FINAL 25-YEAR CAPITAL IMPROVEMENTS PLAN

Southwest Suburban Denver
Water & Sanitation District

Jefferson County, Colorado

November 28th, 2016

25-Year Capital Improvements Plan
Southwest Suburban Denver Water and Sanitation District
Jefferson County, Colorado
November, 2016

Submitted To:

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Project No.: 14.0350

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1.0 Introduction, History, and Purpose

1.1 Introduction

This 25-Year Capital Improvement Plan (CIP) has been prepared for the Southwest Suburban Denver Water and Sanitation District (District) for planning purposes and for future capital improvements to their aging infrastructure. The District is located in unincorporated sections of Jefferson County, Colorado. The District provides sanitary sewer service to an area generally located between South Wadsworth Boulevard and South Kipling Street, from West Bowles Avenue to West Belleview Avenue, and between South Kipling Street and South Simms Street, from West Bowles Avenue to West Berry Avenue. The District covers the Governor's Ranch and Foothill Green subdivisions. It excludes the Southwest Plaza shopping center located on the northwest corner of South Wadsworth Boulevard and West Bowles Avenue. There are 2,071 residential sanitary sewer connections in the District. In addition to residential connections, the District also provides sanitary sewer service to five commercial areas, two schools, and a church. The commercial areas are located at the intersection of South Kipling Street and West Bowles Avenue (two areas on the northeast and northwest of this intersection), the southeast corner of South Kipling Street and West Belleview Avenue, the northeast corner of South Simms Street and West Brandt Place, and along South Wadsworth Boulevard between West Belleview Avenue and West Crestline Avenue.

The District currently owns and maintains approximately 109,750 linear feet of sanitary sewer collection piping system ranging in size from 8-inch diameter to 18-inch diameter. The District's sanitary sewer collection system connects at several locations to the Metro Wastewater Reclamation District's (Metro) "Coon Creek Main", which conveys wastewater from several water and sanitation districts in the southwestern Denver metro area to the Robert W. Hite Treatment Facility. Lakehurst Water and Sanitation District also connects to the Coon Creek Main where this main crosses South Kipling Street. This connection, and the location where the Coon Creek Main exits the District (at West Belleview Avenue and South Wadsworth Boulevard), are metered by Metro. The District is billed based on these flow meter readings and wastewater characteristics sampling analyzed for biochemical oxygen demand (BOD), total suspended solids (TSS), and total Kjeldahl nitrogen (TKN).

1.2 History

The bulk of the District's collection systems were constructed in the 1970's and 1980's with vitrified clay (VCP) and polyvinyl chloride (PVC) pipe. The majority of the system that was constructed prior to 1984 was constructed of VCP, and after 1984 mostly PVC was used. The Foothill Green subdivision, the portion of the District located west of South Kipling Street, was primarily constructed between 1977 and 1979 using VCP. The sanitary sewer collection system serving the Governor's Ranch subdivision located east of South Kipling Street was constructed primarily in the 1980's and contains a larger proportion of PVC mains. Required maintenance of the existing infrastructure has been performed over time and has become more frequent in recent years as infrastructure ages. Maps displaying the existing condition of the District's sanitary sewer collection system can be found in Appendix A (Figures A-1 – A-20). The existing conditions include the age, pipe material, and previous rehabilitation of sanitary sewer mains and manholes.

1.3 Purpose

According to the Environmental Protection Agency's (EPA's) 2008 *Asset Management: Best Practices Guide*, there are five important steps for preparation of a 25-Year CIP. These steps include:

- Determining the current state of assets;
- Establishing a sustainable level of service;
- Determining assets critical to system performance;
- Establishing the minimum life cycle cost; and
- Creating a long-term funding plan

In the past the District has implemented several of these procedures, such as determining the current state of assets through regular CCTV inspection. The District has requested their District Engineer, Martin/Martin Consulting Engineers (Martin/Martin), to develop this 25-Year CIP in conjunction with operations, maintenance, and asset management and a Geographical Information System (GIS). Current state of assets, critical assets, and other attribute data pertinent to system sustainability, life cycle cost, and long-term funding requirements have been compiled and recorded as part of the District's newly developed GIS. This datum was used to analyze the existing sanitary sewer collection systems and develop this CIP.

This CIP also serves to identify a sustainable level of service and a minimum life cycle cost associated with ownership, operations and maintenance of the sanitary sewer collection systems. While this CIP does not address an associated financial funding plan, this CIP intends to identify the need and requirement of such and to initiate discussion of the sustainable level of service that the District can afford to provide based on the minimum life cycle infrastructure costs projected over the next 25 years.

2.0 Existing Conditions of the District Infrastructure

Since Martin/Martin was hired as District Engineer in 2014, there have been multiple changes associated with the means and methods by which the District operates and maintains their infrastructure. These generally include updating and improving the efficiency of the cleaning and CCTV inspection schedule and creating a GIS database for the District.

The District sanitary sewer collection system is cleaned (jetted) once every three-years and televised once every six-years in accordance with EPA recommendations. There are several areas of the District that the previous District engineer had scheduled for accelerated cleaning based on historical increased amounts of roots, debris, and grease build-up within those areas. Martin/Martin has re-evaluated these identified areas for the need for increased cleaning and updated the accelerated cleaning schedule. Based on recent (past 2 years) cleaning reports, the current accelerated cleaning schedule appears appropriate. Over time there may be additional areas added to the accelerated cleaning schedule based on the findings of the regular cleaning and CCTV inspection.

2.1 Sanitary Sewer Collection System

The District's sanitary sewer collection system consists of approximately 21 miles of PVC and VCP pipe ranging in size from 8-inch to 18-inch in diameter. On-going periodic maintenance (cleaning and CCTV inspection) is required to keep the system operating efficiently and to mitigate the potential for backups and sanitary sewer overflows (SSOs). The portions of this system that were constructed with PVC pipe in the 1980s and 1990s are not expected to reach the anticipated design life (75 years) in the time period of this CIP. VCP gravity sewer mains have a shorter anticipated design life than PVC mains because VCP mains have lower material strength, more joints, and can degrade over time. Rehabilitation methods such as Cured-in-Place Pipe (CIPP) lining can be used to extend the design life of existing VCP mains where feasible. This method allows in place rehabilitation instead of excavating and removing/replacing these mains. In the past, the District has undertaken projects to CIPP line, line with other materials (i.e. slip-lining with plastic pipe), or replace sanitary sewer mains. Table 2.1 below summarizes the original construction year and pipe material of the District's sanitary sewer mains as well as improvements undertaken to date.

There are 571 concrete sanitary sewer manholes, typically spaced 200 feet apart, within the District. Recent manhole maintenance has been conducted for manhole cover ring support issues and interior manhole deterioration from sewer gases. Approximately 30% of the District's manholes have observed defects causing groundwater infiltration to enter the sanitary sewer collection system. In the recent past, the District has undertaken projects to line manholes with observed infiltration with epoxy coatings. Capital projects to line manholes with infiltration and corrosion are expected to continue through the planning period of this CIP.

Table 2.1: Sanitary Mains Existing Conditions

Year Built	VCP Length (LF)	PVC Length (LF)	Total Length (LF)	CIPP Length (LF)	Other Lined Length (LF)	Replaced Length (LF)	Total Length Improved (LF)	% Improved
1977	9,687	0	9,687	4,265	1,713	809	6,787	70.1%
1978	33,736	0	33,736	6,920	10,209	1,864	18,993	56.3%
1979	7,910	0	7,910	1,965	1,236	0	3,201	40.5%
1982	9,087	3,188	12,275	1,322	0	175	1,497	12.2%
1983	1,862	7,706	9,568	0	0	0	0	0.0%
1984	0	2,999	2,999	0	0	0	0	0.0%
1986	120	22,453	22,573	0	120	0	120	0.5%
1987	0	166	166	0	0	0	0	0.0%
1989	0	3,323	3,323	0	0	0	0	0.0%
1993	0	3,181	3,181	0	0	0	0	0.0%
1994	0	3,917	3,917	0	0	0	0	0.0%
2010	0	411	411	0	0	0	0	0.0%
Total	62,402	47,344	109,746	14,472	13,278	2,848	30,598	27.9%

3.0 Capital Improvements

Since Martin/Martin became District Engineer in 2014 several capital improvements have been undertaken on an as needed basis in the District. These projects included manhole rehabilitation lining to mitigate corrosion and infiltration, cured-in-place pipe (CIPP) lining, and removal/replacement of sewer mains. This 25-Year CIP seeks to identify future locations where capital improvements are anticipated and to plan for these projects instead of completing them on an emergency or as needed basis. For the purpose of this CIP, it was assumed that increased maintenance would be undertaken to extend the useful design life of District infrastructure such that some capital improvements will not be need within the planning period of this CIP.

3.1 Sanitary Sewer Collection System

As previously stated, the sanitary sewer collection system is constructed of a combination of VCP and PVC pipe. The actual useful life of PVC pipe is not currently documented, since pipe material failure due to age has not been documented since its introduction into the industry over 50 years ago. Some sources indicate a useful life may be as much as 75 or 100 years. For purposes of this CIP, a 75-year design life will be used. The parts of the sanitary sewer system constructed with PVC pipe will not reach the 75-year design life within the timeframe of this CIP (2016 through 2040).

VCP water/wastewater conveyance systems do not have as long of a design life as PVC pipe. VCP has a lower material strength and is more susceptible to corrosion, root intrusion, and other types of pipe degradation. There are several methods used in the industry to rehabilitate VCP mains and to extend the design life of these systems. In the past, the District has undertaken capital improvements to line VCP mains either through CIPP lining or slip-lining, where plastic pipe is pulled through an existing VCP main. The District has also replaced several VCP mains with PVC pipe. CIPP lining is the most cost effective method to rehabilitate VCP sanitary sewer mains currently available in the industry. Based on the system age and the anticipated design life, all the VCP sewer mains in the system are planned to be CIPP lined within the timeframe of this CIP. Older VCP sewer mains and mains that have been observed, by CCTV inspection to have pipe defects, are planned to be lined in earlier planning phases of this CIP. Table 3.1 below summarizes the CIPP improvements planned for the timeframe of this CIP and the primary reason for the improvement.

PVC pipe material is more resistant to corrosion, root intrusion, and pipe degradation than other pipe materials such as VCP, however, buried PVC pipe can be more susceptible to earth movement due to its flexibility. Sags, deformation, and offset/separated joints can result from earth movement from normal physical cycles such as freeze/thaw, expansion of clayey soils, groundwater, or induced pressures such as traffic loads and vibrations. These defects could require replacement of the sewer main should flow be impeded. Point repairs may also be required to mitigate infiltration or exfiltration issues. The District's on-going maintenance program has identified sanitary sewer pipes with these defects through the use of CCTV inspection. Utilizing the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP), which is the industry standard for categorizing pipe defects through CCTV inspection, Martin/Martin has compiled pipe defect data for the sanitary sewer mains in the District. This data has been entered into a GIS database format. Pipe defects have been graded on a scale from 1 to 5

based on the severity of the defect by using the PACP protocol; a grade of 1 being the least severe and 5 being the most severe.

Martin/Martin anticipates that sewer mains with sags and deformations may need to be replaced from manhole to manhole over the time period of this CIP. There is a greater risk of catastrophic pipe failure in VCP mains with deformations than in PVC mains. The PVC pipe material is more resistant to the cracking, fracturing, and/or collapsing of the pipe that can result from deformations in VCP mains. For sewer mains with sags, Martin/Martin compared the age of the particular sewer main against the severity of the sag and estimated when the sag might exceed a PACP grade of 4 (> 50% of the pipe diameter). In areas where pipe deformations were observed, the most severe cases (PACP Grade 5) were planned for replacement within 5 years, PACP Grade 4 were planned for replacement within 10 years, Grade 3 were planned for within 15 years, Grade 2 were planned for replacement in 20 years, and Grade 1 were planned for replacement within 25 years. Many of the mains with sags and deformations may not require replacement within the planning period of this CIP. Accelerated cleaning and CCTV inspection could be used to mitigate the potential for building up solids and debris. Capital improvements for sags and deformations were estimated assuming that any mains with existing sags with PACP grades of 2 or less could be sufficiently maintained and replacement would not be necessary within the timeframe of this CIP. Table 3.2 below summarizes the removal and replacement planned for the timeframe of this CIP and the primary reason for the repair.

Other pipe defects such as cracks, fractures, holes, and offset/separated joints have also been found by past CCTV inspection and have been recorded in the District's GIS database. These defects were also graded using PACP and these defect grades were used to prioritize and schedule point repairs. All needed point repairs were scheduled to be completed within the first 5 years of this plan's timeframe (2016 – 2020), the most severe being scheduled first and least severe, based on PACP, being scheduled in subsequent years. It is anticipated that point repairs will be needed throughout the 25-year planning period of this CIP. For planning purposes, Martin/Martin estimates there may be 10 point repairs required during each 5-year planning phase.

In previous years, the District has undertaken several projects to line manholes that have corrosion, degradation, and/or infiltration issues. Manholes have been lined with epoxy coating that provides a barrier to corrosive microorganisms/gases and seals cracks/holes against groundwater infiltration. The District's cleaning contractor provides manhole inspections following the National Association of Sewer Service Company's (NASSCO) Manhole Assessment and Certification Program (MACP) protocol for identifying manhole defects. These observations have been recorded in the District's GIS database and were used to prioritize and schedule manhole lining projects. Manhole defects are given a grade between 1 and 5 similarly to PACP grading, with 1 being the least severe and 5 being the most severe. In total, 166 (29%) manholes have been identified to date to have some degree of infiltration. Manholes with the most severe amount of infiltration (MACP grade 3 through 5, 11 total manholes) are scheduled to be lined in Phase I of this CIP as well as any manholes with grade 2 infiltration that were constructed prior to 1980. The 57 manholes that have been identified to date with grade 2 infiltration have been scheduled for lining in Phase I and II of this CIP, and the remainder of the manholes identified with grade 1 infiltration have been scheduled for lining in Phases III – V of this CIP. Based on previous experience and age of the sanitary sewer collection system, it is anticipated that in later phases of this CIP there will be additional manholes identified

to have infiltration. For planning purposes an additional 10 manholes each in Phases III, IV, and V are scheduled to be lined to mitigate infiltration. Table 3.3 below summarizes the number of manholes to be lined within each 5-year phase of this report and Figures A-1 – A-20 in Appendix A indicates the current condition of the District's sanitary sewer manholes.

Table 3.1: CIPP Capital Improvements

Phase	CIPP Length (LF)	Primary Reason for Repair (LF)					
		Infiltration	Cracks	Fractures	Roots	Age	Combination
I (2016 – 2020)	5,480	465	528	132	734	351	3,270
II (2021 – 2025)	8,241	0	2,514	0	596	0	5,131
III (2026 – 2030)	7,844	0	0	0	0	3,978	3,866
IV (2031 – 2035)	5,744	0	0	0	0	5,491	253
V (2036 – 2040)	3,379	0	224	0	0	2,536	619

Table 3.2: Remove/Replace Capital Improvements

Phase	Replace Length (LF)	Primary Reason for Repair (LF)	
		Deformed	Sag
I (2016 – 2020)	634	530	104
II (2021 – 2025)	573	173	400
III (2026 – 2030)	710	237	473
IV (2031 – 2035)	432	432	0
V (2036 – 2040)	132	0	132

Table 3.3: Anticipated Manhole Lining Schedule

Phase	Manholes with Identified Infiltration	Additional Manholes with Infiltration	Total Manholes to be Repaired
I (2016 – 2020)	24	0	24
II (2021 – 2025)	33	0	33
III (2026 – 2030)	40	10	50
IV (2031 – 2035)	35	10	45
V (2036 – 2040)	34	10	44

4.0 Phase I Planning – 2016 through 2020

Due to the age of the District's sanitary sewer and underdrain collection system infrastructure, several capital improvements are anticipated to take place during the first 5-year phase of the 25-year CIP planning timeframe. Martin/Martin anticipates most of the capital improvements cost to come from sanitary sewer main replacements. It was assumed that all the VCP mains should be lined sometime over the planning period of this report. Thus, this lining was divided evenly over each of the 5 planning phases, with mains that have existing defects being scheduled for lining first. Figures and tables summarizing all the anticipated capital improvements for Phase I of this CIP can be found in Appendix B.

Costs to complete expected capital improvements was estimated based on recent capital improvement bid tabs, quotations, and proposals for similar work. The anticipated total cost for capital improvements from 2016 through 2020 is approximately $ 691,400 or $ 138,280 per year. Table 4.0 in Appendix G summarizes the anticipated capital improvements cost for all phases of this CIP. Table 4.1 below summarizes the anticipated capital improvements required for planning Phase I and the expected cost for these improvements.

Table 4.1: Phase I Anticipated Capital Improvement

Improvement	Quantity	Anticipated Unit Cost	Anticipated Total Cost
Cured-in-Place Pipe Lining	5,480 LF	$ 35	$ 191,800
Main Replacement	634 LF	$ 400	$ 253,600
Point Repair	10 Ea.	$ 15,000	$ 150,000
Manhole Lining	24 Ea.	$ 4,000	$ 94,000
		Phase I Total=	**$ 691,400**
		Phase I Total per Year=	**$ 138,280**

5.0 Phase II Planning – 2021 through 2025

There are several capital improvement projects anticipated for Phase II of this 25-year CIP. These projects are expected to include sanitary sewer main replacements, point repairs, and cured-in-place pipe lining. Over 8,200 LF of existing VCP mains were scheduled for CIPP lining in this phase. There are also almost 600 LF of mains anticipated to require replacement in this phase. These mains have existing observed defects such as fractures, cracks, severe sags, and deformations. Figures and tables showing the anticipated capital improvements for this phase can be found in Appendix C.

Costs to complete anticipated capital improvements were estimated based on recent capital improvement bid tabs, quotations, and proposals for similar work. The future cost was calculated using the future value formula in Microsoft Excel. A conservative 4% interest rate was used in this calculation to forecast the future cost of capital improvements in Phase II of this CIP. The anticipated total cost for capital improvements from 2021 through 2025 is $ 980,000 or $ 200,000 per year. Table 5.1 below summarizes the anticipated capital improvements required for planning Phase II and the expected cost for these improvements.

Table 5.1: Phase II Anticipated Capital Improvements

Improvement	Quantity	Anticipated Unit Cost	Anticipated Total Cost
Cured-in-Place Pipe Lining	8,241 LF	$ 43	$ 354,363
Main Replacement	573 LF	$ 490	$ 280,770
Point Repair	10 Ea.	$ 18,300	$ 183,000
Manhole Lining	33 Ea.	$ 4,900	$ 161,700
		Phase II Total=	**$ 979,833.00**
		Phase II Total per Year=	**$ 195,966.60**

6.0 Phase III Planning – 2026 through 2030

In addition to point repairs, manhole lining, and other manhole repairs, it is anticipated that over 700 LF of sewer mains will need to be replaced in Phase III of this CIP. All of the scheduled main replacements in this phase are mains that have been previously observed to have sags or deformation. These mains were estimated to require replacement in this phase because we project that the severity of the sag may be such that increased build-up of debris impedes flow. Some of this risk may be mitigated by accelerated cleaning of the mains observed to have sags. Figures and tables showing the anticipated capital improvements for this phase can be found in Appendix D.

Costs to complete expected capital improvements was estimated based on recent capital improvement bid tabs, quotations, and proposals for similar work. The future cost was calculated using the future value formula in Microsoft Excel. A conservative 4% interest rate was used in this calculation to forecast the future cost of capital improvements in Phase III of this CIP. The anticipated total cost for capital improvements from 2026 through 2030 is $ 1.35 million or $ 271,000 per year. Table 6.1 below summarizes the anticipated capital improvements required for planning Phase III and the expected cost for these improvements.

Table 6.1: Phase III Anticipated Capital Improvement

Improvement	Quantity	Anticipated Unit Cost	Anticipated Total Cost
Cured-in-Place Pipe Lining	7,844 LF	$ 52	$ 407,888
Main Replacement	710 LF	$ 600	$ 426,000
Point Repair	10 Ea.	$ 22,350	$ 223,500
Manhole Lining	50 Ea.	$ 5,950	$ 297,500
		Phase III Total=	**$ 1,354,888.00**
		Phase III Total per Year=	**$ 270,977.60**

7.0 Phase IV Planning – 2031 through 2035

It is anticipated that sewer main replacements will continue in Phase IV of this 25-Year CIP. Under this scenario there are 432 LF main replacements anticipated for this phase. Cured-in-Place Pipe (CIPP) lining will continue in this phase of the capital improvements plan, with 5,744 LF being planned for lining. Figures and tables showing the anticipated capital improvements for this phase can be found in Appendix E.

Costs to complete expected capital improvements were estimated based on recent capital improvement bid tabs, quotations, and proposals for similar work. The future cost was calculated using the future value formula in Microsoft Excel. A conservative 4% interest rate was used in this calculation to forecast the future cost of capital improvements in Phase IV of this CIP. The anticipated total cost for capital improvements from 2026 through 2030 is $ 1.29 million or $ 259,000 per year. Table 6.1 below summarizes the anticipated range of capital improvements required for planning Phase IV and the expected cost for these improvements.

Table 7.1: Phase IV Anticipated Capital Improvement

Improvement	Quantity	Anticipated Unit Cost	Anticipated Total Cost
Cured-in-Place Pipe Lining	5,744 LF	$ 64	$ 367,616
Main Replacement	432 LF	$ 750	$ 324,000
Point Repair	10 Ea.	$ 27,300	$ 273,000
Manhole Lining	45 Ea.	$ 7,300	$ 328,500
		Phase IV Total=	**$ 1,293,116.00**
		Phase IV Total per Year=	**$ 258,623.20**

8.0 Phase V Planning – 2036 through 2040

There are several capital improvement projects anticipated for Phase V of this 25-year CIP. These projects are expected to include sanitary sewer main replacements, point repairs, and cured-in-place pipe lining. Almost 3,400 LF of existing VCP mains were scheduled for CIPP lining in this phase. There are also 132 LF of mains anticipated to require replacement in this phase. Figures and tables showing the anticipated capital improvements for this phase can be found in Appendix F.

Costs to complete expected capital improvements were estimated based on recent capital improvement bid tabs, quotations, and proposals for similar work. The future cost was calculated using the future value formula in Microsoft Excel. A conservative 4% interest rate was used in this calculation to forecast the future cost of capital improvements in Phase V of this CIP. The anticipated total cost for capital improvements from 2036 through 2040 is $ 1.11 million or $ 221,500 per year. Table 6.1 below summarizes the anticipated capital improvements required for planning Phase V and the expected cost for these improvements.

Table 8.1: Phase V Anticipated Capital Improvement

Improvement	Quantity	Anticipated Unit Cost	Anticipated Total Cost
Cured-in-Place Pipe Lining	3,379 LF	$ 78	$ 263,562
Main Replacement	132 LF	$ 900	$ 118,800
Point Repair	10 Ea.	$ 33,350	$ 333,500
Manhole Lining	44 Ea.	$ 8,900	$ 391,600
		Phase V Total=	**$ 1,107,462.00**
		Phase V Total per Year=	**$ 221,492.40**

APPENDIX G – CAPITAL IMPROVEMENTS COST ESTIMATION

SOUTHWEST SUBURBAN WATER & SANITATION DISTRICT
DENVER

MARTIN/MARTIN
CONSULTING ENGINEERS

Table 4.0: Anticipated Cost Calculations

Phase I (2016 - 2020)				
Improvement	Quantity	Units	Anticipated Unit Cost	Anticipated Total Cost
Cured-in-Place Pipe Lining	8,417	LF	$ 35.00	$ 294,595.00
Main Replacement	634	LF	$ 400.00	$ 253,600.00
Point Repair	10	EA	$ 15,000.00	$ 150,000.00
Manhole Lining	24	EA	$ 4,000.00	$ 96,000.00
			Phase I Total =	**$ 794,195.00**
			Phase I Total per Year =	**$ 158,839.00**

Interest rate: 4%

Phase II (2021 - 2025)						
Improvement	Quantity	Units	Anticipated Unit Cost	Anticipated Total Cost	Round Unit Cost	Round Total Cost
Cured-in-Place Pipe Lining	8,241	LF	$ 42.73	$ 352,178.15	$ 43.00	$ 354,363.00
Main Replacement	573	LF	$ 488.40	$ 279,852.42	$ 490.00	$ 280,770.00
Point Repair	10	EA	$ 18,314.95	$ 183,149.49	$ 18,300.00	$ 183,000.00
Manhole Lining	33	EA	$ 4,883.99	$ 161,171.55	$ 4,900.00	$ 161,700.00
			Phase II Total =	**$ 976,351.61**		**$ 979,833.00**
			Phase II Total per Year =	**$ 195,270.32**		**$ 195,966.60**

Phase III (2026 - 2030)						
Improvement	Quantity	Units	Anticipated Unit Cost	Anticipated Total Cost	Round Unit Cost	Round Total Cost
Cured-in-Place Pipe Lining	8,181	LF	$ 52.18	$ 426,877.58	$ 52.00	$ 425,412.00
Main Replacement	710	LF	$ 596.33	$ 423,396.48	$ 600.00	$ 426,000.00
Point Repair	10	EA	$ 22,362.49	$ 223,624.90	$ 22,350.00	$ 223,500.00
Manhole Lining	50	EA	$ 5,963.33	$ 298,166.54	$ 5,950.00	$ 297,500.00
			Phase III Total =	**$ 1,372,065.50**		**$ 1,372,412.00**
			Phase III Total per Year =	**$ 274,413.10**		**$ 274,482.40**

Phase IV (2031 - 2035)						
Improvement	Quantity	Units	Anticipated Unit Cost	Anticipated Total Cost	Round Unit Cost	Round Total Cost
Cured-in-Place Pipe Lining	5,787	LF	$ 63.71	$ 368,692.99	$ 64.00	$ 370,368.00
Main Replacement	432	LF	$ 728.12	$ 314,548.12	$ 750.00	$ 324,000.00
Point Repair	10	EA	$ 27,304.52	$ 273,045.24	$ 27,300.00	$ 273,000.00
Manhole Lining	45	EA	$ 7,281.21	$ 327,654.29	$ 7,300.00	$ 328,500.00
			Phase IV Total =	**$ 1,283,940.65**		**$ 1,295,868.00**
			Phase IV Total per Year =	**$ 256,788.13**		**$ 259,173.60**

Phase V (2036 - 2040)						
Improvement	Quantity	Units	Anticipated Unit Cost	Anticipated Total Cost	Round Unit Cost	Round Total Cost
Cured-in-Place Pipe Lining	3,641	LF	$ 77.79	$ 283,234.75	$ 78.00	$ 283,998.00
Main Replacement	132	LF	$ 889.03	$ 117,352.33	$ 900.00	$ 118,800.00
Point Repair	10	EA	$ 33,338.73	$ 333,387.31	$ 33,350.00	$ 333,500.00
Manhole Lining	44	EA	$ 8,890.33	$ 391,174.45	$ 8,900.00	$ 391,600.00
			Phase V Total =	**$ 1,125,148.84**		**$ 1,127,898.00**
			Phase V Total per Year =	**$ 225,029.77**		**$ 225,579.60**

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