be replaced from the water main to the water meter inside the residence. If undocumented lead or galvanized are encountered during the water main replacement, the service lead will be replaced according to the guidelines set forth under the EGLE Lead and Copper rule.
- Water mains with a history of breaking (noted in condition chart) will be replaced.
- Aged or undersized (6-inch and smaller) pipes will be replaced with 8-inch pipe.
- Existing water mains within Areas 1 through 4 will be replaced with PVC.
- Dead-end water mains will be replaced with looped water mains where feasible.

Applicable EGLE procedures, Ten States Standards, as well as local ordinances shall be strictly adhered to during design and construction.

B. SCHEDULE FOR DESIGN AND CONSTRUCTION

Grosse Pointe Park is requesting consideration for third quarter funding under EGLE's DWSRF program. The proposed design and construction schedule is summarized in Table 12.

Table 12: Design and Construction Schedule

Task	Submittal Date
Draft Documents Submittal to EGLE	November 30, 2021
Final Design Water Main Replacement and Identify Lead Service Line Replacement Locations	January 15, 2022
Rate Methodology Approved	January 31, 2022
Environmental Assessments Published No Later Than	February 7, 2022
Part I and Part II Application	February 15, 2022
Final Documents Submittal to EGLE	February 18, 2022
Finding of No Significant Impacts Clearance; Plans & Specs Approved	March 9, 2022
Bid Ad Published No Later Than	March 9, 2022
Part III of Application; Bid Data Submittal (With Tentative Contract Award)	April 15, 2022
EGLE Order of Approval Issued	May 16, 2022
Borrower's Pre-Closing with the MFA	May 27, 2022
MFA Closing	June 6, 2022
Notice to Proceed Issued	August 5, 2022
Water Main Construction Completed	December 20, 2026

C. COST ESTIMATE

A summary of the cost by project area is presented in Table 13.

Table 13: Summary of Costs by Project Area

Category	PVC Directional Drilled Installation
Area 1 Cost	$5,800,000
Area 2 Cost	$7,400,000
Area 3 Cost	$8,100,000
Area 4 Cost	$6,400,000
Total Project Cost	**$27,700,000**

D. USER COSTS

User costs were calculated using an DWSRF interest loan rate of 1.875% for 20 years. Based on a total of 4,225 service meters, the bimonthly increase in user costs due to the water main upgrades, meter replacements, and lead service line replacements is $66.00 on a bi-monthly basis, as shown in Table 14.

Table 14: Projected User Costs

Project Area	Capital Cost	Annual Loan Repayment	Bimonthly Rate Increase
Project Area 1	$5,800,000	$350,000	$13.81
Project Area 2	$7,400,000	$447,000	$17.63
Project Area 3	$8,100,000	$489,000	$19.29
Project Area 4	$6,400,000	$387,000	$15.27
Total Project Cost	**$27,700,000**	**$1,673,000**	**$66.00**

The City is requesting Green Project Reserve Principal Forgiveness Funding for the water main and water meter replacements. If awarded, the amount would represent principal forgiveness and would not be included in the loan repayments. The user costs presented in Table 14 could be reduced based on Green Project Reserve Principal Forgiveness Funding. The Green Project Reserve Principal Forgiveness business case can be found in Appendix C.

E. DISADVANTAGED COMMUNITY

This section does not apply to this project.

F. ABILITY TO IMPLEMENT THE SELECTED ALTERNATIVE

The selected alternative will be implemented by the City of Grosse Pointe Park. All work is under the jurisdiction of the City and requires no inter-municipal agreements. Grosse Pointe Park has the legal, institutional, technical, financial, and managerial capacity to implement the project. All work will be performed in road rights-of-way, utility easements, or on property owned by the City of Grosse Pointe Park.

VI. ENVIRONMENTAL EVALUATION

A. HISTORICAL/ARCHEOLOGICAL/TRIBAL RESOURCS

Many of the homes in Grosse Pointe Park are over 50 years old. The water main upgrades and lead service line replacements are not anticipated to negatively impact the appearance or structural integrity of the homes. Directional drilling will decrease the likelihood of impacting trees in the neighborhoods that contribute to the look and feel of the area. Photographs of the areas where work will be performed are included in Appendix D.

Grosse Pointe Park has little undeveloped land. All work is to be performed in previously disturbed areas. It is unlikely that any archeological or tribal resources will be encountered during construction.

B. WATER QUALITY

There are no anticipated impacts on the quality of the ground water and surface water within the proposed construction limits. Soil erosion and sedimentation control measures will be utilized to contain soils within construction areas.

The project will improve the reliability of drinking water quality for residents and customers. Aged water mains have a higher probability of breaking and subsequent contamination, which leads to boil water advisories or loss of service. Dead-end water mains are a potential source of undesirable biological activity.

The replacement of lead service lines will protect residents from possible exposure to lead.

C. SITES OF ENVIRONMENTAL CONCERN

There are at least 3 proposed water mains that pass close to or through locations that have Part 201 and open Part 213 sites, previously listed in Table 11.

- Charlevoix Street between Wayburn Street and Maryland Avenue in Area 1
- East Jefferson Avenue between Beaconsfield Avenue and Nottingham Road in Area 4
- Kercheval Avenue between Lakepointe Street and Nottingham Road in Area 2

Any new water main in the presence of potential contaminants will be installed via directional drilling with ductile iron pipe. This method of installation and material will reduce any exposure to potential contaminants as well as reduce pipe failure due to a reaction with the pipe material. Specialized gaskets designed to withstand ground water contamination at water main joints will be proposed in this area to help prevent contaminants from entering the system. Due to the uncertainty of contaminants in these locations, PVC will be eliminated from consideration in these locations.

D. LAND/WATER INTERFACE

WETLANDS

As shown in Figure 5, there are no wetlands within the Grosse Pointe Park City limits.

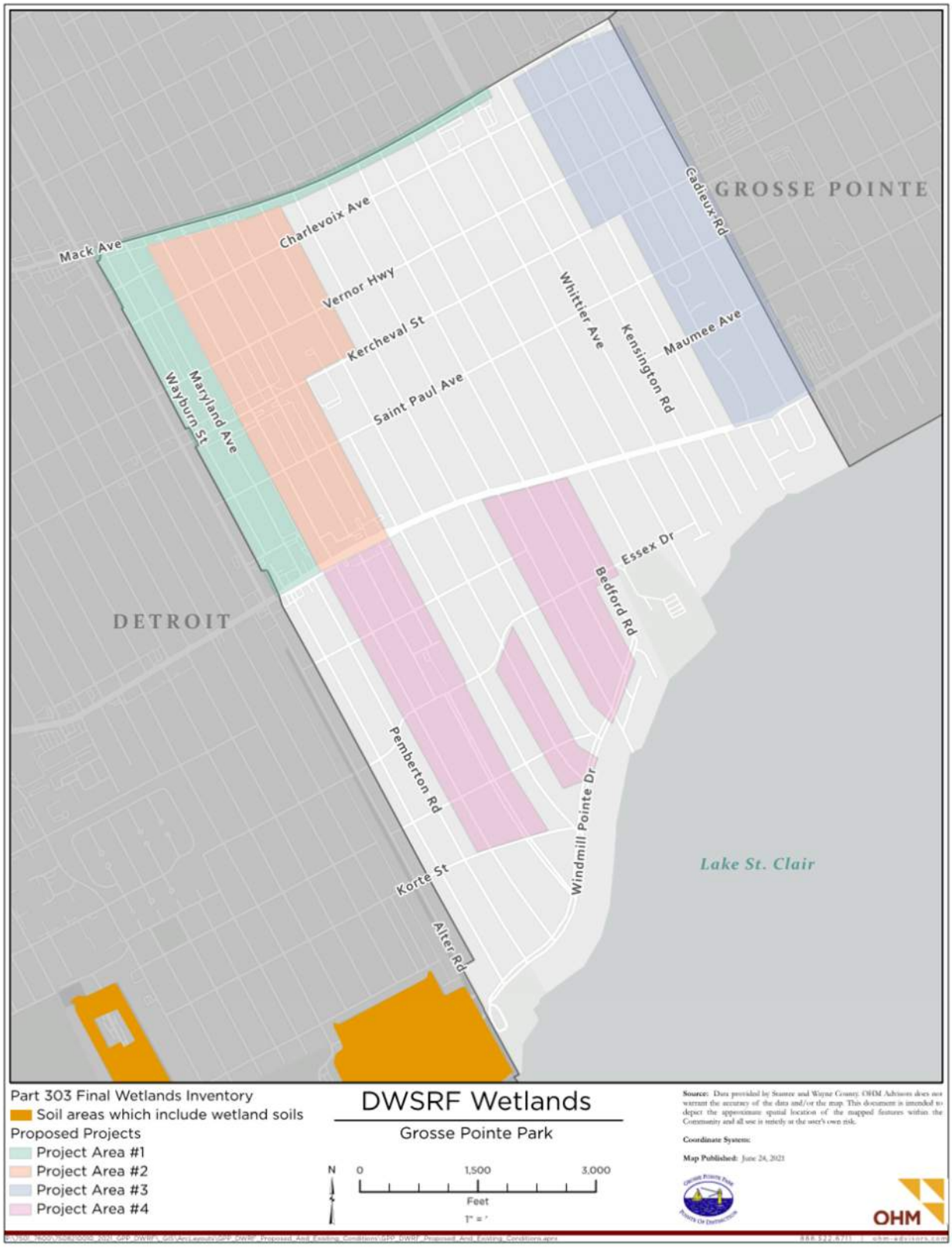


Figure 5: Wetlands in Vicinity of Grosse Pointe Park

FLOODPLAINS

The eastern edge of Grosse Pointe Park is bounded by Lake St. Clair. The land border with Lake St. Clair is within the 100-year floodplain, as shown in Figure 6. None of the project areas are within the 100-year floodplain. Therefore, no impact to the floodplain is anticipated.

SOILS

Figure 7 presents a summary of the type of soils found in Grosse Pointe Park, which are mainly moderately to poorly draining soils with a narrow area along Jefferson Avenue that contains moderately well drained soils. All work will be required to comply with the State's Soil Erosion and Sedimentation Control requirements. No work is anticipated to occur within Lake St. Clair.

GEOLOGY

The bedrock geology below Grosse Pointe Park is part of the Antrim Shale formation that begins in southern Washtenaw County and extends northeast into northwestern and northern Wayne County. The formation also extends into the southeast corner of Oakland County and the southern half of Macomb County. The Antrim Shale is covered by glacial deposits that are 20 feet to 400 feet thick in Wayne County. The majority of water mains to be replaced will be within the glacial deposits. The water main replacement will be completed through directional drilling.

Figure 6: 100-year Floodplain

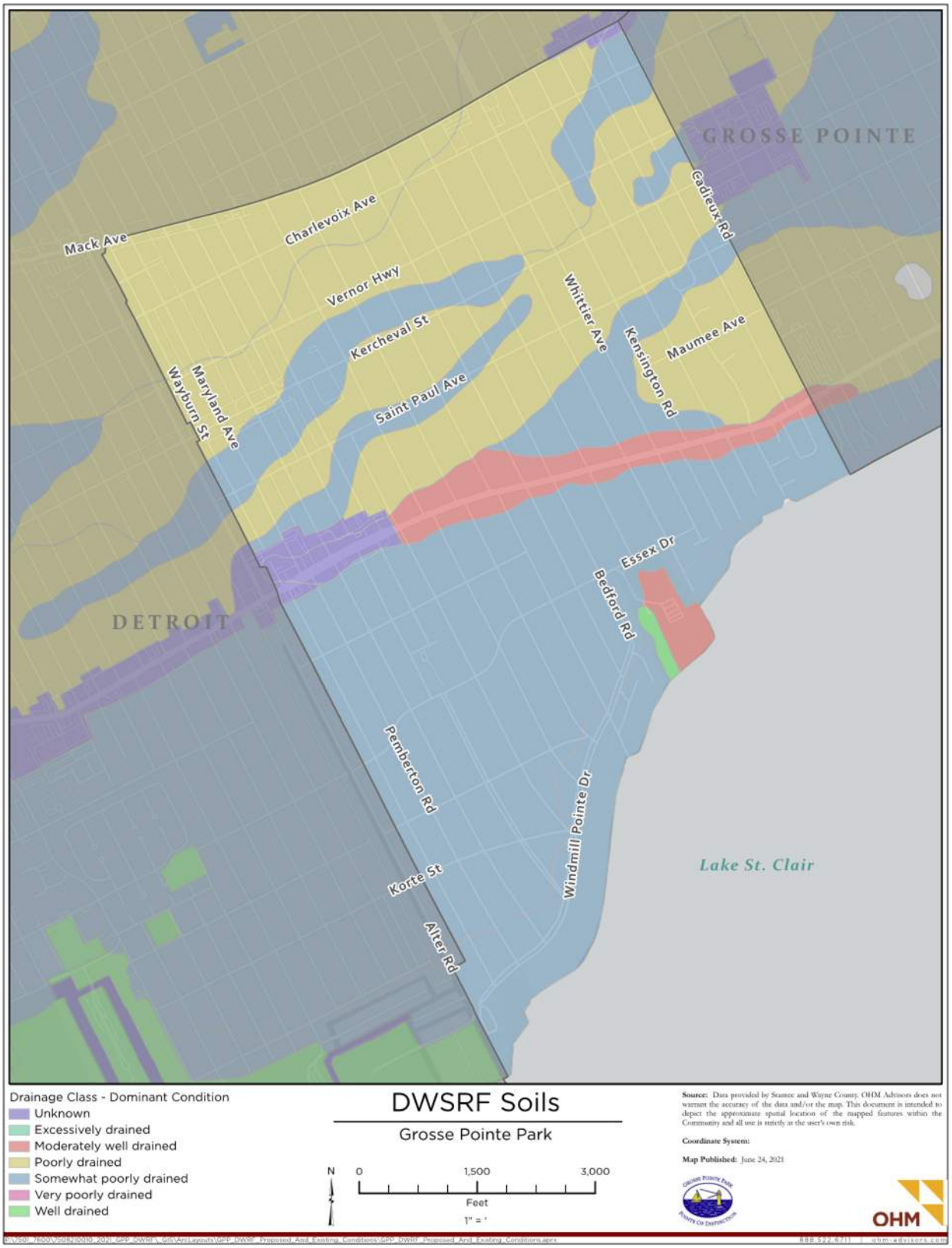


Figure 7: Soils in Grosse Pointe Park

E. ENDANGERED SPECIES

The City of Grosse Pointe is an urban area. The water main replacements and lead service lines will be replaced in areas currently served and previously disturbed. During design, tree removal will be avoided to the extent possible. If tree clearing is necessary, trees will be removed between October 1st and March 31st to minimize any impact on sensitive bat species. Other endangered species are not anticipated to be present in the area.

F. AGRICULTURAL LAND

As noted in Table 1, there is no agricultural land within the City of Grosse Pointe Park. Therefore, agricultural land will not be negatively impacted by the proposed project.

G. SOCIAL/ECONOMIC IMPACT

Impacts on materials, land, and energy will be minimized by selection of qualified contractors. All construction activities for the water mains will take place in previously served areas. The replacement of lead service lines will protect public health and assist the City in maintaining compliance with the EGLE's revised Lead and Copper Rule.

H. CONSTRUCTION/OPERATIONAL IMPACT

The replacement of water mains will have some impact on traffic in the vicinity of where the construction is occurring. The project may require lane closures along most adjacent segments of road. The construction area impacts several signalized intersections, as well as many unsignalized intersections, and driveways.

Normal construction activities have the potential to produce noise and dust. There will be short term service disruptions when replacing water meters. There will also be disruptions during the replacement of lead service lines.

I. INDIRECT IMPACTS

There are no anticipated impacts to the rate, density, or type of development due to this project. Grosse Pointe Park is almost completely developed, and no growth is projected for the area over the next 20 years. There are no expected changes in land use. There are no expected changes in air quality due to primary or secondary development. Impacts related to air quality are limited to direct impacts due to traffic and construction equipment.

There are no anticipated changes to the natural setting or ecosystem. Threatened and endangered species are not anticipated to be present in the project area. Tree clearing will be avoided to the extent possible. If tree clearing is necessary, it will occur between October 1st and March 31st to avoid impacting bat species.

Impacts on cultural, human, social, and economic sources are expected to be minimal, and occur during the construction phase as a result of the traffic routing around the construction area. These impacts are expected to be short-term.

There is no anticipated resource consumption over the useful life of the water main and it is not expected to generate wastes. Aesthetic impacts are anticipated to be short-term and occur during the construction phase. Following construction, all project areas will be reestablished to their previous conditions.

J. CUMULATIVE

No cumulative impacts, for example population growth, are anticipated as a result of the improvement projects.

VII. MITIGATION MEASURES

A. MITIGATION OF SHORT-TERM IMPACTS

Typical construction mitigation is expected for the selected alternative. Traffic control may be required on larger avenues during the construction of the water mains. Access to some roads may be temporarily restricted to provide a safe working environment. Soil erosion and sedimentation control measures will be required during the water main and lead service line replacements to ensure nearby sewers or storm drains are not impacted by the construction process. Any vegetation disrupted by the construction process will be rehabilitated to its original condition. Service will be maintained for residents during construction, with short term disruptions due to water meter and lead service line replacements.

Limited tree clearing may be required. Trees to be removed would be identified during the design phase. Protection measures will be taken to ensure that no endangered or threatened species will be affected during the tree clearing phase. Trees that are removed would be replaced.

Construction activities start as early as year 2022. All Construction activities are anticipated to conclude in 2026.

B. MITIGATION OF LONG-TERM IMPACTS

No long-term impacts are anticipated as part of the water main replacement project. Sensitive species are not anticipated to be impacted. There are no wetlands in the City of Grosse Pointe Park and no work is proposed within the 100-year floodplain.

C. MITIGATION OF INDIRECT IMPACTS

The proposed project is intended to improve the reliability of the existing system by replacing aging water mains and looping dead-end mains. Public health will also be protected by replacing existing lead service lines. The project is not intended to induce growth within the project area.

VIII. PUBLIC PARTICIPATION

A. FORMAL PUBLIC HEARING AND/OR RECORDING

A public hearing was originally scheduled for June 28, 2021. Due to the historic rainfall and resulting flooding received on June 25, 2021, the public hearing was postponed to allow residents to focus on addressing the impacts of the flood. The public hearing has been rescheduled for July 12, 2021, via Zoom.

B. PUBLIC HEARING ADVERTISEMENT

The public notice was published on May 27, 2021, in the Grosse Pointe News. In addition, a public notice was placed on the City's website along with a copy of the draft Project Plan for public review. A copy of the advertisement of public hearing and affidavit of publishing can be found in Appendix E. The revised public hearing date was published in the Grosse Pointe News on July 1, 2021. A copy of the updated advertisement and affidavit of publishing is also included in Appendix E.

C. PUBLIC HEARING RECORDING

A link to the Zoom recording of the public hearing was provided to EGLE via email. The recording was also provided on a USB drive. A list of the attendees of the public hearing is included in Appendix E.

D. PUBLIC HEARING CONTENTS

The public hearing presentation can be found in Appendix E.

E. COMMENTS RECEIVED AND ANSWERED

A list of the comments received and answers to any questions received during the public hearing are included in Appendix E.

F. ADOPTION OF THE PROJECT PLAN

The City Council adopted a resolution following the public hearing on July 12, 2021. A signed copy of the resolution is included in Appendix F, along with the DWSRF Submittal Form.

APPENDIX A: DRINKING WATER ASSET MANAGEMENT PLAN 2020

Water System Asset Management Plan

City of Grosse Pointe Park

December 11, 2020

Prepared for:

City of Grosse Pointe Park
15115 East Jefferson Avenue
Grosse Pointe Park, MI 48230

Prepared by:

Stantec Consulting Michigan Inc.
3754 Ranchero Drive
Ann Arbor, Michigan 48108

Revision	Description	Author		Quality Check		Independent Review	
0	Draft	SNC	12/8/2020			KDJ	12/10/2020

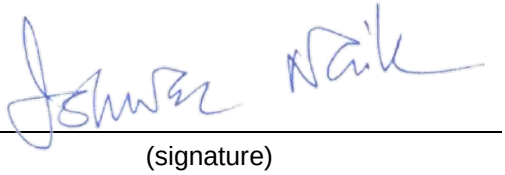
This document entitled Water System Asset Management Plan was prepared by Stantec Consulting Michigan Inc. (“Stantec”) for the account of the City of Grosse Pointe Park (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 
(signature)

Spencer Cain, PE

Reviewed by 
(signature)

Ken Jewison

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.

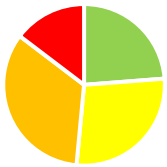
- 4 = Fair: Significant Deterioration - Significant renewal/upgrade required.
- 5 = Poor: Asset Unserviceable - Replacement required OR asset poses safety risk.

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.

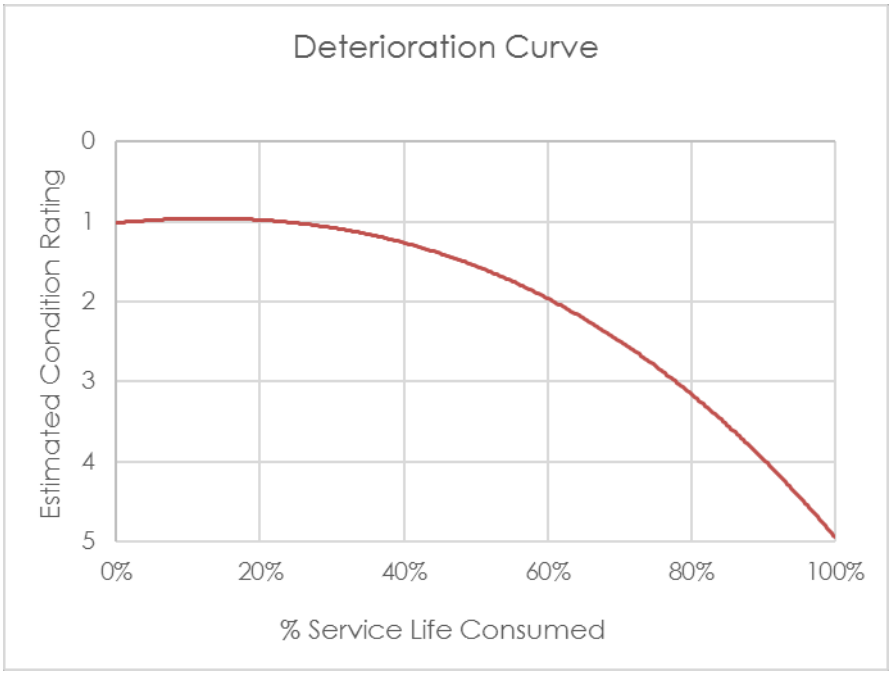


Figure 3-1 - Condition Deterioration Curve

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).

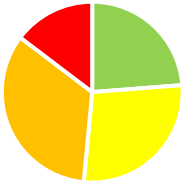
Table 3-5 - Pipe Material Condition

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.

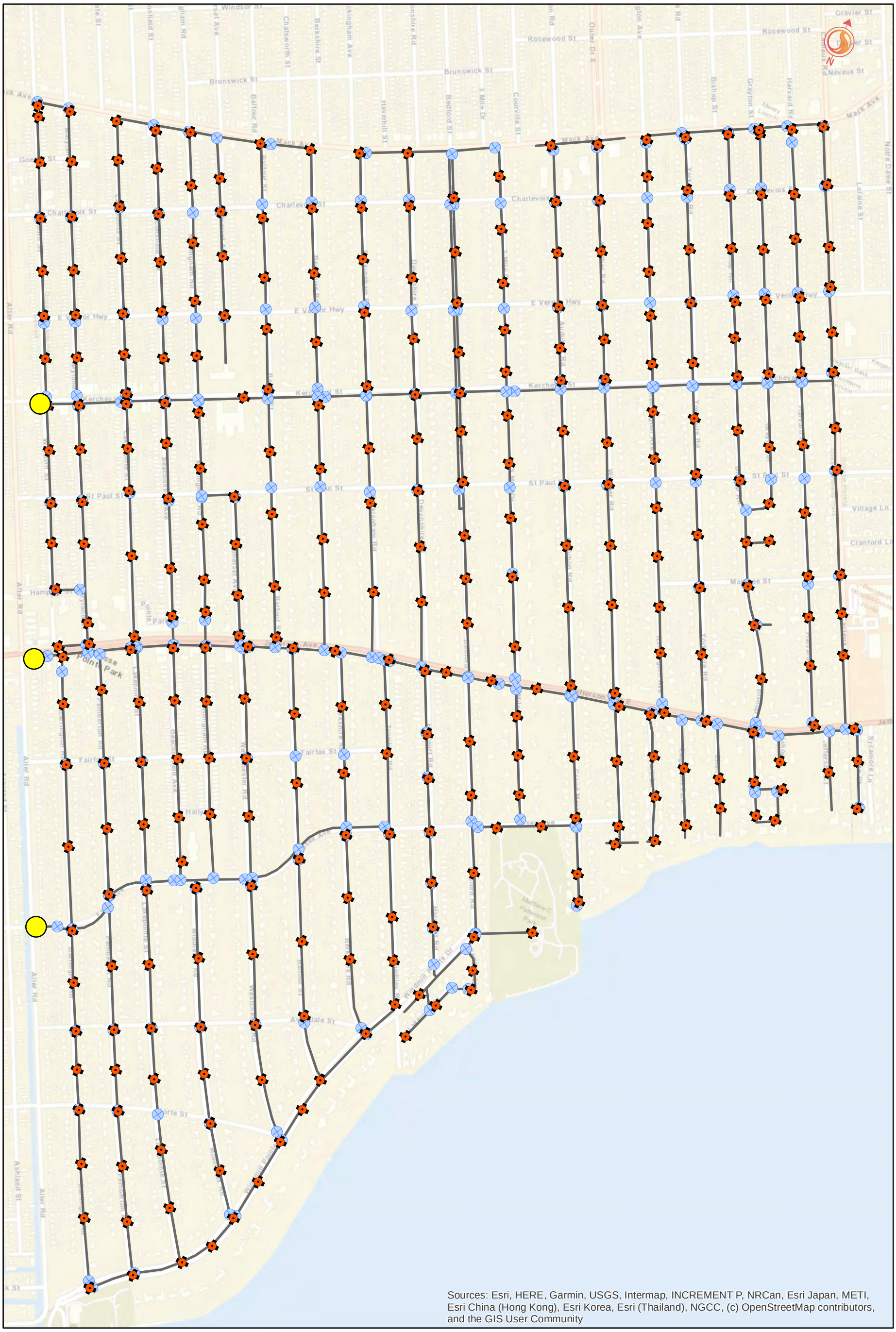
6.1 FUNDING STRUCTURE AND RATE METHODOLOGY SUSTAINABILITY

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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8/31/2020 03:11 PM By: cwinner

Original Sheet - ANSI B

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

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8/31/2020 02:30 PM By: cwinner

Original Sheet - ANSI B

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

Client/Project
GROSSE POINTE PARK
WATER SYSTEM AMP
CRITICALITY

Figure No.
1.1

Title
Overall Criticality Score

V:\2075\active\20751499900\design\GIS\Water System Criticality_20200825\GPP_WaterSystemCriticality_20201014.mxd
12/4/2020 03:35 PM By: spcain

December, 2020
20751499900

Original Sheet - ANSI B

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

C:\Users\spcain\Desktop\GPP\geodatabases\GPP_DWRF_local.mxd
3/17/2020 05:01 PM By: spcain

Original Sheet - ANSI B

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

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

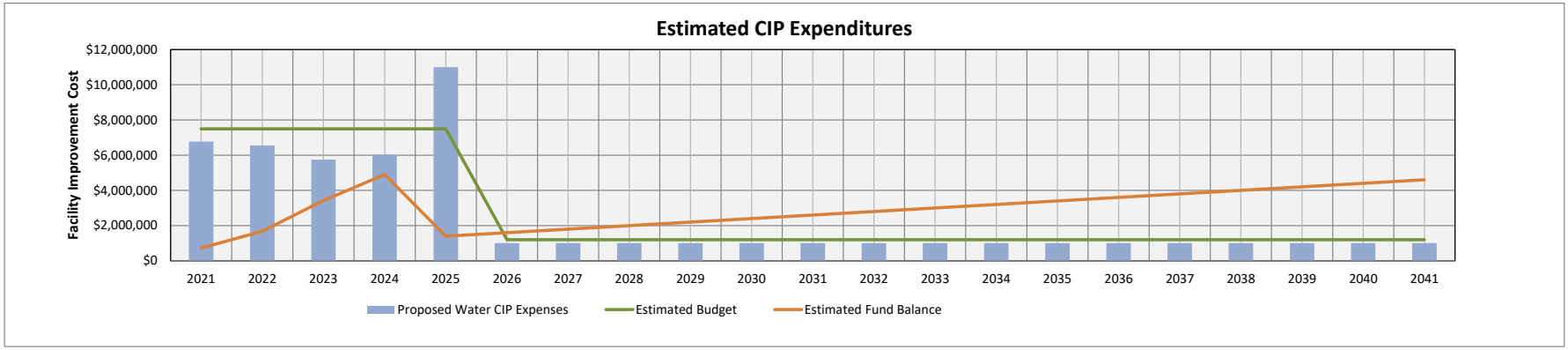
Beginning Year of 20-yr Planning Period	2021
Level of Service	High
Condition Rating Filter (Water Main only)	Score of 1 or more
Risk Threshold	0

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

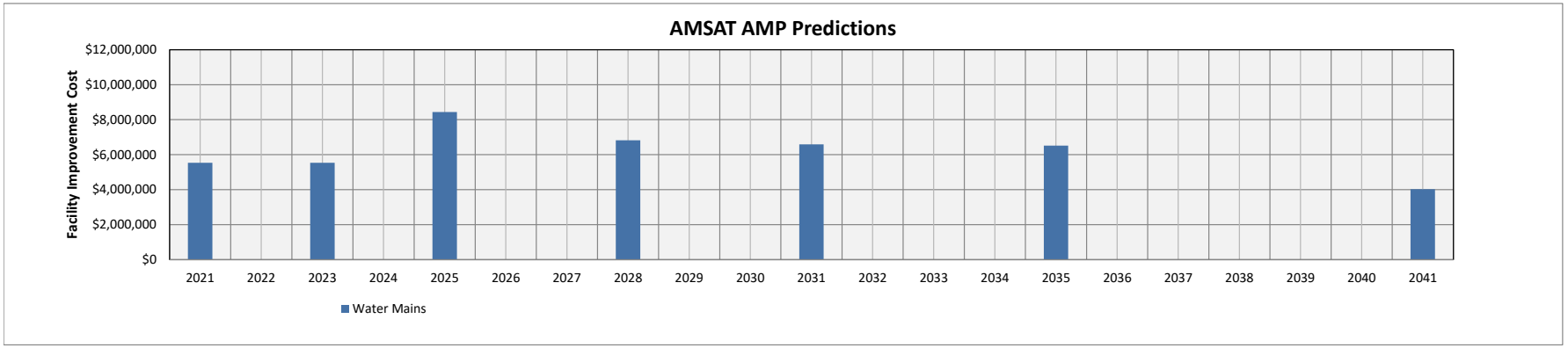
Estimated System Replacement Value $50,584,800

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

APPENDIX B: OPINION OF PROBABLE COSTS

OPINION OF PROBABLE PROJECT COST 2021
WATER MAIN REPLACEMENTS (ALTERNATE #1)
WATER SERVICE REPLACEMENTS
WATER METER REPLACEMENTS

26-May-21

City of Grosse Pointe Park DWRF

Grosse Pointe Park, Michigan

Description: Proposed work includes replacement of existing water main and lead water service lines.

DESCRIPTION	UNIT	TOTAL	UNIT PRICE	ALL COSTS
DISTRIBUTION - DIRECTIONAL DRILL				
PROJECT AREA 1				
Wayburn/ Mack to Jefferson	FT	4388	$170.00	$ 746,000.00
Maryland/ Mack to Jefferson	FT	4872	$170.00	$ 829,000.00
Mack/ Wayburn to Whittier	FT	5584	$170.00	$ 950,000.00
Hampton/ Wayburn to Maryland	FT	268	$170.00	$ 46,000.00
Kercheval/ Alter to Maryland	FT	758	$170.00	$ 129,000.00
Jefferson/ Alter to Maryland	FT	869	$170.00	$ 148,000.00
PROJECT AREA 2				
Lakepointe/ Mack to Jefferson	FT	4834	$170.00	$ 822,000.00
Beaconsfield/ Mack to Jefferson	FT	4649	$170.00	$ 791,000.00
Nottingham/ Mack to Jefferson	FT	4599	$170.00	$ 782,000.00
Somerset/ Mack to Kercheval	FT	2277	$170.00	$ 388,000.00
Balfour/ Mack to Kercheval	FT	2285	$170.00	$ 389,000.00
Kercheval/ Maryland to Nottingham	FT	645	$170.00	$ 110,000.00
Jefferson/ Maryland to Nottingham	FT	956	$170.00	$ 163,000.00
PROJECT AREA 3				
Yorkshire/ Mack to Kercheval	FT	2260	$170.00	$ 385,000.00
Bishop/ Mack to Jefferson	FT	5694	$170.00	$ 968,000.00
Greyton/ Mack to Jefferson	FT	3593	$170.00	$ 611,000.00
Harvard/ Mack to Jefferson	FT	5432	$170.00	$ 924,000.00
Cadieux/ Mack to Jefferson	FT	5427	$170.00	$ 923,000.00
PROJECT AREA 4				
Lakepointe/ Jefferson to Korte	FT	4157	$170.00	$ 707,000.00
Beaconsfield/ Jefferson to Korte	FT	2100	$170.00	$ 357,000.00
Nottingham/ Jefferson to Korte	FT	2076	$170.00	$ 353,000.00
Middlesex/ Essex to Korte	FT	2177	$170.00	$ 371,000.00
Essex/ Lakepointe to Bedford	FT	1606	$170.00	$ 274,000.00
Balfour/ Essex to Windmill Pointe Dr	FT	2090	$170.00	$ 356,000.00
Trembley/ Jefferson to Windmill Pointe Dr	FT	3130	$170.00	$ 533,000.00
Harcourt/ Jefferson to Windmill Pointe Dr	FT	2758	$170.00	$ 469,000.00
Bedford/ Jefferson to Essex	FT	1283	$170.00	$ 219,000.00
Windmill Pointe Drive/ Balfour to Harcourt	FT	1033	$170.00	$ 176,000.00
				$ 13,919,000.00
WATER SERVICE LEADS				
Lead Service Replacement	EA	1225	$ 4,400.00	$ 5,390,000.00
Water Meter Replacement	EA	1225	$ 500.00	$ 613,000.00
SUBTOTAL SERVICE LEADS				**$ 6,003,000.00**
SUBTOTAL CONSTRUCTION				**$ 20,000,000.00**
CONTINGENCY (15%)				**$ 3,000,000.00**
TOTAL CONSTRUCTION COST				**$ 23,000,000.00**
DESIGN/CONSTRUCTION ENGINEERING (15% TCC)				**$ 3,500,000.00**
LEGAL/FINANCIAL (5% TCC)				**$ 1,200,000.00**
TOTAL PROJECT COST				**$ 27,700,000.00**

OPINION OF PROBABLE PROJECT COST 2021
WATER MAIN REPLACEMENTS (ALTERNATE #2)
WATER SERVICE REPLACEMENTS
WATER METER REPLACEMENTS

26-May-21

City of Grosse Pointe Park DWRF

Grosse Pointe Park, Michigan

Description: Proposed work includes replacement of existing water main and lead water service lines.

DESCRIPTION	UNIT	TOTAL	UNIT PRICE	ALL COSTS
DISTRIBUTION - OPEN CUT				
PROJECT AREA 1				
Wayburn/ Mack to Jefferson	FT	4388	$220.00	$ 966,000.00
Maryland/ Mack to Jefferson	FT	4872	$220.00	$ 1,072,000.00
Mack/ Wayburn to Whittier	FT	5584	$220.00	$ 1,229,000.00
Hampton/ Wayburn to Maryland	FT	268	$220.00	$ 59,000.00
Kercheval/ Alter to Maryland	FT	758	$220.00	$ 167,000.00
Jefferson/ Alter to Maryland	FT	869	$220.00	$ 192,000.00
PROJECT AREA 2				
Lakepointe/ Mack to Jefferson	FT	4834	$190.00	$ 919,000.00
Beaconsfield/ Mack to Jefferson	FT	4649	$190.00	$ 884,000.00
Nottingham/ Mack to Jefferson	FT	4599	$190.00	$ 874,000.00
Somerset/ Mack to Kercheval	FT	2277	$190.00	$ 433,000.00
Balfour/ Mack to Kercheval	FT	2285	$190.00	$ 435,000.00
Kercheval/ Maryland to Nottingham	FT	645	$190.00	$ 123,000.00
Jefferson/ Maryland to Nottingham	FT	956	$190.00	$ 182,000.00
PROJECT AREA 3				
Yorkshire/ Mack to Kercheval	FT	2260	$190.00	$ 430,000.00
Bishop/ Mack to Jefferson	FT	5694	$190.00	$ 1,082,000.00
Greyton/ Mack to Jefferson	FT	3593	$190.00	$ 683,000.00
Harvard/ Mack to Jefferson	FT	5432	$190.00	$ 1,033,000.00
Cadieux/ Mack to Jefferson	FT	5427	$190.00	$ 1,032,000.00
PROJECT AREA 4				
Lakepointe/ Jefferson to Korte	FT	4157	$190.00	$ 790,000.00
Beaconsfield/ Jefferson to Korte	FT	2100	$190.00	$ 399,000.00
Nottingham/ Jefferson to Korte	FT	2076	$190.00	$ 395,000.00
Middlesex/ Essex to Korte	FT	2177	$190.00	$ 414,000.00
Essex/ Lakepointe to Bedford	FT	1606	$190.00	$ 306,000.00
Balfour/ Essex to Windmill Pointe Dr	FT	2090	$190.00	$ 398,000.00
Trembley/ Jefferson to Windmill Pointe Dr	FT	3130	$190.00	$ 595,000.00
Harcourt/ Jefferson to Windmill Pointe Dr	FT	2758	$190.00	$ 525,000.00
Bedford/ Jefferson to Essex	FT	1283	$190.00	$ 244,000.00
Windmill Pointe Drive/ Balfour to Harcourt	FT	1033	$190.00	$ 197,000.00
				$ 16,058,000.00
WATER SERVICE LEADS				
Lead Service Replacement	EA	1225	$ 4,000.00	$ 4,900,000.00
Water Meter Replacement	EA	1225	$ 500.00	$ 613,000.00
SUBTOTAL SERVICE LEADS				**$ 5,513,000.00**
SUBTOTAL CONSTRUCTION				**$ 21,600,000.00**
CONTINGENCY (15%)				**$ 3,300,000.00**
TOTAL CONSTRUCTION COST				**$ 24,900,000.00**
DESIGN/CONSTRUCTION ENGINEERING (15% TCC)				**$ 3,800,000.00**
LEGAL/FINANCIAL (5% TCC)				**$ 1,300,000.00**
TOTAL PROJECT COST				**$ 30,000,000.00**

APPENDIX C: GREEN PROJECT RESERVE PRINCIPAL FORGIVENESS BUSINESS CASE

Drinking Water Revolving Fund
Green Project Reserve Qualification Template

Applicant: City of Grosse Pointe Park, Michigan Project No: 7494-01
Project Name: Grosse Pointe Park Drinking Water State Revolving Fund Project Plan

Identify by page number from the project plan, or attach excerpts, where water efficiency or energy efficiency improvement justification is provided or discussed to support the need for the recommended green project reserve component: Pages 7 through 11.

Please ensure all requested information is provided to enable an assessment by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) of whether the project or project component can qualify for funding from the green project reserve.

Water Meter Replacement

Water meters will be replaced with automatic meter readers with radio transmitters. Current water loss due to inaccurate meters is estimated to be approximately 20%. The 2020 water demand was 425.58 million gallons (MG) for the City. The water loss through inaccurate meters is approximately 85 MG per year.

Water Main Replacement

1. Over the last ten years, 103 water main breaks have occurred in the City of Grosse Pointe Park water main distribution system.

2. Identify the length, diameter, age and type of pipe to be replaced:

Diameter (inch)	Length (feet)	Age (years)	Material
6	56,864	100	Cast Iron
8	19,977	100	Cast Iron
12	882	100	Cast Iron
16	1,403	100	Cast Iron

3. Each break is estimated to result in the average loss of 3,600,000 gallons of water. At an average of 13 break per year, the calculated annual water lost is over 46,700,000 gallons.

4. Present the data indicating how this is a significant source of water loss in the system and how the pipes proposed for replacement are likely to generate the greatest return in leak reduction.

   The City's water system has approximately 186,260 feet linear feet of water main, or approximately 35.3 miles. Of that water main, 79,100 linear feet is 6-inch, 8-inch, 12-inch, and 16-inch cast iron water main that is proposed for replacement. The City is averaging approximately 11 water main

breaks per year (between the years of 2010 and 2019), which is equal to 0.28 breaks/mile/year.

The estimated water lost due to water main breaks is approximately 46,700,000 gallons/year, which is equal to 6,246 thousand cubic feet per year (MCF/year). The City of Grosse Pointe had a water demand of 425.58 million gallons in 2020 or 56,896 MCF/year. The water lost through water main breaks is approximately 11% of the water used annually in the City. The pipes to be replaced were selected based on where the most recent water main breaks have occurred. The pipe replacement areas were selected as part of the 2020 Water System Asset Management Plan.

5. The energy savings from pumping/delivering water through the new water mains versus the old ones is estimated at 296,874 kWH/year.

6. Describe the condition of the replaced mains with respect to friction/head loss etc from tuberculation or other deterioration issues. As appropriate, identify if the soils are corrosive and contributing to the deterioration/breaks or leaks in the mains, and how the replacement mains are designed to address future corrosion:

   The water mains to be replaced are over 100 years old, cast iron mains. The piping is anticipated to have sever tuberculation and a C factor of 50 compared to new pipe with a C factor of 120. In addition, most of the water main is 6-inches in diameter. Additional head loss reduction will be realized by installing the current standard water main that is 8-inches in diameter. The soils are not known to be corrosive. The deterioration/breaks observed is due to the age of the mains, which are over 100 years old. The replacement mains will be new HDPE or ductile iron to be selected during bidding.

7. Total projects costs for the water main replacement component of the project are $13,919,000.

8. Identify the source of data used for these calculations: 2020 Water System Asset Management Plan and attached calculations.

Submitted by:

Krista M. Takacs, P.E.	July 1, 2021
Name	Date
Project Manager	
Title	

Drinking Water State Revolving Fund
Green Project Reserve
City of Grosse Pointe Park

The purpose of this memo is to document the basis for determining that the City of Grosse Pointe Park Drinking Water State Revolving Fund (DWSRF) Project qualifies for the green project reserve funding. This project is replacing 79,000 feet of 6-inch, 8-inch, 12-inch, and 16-inch unlined cast iron mains that are more than 100 years old (constructed in the 1920s). In addition, 1,225 water meters will be replaced with an automatic meter reading system in the project areas. The following information was used to make this determination.

Categorical Project – Water Meter Replacement

The project includes the replacement of 1,225 conventional water meters with an automatic meter reading system. The City estimates that they are losing approximately 20% of the water due to inaccurate water meter readings. The project cost to replace the water meters is $613,000.

Business Case – Water Main Replacement

This project will address 55,800 feet of the 122,885 feet of 6-inch cast iron pipe, 19,900 feet of the 48,339 feet of 8-inch cast iron pipe, 880 feet of the 8,028 feet of 12-inch cast iron pipe, and 1,1400 feet of the 6,660 feet of 16-inch cast iron pipe in the City. Many of these mains are corroded and contain deposition that has significantly reduced the carrying capacity while at the same time, increasing the friction losses and energy necessary to deliver water through them.

Over the last 10 years, the City experienced 103 water main breaks, for an average of 0.28 breaks per mile per year. The City also estimates that each break results in an average water loss of 3.6 million gallons for a total of 46.7 million gallons per year. The cost of the water main replacement is $13,919,000.

The new mains will also have an improved C factor as compared to the existing pipes. Based on the age of the water mains, the current, cast iron piping is estimated to have a C factor of 50, while the new HDPE or ductile iron piping will have a C factor equal to 120. Grosse Pointe Park estimates an energy savings of 296,000 kWH/year from pumping water through the new mains versus the old ones.

Additional benefits include reductions in unnecessary operation and maintenance expenditures and eliminating potential health hazards associated with waterborne pathogens entering the water distribution system during breaks.

Based on this information, the City of Grosse Pointe Park feels that the project meets the eligibility criteria for the green project reserve funding. The water main replacements will improve water conservation/efficiency by reducing water losses experienced from frequent breaks and on-going leaks as well as provide for reduced energy use.

APPENDIX D: PHOTOGRAPHS OF PROJECT AREAS

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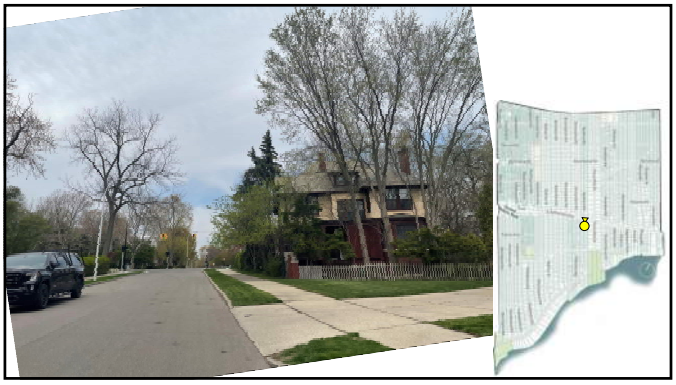

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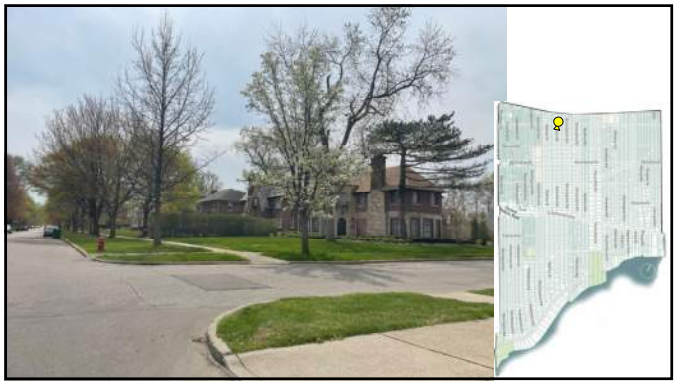

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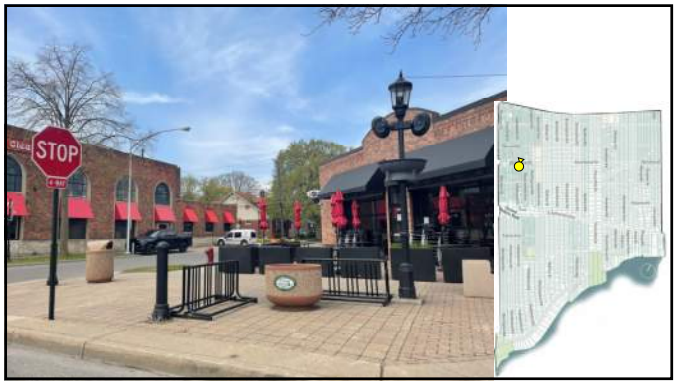

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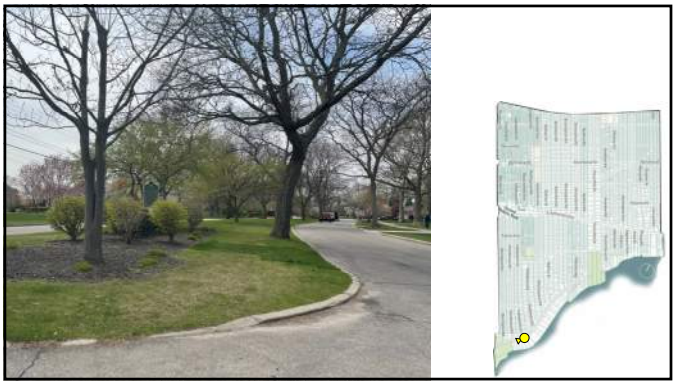

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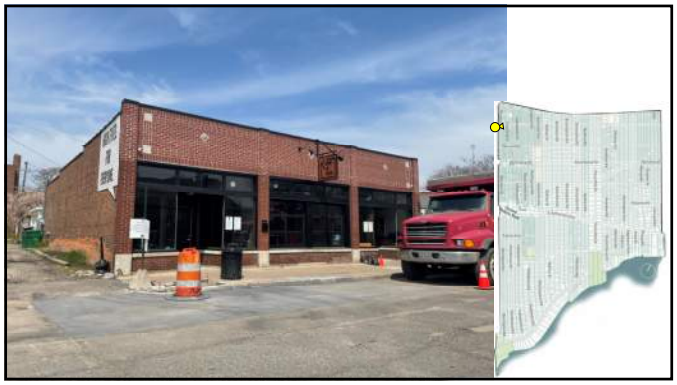

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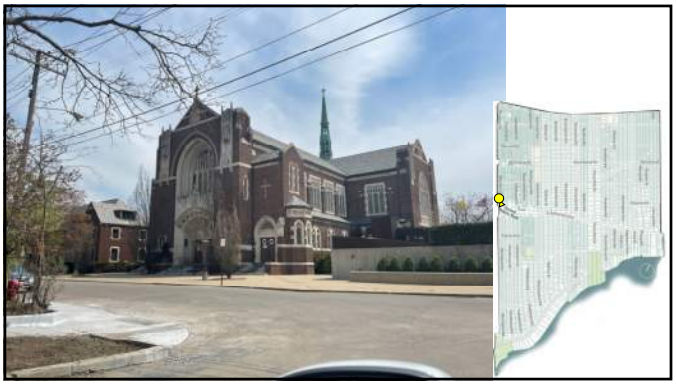

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APPENDIX E: PUBLIC HEARING DOCUMENTS

AFFIDAVIT OF LEGAL PUBLICATION

Grosse Pointe News

16980 Kercheval Avenue
Grosse Pointe, Michigan 48230
(313) 882-3500

COUNTY OF WAYNE
STATE OF MICHIGAN, SS.

Melanie Mahoney
being duly sworn deposes and says that attached advertisement of

City of Grosse Pointe Park

was duly published in accordance with instructions, in the GROSSE POINTE NEWS on the following date:

May 27, 2021

#7 GPP 5/27 PHN DRINKING WATER

and knows well the facts stated herein, and that she is the Administrative Assistant of said newspaper.

Melanie Mahoney

Notary Public

JACQUELYN E KINSEL-STOFFEL
NOTARY PUBLIC - STATE OF MICHIGAN
COUNTY OF MACOMB
My Comm. Exp. 07-05-2022
Acting in the County of Wayne
Date 5/27/2021

McMullen's memory with a gift to the FPE Endowment Fund, which will port the Grosse Pointe Public School tem well into the future. The GPFPE rently has an endowment of $360,000, d at the Community Foundation for itheast Michigan, which profession- manages the funds of thousands of anizations. The GPFPE endowment n integral part of the organization's ger multi-pronged fundraising proach and overall comprehensive George's memory."

The GPFPE is an independent, not-for-profit organization with the mission of funding educational opportunities for the students of the Grosse Pointe Public School System. Since 2007, the GPFPE has provided close to $3.5 million in funding to the GPPSS, supporting a diverse roster of programs and projects at every school and grade level across the district.

For more information, visit gpfpe.org.

City of Grosse Pointe Park, Michigan

NOTICE OF PUBLIC HEARING
CITY OF GROSSE POINTE PARK
DRINKING WATER STATE REVOLVING FUND PROJECT PLAN

The City of Grosse Pointe Park, Michigan will hold a public hearing on proposed improvements to the City's water distribution system for the purpose of receiving comments from interested persons. The City will be applying for a low interest Drinking Water State Revolving Fund (DWSRF) loan for FY 2022.

The purpose of the proposed project is to design and replace water main, water meters, and existing lead water service lines. Hydrants and valves located along the length of the water mains would also be replaced. Dead-end water mains would be looped as feasible. The water meters installed in residents' homes are also nearing the end of their useful life and require replacement. Additionally, a large percentage of the City's residential water services are made of lead. The projects would increase the reliability of City's water system by decreasing water main breaks, protect public health by replacing lead service lines, and maintain compliance with EGLE's revised Lead and Copper Rule.

The projects would take place over 5 years from 2022 through 2026. Construction-related impacts during water main replacements would include temporary lane closures, noise, and dust generation. Short term water service disruptions would also occur. The City is proposing to fund the project with money collected from user charges. The estimated cost to users for the proposed projects would be a total increase of up to $66.00 per bimonthly billing cycle over the next 5 years. Total cost of the project is estimated at $27,700,000.

THE MEETING WILL BE HELD ON:

DATE:	Monday, June 28, 2021
TIME:	7:00 p.m.
PLACE:	**Zoom Meeting** Public Call-In Number: 1 301 715 8592 US Toll-Free Meeting ID: 874 0505 6781 Passcode: 293127

Copies of the plan detailing the proposed projects are available for review beginning on Friday, May 28, 2021 on the City of Grosse Pointe Parks website. Written comments received before the hearing record is closed on Monday, June 28th, 2021 at 12:00pm and will receive responses in the final project plan. Written comments can be submitted via email to clerk@grossepointepark.org or mailed to:

Grosse Pointe Park City Clerk
15115 East Jefferson Avenue
Grosse Pointe Park, MI 48230

GPN: 5/27/21

NOTICE OF RESCHEDULED PUBLIC HEARING
CITY OF GROSSE POINTE PARK
DRINKING WATER STATE REVOLVING FUND PROJECT PLAN

Due to the unprecedented precipitation events on June 25-26, 2021, The City of Grosse Pointe Park, Michigan has rescheduled the public hearing that was to be held on June 28, 2021, to July 12, 2021. The public hearing on proposed improvements to the City's water distribution system will be held for the purpose of receiving comments from interested persons. The City will be applying for a low interest Drinking Water State Revolving Fund (DWSRF) loan for FY 2022.

The purpose of the proposed project is to design and replace water main, water meters, and existing lead water service lines. Hydrants and valves located along the length of the water mains would also be replaced. Dead-end water mains would be looped as feasible. The water meters installed in residents' homes are also nearing the end of their useful life and require replacement. Additionally, a large percentage of the City's residential water services are made of lead. The projects would increase the reliability of City's water system by decreasing water main breaks, protect public health by replacing lead service lines, and maintain compliance with EGLE's revised Lead and Copper Rule.

The projects would take place over 5 years from 2022 through 2026. Construction-related impacts during water main replacements would include temporary lane closures, noise, and dust generation. Short term water service disruptions would also occur. The City is proposing to fund the project with money collected from user charges. The estimated cost to users for the proposed projects would be a total increase of up to $66.00 per bimonthly billing cycle. Total cost of the project is estimated at $27,700,000.

THE RESCHEDULED MEETING WILL BE HELD ON:

DATE: Monday, July 12, 2021

TIME: 7:00 p.m.

PLACE: **Zoom Telephonic Meeting**
Public Call-In Number: 1 301 715 8592

Meeting ID: 874 0505 6781
Passcode: 293127

Copies of the plan detailing the proposed projects continue to be available for review on the City of Grosse Pointe Park's website. Written comments received by 5 pm on Sunday, July 11, 2021, will receive responses in the final project plan. Written comments are limited to 250 characters and can be submitted via email to clerk@grossepointepark.org or smithl@grossepointepark.org or mailed to:

Grosse Pointe Park City Clerk
15115 East Jefferson Avenue
Grosse Pointe Park, MI 48230

City of Grosse Pointe Park

Drinking Water State Revolving Fund (DWRF)
Project Plan Public Hearing

July 12, 2021

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Agenda

1. Drinking Water Revolving Plan Overview
2. Grosse Pointe Park Statement of Need
3. Recommended Improvements
4. Anticipated Project Costs and Water Rates
5. Environmental Impacts and Mitigation
6. Benefits of the project
7. Questions
8. Vote on Resolution

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City of Grosse Pointe Park

DRINKING WATER REVOLVING FUND

OHM Advisors

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Drinking Water State Revolving Fund (DWRF)

Jointly administered loan program:

- Michigan Department of Environment, Great Lakes, and Energy (EGLE)
- Michigan Municipal Bond Authority

Funding for water infrastructure projects to resolve current needs

- 20-year loan with interest rates of approximately 1.875%

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City of Grosse Pointe Park
Need for DWRF Project

- Aging infrastructure resulting in water main breaks
- Undersized and dead-end water mains
- Water meters are nearing the end of their useful life
- Presence of lead service lines that require replacement under Michigan's Revised Lead and Copper Rule
  - 5% of lead service lines must be replaced per year
- Projects identified as part of Asset Management Plan that was prepared in 2020.

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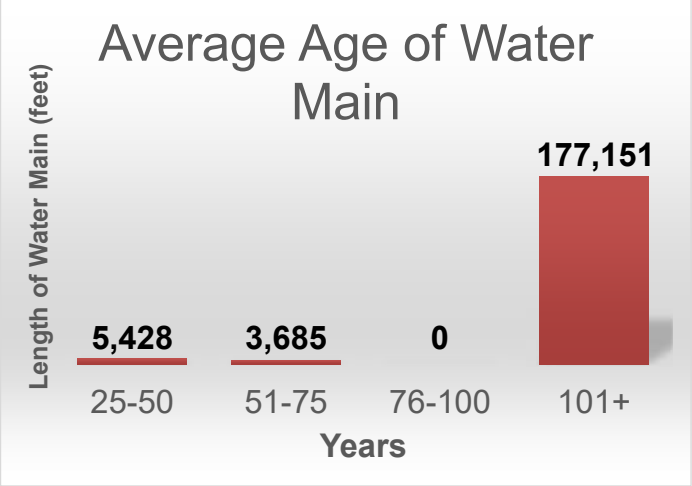
Aging Infrastructure

- The City has a relatively old distribution system, with most water mains 80 to 100 years old
- Effective useful life of cast iron mains are on the order of 75 to 100 years



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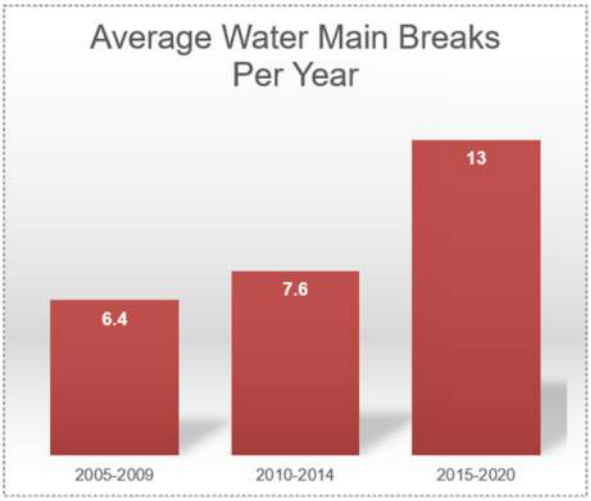
Consequences of Aging Infrastructure

- Indication that water main is reaching the end of useful life is the number of breaks that occur.
- Service meters are reaching the end of useful life (resulting in readings lower than actual consumption)



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City of Grosse Pointe Park

PROPOSED PROJECTS

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City of Grosse Pointe Park
DWRF Proposed Projects

The proposed projects consist of the following:

- Loop *dead-end* water mains
- Replace *undersized* water mains
- Replace *aged, less reliable* water mains
- Replace water *meters* (1,225)
- Replace *lead service lines* (1,225)

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City of Grosse Pointe Park
DWRF Project Development

Factors that serve as the basis for the identifying proposed projects:

- Water main breakage frequency
- Requirements for minimum water main size
- Water meters approaching the end of useful life
- Lead service line replacement will protect public health and comply with Michigan Lead and Copper Rule

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Improve Distribution System Reliability, Replace Water Meters, and Replace Lead Service Lines

The following alternatives were evaluated:

- Regional alternative
- Optimal performance of existing water system
- Water main replacements and upgrades, replace water meters, and replace lead service lines
  - Alternative 1: Horizontal Directional Drilling Technique with PVC
  - Alternative 2: Open Trench Construction with Ductile Iron Pipe

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Improve Distribution System Pressures and Reliability

The following alternatives were evaluated:

- ~~Regional alternative~~
- ~~Optimal performance of existing facility~~
- Water main replacements and upgrades, replace water meters, and replace lead service lines
  a) Replace aged, less reliable water mains with PVC or ductile iron
  b) Loop dead-end water mains
  c) Replace water meters at the end of useful life
  d) Replace lead service lines

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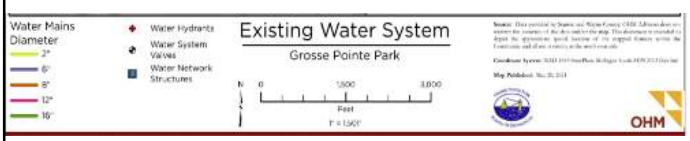
Existing Water Mains

- Current standards include 8-inch water mains.
  - *6-inch water mains are common throughout City*
- Dead ends present on certain streets.



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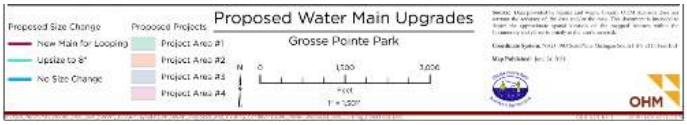
Proposed DWRF Water Main Improvements

- 2-inch and 6-inch water mains to be replaced by 8-inch water main
- New looping segments
- Associated hydrants and valves will be replaced with water main
- Water meter and lead service lines replaced in project areas



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DWRF Project Cost Comparison

	Alternative 1: Directional Drilled PVC	Alternative 2: Open Trench Ductile Iron
Area 1 Capital Cost	$5,800,000	$7,000,000
Area 2 Capital Cost	$7,400,000	$7,700,000
Area 3 Capital Cost	$8,100,000	$8,500,000
Area 4 Capital Cost	$6,400,000	$6,800,000
Total Capital Cost	**$27,700,000**	**$30,000,000**

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DWRF Project Cost Opinion and User Cost

	DWRF Loan	Est. Bi-monthly Resident Payment
Area 1 Capital Cost	$5,800,000	$13.81
Area 2 Capital Cost	$7,400,000	$17.63
Area 3 Capital Cost	$8,100,000	$19.29
Area 4 Capital Cost	$6,400,000	$15.27
Total Loan Value	**$27,700,000**	
Total Bimonthly Increase		$66.00

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Environmental Impacts and Mitigation

Impacts during construction:

- Traffic disruption/delays and lane closures
- Temporary noise, dust and traffic disruption
- Short period of water service disruption

Mitigation during construction:

- Traffic control and typical work hours
- Soil erosion and sedimentation control
- Associated surface restoration

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Benefits of DWRF Project

- Increase reliability of water service to residents.
- Improved system pressures and flow to meet fire suppression requirements.
- Protect public health through the replacement of lead service lines and comply with regulatory requirements.
- More accurate tracking of water consumption to aid in tracking system water loss.

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Questions and Answers

Please state name and home address for the record.

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Vote on Resolution

22

City of Grosse Pointe Park
Drinking Water State Revolving Fund Project Plan
Responses to Written Questions

Question 1 received on June 16, 2021

Hi, Leah and City Clerk.

Please consider this a comment to the City Clerk on the DWRF plan requiring a response at or before the June 28, 2021 public hearing as stated in the Notice of Public Hearing published May 27, 2021. Please acknowledge receipt of this comment.

I finally read through the plan. I had a concern about the cost and found a problem that I believe needs to be addressed if the city wants to avoid a law suit.

The Notice of Public Hearings in the May 27 Grosse Pointe News states "The estimated cost to users for the proposed project would be a total increase of up to $66.00 per bimonthly billing cycle over the next **5** years."

The problem is that the DWRF plan, Table 13, shows the increase will be over **20** years, not 5 years.

I think the public notice needs to be republished and corrected or the city might find itself in year six sued for 75% of the cost for misstating the cost to residents. You might want to check that out with your city attorney.

Not to mention the city employees will need to be trained to explain to complaining citizens why their water bill suddenly increased by $66 (or roughly 33% in our case) every two months starting in the summer of 2022. I believe the project is needed but that cost will draw a lot of criticism.

Just a thought.

Phillip Matous
1139 Harvard Road
Grosse Pointe Park, MI 48230
313 300 4552 Cell

Response

Dear Mr. Matous,

The City appreciates the receipt of your comment concerning the Drinking Water State Revolving Fund (DWSRF) Project Plan. It appears that there may be a misinterpretation of the language used in the public notice of the public hearing. The mention 5 years noted in the message was meant to convey was that the water rates are anticipated to increase by up to $66.00 per bimonthly billing cycle over a five-year period. The length of time that the increase would last was not anticipated to be specified in that sentence. The DWSRF loan that the City is applying for would have a 20-year term. Therefore, costs associated with the improvements in the Project Plan would be repaid over a 20-year time period.

We apologize that the wording caused confusion and trust that the explanation provided above addresses your concern. At this time, the City does not plan to re-issue the public notice but will note your concern should future projects be proposed. The City acknowledges that it is a significant rate increase and appreciates that you recognize that the improvements are needed.

Sincerely,

City of Grosse Pointe Park

Question 2 received on June 24, 2021

"Will this project include replacing the water meters? If so, my wife and I do not want a water meter that transmits data using radio frequencies. Please include an option to allow water meters that are other than radio wave emitting meters."

Thanks.

Phil Matous

Response to Question 2

Dear Mr. Matous,

We appreciate your comment. At this time, the City is planning to install service meters that emit a radio signal to collect water usage data more efficiently. The City plans to install the same type of meter at each house in order to benefit from quantity discounts during purchasing and ease of installation and future maintenance.

Attached is information from the American Cancer Society that discusses Smart Meters and the relative risks compared to other devices commonly found within homes.

https://www.cancer.org/cancer/cancer-causes/radiation-exposure/smart-meters.html

Sincerely,

City of Grosse Pointe Park

Smart Meters

What are smart meters?

To use (and be billed for) utilities such as electricity, natural gas, or water, the amount you use must be measured. This is generally done with a meter. In the past, the data from the meters had to be read by a person. More recently, meters that automatically send usage information back to the product supplier have been used. These are called smart meters.

Smart meters have been used for a number of years in some developed countries, especially in parts of Europe. In recent years, they have been installed in some areas of the United States as well.

Concerns have been raised about the safety of smart meters, mainly because they give off the same kinds of radiofrequency (RF) waves as cell phones and Wi-Fi devices.

How do smart meters work?

Smart meters record the amount of the product (electricity, water, etc.) consumed over time. They differ from traditional utility meters in that they are electronic and can talk to a central computer system.

Smart meters talk to their central systems using RF transmissions, based on a cell phone, pager, satellite, radio, power line (PLC), Wi-Fi or Internet (TCP/IP) communication method. Internet and cell phone applications have become the preferred options because of their flexibility and ease of deployment.

How are people exposed?

Smart meters are typically installed outside the home, either in place of or as part of existing meters. How much RF energy that people are exposed to from the smart meter depends on how far they are from the smart meter antenna and how the smart meter sends its signal. The frequency and power of the RF waves given off by a smart meter are similar to that of a typical cell phone, cordless phone, or residential Wi-Fi router. Smart meters typically send and receive short messages about 1% of the time.

Because the smart meter antenna usually is located outside the home, people are much farther away from the source of RF waves than some other possible sources of exposure to RF radiation, such as personal cell phones and cordless phones. In addition, walls between the person and the smart meter's antenna further reduce the amount of RF energy exposure. This means that the amount of RF radiation that someone would be exposed to from a smart meter is probably much lower than the amount that they would be exposed to from other sources.

Can smart meters cause cancer?

Smart meters give off RF radiation. RF radiation is low-energy radiation. RF radiation doesn't have enough energy to remove charged particles such as electrons (ionize), and so is called non-ionizing radiation. Non-ionizing radiation has enough energy to move atoms in a molecule around or cause them to vibrate, which can lead to heat but it can't damage DNA directly.

RF radiation is classified by the International Agency for Research on Cancer (IARC), as "possibly carcinogenic to humans." This is based on the finding of a possible link in at least one study between cell phone use and a specific type of brain tumor. Because RF radiation is a possible carcinogen, and smart meters give off RF radiation, it is possible that smart meters could increase cancer risk. Still, it isn't clear what risk, if any there might be from living in a home with a smart meter.

It would be nearly impossible to conduct a study to prove or disprove a link between living in a house with smart meters and cancer because people have so many sources of exposure to RF and the level of exposure from this source is so small. Because, the amount of RF radiation you could be exposed to from a smart meter is much less than what you could be exposed to from a cell phone, it is very unlikely that living in a house with a smart meter increases risk of cancer. The World Health Organization has promised to conduct a formal assessment of the risks from RF exposure but this report is not yet available.

See Microwaves, Radio Waves, and Other Types of Radiofrequency Radiation[1] and Cellular Phones[2] for more information about the link between RF radiation and cancer

risk.

Do smart meters cause any other health problems?

Smart meters have not been studied to see if they cause health problems. Studies have looked at RF radiation from other sources. Exposure to large amounts of RF radiation, as from accidents involving radar, has resulted in severe burns. No other serious health problems have been reported.

One concern expressed is that the RF waves produced by smart meters might interfere with electronic medical devices such as a heart pacemaker. A study that examined the effect of smart meters on pacemakers and implantable defibrillators found that the smart meters did not interfere with these devices.

Could smart meters cause health problems in cancer survivors?

While RF exposure might not cause cancer directly, concern has been voiced that cells in the body that have been damaged by exposure to some other substance might somehow be more likely to become cancerous when exposed to RF waves. In theory, this might be a concern for cancer patients being treated with ionizing radiation and/or medicines that might cause cancer themselves. Animal studies have not shown evidence of this and this effect has not been studied in people.

How can I reduce my exposure to RF radiation from smart meters?

There isn't much you can do to lower your exposure to RF radiation from smart meters. In some places where smart meters are being installed, people have the choice to opt in or opt out of having them, but this isn't an option everywhere.

It may be possible to lower exposure from cell phones and other sources of RF radiation. See Microwaves, Radio Waves, and Other Types of Radiofrequency Radiation[3] and *Cellular Phones*[4].

Because the low levels of energy from RF radiation have not been clearly shown to cause problems even at close range, it isn't clear that lowering exposure to RF radiation has health benefits.

Hyperlinks

1. www.cancer.org/cancer/cancer-causes/radiation-exposure/radiofrequency-

radiation.html
2. www.cancer.org/cancer/cancer-causes/radiation-exposure/cellular-phones.html
3. www.cancer.org/cancer/cancer-causes/radiation-exposure/radiofrequency-radiation.html
4. www.cancer.org/cancer/cancer-causes/radiation-exposure/cellular-phones.html
5. http://fcc.gov/oet/rfsafety/rf-faqs.html

Additional resources

In addition to the American Cancer Society, other sources of information include*:

Federal Communications Commission (FCC) Radio Frequency Safety: http://fcc.gov/oet/rfsafety/rf-faqs.html (http://fcc.gov/oet/rfsafety/rf-faqs.html)[5]

**Inclusion on this list does not imply endorsement by the American Cancer Society.*

References

Federal Communications Commission. Radio Frequency Safety FAQs. 6/25/2012. Accessed at http://transition.fcc.gov/oet/rfsafety/rf-faqs.html on June 17, 2014.

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Tell RA, Kavet R, Mezei G. Characterization of radiofrequency field emissions from smart meters. *J Expo Sci Environ Epidemiol*. 2013 Sep-Oct;23(5):549-53.

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World Health Organization. Electromagnetic fields and public health: Mobile phones. Accessed at www.who.int/mediacentre/factsheets/fs193/en on September 19, 2012.

Last Medical Review: September 10, 2014 Last Revised: September 24, 2014

Written by

The American Cancer Society medical and editorial content team (www.cancer.org/cancer/acs-medical-content-and-news-staff.html)

Our team is made up of doctors and oncology certified nurses with deep knowledge of cancer care as well as journalists, editors, and translators with extensive experience in medical writing.

Question 3 received on June 25, 2021

Comment by Mike Bannon, 1129 Nottingham Rd

Of course, water system improvements are sorely needed. I would raise additional two points for consideration:

1. Replacement of water mains and lead service lines should be accompanied by some public outreach aimed at encouraging the identification and replacement of potentially substandard pipes within individual residences. This could provide additional bang for the buck in terms of water quality for residents.

2. Although homeowner self-report of lead service lines is useful, I'd be interested in knowing any additional steps that will be used to identify these lines. There may be lead lines, for example, that have been affixed to non-lead repairs within the interior of the household, making the exterior lead service less obvious.

Response to Question 3

Dear Mr. Bannon,

The City appreciates acknowledgement that water system improvements are needed. We offer the following responses to your comments:

1. *The choice to replace interior piping (from the service meter to the individual faucets) would be up to individual homeowners. It should be noted that Great Lakes Water Authority (GLWA) does provide suitably treated water that includes corrosion inhibitors that reduce the likelihood that lead would leach from interior piping or fixtures in quantities that would be harmful for human consumption.*

2. *As part of the water main replacement, City contractors will have access to the water main in the vicinity of the corporate stop, as well as access to the service line at the curb stop, which will be inspected for presence of lead or a galvanized steel goose neck. Residents in the project areas will also be requested to provide the contractor access to their home, so that the piping from the water main to the service meter can be inspected to determine if it contains lead. If any of those locations (water main connection, piping on either side of the curb stop, or piping leading into the house at the service meter) are determined to be a lead service line, the line will be replaced from the water main to the service meter. These inspections are required in order for the City to submit their Complete Distribution System Materials Inventory, which is due to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) by January 1, 2025.*

Sincerely,

City of Grosse Pointe Park

APPENDIX F: SUBMITTAL FORM AND RESOLUTION FOR DWSRF PROJECT PLAN

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
FINANCE DIVISION

DRINKING WATER STATE REVOLVING FUND
PROJECT PLAN SUBMITTAL

Part 54, Safe Drinking Water Assistance, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended

Name of the Project

Grosse Pointe Park DWSRF Project Plan

Applicant's Federal Employer Identification Number (EIN)

Legal Name of Applicant (The legal name of the applicant may be different than the name of the project. For example, a county may be the applicant for bonding purposes, while the project may be named for the particular village or township it serves.)

City of Grosse Pointe Park, Michigan

Areas Served by this Project

Counties

Wayne

Congressional Districts

14

State Senate Districts

2

State House Districts

2

Address of Applicant

Street Address

15115 East Jefferson Avenue

PO Box

City	State	Zip
Grosse Pointe Park	MI	48230

Population Served by the Water Supplier

12,320 (in City provided by GLWA)

Water Supply Serial Number (WSSN)

02838

Brief Description of the Project

Replace water mains, lead service lines, and water meters within four project areas in the City.

Estimated Total Cost of the Project

$27,700,000

Construction Start Target Date

08/05/2022

Name and Title of Applicant's Authorized Representative

Name

Nick Sizeland

Title

City Manager

Telephone

(313) 822-6200

E-mail Address

sizelandn@grossepointepark.org

Address of Authorized Representative - if same as address above, check here ☑

Street Address 15115 East Jefferson Avenue

PO Box

City Grosse Pointe Park State MI Zip 48230

Signature of Authorized Representative	**Date**
Mich Hlud	06/30/2021

State approval of the water supplier's Surface Water Intake Protection Program is attached (if applicable) check here ☐

State approval of the water supplier's Wellhead Protection Program is attached (if applicable) check here ☐

Joint Resolution of Project Plan Adoption/Authorized Representative Designation is attached check here ☑

A final project plan, prepared and adopted in accordance with the Department's *Drinking Water State Revolving Fund Program Project Plan Preparation Guidance*, must be submitted by July 1st in order for a proposed project to be considered for placement on Michigan's Project Priority List for the next fiscal year.

Please send your final project plan with this form to your EGLE Water Infrastructure Financing Section Project Manager. Electronic submittal to Project Manager is acceptable.

WATER INFRASTRUCTURE FINANCING SECTION
FINANCE DIVISION
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
P O BOX 30457
LANSING MI 48909-7957

For information or assistance on this publication, please contact the Drinking Water State Revolving Fund, through EGLE Environmental Assistance Center at 800-662-9278. This publication is available in alternative formats upon request.

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This form and its contents are subject to the Freedom of Information Act and may be released to the public.

A RESOLUTION ADOPTING A FINAL PROJECT PLAN

FOR WATER SYSTEM IMPROVEMENTS AND

DESIGNATING AN AUTHORIZED PROJECT REPRESENTATIVE

WHEREAS, the City of Grosse Pointe Park *(legal name of applicant)* recognizes the need to make improvements to its existing water treatment and distribution system; and

WHEREAS, the City of Grosse Pointe Park *(legal name of applicant)* authorized OHM Advisors, Inc. *(name of consulting engineering firm)* to prepare a Project Plan, which recommends the construction of 81,800 ft of replacement or looping, 8-inch or larger water main, and replacement of 1,225 lead service lines and water meters.;

WHEREAS, said Project Plan was presented at a Public Hearing held on 07/12/2021 and all public comments have been considered and addressed;

NOW THEREFORE BE IT RESOLVED, that the City of Grosse Pointe Park *(legal name of applicant)* formally adopts said Project Plan and agrees to implement the selected alternative (Alternative) Alternative 1 with horizontal directionally drilled water main, lead service line replacement, and service meter replacement..

BE IT FURTHER RESOLVED, that the City Manager *(title of the designee's position)*, a position currently held by Nick Sizeland *(name of the designee)*, is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Drinking Water State Revolving Fund Loan to assist in the implementation of the selected alternative.

Yeas (names of Members voting Yes): Councilmembers Robson, Fluitt, Hodges, McConnell, Read, Relan and Mayor Denner

Nays (names of Members voting No):

I certify that the above Resolution was adopted by City Council of Grosse Pointe Park *(the governing body of the applicant)* on 07/12/2021.

BY: Nick Sizeland — City Manager

Name (please print or type) — Title

[signature] — 7/12/2021

Signature — Date