Draft – 2009 Wastewater Master Plan

Prepared for

City of Milwaukie
6101 SE Johnson Creek Blvd.
Milwaukie, OR 97206

Prepared by

Parametrix
700 NE Multnomah, Suite 1000
Portland, OR 97232-4110
503-233-2400

With the cooperation of

Cascade Design Professionals, Inc.
2780 SE Harrison, Suite 104
Milwaukie, OR 97222
503-652-9090

Financial Consulting Solutions Group, Inc.
14020 SE Johnson Road, Suite 205
Milwaukie, OR 97267
503-353-7440

Portions of this document were prepared in 2004 by

Crane and Merseth Engineering/Surveying
6566 SE Lake Road, Suite D
Milwaukie, OR 97222
503-654-2005

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INTRODUCTION

Parametrix was selected in February 2008 to prepare an update to the City's Wastewater Master Plan. This update completes work prepared by Crane and Merseth Engineering in 2004 which provided a summary of the existing system, a list of projects for the existing system Capital Improvements Plan (CIP), several options for sewering areas presently unsewered, system hydraulic modeling, and general background data. The 2009 Update summarizes Crane and Merseth's work, provides a link to future planning and CIP tasks, recommends future maintenance projects for the collection system, offers technical assistance to sewering of portions of the existing system, reviews existing Intergovernmental Agreements (IGAs) with neighboring public agencies, and assess staffing needs.

The intent of this introduction is to provide City Staff and Council with a brief overview of previous planning work to help bridge the understanding of previous planning efforts with this current effort.

EXECUTIVE SUMMARY

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Chapter 1, The Existing System Summary. This chapter provides a summary of the existing sanitary sewer collection system. The following is a brief review of key aspects provided within this chapter:

- Current (2008) service population of 20,915.
- Year 2028 service population of 25,998.
- Approximately 396,327 feet (75.1 miles) of collection system piping.
- Approximately 1650 manholes.
- Five raw sewage pumping stations.
- Wastewater treatment provided by the Kellogg Creek wastewater treatment facility.

Chapter 2, The Existing System Study Area Definition. This chapter describes the study area considered. Figures are provided that depict the Milwaukie service area and collection system sub basins. The six major collection system sub basins are North Milwaukie, Mid-Milwaukie, Johnson Creek, South Milwaukie, Harmony, and Lower Kellogg. The chapter notes that sanitary sewer service is provided by the Clackamas County Service District No. 1 (CCSD #1) in some areas on the east and south sides of Milwaukie. Service billings from CCSD #1 to Milwaukie are based on flow recorded by meters. These billings pay for services provided by CCSD #1.

The city of Portland borders Milwaukie on the north and provides sewer service as far south as Johnson Creek Blvd. Service is provided through the Lents trunk line. Milwaukie pays Portland a charge based upon water consumption records for approximately 15 residential and commercial properties connected to the Lents line.

The Oak Lodge Sanitary District provides sanitary sewer service near the southwest perimeter of the Milwaukie system. An agreement between the Oak Lodge Sanitary District and the City governs the charges Milwaukie pays for the collection and treatment of sewage from these customers.

Chapter 3, The Existing System Current and Future Conditions. The intent of this chapter is to provide a baseline for existing conditions and estimate future flow impacts if full

build out were to occur. Chapter 4 contains a more detailed discussion of the existing sanitary sewer system. The characteristics of each basin are described in detail. Information provided for each basin includes service acreage, current and future EDU's served, current and future peak flows, length of piping, and existing information on pump stations and flowmeters. The chapter also contains a summary of the existing system deficiencies and an infiltration and inflow analysis by basin.

Chapter 4, The Existing System Future Flows Analysis. This chapter updates demographic projections from the 1994 Master Plan. It outlines the methodology used for collection system modeling using the hydraulic model Storm Water Management Model (SWMM). Sewage quantity parameters used in modeling and the availability of flow data were also described in this chapter. Flow data includes portable flowmeter data gathered by City staff from several locations in the collection system. This field data was used to establish diurnal flow patterns. In addition, flow information was used from the Harmony meter and the Milwaukie meter to provide modeling data. The completed model along with an operating guide was provided as part of Crane and Merseth's work.

Chapter 5, The Existing System Capital Improvement Projects Identification. This chapter provides a review of the CIP projects identified in the 1994 Master Plan. Eight of the 13 projects identified have been completed or terminated. The remaining five projects were included in the CIP recommendations listed below. This chapter also reviewed Kellogg Creek wastewater treatment plant options. The chapter then proceeded on a basin by basin basis to outline the current CIP recommendations. These are summarized below:

- Decommission Kellogg Creek WWTP, construction of pump station and force main
- Construct a 200 foot bypass around the Lakeside Apartments.
- Initiate a detailed flow monitoring program.
- Conduct CCTV inspections of all basins.
- Monitor flows in the Brookside trunkline; replace 1040 feet of trunkline with 12 inch piping.
- Jefferson Street to Kellogg WWTP, replace existing sewer with 30 inch line or construct a 21 inch parallel sewer line.

Chapter 6, CCSD#1 Agreements. This chapter provides a review of previous agreements with CCSD#1, a review of the prposed Intergovernmental Agreement (IGA) between CCSD#1 and Milwaukie, and makes recommnedations for consideration by Milwaukie regarding the proposed IGA.

Chapter 7, Collection System Asset Management. This chapter provides an abbreviated sewer collection system asset management strategy for the City of Milwaukie. It will enable the City to make informed decisions on how to most effectively allocate resources for capital improvements to the collection system on an annual basis.

Chapter 8, Waverly Heights Sewer System Analysis, The purpose of this chapter is to provide an analysis of the existing sewer collection system within Waverly Heights, a residential neighborhood within the city of Milwaukie, in terms of existing lateral conditions and recommendations for future sewer service. Several viable options for the City of Milwaukie to improve the management of the sanitary sewer system within the Waverly Heights community are presented.

Chapter 9, Lents Sewer Line Analysis. The purpose of this chapter is to provide an analysis of the existing sewer collection system of the Lents Trunk line and the City of Milwaukie's agreement with the City of Portland The Lents Trunk line begins near 162nd Avenue and SE

Foster Road and ends in the Sellwood neighborhood of Portland at the Willamette River. The location of the Lents Trunk line can be seen in Figure 9-1.

Chapter 10, Staffing Needs. The purpose of this chapter is to provide a recommendation for staffing needs within the City of Milwaukie's Engineering and Wastewater Operations departments.

Chapter 11, Dual Interest Area A Financing Options, The City of Milwaukie is working cooperatively with CCSD #1 to provide sewer service to an area known as Dual Interest Area A. This area is located in northeast Milwaukie and is roughly bounded on the east by Linwood Avenue, on the north by West Fork Avenue, on the west by Stanley Avenue, and on the south by King Road. The area is located outside the Milwaukie City Limits and within the City's Urban Growth Management Area. CCSD #1 is serving as the lead agency for the overall project, while Milwaukie is leading the effort for the portion of the project for which they will assume ownership.

The purpose of this chapter is to provide information on the funding and implementation of the project. Project funding will be through DEQ's Clean Water State Revolving Fund (CWSRF) low-interest loan program. A spreadsheet illustrating a probable loan repayment schedule is provided.

Chapter 12, Cost of Service Study. A cost of service study was done (an update of one done for the City in 2005). The study addresses the planned capital improvements, and also provides a defensible wastewater SDC to generate funding to meet the infrastructure needs of growth without unduly burdening existing residents and business owners.

STUDY RECOMMENDATIONS

This study makes the following recommendations:

1. Implement the Capital Improvement Projects (CIP) as listed in Chapter 5. The utility's rate structure should include provision for construction of the CIP.
2. Begin capital reserve funding for asset management by funding system replacement with a rate that recognizes and accounts for depreciation of the system. Following the recommendations of this plan, which identifies specific areas to be corrected after prioritizing the inspected system, continue to inspect the system and prioritize corrective action.
3. Obtain easements for the existing Waverly area sewer where they do not exist. Plan for option 4, from the alternatives section of chapter 8, as the ultimate solution for this area's collection issues.
4. Conduct a study of the City boundary for interjurisdictional connections and draft new IGA's with those providers to provide a clear understanding of billing and maintenance issues.
5. Begin funding of the Capital Maintenance Program per chapter 7.
6. Implement the new SDC and Rate recommendation of chapter 12.

SUPPORTING DOCUMENTS

Information contained in this plan was obtained from Milwaukie Public Works Engineering and Operations records and staff, the Sewerage Facilities Plan, 1994 – CH2M Hill, Clackamas County Water Environment Services, the City of Portland Bureau of Environmental Services, and the Oak Lodge Sanitary District. Earlier engineering studies including the Evaluation of Central Milwaukie and Brookside Basin Sanitary Sewers, (Rehabco Pipe Services, March 1985), Johnson Creek Area Sanitary Sewer Study, (Clackamas County, 1989), Johnson Creek Sanitary Sewer Feasibility Study) (CH2M Hill, January 2004) were used to provide background information for the study.

CHAPTER 1. THE EXISTING SYSTEM SUMMARY

STUDY FINDINGS

Milwaukie currently (Dec 2008) provides sanitary sewer service to about 20,915 people, a population which is expected to increase to about 25,998 by the year 2028. Milwaukie's sanitary sewer customers are comprised of single and multifamily residences and commercial, institutional, and industrial customers.

This study found that the City's sanitary sewer system is well operated and provides for public health in a safe, economical fashion. No significant problems were identified and the system operates within the rules and regulations as set forth by the Department of Environmental Quality. Milwaukie relies on Clackamas County for sewage treatment services at the Kellogg Creek Wastewater Treatment Facility, located on the Willamette waterfront near Jefferson Street.

The sanitary sewer utility has about 396,327 feet (75.1 miles) of pipe, about 1615 manholes and five raw sewage pumping stations. All routine maintenance of the system is provided by City public works staff. In addition, public works staff is responsible for system inventory, scheduled inspections, emergency call-outs, flow monitoring, and new construction inspection. Occasionally, City staff is used for new, or replacement construction projects when the project is small and time and staff are available.

Milwaukie has provided sanitary sewer service to its citizens since about 1926. Earliest service included sanitary sewers discharging to local streams. In the 1950's, the City constructed a wastewater treatment plant along Johnson Creek, west of Highway 99E. All sewers conveyed sewage to the plant until 1973 at which time Milwaukie began receiving treatment service from Clackamas County at their Kellogg Creek Wastewater Treatment Plant. This facility continues to provide service to the city.

With construction of the Kellogg Creek plant and construction of sanitary sewers to many unincorporated areas east of the city, Milwaukie was able to provide service to areas previously unserved. Currently, most of Milwaukie's sewage flows by gravity directly to the treatment plant. Sewage from the southeast area of the city flows to a metering station on Lake Road where it enters the Clackamas County system. Sanitary sewage is also pumped from small stations on the east side of the city into upper portions of the Clackamas County system.

CHAPTER 2. THE EXISTING SYSTEM STUDY AREA DEFINITION

CITY OF MILWAUKIE

The City serves almost all of the population within its boundaries with sanitary sewer service. Figure 2-1 shows the current city limit line, the Urban Growth Management Area (UGMA), and highlights the current area within the city limits where sanitary sewer service is provided. The UGMA contains about 6,870 acres while the City currently serves about 3081 acres of that area within the city limits.

Figure 2-2 shows the current City's sanitary sewer service area and city limit. This figure also shows the major drainage basins of the City's sanitary sewer system. The City's sewer system is divided into six discrete basins, generally defined by topography, each with a discrete outlet for sanitary sewage collected in the basin. In most cases, flows from these basins are combined prior to reaching their terminus at the Kellogg Creek Wastewater Treatment Facility. These six major basins are named:

- North Milwaukie,
- Mid-Milwaukie,
- Johnson Creek,
- South Milwaukie,
- Harmony, and
- Lower Kellogg.

Most of the City's service area is contained within three of the basins; North Milwaukie, Mid-Milwaukie and Harmony. These three basins account for 2,717 acres of the served area.

The remaining three basins, with a total of 364 acres are much smaller and are located on the north and south fringes of the city. It is unlikely that any of these three small basins will increase in size as the city grows. Sewage from the Johnson Creek basin is directed into the City of Portland's sanitary sewer system, and sewage from the Lower Kellogg basin flows directly into the Clackamas County Service District No. 1 system.

ADJACENT SERVICE PROVIDERS

Due to topographical constraints with service boundaries, districts are often faced with inter-connections with adjacent entities. Milwaukie is bordered by three separate service providers which have connections to our system as well as Milwaukie connections to theirs. These connections cause confusion due to multiple utility bills and necessary follow ups between billing departments. It is recommended that the City conduct a study that analyzes the interjurisdictional accounts and provides a billing process that is accurate and efficient.

Figure 2-1. City Limits and Urban Growth Management Boundary

Figure 2-2. Sub-Basin Boundaries

Clackamas County Service District No. 1

Sanitary sewage service is provided to areas east and south of the city by CCSD #1. This large system provides sanitary sewer service to most of the urbanized area of the county outside the incorporated areas. Portions of the Milwaukie sewer system discharge directly to the CCSD #1 system, either through small pumped areas on the east side of the city or by direct gravity service (Lower Kellogg Basin) along Kellogg Creek to the south.

The Harmony Basin, a large area serving the southeast third of the city also discharges to the CCSD #1 system. Flows from this area are large enough that a special meter located near the intersection of SE Harmony and SE Linwood was installed to measure the quantity of sewage discharged from Milwaukie to the CCSD #1 system. This is one of the two meters that record flows that the service billings from Clackamas County to Milwaukie are based on.

City of Portland

The City of Portland borders Milwaukie on the north, providing service as far south as Johnson Creek Boulevard. Portland's Lents Trunk line is a large sanitary sewer trunk line located along the Springwater Trail near Johnson Creek. The location of this line provides service to several Milwaukie residences and commercial areas along Johnson Creek Blvd. Sewage from the small Johnson Creek Pump Station (S4) is also directly pumped into the Lents Trunk. Milwaukie pays the City of Portland a charge based upon water consumption records for approximately 15 residential and commercial properties connected to the Lents Trunk. Sewage from the Precision Castparts plant is also collected by the Lents Trunk line through a gravity connection.

The City of Milwaukie has studied the feasibility and cost of diverting the flows from Precision Castparts and nearby commercial properties into the Milwaukie system. A study by CH2M Hill in January 2004 has shown that the cost of making this change is expensive and no change in the system is warranted.

The City is currently under contract (4/2009) for the design to provide sanitary service for the area referred to as the Dual Interest Area "A." The construction of this project will send additional flow to the Lents line. These connections and flows need to be accounted for following accordance with the current wastewater agreement the City has with Portland.

Oak Lodge Sanitary District

The Oak Lodge Sanitary District provides sanitary sewage service at the southwest perimeter of the Milwaukie system through agreement between the City and the District. Several Milwaukie residences, both single and multi-family, are connected to the Oak Lodge system. Sewage flows are routed to Oak Lodge because the topography of this area allows the use of gravity service without the use of a pump station. Milwaukie pays a charge to the Oak Lodge Sanitary District for collection and treatment of sewage from these customers. The City has no plans to change this part of the system in the foreseeable future. There are also accounts that are billed to the Oak Lodge Sanitary District for residences located in the sewer district, and outside the city and served by the City's collection system.

CHAPTER 3. THE EXISTING SYSTEM CURRENT AND FUTURE CONDITIONS

A number of parameters must be considered when evaluating the current and future potential of the sanitary sewer system to provide safe, economical service to the customers of the City. Major parameters include the inventory of the existing system, current and projected population, service area boundary, land use and zoning, geographic areas that may be added to the system, condition of the existing system, and operation and maintenance functions and programs.

EXISTING SANITARY SEWER SYSTEM

The existing sanitary sewer system is shown on Figure 3-1. The City's sanitary sewer system is divided into six basins based on their topography, each with an outlet for sanitary sewage collected in the basin. These basins are named: North Milwaukie, Mid-Milwaukie, Johnson Creek, South Milwaukie, Harmony, and Lower Kellogg.

These basins each serve areas containing a mix of land uses and in some cases flow to sanitary sewer systems outside the Milwaukie system. Most of Milwaukie's sanitary sewage is collected into the sewer system served by the Clackamas County Kellogg Creek Wastewater Treatment Facility located at the west end of Jefferson Street on the Willamette River. Milwaukie pays Clackamas County to provide wastewater treatment of the City's sewage at the plant. The City also reimburses the County for a share of the operation and maintenance costs of the county-owned interceptor system that conveys sewage from the City's system to the treatment plant.

POPULATION ESTIMATES

A review of the historical growth patterns in Milwaukie indicates a slow upward trend in place over the past several decades. Recent statistics indicate that population growth and increases in the number of new homes and businesses in the city of Milwaukie has been slow. Statistics collected between 2003 and 2008 show an average annual population growth of 0.92 percent.

The current city population as certified by the Portland State University Population Research Center was 20,915 on December 15, 2008, an increase of 425 people from the July 1, 2000. Discussions with the City Planner indicate there is no compelling reason that the growth rate experienced in the recent few years will change over time (except for the redevelopment potential noted below). With this premise, forecasted population can be expected to increase to about 25,998 by the year 2028. In addition, parcels that are zoned and suitable for new development are scattered throughout the city and currently comprise about 34 acres of land in total. The parcels may continue to develop and in some cases, these are large enough to be divided into several lots. Development of these lots is included in the population growth cited above.

Based on a recent review of Milwaukie's growth capacity, given both current zoning and the construction of new housing units between 1997- 2008, staff can make the following conclusions about Milwaukie's planned capacity for growth. (source: Planning Department Memo re: Milwaukie's Regional and Local Density Requirements, April 15, 2008.)

- The City's current zoning provides a capacity for approximately 3,200 housing units.
- The City's current zoning for downtown allows the construction of approximately 1,300 housing units.

- The City's current zoning of the larger Town Center area, excluding downtown, allows the construction of up to approximately 980 units.
- The City's current zoning for the rest of the residential zones (R10, R7 and R5), allows the construction of up to approximately 700 units through partitions, subdivisions, and creation of accessory dwelling units.

NORTH MILWAUKIE BASIN

The North Milwaukie Basin serves the areas extending across the northern one-third of the city, extending from the Willamette River on the west to the city limits on the east and south to a line generally following Logus Road. This basin covers about 1063 acres and serves a variety of land uses such as single family residential, multifamily residential and commercial. The sewage generated in this area is conveyed by a trunk line terminating at the Kellogg Creek WWTP. This line extends north from the plant, crosses Johnson Creek several times, extends along North Main through the industrial area, and crosses the railroad to SE Boyd. From there it extends south on SE 32nd and east in SE Filbert Street. East of the railroad, most of the land is in residential use.

A sub-basin of the North Milwaukie basin is the Brookside area where sewage is collected into the Brookside Pump Station (S5). The Brookside area covers about 160 acres and is primarily in residential use. The Brookside pump station conveys sewage to a gravity sewer on Filbert Street where it flows to the Kellogg Creek Wastewater Treatment Plant. The Brookside pump station has an overflow relief line connected to the City of Portland Lents Trunk to prevent raw sewage overflows into Johnson Creek should the station fail.

With the extension of service into the Dual Interest Area "A" this basin will see additional flow from approximately 187 more homes. The Brookside pump station will be modified (belt adjustment) to accommodate the required flows. There are also two pipe line projects listed in the Capital Improvement Plan related to the additional flow; the Brookside main upsizing and the forcemain extension on Filbert.

Figure 3-1. Existing Sanitary Sewer System

Johnson Creek Basin

The Johnson Creek Basin is a 17 acre service area located north of Johnson Creek Boulevard between Stanley and Linwood Avenues. Sewage from this area is collected at a small pump station (S4) and pumped into the City of Portland's Lents Trunk line. The Johnson Creek basin serves both residences and commercial customers with a combined EDU total of 47 units. Payment for sewage conveyance and treatment is made to the City of Portland based on water consumption of the customers in the basin. If sewage from this small basin is ever routed into the Milwaukie system, it would be connected to the upper end of the Brookside basin.

As a part of providing sewer to the remaining unserved properties in this basin, an additional 72 connections north of Johnson Creek are planned (from the Dual Interest Area "A"). As part of the project, the Johnson Creek Pump Station (S4) will be replaced by a larger pump station and relocated to 55th Ave. north of Johnson Creek. This pump station will accommodate gravity flow for the area and pump into the Lents Trunk line.

Mid-Milwaukie Basin

The Mid-Milwaukie Basin serves the older, central portions of the city, encompassing about 620 acres of land. This area extends generally from Howe Street on the north, 42nd Street on the east, McLoughlin Boulevard on the west and includes the area between Lake Road and the Milwaukie Expressway to the south. Sewage from this area is collected by three major trunk lines which converge at Main and Jefferson Streets and discharge to the Kellogg Creek WWTP. This system includes the oldest portions of the sanitary sewer system, some constructed as early as the 1930's. While no significant structural problems have been observed in this area, it is reasonable to expect, based on the age of the system, that failures will begin to occur here first.

Three large trunk sewer lines provide service to the Mid-Milwaukie basin. To the north, a trunk line extends north on 21st to Harrison, terminating near 43rd Street. A second large trunk line extends east on Washington Street to Hwy 224, serving most of the older residential areas between 27th and 37th Streets.

The third trunk line extends southeast from 20th and Jefferson, past the Milwaukie High School and serves the uphill properties along Lake Road as far east as 47th Street.

Sewage from these three trunk lines is collected into a 24" sewer line in Jefferson Street where it is conveyed to the Milwaukie Meter located at the Kellogg Creek Wastewater Treatment Plant.

South Milwaukie Basin

South Milwaukie (Island Station) Basin covers an area of 117 acres and is located south of the Kellogg WWTP and west of McLoughlin Boulevard, to the southern city limits. Except for a few commercial properties located along McLoughlin Boulevard, land use is residential. Sewage from several residential properties, both single family and multi-family, at the south edge of the basin is directed to the Oak Lodge Sanitary District for treatment. The remaining flows from this basin are metered by the Milwaukie Meter located at the Kellogg Creek WWTP.

This basin also contains the Island Pump Station (S1) located along the Willamette River near the intersection of Bluebird and 19th Streets. Sewage from this station is lifted to the gravity sewer located at that intersection.

Harmony Basin

The Harmony Basin, an area of 1034 acres serves the southeast third of the city. This basin is generally bounded on the north by King Road and Logus Avenue and extends to the west to SE 37th Avenue. It also includes sewage generated in the Milwaukie Marketplace and the industrial/commercial uses located in the International Way area. Flows from this area are large enough that a special meter located near the intersection of SE Harmony and SE Linwood was installed to measure the quantity of sewage discharged from Milwaukie to the CCSD #1 system. Billings from Clackamas County to Milwaukie are based on the flow recorded by this meter, the City pays for conveyance and treatment of the sewage.

A sub basin in the Harmony area is served by a sewage pump station near the intersection of Home and Monroe Avenues. This Home and Monroe Pump Station (S3) serves an area of 123 acres within the Harmony Basin which is a mix of residential and commercial uses. Some earlier studies refer to this area as the King Road Basin.

The Harmony Basin also contains the small Harrison Pump Station (S2) to serve three homes with basements located near the intersection of SE Harrison and SE 59th Street. These homes are situated such that gravity sewer service is not available.

Lower Kellogg Basin

A number of residences located along the north side of Kellogg Creek are provided sanitary sewer service using direct connections to the CCSD #1 Lower Kellogg Interceptor. This area encompasses about 230 acres and serves about 370 residences, both single family and multifamily. A few commercial customers are located on Lake Road along with Rowe Junior High School.

Table 3-1 summarizes the inventory of facilities located in the Milwaukie system and major system components are shown on Figure 3-1.

Table 3-1. City of Milwaukie Sanitary Asset Inventory Current and Projected Populations

	Acreage		EDUs[1]		Sanitary Peak Flow[2]		Sanitary Sewer Inventory	
Sanitary Sub Basin	Current	Buildout	Current	Buildout	Current (gpm)	Buildout (gpm)	Total Length (ft)	Diameter Range (inches)
North Milwaukie	1063	1152	2409	2676	786	873	130,814	6-27”
Mid-Milwaukie	620	620	1595	1772	521	578	82,525	6-18”
Harmony	1035	1056	2483	2758	810	900	131,491	6-18”
South Milwaukie	117	117	256	284	84	93	17,749	8-15”
Lower Kellogg	230	230	370	411	121	134	27,951	6-10”
Johnson Creek / PCP	17	17	47	52	15	17	2,126	6-8”
	Totals:							

Pump Stations	Location	Capacity	Force Main length/dia	SCADA	S/B Power
S1	Island Station - located west of SE 19th and Bluebird	215 gpm	95 ft. of 4" force main	Yes	Yes
S2	Harrison and SE 59th Avenue	100 gpm	10 ft. of 4" ductile iron	Yes	Yes
S3	Intersection of Home and Monroe - Discharges to a gravity sewer on SE Home Avenue.	400 gpm	1100 ft. of 8" ductile iron	Yes	Yes
S4	Johnson Creek Boulevard and Stanley.	200 gpm	120 ft. of 4" ductile iron	Yes	Yes
S5	Located at Brookside and Johnson Creek Boulevard	550 gpm	1,978 ft. of 8" ductile iron	Yes	Yes

Flow Meters	Type	Size	Owner
Harmony Meter	Palmer Bowlus Flume w/ Sigma 950 Meter	18"	Clackamas County Water Environment Services
Milwaukie Meter (Kellogg Creek)	Sigma Ultrasonic 950 - Area/Velocity Sensor	30"	Clackamas County Water Environment Services

Notes:

1. Assumes an average of 4.5 EDU's / acre for residential and 7.8 EDU's for commercial properties at buildout.
2. Assume a peaking factor of 2.5

Table 3-2 shows current and future populations in each of the major drainage basins of the City's existing sanitary sewer system.

Table 3-2. Future Sub-Basin Demographics

Sanitary Sub Basin	2008	2028
North Milwaukie	6,699	8,172
Mid-Milwaukie	4,842	6,422
Harmony	7,095	8,839
South Milwaukie	772	925
Lower Kellogg	1,110	1,415
Johnson Creek/PCP[1]	0	225
TOTALS	*20,518*	*25,998*

Notes:

1. Includes both Johnson Creek basin and Precision Cast Parts area

1. All parcels zoned industrial, i.e. no residents

2. Residential occupancy assumed at 2.35 people/residence

3. Commercial and Industrial zoned lots excluded in all basins

SERVICE AREA BOUNDARY

Milwaukie's development is guided by established boundaries. City ordinances state that sanitary sewer service is provided to only those property owners who are within the incorporated boundaries of the city. Milwaukie does not serve properties outside that boundary.

LAND USE AND ZONING

The current zoning map for the city is shown as Figure 3-2. No major changes in land use, zoning practices or application are currently being considered. Changes in local economics or redevelopment of a major land parcel could impact sanitary sewer services and cause need for a capital improvement project to add capacity to the conveyance system.

Figure 3-2. Land Use and Zoning Provided By City of Milwaukie

EXISTING SYSTEM CONDITION

Discussions with City staff from both the engineering and maintenance groups indicate that there are no significant problem areas in the system. City crews maintain all sewers, manholes, and appurtenant structures, conducting visual inspections of the system using a closed-circuit television system owned by the City. City crews are aware of several areas where older pipelines have shown evidence of deterioration and bear closer monitoring.

These include:

- Chronic problem areas where a low spot in the line causes odor generation and release, debris accumulation and similar symptoms. These known trouble spots are inspected quarterly, flushed, and cleaned as needed.
- The older downtown system which was constructed using a lot of terra cotta pipe. This material is no longer produced or installed in this area.
- The 24-inch trunk line serving the North Milwaukie Basin. This line parallels Johnson Creek several times and was designed with "inverted siphons" to allow continuous gravity service into the Kellogg Creek Wastewater Treatment Facility. Inverted siphons can be effective but require more frequent inspection and intensive maintenance. This line is particularly difficult to inspect since it carries most of the City's sewage flow and is not readily accessible to maintenance vehicles.
- The area bounded by Balfour and Sherrett, and 32nd and the railroad is also an older area where root intrusion, protruding taps and similar indications of poor materials or construction indicate at best an area of continued high maintenance and infiltration and at worst, extensive system replacement.

The worst of these problem areas have been identified in chapter 7 and placed in the asset management schedule of work. None of the other areas are causing immediate problems but City staff should continue to monitor their conditions closely and document the location, type, and severity of any problems. In addition, once a problem is identified, maintenance managers will work with public works engineers to determine the best approach to its repair. City repair crews may be assigned to correct small problem areas but larger problems are typically solved through public contracting with construction contractors who specialize in underground utility work. The City's five pump stations have all been upgraded to include provisions for standby power and are monitored using remote telemetry (SCADA).

INFILTRATION/INFLOW (I/I)

A part of the analysis of the existing system includes evaluation of the infiltration and inflow conditions. This requires daily flow measurement at specified manholes, with recording flow levels at frequent time intervals. Flow monitoring was provided by City staff and was done at five selected points in the system. These readings, taken during both dry and wet seasons provide definitive information regarding the infiltration into the system. These flow measurements were taken at specific manholes, each of which carries the total flows from a specific sub basin of the system. These sub basins were selected to represent the City's flows under varying land uses and topographic conditions.

As compared with other municipal systems located in the metropolitan area, infiltration was found to be within acceptable ranges given the age of the system. Several reasons may

account for this; among these are good long term maintenance practices, good initial construction, and low ground water conditions even during the wet season, or a combination of these. Of course, infiltration is never "acceptable" if the source is known and can be economically corrected. However, it is frequently found that the costs of correction exceed the benefits. A detailed Infiltration/Inflow Analysis would be needed to determine the cost effectiveness of an I/I removal program.

In addition, an I/I Analysis study would determine whether most of the I/I comes from service laterals connecting individual homes to the public system, or if the I/I comes directly into the public system. It is frequently found that over half of all infiltration originates in the private service laterals. Inflow is more frequently found to occur in the public system.

Table 3-3 provides a summary of the infiltration and inflow quantities found during this analysis.

Table 3-3. Infiltration and Inflow Quantities

HARMONY BASIN					MILWAUKIE METER BASINS				
	Area (acres)	**Flow (mgd)**	**I/I Avg (gpad)**	**Pipe Footage**		**Flow (mgd)**	**I/I Avg (gpad)**	**Monitored Flow (gpm)**	**Pipe Footage**
Basin Acreage	1,034			116,000	Basin Acreage	1,683			218,400
Dry Weather Low Flow Averages									
21-Jan-03		0.615	595						
12-Feb-03		0.851	823						
15-Jul-03		0.846	818		15-Jul-03	1.080	642		
20-Aug-03		0.783	757		20-Aug-03	0.793	471		
Average			**748**		**Average**		**556**		
Wet Weather Low Flow Averages									
17-Feb-03		1.109	1073						
8-Sep-03		0.764	739			0.971	577		
Average			**906**		**Average**		**577**		
Basin Sub-basin	**Area**	**(gpm)**			**Basin Sub-basin**	**Area**			
Harmony	1,034				North Milwaukie	1,063			121,000
Linwood	175	17	140		Brookside 1A	43			
Home/Monroe	123				Brookside 1B	117	1538		
					Johnson Creek	17			1,400
					Mid-Milwaukie	620			78,500
					Hospital	64	113	5 gpm	
					Commercial	80	180	10 gpm	
					High School	130	388	35 gpm	
					South Milwaukie	117			17,500

Note: gpad = gallons per acre per day; cfs = cubic feet per second; mgd = millions of gallons per day.

OPERATION AND MAINTENANCE

Ongoing maintenance activities are conducted throughout the system by city staff. This study found that the City's sanitary sewer system is well operated and provides for public health in a safe, economical fashion. No significant problems were identified and the system operates within the rules and regulations as set forth by the Oregon Department of Environmental Quality. Periodic inspection of problem areas and non-problem areas are conducted by City staff. Records of these inspections and their findings are kept as part of the public works file. The City has also invested in equipment designed specifically for maintenance of the sanitary sewer system. These include a closed-circuit television inspection van, a hydro-flusher unit designed to thoroughly clean debris from sewers and manholes, and a pneumatic vacuum unit designed to remove debris from sewers and manholes without the need for crews to enter the manholes.

A key element of the City's sanitary sewer operation is the grease control program. Grease discharged into the sanitary sewer by residential and commercial users can be a major concern for the operators. Grease cools and accumulates in the sewer. Large deposits of congealed grease cause flow restrictions, buildup of organic and inorganic materials, further restricting flows.

The grease control program, or Fat, Oils and Grease (FOG) Program, requires approximately 60 commercial customers such as restaurants and other users/producers of grease, fat, or oils to operate a grease trap. These traps intercept grease, fats, and oils before the sewage enters the public system. The customer is required to clean the trap periodically and maintain it in a good operating condition. The City has recently devoted staff time to perform these routine inspections.

The City also owns and uses a flow monitoring unit. This equipment, together with the software necessary for its proper use is available to field crews for flow monitoring. Measuring sewage flows at specific, key points in the system provides a long-term history of the change in total flows and changes in diurnal flow patterns resulting from growth, land use changes, or development of a new large commercial or institutional customer in the upstream basin. Sudden changes in what have been typical flow patterns can indicate an acute problem while gradual changes in these flows as noted over many years of flow monitoring records will indicate the degree of gradual deterioration of the upstream system.

Flow monitoring should become a routine part of the City's operation and maintenance program. Together with monitoring rainfall, groundwater elevations, and the growth of the sewer system into newly served areas, parameters such as the gallons per acre per day of infiltration, hourly and daily peak sanitary flows, per capita sewage flows, and similar ratios may indicate detrimental changes in the sanitary sewer system. A routine logging of these data into the City's GIS system will provide a historical record, useful in forecasting upcoming maintenance project needs.

CHAPTER 4. THE EXISTING SYSTEM FUTURE FLOWS ANALYSIS

PURPOSE

This chapter of the report presents the estimates of sewage flows (quantity and rate) that may be anticipated when development occurs within the existing service area. Sanitary sewers are traditionally designed with future growth in mind and sizes of new lines account for predictable growth. Since demographic projections change in reaction to unanticipated conditions, the ability to accurately predict the extent to which a city will grow or the density and type of land use that will occur is limited and periodic reassessments of flow projections are necessary. This report updates the demographic projections from the 1994 Master Plan using more recent data and experiences.

This scope of services does not include development of a dynamic hydraulic model of the City's sanitary sewer system. A model was developed for use in the 1994 Master Plan and the data base portions of it have been recovered. This Master Plan scope of work was modified to allow preparation of a new model using the historic data base. The new model is not as technically sophisticated as the 1994 model but is easily sufficient to predict peak flows in the Milwaukie system. This updated model is provided to the City as part of the contract along with a brief users guide.

Since the new model utilizes existing data about the sewer system and the inventory that was incorporated at that time, most of the City's system is included in the current model. Sewer line extensions or other changes to the sewer system constructed since 1994 have not been added to the model, however all properties discharging sewage to the system are accounted for in the model.(This model is used in the Master Plan to forecast future flows in the City's sanitary sewer system. Needs to be contained within this document)

BACKGROUND

Almost all sanitary sewers function by using gravity to move waste water through the system to the point of treatment. Once the route and diameter of a sewer has been selected, the slope of the line determines its capacity and therefore the limits of sewage flow that can be conveyed. Minimum slopes are determined by setting the flow velocity criteria to be at least two and a half feet per second. At this velocity, suspended solids in the sewage will tend to remain suspended and be carried to the treatment plant. Except for unusual circumstances where the pipe slope can be increased, a minimum slope is desired as this provides the most economical construction depth.

In most sewer systems, not all areas are able to flow by gravity to the treatment plant. Where this is the case, a pumping station is constructed to lift sewage to a high point where it can resume gravity-driven flow to its destination. Pumping stations provide a good point at which to measure flows since they provide a control structure and opportunity for measuring and recording instantaneous and total flows. Milwaukie has five sewage pumping stations in its system. Only the Brookside Pump Station has the facilities to monitor flows. The other stations are smaller however and were not designed with flow monitoring capabilities. Since the City has portable flow monitoring equipment, it is not necessary to install permanent flow monitors at the other stations.

System flow data is also gathered through metered connections to CCSD #1 system. Sewers located in the southeast portion of the city and between the Milwaukie Expressway and Railroad Avenue are connected directly to the CCSD #1 system. These flows are metered near the intersection of SE Harmony and SE Linwood Avenue. Most of the remainder of the

City's system connects to the CCSD #1 system at the Kellogg Creek Wastewater Treatment Plant where they are metered. Sewage flows have also been monitored at several other locations throughout the system by Milwaukie's field personnel.

SEWAGE QUANTITY PARAMETERS

A number of factors are used to calculate the potential sewage flows at a given time and at any point in the sewer system. These include:

1. acreage served
2. number of Equivalent Dwelling Units – EDU's (residences)
3. average household population
4. average per capita water consumption
5. the diurnal pattern
6. average and peak infiltration and inflow flows
7. commercial and industrial land uses

Acreage, Residences and Population Served

Table 3-1 shows a listing of the acreage, equivalent dwelling units, and the estimated peak sanitary sewage flows from each sub basin.

Average household population is taken from demographic data generated during the 2000 census. These data show a household population of 2.52 people per owner-occupied home, 2.09 people per rental unit, with a city average of 2.35 people per household or Equivalent Dwelling Unit (EDU).

Average daily household sewage discharge assumes that almost all of the potable water used by a household is disposed of through the sewer system. This slightly overestimates the sewage flows since a small fraction of the total water used may be carried away, evaporated, spilled, etc. Using measured flows as determined using data from metered water consumption records provided by the City provides the best estimate of the amount of sewage generated by an individual home. Typically, winter use records are analyzed to minimize the effects of irrigation and other summer water uses which do not enter the sewer system. For this project, records from three customer classes were analyzed; single family residential, multifamily residential and commercial/industrial. These records indicate that an average single family household uses 190 gallons of water per day during the winter season, or 76 gallons per capita per day. This compares with 79 gallons of water per day for a typical multifamily residence. The summary water use records analyzed do not differentiate between single family and multifamily residences so; the data for multifamily units were taken from usage records from a single 9-unit complex.

On average, commercial records show daily water consumption averaged over a 2-month period to be 618 gallons/day. This is equivalent to water used by 7.8 dwelling units. Commercial customers will be factored into the flow calculations using the flow equivalent of 7.8 residences for each commercial use.

ANALYSIS OF 2004 FLOWS

Local Basin Monitoring Results

During preparation of the 1994 Master Plan, a hydraulic model was prepared based on use of the EPA SWMM flow model. This model predicted a number of locations in the system where sewage flows would exceed the pipe capacity causing an overload condition. Since these predictions were estimated based on the best available information, the study recommended that the City staff monitor high flow conditions during the subsequent years to see if the model was accurate in its flow level predictions.

A part of preparation of this Master Plan involved having City staff install a portable flow meter and gather data from a number of locations in the sewer system. Flow data were collected at the following locations.

8. Brookside – installed in MH 1419 entering the pump station from the east.
9. SE Harrison St. – MH 2017, line entering from the east
10. SE Harmony – MH 3348, east of the Linwood Avenue intersection.
11. SE 23rd – MH 2217, just north of Washington Street
12. SE 32nd and Harrison – MH 2017 line entering from the north

These locations were selected to provide information on areas of the city where varying land uses exist and differences in flow patterns could be expected. For example, data collected at SE 32nd and Harrison includes a mix of residential sewage mixed with flows from the Providence Milwaukie hospital complex, while flow data from the location at SE 23rd north of Washington primarily includes mixed commercial uses and some residences.

Data on flows from these locations were reduced and compared with modeled flows. In most cases, a reasonable correlation between actual and modeled flows was observed.

Diurnal Flow Pattern

A key element of sewage flow forecasting includes understanding and use of the diurnal flow pattern that describes the rise and fall in flow in conjunction with typical human activities. This flow pattern defines the ratio between the average flow and peak flow that can be expected. Since sewers are designed based on forecasted peak flow rates, this “peaking factor” ratio is very important. Flows from Milwaukie residents are continuously monitored at the Harmony Metering Station and the Kellogg Creek Wastewater Treatment Facility. In addition, flows were monitored at five locations in the Milwaukie system to determine the diurnal pattern and associated flow parameters.

Analysis of flows metered at several of the key manholes show an average diurnal pattern ranging from a low of 0.33 times average to a peak flow of 1.9 times average flows on a typical summer day. Design textbooks suggest a peaking factor of from 2.0 to 2.5 depending on local conditions. For this study, a peaking factor of 2.5 will be used to estimate the maximum sanitary sewage component of the total flow.

Figure 4-1 shows the average diurnal flow pattern as measured at MH 3348 in the Harmony Basin during the week of March 27, 2004.

Figure 4-1. Average Diurnal Flows – Harmony Basin

CCSD #1 – METERED FLOWS

Records of gross flows are collected by CCSD #1 and used for billing purposes. These flows have been recorded for a number of years and are kept by staff at CCSD #1. In this study, flow records for "typical" summer and winter days were used to give an indication of the amount of infiltration and inflow (I/I) that enters the system as extraneous water through faults in the lines.

Readings at both the Harmony Meter and the Milwaukie (Kellogg Creek) Meter indicate that, on average, infiltration is not a significant concern when measured over areas this large. The more discrete monitoring of flows in smaller basins as referenced above also provided indications of infiltration and inflow rates. In both cases, infiltration and inflow do not appear to contribute a significant amount of water to the total flows. Even though the record indicates a relatively minor level of infiltration and inflow, it does provide a good basis for monitoring changes in the system as it deteriorates.

Infiltration rates calculated for the Harmony Basin and the basins measured at the Milwaukie Meter range from 750 gallons per acre per day (gpad) to 900 gpad in the Harmony Basin and about 560 gpad for the Milwaukie Meter basins. The increase in the winter infiltration flows in the Harmony Basin, from 750 gpad to 900 gpad, is not a significant cause for concern at this time. Ongoing monitoring and analysis of these data is recommended.

Infiltration rates measured at the Milwaukie Meter indicate miniscule change between summer and winter flows. This is somewhat unusual as winter rates could reasonably be expected to increase due to higher groundwater levels and the generally wetter winter season experienced in western Oregon. Regardless of the reason for the unusual nature of these monitoring results, City staff should continue to monitor these flows and be aware of any changes in the patterns.

FUTURE FLOW PROJECTIONS

Since the infiltration rates are considerably below what is normally experienced, it is suggested that a higher figure be used in forecasting future flows. Improvements in pipe materials, repair technology for failing systems and installation inspection have improved the longevity of sewer systems and may have a positive long term impact on limiting infiltration rates. In the interests of providing a somewhat conservative estimate of future flows, this report will use 2,500 gallons per acre per day as the projected infiltration rate.

Future flows are therefore predicated on the following assumptions:

- Average per capita domestic sewage contribution = 80 gallons per capita per day
- People per EDU = 2.35
- Residential peaking factor = 2.5
- Infiltration = 2,500 gpad
- Population, density, land use based on the current comprehensive plan and zoning regulations.

CHAPTER 5. THE EXISTING SYSTEM CAPITAL IMPROVEMENT PROJECTS IDENTIFICATION

Analysis of the hydraulic and operational conditions of the sanitary sewer system results in identification of capital improvement projects which must be considered for future implementation as the system ages and the city grows. A review of the progress resulting from the capital improvement projects identified in the 1994 Master Plan is presented in Table 5-1. It is apparent that some of these projects were necessary to the continued sound operation of the system and were completed as planned. Upon further investigation of the recommended projects, some were determined to be unnecessary, and some have been carried over onto the new list and will remain areas of concern. Those determined to be unnecessary are not vital to public health or will adversely effect operation of the system and may be postponed until conditions show a need for them to be placed on the 5-year CIP.

Table 5-1. Milwaukie Sanitary Sewer 1994 Master Plan Recommendations

Completed	1.	Home & Monroe Pump Station – Upgrade pumps to 400 gpm and replace controls
Completed	2.	Divert Brookside flows to the City of Portland or extend force main to 32nd Avenue
Terminated	3.	Construct a 200-foot bypass sewer around the Lakeside Apartments
Completed	4.	Replace Brookside Pump Station pumps and controls
CMP	5.	Initiate detailed flow monitoring program
Ongoing	6.	Conduct CCTV inspections of the (1) Brookside basin, (2) North Milwaukie basin, (3) Mid-Milwaukie basin, (4) Harmony basin, (5) South Milwaukie basin, (6) Lower Milwaukie basin.
2008/09 CIP	7.	Monitor flows in the Brookside trunk; replace 1040 feet of trunk with 12” line
Terminated	8.	Inspect 30th Avenue sewer, monitor maintenance costs, replace 100 ft of line if ponding continues
Terminated	9.	Harrison and Hwy 224 – Inspect sheared line, reconstruct if necessary
Completed	10.	Plum and Sequoia – Inspect sheared line, reconstruct if necessary
Completed	11.	42nd Avenue Sewer – Inspect to confirm low point, reconstruct if necessary
Future CIP	12.	Jefferson St. to the Kellogg Creek WWTP – replace existing sewer with 30” line or construct a 21” parallel sewer line
Completed	13.	32nd Avenue to Sherrett – Extend sewer to unserved area

The following discussion identifies capital improvement projects which are either carried over from the 1994 listing or identified in this study and listed by the basin in which they occur.

Kellogg Creek Wastewater Treatment Plant Options

As described in Chapter 3 of this report, Milwaukie receives wastewater treatment services from Clackamas County at the Kellogg Creek Wastewater Treatment Plant. Milwaukie residents are well acquainted with this facility since it is located on the Willamette River in downtown Milwaukie. It was constructed during 1973 – 75 and has been a topic of discussion for City and County officials for a number of years and city residents have long desired removal of the plant from the waterfront.

In 2003, Clackamas County began to study options for the future of the Kellogg Creek plant including removing it from the site and diverting sewage currently treated there to another treatment location. That study included involvement by City staff and was prepared with their input.

Options identified in the *Regional Wastewater Treatment Options Study* include:

> Option 1: Maintaining the status quo, the "base" option.
>
> Option 2: Maintain and operate but do not expand the Kellogg Creek plant.
>
> Option 3: Decommission the Kellogg Creek plant and pump sewage to the Oak Lodge Wastewater Treatment Plant.
>
> Option 4: Decommission the Kellogg Creek plant and pump sewage to the Tri-City Wastewater Treatment Plant.
>
> Option 5: Decommission the Kellogg Creek and the Oak Lodge plants and pump all sewage to the Tri-City plant.

The final draft of the study, submitted in April, 2004, recommends Option 5. Decommissioning the Kellogg Creek plant will remove the structural and mechanical components and retain a pump station to reroute sewage flows to the Tri-City plant in Oregon City.

As stated in the final report,

> *The next step is for the governing bodies and partner jurisdictions to adopt a consensus position on the selected alternative that best meets the long-term wastewater service needs of the communities within north Clackamas County. Once a decision has been made regarding the elected officials selected option, the stakeholders and general public should be engaged in discussing the selected option and inviting public participation in establishing community values, priorities, and preferences in implementation. Staff recommends individual councils, boards, and commissions take separate action to formally adopt the preferred option and direct staff to begin the public involvement process. Staff further recommends that individual councils, boards and commissions, direct staff to develop a plan and time line for full implementation of the selected option.*

As a partner in the study, the City of Milwaukie was asked to participate politically and financially in the project. The IGA documenting the partnership (Sept 2005, see chap 7, p 7-2) establishes the following:

- the City's share of the Kellogg Creek decommissioning costs
- schedule for the decommissioning
- deposition of the property following decommissioning, demolition and remediation of any environmental contaminants or hazards.

As a result of the IGA, the City established a rate structure that would provide for the funding of the decommissioning. The rate structure adopted in 2005 provided for 6% annual rate increases through 2010 and a 3.75% rate increase in 2011.

The recommendations of the study have not moved forward due to political and legal issues raised by the constituency of the CCSD #1. The formation of the Citizen's Advisory Council (CAC) for CCSD #1 was largely a result of the desire to maintain local control over the sewer district. After studying capacity solutions (basically three options: site new plant, rebuild

Kellogg, or shift treatment to the Tri-City plant), shifting treatment to the Tri-City plant was determined to be the best solution.

The partnering process that began in early 2008 and continues today (Feb 2009) is trying to develop the framework for the governance of the area sewer service providers and determine the process for transferring the treatment to the Tri-City plant including when (and even if) the Kellogg plant will be decommissioned.

As the partnering efforts continue through the early part of 2009, the City is faced with the following:

1. Oak Lodge is moving forward with replacing their treatment plant and maintaining autonomy.
2. CCSD #1 is less concerned about the decommissioning of the Kellogg plant than with providing additional capacity (at the Tri-City plant).
3. CCSD #1 pressure on the City to accept a share of the system expansion occurring outside of the City of Milwaukie.
4. Ensuring the City's position (addressing the future of the Kellogg Treatment Plant, and a justifiable treatment rate) will require significant political pressure and will to move forward.

North Milwaukie Basin

The 24" diameter line crossing Johnson Creek, an inverted siphon, shows significant overloading during peak flow periods. This system is designed to surcharge however and is not considered to be a significant operations problem. It is imperative that this be inspected regularly and any debris which may impede flow through the siphon removed. Cleaning the line is recommended, especially if it has not been cleaned in some time. This will require a detailed work plan since the line must be closed off to be cleaned. This will cause significant backup of sewage in the upstream system. Typically, cleaning of a critical part of the system requires work to be done during the lowest flow periods of the day, usually between 2 am and 5 am. The elevation of sewage in the upstream system must be monitored closely and precautions taken to avoid overflows from the system during the cleaning operation.

Additionally, the City was notified by the Johnson Creek Watershed Council in the summer of 2008 that the crossing closest to the mouth of the creek was too high and presented a barrier to fish passage. Also noted was that the concrete armoring this part of the crossing has largely fallen off, exposing portions of the siphon pipe. Repair of this section of the siphon (lowering the pipe) is a planned capital improvement project.

The blocks immediately east of McLoughlin Boulevard, between Scott Street and Jefferson Street, are served by a badly aging sewer main. This area contains about fifteen buildings, several with multiple tenants. The existing main is an 8-inch vitrified clay pipe, which was installed in the 1920's. Because of its current location, material and age, maintenance of the pipe is increasingly difficult and there is potential for serious failure. Replacing this pipe is an important investment in preventative maintenance. The original sewer main was constructed mid-block in what used to be a public alley. However, that alley was vacated and several buildings have been constructed over the top of the pipe (the main was constructed under an emergency ordinance, passed in 1926). Replacement of this main was identified as a capital improvement project and the design and construction planned for during the 2008-09 fiscal year.

Brookside Basin

The 1994 Master Plan identified a portion of the 10-inch sewer in Brookside Drive as overcapacity (due to its low slope) at the time of that report. Also, that ultimate build-out would result in the sewer in Brookside Drive being over capacity from SE Regents Drive to the pump station. The recommendation of that study was to replace 1,040 feet of the Brookside Trunk with larger, 12-inch diameter pipe. The ultimate build scenario included adding areas east of the Brookside Basin and west of Linwood Ave. The actual need for this capital improvement project will be determined by the rate that the properties in the Dual Interest Area "A" connect to the system. Construction of the system in this area is planned to complete by the Summer of 2010. The need for the Brookside sewer replacement is anticipated by

The Brookside basin sewers and the impact of increasing flows through that basin by adding sewage from previously unsewered areas is discussed in Chapter 11.

The 15-inch diameter line that runs in SE Filbert Street between 32nd Avenue and 42nd Avenue is expected to be overloaded at ultimate build-out. The past models indicate that this line was operating at 100 percent capacity in 1994 and will be at 104 percent capacity by the year 2010. To alleviate this potential capacity problem, the trunk line in SE Filbert should be replaced with a new 18-inch diameter line. However this sewer is over 20 feet deep and would be difficult to build. Another alternative would be to construct the project listed below.

42nd Avenue Force Main Extension would extend the Brookside force-main to 32nd Ave, This would bypass the Brookside Basin Flow of 0.8 mgd (currently) around the Filbert Street Constriction and alleviate the problem.

Lower Kellogg Basin

No capital improvement projects were identified in this basin.

Mid-Milwaukie Basin

The model used in the 1994 Master Plan indicated that the 24-inch diameter interceptor that runs from the lower end of Jefferson Street to the Kellogg Creek WWTP was operating at over its design capacity during peak flow conditions at that time. The recommendation of that Plan was to either replace the 24-inch interceptor with a 30-inch or build a 21-inch relief sewer along side the existing line to carry the flow from the Mid-Milwaukie Basin. Subsequent observations of that line have shown no significant issues relating to its capacity or ability to carry sewage flows.

Harmony Basin

No capital improvement projects were identified in this basin.

South Milwaukie Basin

No capital improvement projects were identified in this basin.

Johnson Creek Basin

As a part of the additional flows brought in by the sewer construction of the NE Milwaukie Sewer Extension Project, the Johnson Creek Pump Station (S4) will need to be relocated to 55th Avenue just south of Johnson Creek Boulevard. The new location will allow properties on the south side of Johnson Creek Boulevard (which are lower) to connect to the City's

sewer system. As a part of this project the existing pump station on Johnson Creek Blvd. will be de-commissioned.

Construction a decant facility on the City's JCB property will be used to dry waste materials collected as a by-product of maintenance work. The waste material is typically retrieved from catch basins, drywells, pipe cleaning, street sweeping and small excavations. The waste material consists of dirt, gravel, and sediments in solid form, semisolid form, or slurry condition. Landfills will not accept this watery material until it is "de-watered." As the facility will be used by all the utilities, funding from the wastewater account will be 20% of the total project cost.

CHAPTER 6. CCSD #1 AGREEMENTS

This chapter provides a review of previous agreements with CCSD #1, a review of the proposed Intergovernmental Agreement (IGA) between CCSD #1 and Milwaukie, and makes recommendations for consideration by Milwaukie regarding the proposed IGA.

HISTORY OF AGREEMENTS WITH CCSD #1

November 3, 1969. This basic agreement established the terms under which the City would utilize a wastewater treatment plant constructed and operated by CCSD #1 (also called the District). This agreement generally outlined contract terms including lump sum payment amounts, unit charges, and other technical aspects of the agreement. The term of the agreement was set at 10 years or until the treatment plant was expanded to 7.5 MGD, whichever occurred first. Lump sum payment percentages were established for facilities construction. A unit charge of $85 per million gallons of sewage conveyed to the District was set. This agreement was superseded the following year by the agreement dated November 25, 1970, discussed below.

November 25, 1970, Basic Agreement. This agreement serves as the Basic Agreement between the City of Milwaukie and the District. The agreement states the District will construct and operate a sewage collection system and treatment plant known as the Kellogg Creek Water Pollution Control Plant. The plant was to be constructed with an average design flow of 10 MGD and a design population equivalent of 100,000 persons.

The term of the agreement was for a period of 10 years or until the District expanded and put into operation a 15 MGD plant or larger, whichever date first occurred. Either party could terminate the agreement with 180 days written notice.

The basic agreement established that Milwaukie would make an annual lump sum payment on the anniversary of the effective date of this agreement. The annual lump sum charge was to be a proportional share of money necessary per year to retire the debt incurred to construct a wastewater treatment plant. The proportional share of the retirement was determined as follows:

- 40% of all costs incurred in constructing a 10 MGD wastewater treatment plant.
- 13.5% of all costs incurred in constructing the Lower Kellogg Creek Interceptor.
- 11.2% of all costs incurred in constructing the Mount Scott Creek Interceptor west of Linwood Avenue.

The agreement states that "the annual lump sum charge shall cover that portion of plant capital costs deemed applicable to Milwaukie for treatment of up to an average 4.0 million gallons per day sewage flow from Milwaukie. Should the average yearly Milwaukie sewage flow to the district exceed 4.0 million gallons per day, or the recomputed minimum as provided hereinafter, the annual lump sum payment shall increase proportionately to the increase in flow above 4.0 MGD, or the recomputed minimum, using the above initial formula as a base, excluding costs of interceptor lines". The agreement provides provisions for a reduction in the lump sum payment in the event the District contracts with others outside the District to provide sewage treatment services at the Kellogg Creek Plant. The agreement provides that should the average yearly sewage flow to the Kellogg Creek Plant exceed 10 MGD less Milwaukie's minimum proportion, the annual Milwaukie lump sum payment shall be renegotiated with the payment being based on actual contribution by Milwaukie.

A unit charge of $85 per million gallons of sewage transmitted by Milwaukie was established by this agreement. This fee was to be paid monthly upon billing by the District. This fee was to cover operation and maintenance and generally consisted of direct supervision, labor, operating materials and supplies, maintenance, repair and replacement of plant machinery and equipment, and administration. The agreement provided for annual revision of this charge. In no case was Milwaukie's operation and maintenance charge to exceed 65% of the annual total operation and maintenance cost for the plant, provided Milwaukie's flow did not exceed 4.0 MGD.

One comment of note: the unit charge portion of the base agreement was rescinded by Agreement No. 4 (discussed below) in July 1984 and replaced with alternate language.

August 31, 1978, First Amendment to Basic Agreement. Milwaukie and the District agreed that the amount of a lump sum payment from Milwaukie to the District for capital construction of the Kellogg Wastewater Treatment Plant was $1,763,631.92. A payment schedule for this amount was established over a 20 year period, commencing November 25, 1978 and ending November 25, 1997. This agreement also provides an alternate lump sum payment schedule in the event of early termination of the agreement.

July 14, 1983, Second Amendment to Basic Agreement. This amendment extends the Basic Agreement beyond the original 10 year term and provides a new termination date of June 30, 1984.

July 1, 1984, Agreement No. 4, Third Amendment to Basic Agreement. Agreement No. 4 rescinds the unit charge portion of the Basic Agreement. The revised language is repeated below:

> "A charge to be known as a unit charge shall be made by the district to Milwaukie, based upon a rate per million gallons of sewage transmitted by Milwaukie to the District to be paid monthly by Milwaukie upon being billed therefore by the District as hereinafter set forth. The unit charge shall include actual current cost of operation and maintenance consisting of direct supervision, labor, operating materials and supplies, maintenance, repair and replacement of plant machinery and equipment, and administration. In no case shall Milwaukie's operation and maintenance charges exceed 65% of the annual total operation and maintenance cost for the plant, provided Milwaukie's flow does not exceed 4.0 MGD."

Agreement No. 4 also establishes that when connections to the District sewage system by Milwaukie are in a location where flow measurement facilities are impractical or unwarranted, the contributing flow shall be determined by using the number of connections on the contributing line multiplied by an average sewage flow of 300 gallons per day per residential connection, or upon justified other volumes of flow. Flows for commercial establishments are to be estimated using the average daily water used for the preceding year based on water meter records.

July 1, 1986, Agreement No. 5, Fourth Amendment to the Basic Agreement. Agreement No. 5 extends the terms of all previous agreements to June 30, 1987, and thereafter on a month to month basis until such time as the parties either renew the agreement or enter into a new agreement. The City also agreed to pay the district $49,517.20 for 222 newly discovered unmetered units connected to Milwaukie's sewer system. This amount was to be paid in six equal monthly installments beginning July 1, 1986.

July 1, 1987, Agreement No. 6, Fifth Amendment to the Basic Agreement. Agreement No. 6 extends the terms of all previous agreements to June 30, 1988 and thereafter on a month-to-month basis until renewed or such time as the parties may enter into a new agreement.

November 2, 1989. This agreement is not a part of the Basic Agreement. Milwaukie agrees to pay $37,441 as its share of the cost of a sewerage facilities study in the District's North Clackamas Service Area, Milwaukie's existing collection system, and the Kellogg Creek Water Pollution Control Plant to assess current operating performance, project future loads and treatment requirements, and any facility modifications or additions that may be necessary to meet them.

August 21, 2001, **Intergovernmental Agreement**. This agreement is not a part of the Basic Agreement. Milwaukie acknowledges and agrees that it owes the district $356,508 for wastewater treatment services and capital improvements through the period ending June 30, 2000. Payments are to be made in five annual installments, with interest, at the Government Investment Pool rate. Of note is that this agreement assumes an obligation to pay for capital improvements after initial construction that is not established in the Basic Agreement or any amendments. Other general contract language is included in this agreement.

December 17, 2002, Intergovernmental Agreement. This agreement is not a part of the Basic Agreement. The City and District agree that Milwaukie is obligated for an additional $891,670.40 for capital improvement costs beginning on July 1, 2000 through June 30, 2001. Given previous amounts paid by Milwaukie based on the August 21, 2001 agreement, the parties agree that Milwaukie currently owes the district $1,137,351.80 for wastewater treatment services and capital improvements through the period ending June 30, 2001. This amount is in addition to any sums previously paid by Milwaukie. Payment is to be made in 10 annual installments beginning June 1, 2003. This agreement also contains other general language.

September 1, 2005, Clearwater Agreement. This agreement is not a part of the Basic Agreement. This agreement between CCSD #1, the Tri City Service District, and Milwaukie was for regionalized wastewater treatment services. The parties to this agreement agreed to support the implementation of the Clearwater project. The parties agreed to form a Clearwater Advisory Committee to perform various functions in the process of implementation of the Clearwater plan no later than September 1, 2005. Of particular note in this agreement is that the District agrees to transfer ownership of the property on which the Kellogg Creek Water Pollution Control Facility is sited (except for the raw sewage pump station and necessary road access) to the City following decommissioning, demolition and remediation of any environmental contaminants or hazards discovered on the site after structures are removed by the end of calendar year 2012. The District agrees to cooperate with the City as to possible relocation or modification of the pump station in connection with the redevelopment of the property.

Milwaukie agrees to pay the district a one time payment of $4,500,000 towards the capital costs for the Clearwater Project payable as follows: the first payment of $450,000 is due when the Trolley Trail pipeline starts construction. The second payment of $1,800,000 is due when facilities that will replace the Kellogg Plant's capacity begin construction. The final payment of $2,250,000 is due when the Kellogg Plant is decommissioned.

This agreement also establishes a wholesale wastewater treatment and transmission rate the City pays to the District at an amount per equivalent dwelling unit (EDU) not to exceed $13 per EDU per month for the July 1, 2006 through June 30, 2007 fiscal year. This rate began on July 1, 2006 and replaces the unit charge used from earlier agreements. Future wholesale rates will be considered by the Districts only after review of the rates by the Clearwater Advisory Committee.

The City also agrees to collect on behalf of the District, a new transmission and treatment system development charge as adopted by the District for each new equivalent dwelling unit added to the system beginning on July 1, 2006. The rate for this charge is based on the

District's costs of expanding capacity at the Tri-City site and will be subject to review and comment by the Clearwater Advisory Committee before adoption.

The agreement also establishes the City having one seat on the Clearwater Advisory Committee and afforded full participation rights on the committee.

The agreements listed above were the principal agreements reviewed with respect to wastewater cost and capacity issues between Milwaukie and the District. In the course of review of these agreements, other agreements with the District were also reviewed. A brief summary of these agreements is given below.

December 16, 1986. This agreement between Milwaukie and the District was related to a property known as the Crosswhite property. The District and Portland entered into an agreement allowing the District to provide sewage service within the Southeast Relieving Interceptor Drainage basin by utilizing the Johnson Creek Interceptor of the Lents Trunk Sewer Line. A property known as the Crosswhite property was desirous of annexing to the District while the City was considering urban service boundary adjustments. Milwaukie and the District agreed that the Crosswhite property should be served immediately while issues pertaining to the urban service boundary were discussed. The parties agreed that if the Crosswhite property sought annexation to the District, neither party would file objections with government bodies. The District also agreed that it would not annex or provide service within the unincorporated area served by the Johnson Creek Interceptor for a period of 12 months or when a long-term service agreement was reached, whichever occurred sooner. The agreement stated that the District could commence accepting further petitions for annexation of service.

July 25, 2002. This agreement establishes that Milwaukie will adopt and keep current an Industrial Pretreatment Program meeting all federal and Oregon statutory and regulatory requirements.

CURRENT SITUATION

Milwaukie recently received a draft document titled “Intergovernmental Agreement Between Clackamas County Service District No. 1 and the City of Milwaukie for the Provision of Wastewater Treatment Services” from CCSD #1. This 13-page draft document dated June 13, 2008, proposes a new rate collection methodology, condenses the parties IGA structure, and proposes various management and coordination processes. Milwaukie is in the process of reviewing the IGA. Highlights of this draft agreement are outlined below.

- The new agreement would terminate prior IGAs related to the provision of wastewater treatment services by CCSD #1, but not the “Clearwater Agreement”, dated September 1, 2005.
- The new agreement would establish a revised wholesale treatment rate structure based on a per EDU basis.
- The IGA establishes that CCSD #1 is providing wastewater treatment services on a wholesale per EDU basis while Milwaukie has the responsibility for its collection system that delivers wastewater to CCSD #1.
- CCSD #1 has sole discretion to limit the amount of wastewater delivered by Milwaukie or levy an additional charge if receiving Milwaukie wastewater contributes to permit violations.
- The proposed wholesale rate is estimated to be $22.05 per EDU. This rate can be adjusted annually.

- The IGA provides for a three-year phase in period for the wholesale rate, recognizing the proposed rate structure represents a substantial increase over current charges. The initial rates are proposed to be $18.00 per EDU beginning July 1, 2008, $20.00 per EDU beginning July 1, 2009, and $22.00 per EDU beginning July 1, 2010.
- The IGA requires an initial report estimating the number of EDU's delivering wastewater to CCSD #1, updated bimonthly.
- Section 4 of the IGA contains a number of system management and coordination statements. These generally include commitments to coordinate operations of the systems, work together in development of ordinances, and agreements on mutual notification regarding wastewater collection and treatment issues.
- In paragraph 4.3, Milwaukie acknowledges and agrees that CCSD #1 shall only be required to treat domestic sewage.

RECOMMENDATIONS

The items below are recommendations for Milwaukie consideration as they review the draft IGA proposed by CCSD #1. The inclusion of these recommendations is not intended to suggest that Milwaukie is not already performing any item being discussed. In some instances, recommendations will suggest a continuation of current activities.

- Beginning with the August 2001 IGA, Milwaukie began paying for capital improvements within CCSD #1. Although not included in the original Basic Agreement, this may have been appropriate given the negotiations occurring at the time. However, clarification on what the City intends to pay for and what the City is actually paying for is in the best interests of both parties to minimize the opportunities for misunderstandings and conflict in the future. For example: how will capital expenses be defined? By dollar amount? Only new construction? If the current payment structure remains, how will capital expenses be accounted for? If a new wholesale rate is established, what is the expectation of CCSD #1 on Milwaukie's contribution to capital expenses? What facilities, if any, will capital expenses be assessed on?
- Milwaukie should be diligent in understanding billings received for wastewater treatment services. Under the current system, the City should carefully review operation and maintenance expenses attributed to Milwaukie for the Kellogg Creek Wastewater Treatment Plant to verify that the costs are reasonable and accurate. Under a proposed new wholesale rate, the City should clearly understand the basis for the determination of the rate, how the assessment cost to Milwaukie was determined, and how those charges are billed to the City. While the technical methodology does not necessarily need to be spelled out in the IGA itself, the City should request and receive calculations outlining the basis for the wholesale wastewater treatment service rate of $22.05 per EDU. This may or may not be a reasonable estimate of the cost to provide service. Milwaukie understands that CCSD #1 has a responsibility to maintain a financially healthy and self-sustaining utility. The City also shares this responsibility and has a responsibility to demonstrate to its ratepayers that they are paying a rate that is fair and reasonable.
- Paragraph 2.2 in the current IGA deserves some attention. This paragraph in its current format gives CCSD #1 control over the city's flow and costs incurred by the City. This paragraph needs to be rewritten to provide the City more protections. For example: under what conditions may CCSD #1 limit wastewater discharges? What protocols will exist for notification so the City is not left with an emergency or high cost situation? How will the City be allowed to be a participant in the determination

of whether discharges are causing violations of CCSD #1 permit? In its current form, Paragraph 2.2 would allow CCSD #1 to be the sole determiner of whether Milwaukie's flow was causing a violation and either stop flow or charge for it. From a practical standpoint, stopping the flow is not an option leaving an additional charge as the realistic short-term alternative.

- Paragraph 4.1 allows CCSD #1 to "direct" Milwaukie staff in various collection system operations. For many reasons (including incurred liability by CCSD #1), this language should be modified. It is in both entities best interests to see that both utilities are functioning efficiently. It would be preferable if the wording in this paragraph conveyed that both parties agreed to work together to resolve operational and permit issues.
- Paragraph 4.3 should include language that acknowledges that Milwaukie's wastewater will include wastewater flow from commercial and/or industrial sources receiving pre-treatment, and not be limited strictly to domestic wastewater.
- How do Dual Interest Areas A and B factor into the language included in paragraphs 4.9 and 4.10? These areas are not presently within Milwaukie city limits but are probably included within the text "hereafter becoming part of Milwaukie." This City might consider whether these paragraphs provide an opportunity to clarify future service area issues in Dual Interest Areas A and B.
- For an agreement of this magnitude, the City would be wise to invest in a thorough financial and legal review of the IGA.
- It would seem that the IGA is an appropriate place to clarify and restate future plans for the Kellogg Creek Wastewater Treatment Plant.
- Paragraph 3.8 requires Milwaukie payments to CCSD #1 become superior to any charge or lien of any revenue bonds issued by Milwaukie that are payable from the revenues of its sewerage utility rates. This has the potential to put the City in a poor position for funding of future improvements.
- Paragraph 4.6. The word "elimination" for septicity and odors should be replaced with "minimizing" as was used for I/I. The word "optimum" for pollution and environmental control should be replaced with "accepted standards and practices" as was used earlier in the paragraph.
- The definition of "Prior IGAs" does not include the Clearwater Agreement. This agreement represents a significant financial commitment by Milwaukie. To avoid confusion, it may be wise to be sure that all Council members and City staff understand that the agreement is still in place.
- There were significant issues discussed in the Clearwater Agreement (Kellogg Creek Plant decommissioning, Clearwater Advisory Committee, capital cost commitments, transmission and treatment SDCs, etc.). To the extent Council and staff feel it would be beneficial, consideration may be given to restating or revising these issues in this IGA. If there have been any wishes to bring other items out on the table for discussion, now would be an appropriate time.

CHAPTER 7. COLLECTION SYSTEM ASSET MANAGEMENT STRATEGY

This chapter provides an abbreviated sewer collection system asset management strategy for the City of Milwaukie. It will enable the City to make informed decisions on how to effectively allocate resources for capital improvements to the collection system on an annual basis.

BACKGROUND

In its simplest form, asset management is maintaining a desired level of service for collection system assets at the lowest life cycle cost. Lowest life cycle cost refers to the best appropriate cost for rehabilitating, repairing, or replacing an asset. Asset management is implemented through an asset management program which typically includes a written asset management plan (AMP).[1] The AMP typically includes the following core components:

1. An assessment of the current state of assets.
2. Defining the level of service required.
3. Assessing which assets are critical to sustained performance.
4. Determining the lowest life cycle cost.
5. Determining the best long-term funding strategy.

A significant amount of data was collected by the City on the collection system for the 2004 Wastewater Master Plan using sewer TV inspections.

CAPITAL IMPROVEMENT AND MAINTENANCE PROJECTS (CIP/CMP)

The City of Milwaukie provided Parametrix with a list of sixty-eight collection lines with associated integrity ratings. Some of these lines have been repaired since being inspected. Parametrix developed an asset management strategy to address the highest priority CIP/CMPs. This list was reviewed by City staff to confirm that the top ranked collection lines corresponded to those staff felt were most in need of improvements.

Using the information obtained from City staff, Parametrix staff reviewed sewer inspection videos. The following list outlines the findings and recommendations made for each collection line in order of priority and labeled by upstream and downstream manhole identification numbers. Additional information is contained in Table 7-1 and shown on Figure 7-1.

1. **2135 – 2134** (8”): No video was available for review and the inspection report showed no significant deficiencies other than having a short section of VCP (vitrified clay pipe). According to the City staff, this line is located in an area with easement/access issues and needs to be relocated from McLoughlin Blvd to Main St. as part of a larger improvement project.[2]

[1] Definition was taken from the USEPA Asset Management Best Practices Guide.

[2] Note: CIP items 1 through 3 are adjacent pipe segments and will be considered as one improvement for cost estimating purposes.

Figure 7-1. Capital Improvement/Maintenance Project Locations

Table 7-1. Project List with Associated Details, Notes, and Recommendations

Project #	Upstrm MH	Dwnstrm MH	Address	File #	Date Reviewed	Length, ft	Material	Dia, in	Upstream Depth	DwnStream Depth	Pipe Surface Cover	Apparent Land Use Type	Observations and Comments	Recommendation
1	**2135**	**2134**	1925 SE SCOTT	A2 - D11	8/19/2008	283	Clay	8	8	11.25	Asphalt Street	Downtown business district	Moderate belly from ~150' to 250' downstream of MH 2135.	CIP to replacement/relocation due to access and easement issues.
2	**2134**	**2133**	10700 SE MCLOUGHLIN	A2 - D11	8/19/2008	275	Clay	8	11.25	18	Asphalt Street	Downtown business district	Two bellies in line (one slight and one severe) and heavy roots at many service connections	CIP to replacement/relocation due to access and easement issues.
3	**2133**	**2000**	10700 SE MCLOUGHLIN	A2 - D11	8/19/2008	600	Concrete	8	18	21.5	Asphalt Street	Downtown business district	Belly noticed from ~25' to 80' downstream of MH 2133. Tape did not cover entire length of pipe due to camera not beign able to get past heavily mortared joint.	CIP to replacement/relocation due to access and easement issues.
4	**2008**	**2007**	2323 SE HARRISON	A2 - D12	6/26/2008	147	Concrete	10	5.5	2.58	Asphalt Street	Residential/Comm	Sewer tape started filming at 7.7' Belly for about 80' in First part of pipe	Full replacement
5	**1102**	**1101**	1509 SE OXFORD	A2 - T6	6/26/2008	172	Clay	8	4.83	7.58	Asphalt Street	Residential	Holes, cracks and roots at various points in pipe	CIPP or full replacement
6	**1127**	**1126**	1952 SE OCHOCO	A1 - T5	7/2/2008	228.3	Concrete	10	4.55	6.25	GRAVEL	Industrial (adjacent to railroad tracks)	Infiltration at almost every joint with signs of cracking and holes	CIPP or full replacement
7	**3397**	**3396**	6726 SE HEMLOCK	A3 - D2	6/27/2008	130.6	Concrete	8	9.25	7.75	Asphalt Street	Residential	Belly from 25' downgradient of MH 3397 to end of pipe (MH 3396)	Full replacement
8	**1190**	**1189**	2100 SE OCHOCO	A1 - T4	7/2/2008	35.5	Concrete	8	5.75	5.75	Asphalt Street	Industrial	Water appeared stagnent (no flow). Full radial crack at 33' from MH 1190. Lack of notes on Detail Sheet.	Full replacement
9	**2030**	**2004**	2146 SE MONROE	A2 - T8	8/19/2008	270	Clay	8	8.8	11.91	Asphalt Street	Downtown business district	Off-set jointabotu 10' downstream of MH 2030 and bellies throughout the service line with medium I/I close to MH 2030.	Full replacement
10	**1234**	**1225**	8706 SE 30TH	A1 - D10	7/1/2008	241.6	Concrete	8	11	13	Asphalt Street		There appear to be slight bellies within the first 100' downgradient of MH 1234; however, the major problem areas as identified by the Inspection Report appear to have been repaired already. Sections with offset joints or bellies as reported show new PVC w/o structural problems.	Problem areas fixed
11	**1222**	**1220**	8607 SE VAN WATERS	A1 - D10	7/1/2008	337	Concrete	8	12	8.25	Asphalt Street	Residential	Bellies and visible gaskets within first 225' of video	Full replacement
12	**1216**	**1222**	8514 SE 29TH	A1 - D10	7/1/2008	282.3	Concrete	8	8.25	12	Asphalt Street		No significant problems seen. Section of PVC appears to have fixed problems reported on the previous inspection detail. Report does not match video. Given new report by Shane when asked.	Problem areas fixed
13	**2136**	**2337**	1935 SE WASHINGTON	A2 - D13	N/A	54	Clay	8	4.33	11.25	UNMOVABLE BUILDING	Downtown business district (heavy traffic)	Not able to view tape due to formatting issues. Reports shows offset joints within first 10' of MH 2337.	Abandon and relocate, or CIPP.
14	**4008**	**4007**	11845 SE 26TH	A4 - D5	7/1/2008	37.3	Concrete	8	7.6	10	TREES & SHRUBS/Asphalt	Residential	Water appears stagnent with deepest part (belly) at 26' from MH 4008. Significant build-up at entrance to MH 4007	Full replacement
15	**3033**	**3032**	4040 SE INTERNATIONAL	A3 - D16	6/30/2008	354.2	Concrete	15	10.5	11.5	Asphalt Street	Commercial/Industrial	Two significant bellies of short length and there appears to be a couple of plumber service conections in need of grease traps.	Replace 40' segment between 211' and 260' from MH 3033 and 10' segment between 330' and 340'
16	**1309**	**1308**	9053 SE 41ST	A1 - D7	6/30/2008	285.4	Concrete	8	3.83	12	Asphalt Street	Residential	1 significant belly in line for about 70 ft	Replace ~70 ft of pipe from MH 1309 to 70 ' downstream
17	**3461**	**3460**	11084 SE 64TH	A3 - D17	6/30/2008	207	Concrete	8	7.67	10.42	Asphalt Street	Residential	One significant belly. Noticed some minor pipe jiont offsets within the first 50' downstream of MH 3461 (do not appear to be problematic).	Replace ~9' of pipe from 72' to 81' from MH 3461
18	**1055**	**1054**	9404 SE 42ND	A1 - D8	6/30/2008	252.7	Concrete	12	15.17	19.17	Asphalt Street	Residential	Two bellies with one sag approximately 170' in length and the other about 24' in length.	Full replacement
19	**5052**	**5051**	12113 SE RIVER	A5 - T2	6/30/2008	305	Concrete	8	6	6	Asphalt Street	Residential	Medium infiltration (1-5 gpm) happening at many of the joints. No Bellies and good flow.	CIPP or full replacement
20	**1591**	**1133**	9809 SE 17TH	A1 - T5	7/2/2008	222	Concrete	6	4	5.42	Asphalt Street	Commercial	cracks throughout the service line with minor amount of roots and joint 205' downstream of MH 1591. no bellies noted.	CIPP or full replacement
21	**1575**	**1144**	1520 SE MAIN	A1 - T5	7/2/2008	143.2	Concrete	8	9.5	10	TREES & SHRUBS	Downtown business district	Significant belly within lower 80-90' fo pipe.	Replace entire line
22	**1169**	**1168**	9079 SE FRONTAGE	A1 - T4	7/2/2008	116.5	Concrete	10	8	8	GRAVEL/Asphalt	Industrial	Medium infiltration happening at joints in four locations throughout the line. Belly noted at exit of MH 1169 to about 15' downstream	Replace line.
23	**1166**	**1029**	2400 SE MAILWELL	A1 - T5	N/A	403.2	Concrete	8	8	9.33	Asphalt Street	Industrial	Minor amounts of structural failure and evidence of infiltration throughout line.	CIPP or full replacement
24	**1495**	**1494**	9505 SE 55TH	A1B - D1	6/30/2008	75.5	Concrete	8	6.6	5.9	Asphalt Street	Residential	Belly noted from 16' to 22' stream of MH 1494 and Infiltation noted 2' upstream.	Replace 22' of line from entrance to 22' upstream of MH 1494, or CIPP.
25	**1163**	**1162**	9501 SE FRONTAGE	A1 - T2	7/2/2008	405.4	Concrete	10	9.8	11.5	OPEN AREA	Industrial	Infiltration noticed at many points within first 250' of pipe. Build-up found at many of the joints creating pooling. Roots enterat joints from about 280' downstream of MH 1163 to end of pipe.	CIPP or full replacement
26	**3094**	**3093**	4405 SE RIO VISTA	A3 - D7	6/30/2008	297.2	Concrete	8	9.17	9.42	Asphalt Street	Residential	Heavy amounts of roots coming though at joints, holes in pipe and service connections.	CIPP or full replacement
27	**1204**	**1203**	3461 SE ROSWELL	A1 - D7	6/30/2008	363.1	Concrete	8	8.83	8.33	Asphalt Street	Residential	Light roots thoughout line with no noticable bellies and steady flow.	CIPP
28	**1196**	**1037**	8810 SE ROCKVORST	A1 - D11	N/A	177	Concrete	8	9.17	13.75	SIDEWALK	Residential	Video of line not saved to disk properly, so no review tape. Report shows heavy roots throughout with belly in lower 45' of pipe.	CIPP or full replacement

Note:
1. CIP: Capital Improvement Project
2. CIPP: Cured-In-Place Pipe

2. **2134 – 2133** (8”): No video was available for review and the inspection report showed there to be a 15-ft long belly from 105-ft to 120-ft downstream of MH 2134 and a 20-ft long belly from 140-ft to 160-ft downstream of MH 2134. This line is located in an area with easement/access issues and needs to be relocated from McLoughlin Blvd to Main St.
3. **2133 – 2000** (8”): No video was available for review and the inspection report showed there to be heavy mortar in a joint where a factory service connection enters. This line is located in an area with easement/access issues and needs to be relocated from McLoughlin Blvd to Main St.
4. **2008 – 2007** (10”): A significant belly from exit of upstream MH 2008 to 80’ downstream. It is recommended that the entire pipe be replaced and laid to proper grade.
5. **1102 – 1101** (8”): Multiple sections of infiltration occurring throughout length of line with spots of deterioration and roots visible. It is recommended that the entire pipe be replaced and laid to proper grade.
6. **1127 – 1126** (10”): Infiltration and pipe deterioration happening within the first 110-ft downstream of MH 1127. It is recommended that the pipe be lined with CIPP (cured-in-place pipe) or similar.
7. **3397 – 3396** (8”): A belly starting at 39-ft downstream of MH 3397 to just before the entrance to MH 3396. It is recommended that the entire pipe be replaced and laid to proper grade.
8. **1190 – 1189** (8”): Water appeared to be stagnant without a clear direction of flow. There was a radial crack at 33-ft downstream of MH 1190. It is recommended that the entire length of pipe be replaced and laid to proper grade.
9. **2030 – 2004** (8”): No video was available to view for this collection line, but the inspection report showed bellies of varying severity along the full length of the pipe. It is recommended that the entire pipe be replaced and laid to proper grade.
10. **1234 – 1225** (8”): Significant deficiencies in the pipe as stated in the inspection report had been corrected; therefore, no further improvements are recommended.
11. **1222 – 1220** (8”): Multiple bellies of varying severity throughout the first 235-ft of the line downstream of MH 1222 with visible gasket observed at three locations. It is recommended that the entire pipe be replaced and laid to proper grade.
12. **1216 – 1222** (8”): Significant deficiencies in the pipe as stated in the inspection report had been corrected; therefore, no further improvements are recommended.
13. **2136 – 2337** (8”): The video was unable to be viewed due to formatting issues; however the inspection report stated that a broken joint and crooked main were observed within the first 9-ft upstream of MH 2337. This improvement will require further data collection to determine feasible alternatives. It is in a high traffic commercial area and appears to run under a building. Survey and capacity data of adjacent lines need to be gathered. For CIP development purposes, it is assumed that the line is abandoned and replaced.
14. **4008 – 4007** (8”): Belly running the full length of the pipe with significant build-up at the downstream entrance to MH 4007. It is recommended that the entire pipe be replaced and laid to proper grade.

15. **3033 – 3032** (15”): Couple of plumber service lines with significant grease buildup, a belly between 220-ft and 260-ft downstream of MH 3033 and another belly between 330-ft and 340-ft downstream of MH 3033. It is recommended that the 40-ft and 10-ft sections of pipe be replaced and grease traps be required of the users connected to this line.
16. **1309 – 1308** (8”): Significant belly from the exit of MH 1309 to about 70-ft downstream. It is recommended that this 70-ft section of pipe be replaced and laid to proper grade.
17. **3461 – 3460** (8”): Significant belly from 73-ft to 80-ft downstream of MH 3461. It is recommended that this 7-ft section of pipe be replaced and laid to proper grade.
18. **1055 – 1054** (12”): Two bellies within the pipe totaling about 200-ft in length (80% of pipe length). It is recommended that the entire pipe be replaced and laid to proper grade.
19. **5052 – 5051** (8”): Light to medium amounts of infiltration occurring throughout the length of the pipe. It is recommended that the pipe be lined with CIPP (cured-in-place pipe) or similar.
20. **1591 – 1133** (6”): Deterioration throughout the length of the pipe with radial cracks, broken joints, and light root intrusion. It is recommended that the pipe be lined via CIPP or similar.
21. **1575 – 1144** (8”): Belly from 55-ft downstream of MH 1575 to the entrance of MH 1144. It is recommended that the entire pipe be replaced and laid to proper grade.
22. **1169 – 1029** (10”): Medium amounts of infiltration happening at various points throughout the pipe and a 15’ long belly directly downstream of MH 1169. It is recommended that the entire pipe be replaced and laid to proper grade.
23. **1166 – 1029** (8”): Light infiltration was occurring throughout the pipe with points of deterioration. It is recommended that the pipe be lined with CIPP or similar.
24. **1495 – 1494** (8”): Infiltration just upstream of MH 1494 and a belly from 16-ft to 22-ft upstream of MH 1494. It is recommended that the 22-ft section of pipe upstream of MH 1494 be replaced and laid to proper grade.
25. **1163 – 1162** (10”): Infiltration noted throughout first 250-ft of pipe downstream of MH 1163. Roots and build-up noted at joints for about 25-ft upstream of MH 3093. It is recommended that the entire pipe be replaced and laid to proper grade.
26. **3094 – 3093** (8”): Heavy amounts of roots noted at joints and service connections causing deterioration of the pipe approximately 110-ft downstream of MH 3094. It is recommended that the entire pipe be replaced and laid to proper grade, and vegetation surrounding problem areas be removed if possible.
27. **1204 – 1203** (8”): Light amount of roots noted at joints in portions of pipe. It is recommended that the City provide annual chemical cleaning of this pipe to maintain flow or consider CIPP or similar.
28. **1196 – 1037** (8”): No tape provided. Inspection report shows root intrusion throughout pipe with a belly noted at 116-ft to 160-ft downstream of MH 1196. It is recommended that the entire pipe be replaced and laid to proper grade, and any vegetation surrounding problem areas be removed if possible.

NOTES:

A. In cases where partial line replacement in recommended, additional analysis is required to assess the actual length of pipe needing replacement to correct grade problems. In some cases, longer lengths of replacement may be required in order to not impact upstream or downstream flows.

B. Information related to surface cover, pipe material, and invert elevations was provided by City staff. It is assumed that the information provided in the inspection reports and on video is current.

C. Based on the findings of the TV tape reviews, two of the twenty-eight CIP/CMPs appear to have already been repaired/improved (see numbers 10 and 12).

D. Collection lines with significant bellies (more than half the pipe full) have caused historical maintenance problems for City staff and were all assumed to be replacement projects and in cases where more than half the line was showing signs of deficiencies, the recommendation was to replace the entire line.

E. Cured-in-place pipe (CIPP) was recommended in instances of root intrusion, infiltration, and light structure deficiencies as it is less intrusive and more economical in many situations.

Project Costs and Timeline

Table 7-2 outlines associated costs for each of the recommended actions. In some cases, more than one approach appeared feasible. Most improvement projects involve either replacement of existing pipes or pipe lining (assumed to be CIPP for estimating purposes). In the case of pipe replacement, cost[3] was based on length of pipe to be replaced, average depth of the pipe for excavation and fill, surface cover to be restored, and the assumption that the replacement pipe would be SDR 35 PVC. Table 7-3 provided unit cost data for each of these components. In instances were replacement would occur in a high traffic area, lump sum estimates of traffic control costs were added to the construction cost. The only factors taken into account for CIPP were diameter and length of the pipe.

Two CIPs analyzed estimated costs for relocation of collection and service lines. The first CIP on Table 7-2 has combined the top three priority collection lines in Table 7-1 into one CIP as they are all connected in series and all require the same improvements (Figure 7-2). For this CIP, two options were reviewed for cost: relocation to Main St. and CIPP. In addition to determining the cost of construction of the pipe as outlined above, the relocation was assumed to require four additional manholes, approximately twelve installed service lines, and an increase in size from eight inches to ten inches. Relocation for this project would also require a significant amount of engineering to relocate the collection line to Main St. Because of the lack of survey data and the scope of this project, the estimate cost of associated legal, administrative, contingency, and engineering work was limited to an estimate of 40% of the construction cost. CIPP would be an economical alternative if the City determines that relocation of this set of collection lines is cost prohibitive; however, this option would not address easement and access issues should future problems arise.

[3] All estimated material and construction costs were taken from the 2008 RS Means Heavy Construction Cost Data Reference Guide.

Table 7-2. Estimated Construction Costs

Project #	Upstrm MH		Dwnstrm MH	Project Type	Diameter, in	Improvement Length, ft	Average depth, ft	Surface cover	Relocation Cost	Replacement Cost	Cured-in-place Pipe (CIPP)
1 to 3	**2135**	-	**2000**	**CIP**	8	1158	15	Asphalt	$ 246,000.00		
4	**2008**	-	**2007**	**CMP**	10	147	4	Asphalt Street		$ 11,900.00	
5	**1102**	-	**1101**	**CMP**	8	172	6	Asphalt Street		$ 12,900.00	$ 10,400.00
6	**1127**	-	**1126**	**CMP**	10	228.3	5	Gravel		$ 11,600.00	$ 18,800.00
7	**3397**	-	**3396**	**CMP**	8	130.6	9	Asphalt Street		$ 10,600.00	
8	**1190**	-	**1189**	**CMP**	8	35.5	6	Asphalt Street		$ 5,000.00	
9	**2030**	-	**2004**	**CMP**	8	270	10	Asphalt Street		$ 21,900.00	
11	**1222**	-	**1220**	**CMP**	8	337	10	Asphalt Street		$ 29,300.00	
13	**2136**	-	**2337**	**CIP**	8	54	8	Building	$ 80,000.00		
14	**4008**	-	**4007**	**CMP**	8	37.3	9	Trees & Shrubs		$ 5,000.00	
15	**3033**	-	**3032**	**CMP**	15	50	11	Asphalt Street		$ 5,000.00	
16	**1309**	-	**1308**	**CMP**	8	70	8	Asphalt Street		$ 5,700.00	
17	**3461**	-	**3460**	**CMP**	8	9	9	Asphalt Street		$ 5,000.00	
18	**1055**	-	**1054**	**CMP**	12	252.7	17	Asphalt Street		$ 23,200.00	
19	**5052**	-	**5051**	**CMP**	8	305	6	Asphalt Street		$ 22,900.00	$ 18,500.00
20	**1591**	-	**1133**	**CMP**	6	222	5	Asphalt Street		$ 14,400.00	$ 10,000.00
21	**1575**	-	**1144**	**CMP**	8	143.2	10	Trees & Shrubs		$ 8,200.00	
22	**1169**	-	**1168**	**CMP**	10	116.5	8	Gravel		$ 6,600.00	
23	**1166**	-	**1029**	**CMP**	8	403.2	9	Asphalt Street		$ 32,700.00	$ 24,400.00
24	**1495**	-	**1494**	**CMP**	8	22	6	Asphalt Street		$ 5,000.00	$ 4,600.00
25	**1163**	-	**1162**	**CMP**	10	405.4	11	Open Area		$ 23,100.00	$ 33,400.00
26	**3094**	-	**3093**	**CMP**	8	297.2	9	Asphalt Street		$ 24,100.00	$ 18,000.00
27	**1204**	-	**1203**	**CMP**	8	363.1	9	Asphalt Street		$ 29,400.00	$ 22,000.00
28	**1196**	-	**1037**	**CMP**	8	177	11	Asphalt		$ 14,300.00	$ 10,700.00

Note:

1. CIP: Capital Improvement Project
2. CMP: Capital Maintenance Project
3. Projects 10 and 12 have already been completed.

Assumptions:

1. CIPP improvements require full length of pipe to be lined with a 10% mobilization cost.
2. Project #13 assumes the the repair or relocation happens from Manhole 2136 north to Manhole 2167 (see Figure 1).

Figure 7-2. Potential Relocation Projects

Table 7-3. Unit Costs for Pipe Improvements

DIG UP AND REPLACE

Asphalt Restoration

Pipe Diameter	0' - 8' Excavation, Cost/LF	8' - 15' Excavation, Cost/LF
6"	$65	$71
8"	$75	$81
10"	$81	$87
12"	$86	$92
15"	$93	$99

Native/Gravel Restoration

Pipe Diameter	0' - 8' Excavation, Cost/LF	8' - 15' Excavation, Cost/LF
6"	$35	$41
8"	$45	$51
10"	$51	$57
12"	$56	$62
15"	$63	$69

CAST-IN-PLACE PIPE

Pipe Diameter	Cost/LF
6"	$41
8"	$55
10"	$75
12"	$95
15"	$129

Assumptions:
1. Cost estimates based on 2008 RS Means cost estimating guide.

The CIP labeled as **2136 – 2337** (#13) in Table 7-2 was another project where relocation of the pipe appeared to be the best option. This line currently runs north from Washington St. directly under existing buildings connecting in series with other lines before discharging to a manhole on Jefferson St. (Figure 7-2). Since there is currently a collection line along Main St. between Washington St. and Jefferson St., the relocation alternative involved moving an estimated five service connections from the existing line to the line on Main St. Like the other relocation CIP outlined above, 40% was added to the estimated construction cost to account for associated legal, administrative, contingency, and engineering work.

For all recommended improvements, Parametrix recommends that the collection lines be reinspected prior to construction to ensure that the proposed corrective action is still appropriate.

The City of Milwaukie annually allocates approximately $530,000 for CIP/CMPs. Approximately 10% of the operating budget is held for contingency emergencies leaving the rest for planned projects. Based on the expected cost for the projects from Table 7-2, the projects were divided up over a five-year timeline as shown in Table 7-4. For the most part, the projects were divided into years based on prioritization with the exception of Project 13 which was moved to year two. CIP 1-3 was the only project recommended for the first year due to the relatively high cost when compared with other projects. For all five years, the estimated cost of construction is well below the annual allocated budget.

Table 7-4. Proposed Year of Construction

Year	Project #	Upstrm MH		Dwnstrm MH	Project Type	Relocation Cost	Replacement Cost
1	1 to 3	**2135**	-	**2000**	**CIP**	$ 246,000.00	
						TOTAL:	**$ 246,000.00**
2	6	**1127**	-	**1126**	**CMP**		$ 11,600.00
	13	**2136**	-	**2337**	**CIP**	$ 80,000.00	
						TOTAL:	**$ 91,600.00**
3	4	**2008**	-	**2007**	**CMP**		$ 11,900.00
	5	**1102**	-	**1101**	**CMP**		$ 12,900.00
	7	**3397**	-	**3396**	**CMP**		$ 10,600.00
	8	**1190**	-	**1189**	**CMP**		$ 5,000.00
	9	**2030**	-	**2004**	**CMP**		$ 21,900.00
	11	**1222**	-	**1220**	**CMP**		$ 29,300.00
						TOTAL:	**$ 91,600.00**
4	14	**4008**	-	**4007**	**CMP**		$ 5,000.00
	15	**3033**	-	**3032**	**CMP**		$ 5,000.00
	16	**1309**	-	**1308**	**CMP**		$ 5,700.00
	17	**3461**	-	**3460**	**CMP**		$ 5,000.00
	18	**1055**	-	**1054**	**CMP**		$ 23,200.00
	19	**5052**	-	**5051**	**CMP**		$ 22,900.00
	20	**1591**	-	**1133**	**CMP**		$ 14,400.00
	21	**1575**	-	**1144**	**CMP**		$ 8,200.00
	22	**1169**	-	**1168**	**CMP**		$ 6,600.00
						TOTAL:	**$ 96,000.00**
5	23	**1166**	-	**1029**	**CMP**		$ 32,700.00
	24	**1495**	-	**1494**	**CMP**		$ 5,000.00
	25	**1163**	-	**1162**	**CMP**		$ 23,100.00
	26	**3094**	-	**3093**	**CMP**		$ 24,100.00
	27	**1204**	-	**1203**	**CMP**		$ 29,400.00
	28	**1196**	-	**1037**	**CMP**		$ 14,300.00
						TOTAL:	**$ 128,600.00**

Note:

1. CIP: Capital Improvement Project
2. CMP: Capital Maintenance Project
3. Projects 10 and 12 have already been completed.
4. For the purpose of this analysis, only relocation and replacement costs were assumed. The City may want to consider alternatives as shown in Table 2 where appropriate.

The City of Milwaukie also provided a list of CIP projects for inclusion in this chapter and the financial analysis performed in Section 2, Chapter 7. This list of projects is shown in Table 7-5.

Table 7-5. Additional CIP Projects

Project Name	Estimated Cost	Projected Fiscal Year
Main Street Main	$180,000	2008-2009
	160,000	2009-2010
Johnson Creek Pump Station	75,000	2009-2010
	425,000	2010-2011
Decant Facility	16,666	2008-2009
	13,333	2009-2010
Master Plan	75,000	2008-2009
	100,000	Every 5+ Years
18th Avenue Rehabilitation	170,000	2008-2009
Dual Interest Area A Sewer Design	84,000	2008 -2009
Brookside Basin Repairs	240,000	2008-2009
Filbert Street Main, or	400,000	2011-2012
42nd Avenue Force Main Extension to 32nd	300,000	2011-2012
Jefferson Street Siphon to Kellogg Creek Intercep	750,000	2016-2017
Johnson Creek Siphon	800,000	2020-2021

Additional Recommendations

After reviewing the capabilities of the asset management software and staff at the City of Milwaukie, there are a few recommendations that may help to further improve the efficiency of prioritizing assets needing improvements. While the current version of Hanson® rates deficiencies in collection lines, it does not appear to have a way of rating the collection lines based on the location within the system. This allows for instances where collection lines of lower overall importance to appear to be a higher priority than those in critical areas. The fact that the City staff had to reprioritize the list initially provided to Parametrix shows a key example of this inefficiency. To address this problem, it is recommended that Hanson® rating values and inspection data be entered into the ArcGIS attribute table of the collection system layer for each evaluated collection line. Each collection line could then be color coded based on a range of rating values to show the observer where lines of highest priority are located. This methodology could be further refined by assigning multipliers to lines in critical areas to show a higher priority. It would then be at the discretion of the City staff to determine order of priority. We recommend that the City consider consulting with a Parametrix GIS specialist to aid the Asset Management Technician in developing this strategy.

A second area to potentially improve efficiency is with respect to the handling and recording of data from sewer TV inspections. The following recommendations are suggested:

- Due to changes in staff, equipment, and technology, a formal protocol should be established for the archiving of sewer TV inspections to allow for efficient retrieval.
- Notes regarding starting and ending addresses, surface cover, and manhole depths should be consistently recorded in the field and verified at the City office for inclusion in inspection reports. Inspection reports should also include the pipe diameter, material, and invert elevations when possible.

CHAPTER 8. WAVERLY HEIGHTS SEWER SYSTEM ANALYSIS

INTRODUCTION AND SCOPE

The purpose of this technical memorandum is to provide an analysis of the existing sewer collection system within Waverly Heights, a residential neighborhood within the city of Milwaukie, in terms of existing lateral conditions and recommendations for future sewer service in this area. Waverly Heights is located in Milwaukie, Oregon, near the intersection of Pacific Highway (Highway 99E) and Clackamas Highway (Highway 224). This neighborhood is surrounded on the north and west by the Waverly Country Club, on the bank of the Willamette River, on the east by SE 17th Avenue, and on the south by SE Lava Drive. Figure 8-1 provides a map of the location. This map was developed with information provided by the City of Milwaukie. This memo will present different viable options for the City of Milwaukie to help improve management of the sanitary sewer system within the Waverly Heights community. These options will then be evaluated based on advantages and disadvantages of the option. The option with the best advantages and fewest disadvantages will be recommended to the City of Milwaukie. This recommendation will be based on best available information and further conceptual design should be performed before implementation to assure proper functioning and performance of the option.

EXISTING CONDITIONS

The segments of sewer pipe under analysis include approximately 737 lineal feet (LF) on Waverly Drive, ending at the intersection of Waverly Drive and SE 17th Avenue, and approximately 3,700 LF within the Waverly Heights residential area and paralleling the southern portion of the Waverly Country Club golf course.

TV inspection reports provided by the City of Milwaukie provided information on the existing conditions of the sewer main and laterals. Majority of the existing sewer main is 8" concrete pipe with some segments of PVC pipe and VCP clay pipe. Intrusion of roots, lateral and radial cracking, debris, and structural deterioration were all noted in the TV reports, specifically in the clay pipe. Table 8-1 shows the details of the sewer manholes and mains.

Within the Waverly Heights area, there exists limited documented information regarding the existing sewer service laterals. There are also anticipated "party lines" in which a residence's service lateral has been used for another residence to connect to. Party lines can be problematic for issues concerning ownership and maintenance. If an issue were to arise in which a "party line" fails, there is no protocol for who would be responsible for damages and repair because there are several contributors to the sewer line and the City of Milwaukie has not accepted the line as a public line in which they would manage repair or maintenance.

A visual inspection was performed to determine the location and accessibility of the manholes. The manholes located within Waverly Drive and Cambridge Lane are located within the road and provide easy access for maintenance and construction. A significant number of the manholes within the residential area, however, are located within wooded areas or areas overgrown with vegetation and are more difficult to access. Table 8-1 provides information regarding access for the segments of pipe and manholes.

Table 8-1. Summary Table

Inspection No.	From	To	Length	Pipe Size (In.)	Pipe Material	Access	No. of Laterals	Roots	Cracking	Other
3708	1595	1594	294	8	PVC	Paved Road	2	N	N	
3709	1594	1593	276	8	PVC	Paved Road	2	N	N	
3710	1593	1592	167.4	8	PVC	Paved Road	1	N	N	
4906	1106	1111	16.4			Covered with high grass	0	N	N	Near MH 1111, PVC meets concrete pipe; camera could not pass through this point
3995	1524	1522	109.7	8	CP	In Cambridge Ln.	1	N	N	
3994	1522	1114	121.7	8	CP	In Cambridge Ln.	1	N	N	
3996	1114	1103	184	8	CP	In Cambridge Ln.	2	N	N	
3997	1103	1102	777	6	VCP Clay Pipe	1103 MH is in roadway; 1102 is on private property.	3	Y	N	Entire line was not "TV'ed" because line changes from 8" to a 6"
4050	1102	1101	172	8	VCP Clay Pipe	Both MHs on private property; 1101 easy to locate and access, 1102 could not be seen.	2	Y	Lateral (2), Radial (3)	Heavy structural deterioration also noted
4051	1101	1100	35.4	8	CP	Both MHs on private property; easy to locate and access.	0	N	N	
4052	1100	1099	123	8	CP	Both MHs on private property; easy to locate and access.	0	N	N	Recent replacement of existing wye with PVC pipe
4090	1099	1098	230	8	CP	Both MHs on private property; covered in grass, easy access.		Y(2)		
4098	1098	1097	165	8		Both MHs on private property; covered in grass, easy access.	0	Y	Lateral	
4099	1097	1096	165	8	CP	1096 is located near power utility pole, covered in small shrubbery; easy access.	0	N	N	Debris found
4151	1095	1094	777	8	CP	Neither MH could be seen; in overgrown corridor with power poles and lines; behind country club chipping course.	0	N	N	
4054	1113	1098	777	8	Unknown	1113 located with "MH" sign, behind 2' rock wall, wooded area, not easy access.	0	N	N	

EASEMENTS

The City of Milwaukie provided any recorded easement information on record. This information was used to determine which sewer mains were currently within utility easements. An internet search was also performed in an effort to locate any other easements on record. However, none were located. A professional title search should be performed in pursuit of these easements.

There is an existing abandoned railroad right-of-way, making up the west boundary of the Waverly Heights neighborhood. Sewer pipe from manhole 1096 southeast to manhole 1094 is within this abandoned right-of-way. Also located within this right-of-way are power poles and power lines; this suggests that this right-of-way has been converted to a utility easement, however, no documentation to support this was found.

Several manholes are located within private property lines. However, the only easement found for any of these sewer lines is for the section of pipe between 1095 and 1094 lying within the property line of 10230 Cambridge Lane. This easement is within the southwesterly 40 feet of tax lot 2000 and is owned by the City of Milwaukie. It is outlined within said easement that the City of Milwaukie is responsible for "…laying down, inspecting, maintaining, and replacing…" the sewer located within this easement.

There are several 8-foot wide walkways that are designated from Cambridge Lane to the Waverly Country Club. The locations of these walkways can be seen on Figure 8-1. There is a sewer main and manhole located within one of these walkways; it is unclear whether or not this sewer line is privately or publicly owned.

ALTERNATIVE ANALYSIS

There are five possible alternatives for this system. The first alternative would be to leave the system as-is, as seen in Figure 8-1. The advantages for this alternative include low to zero cost and no risk of conflict between City personnel and residences of Waverly Heights. Disadvantages include possible failure in the system, specifically is the clay lines. Another disadvantage is that there would remain no clear delineation of ownership between residences and the City for sewer mains and laterals.

The second alternative would be to replace only the clay lines. Figure 8-2 shows the location of the clay lines to be replaced. Advantages to this alternative include low cost and replacement of lines that could potentially fail. A disadvantage to this alternative is that it does not remedy the problem regarding ownership and responsibility for payment of sewer mains and laterals within the Waverly Heights community.

The third alternative would be to replace existing clay lines, relocate manholes #1101, #1100, #1099, and #1098 to within the abandoned railroad right-of-way for the City to take over complete ownership of the sewer mains associated with these manholes and to construct new public lines for residences with party lines to connect to. This option can be seen in Figure 8-3. The new line would be along Waverly Drive with three new manholes. This alternative would provide the City of Milwaukie with a new line that is guaranteed to be large enough to handle all waste from the homes nearby. In addition to the security of a large enough line, the line will also be new and will not be at risk of failure.

Figure 8-1. Milwaukie WW System Master Plan Option 1

Figure 8-2. Milwaukie WW System Master Plan Option 2

Figure 8-3. Milwaukie WW System Master Plan Option 3

The relocation of manholes #1101, #1100, #1099, and #1098 to within the abandoned railroad right-of-way would be advantageous to the City because it would allow for this line to be located within an area outside of private property. This would allow for easier maintenance and delineation of ownership. The disadvantages to this option are that there would still remain many sewer lines which are potential party lines. These lines are problematic because there is no delineation of ownership and maintenance costs for the City of Milwaukie and also for the homeowner. Another disadvantage to this option is the need for additional easements.

The fourth option would be to relocate manholes #1101, #1100, #1099, and #1098 to within the abandoned railroad right-of-way and also to add three new sewer mains: Line A, Line B, and Line C as seen on Figure 8-4. With this option, the line between manhole #1092 and manhole #1111 could be abandoned. Line A and Line B are gravity flow, intercepting the existing sewer main to the west which flows southeast. Line C would be located within Cambridge Lane.

An advantage to this option is that it cleans up the existing "party lines" located within the area. Table 8-2 shows how each of these properties can be connected to the new system. Another advantage is that this option would eliminate the line between manhole #1092 and manhole #1111, which is undersized and at risk of failure.

Table 8-2. Option 4 Service Connection

Address	Location of New Service Connection
1515	Line between MH 1103 and MH 1102
1530	Line between MH 1522 and MH 1114
9911	New Line A or maintain existing
4908	New Line C
10000	New Line C
10100	New Line C
10120	New Line C
10200	Line between MH 1094 and MH 1093
1532	New Line A
10005	New Line A
10115	New Line B
10127	New Line B
10131	New Line B
10111	New Line B
1504	New Line A or maintain existing
10252	New Line B
10240	Line between 1095 and 1094
10230	Line between MH 1095 and MH 1094
1505	West to new line
1509	West to new line or between MH 1102 and MH 1103
Property at end of Cambridge with no address	Could pump up Cambridge or obtain an easement from one of it's neighbors to connect to Line B or the line at the base of the hill

A disadvantage to this option is that it could be cost intensive. This option would require the City to purchase easements from the properties which would be affected by Lines A and B. Line C would be located within Cambridge Lane, and as such, would require no easement.

The fifth option is similar to Option 4 but includes abandoning the line from the cleanout on property 1532 to manhole #1111. An advantage to this option is that it removes another line which is potentially a "party line" with new sewer lines. The disadvantage to this option, however, is that the properties which potentially use this line would need to gain easements through other properties to reach Line A or Line B, in addition to the City needing to purchase easements for Lines A and B. Property owners may have conflict with needing to purchase easements for their sewer connections to these new lines, arguing that their current connection is working properly. Table 8-3 shows how affected properties can connect to the proposed improvements.

Table 8-3. Option 5 Service Connection

Address	Location of New Service Connection
1515	Line between MH 1103 and MH 1102
1530	Line between MH 1522 and MH 1114
9911	New Line A or maintain existing
4908	New Line C
10000	New Line C
10100	New Line C
10120	New Line C
10200	Line between MH 1094 and MH 1093
1532	New Line A
10005	New Line A
10115	New Line B
10127	New Line B
10131	New Line B
10111	New Line B
1504	New Line A or maintain existing
10252	New Line B
10240	Line between 1095 and 1094
10230	Line between MH 1095 and MH 1094
1505	West to new line
1509	West to new line or between MH 1102 and MH 1103
Interior properties, connected to the line from property 1532 to MH #1111	Line A or Line B
Property at end of Cambridge with no address	Could pump up Cambridge or obtain an easement from one of it's neighbors to connect to Line B or the line at the base of the hill

Figure 8-4. Milwaukie WW System Master Plan Option 4

Figure 8-5. Milwaukie WW System Master Plan Option 5

CONCLUSIONS/RECOMMENDATIONS/RESULTS

The sewer collection system in Waverly Heights consists of sewer lines within City of Milwaukie property and also within private property. Most of the piping of this system is concrete and PVC and in good shape; however there are segments of clay pipe that are cracking and deteriorating. In addition, there is extremely limited easement information for the parts of the system that are within private property lines as well as locations of existing sewer laterals. This provides difficulties in determining ownership and responsibility for maintenance. It is recommended that easements or documentation of responsibility and ownership be created, if not already existing, for all existing sanitary manholes and collection pipes within Waverly Heights.

A very basic cost estimate has been produced to compare costs associated with each of the above options, see Table 8-4 below. Cost assumptions for this estimate are very basic and should be used for comparison purposes only, not for final costs.

Table 8-4. Cost Comparison

	Number	Unit	Cost/Unit	Cost
Option 1				
Manholes	0	EA	$3,000	$0
New Line	0	LF	$200	$0
Connections	0	EA	$500	$0
			Total	**$0**
Option 2				
Manholes	0	EA	$3,000	$0
New Line	600	LF	$200	$120,000
Connections	0	EA	$500	$0
			Total	**$120,000**
Option 3				
Manholes	3	EA	$3,000	$9,000
New Line	1500	LF	$200	$300,000
Connections	3	EA	$500	$1,500
			Total	**$310,500**
Option 4				
Manholes	9	EA	$3,000	$27,000
New Line	3650	LF	$200	$730,000
Connections	19	EA	$500	$9,500
			Total	**$766,500**
Option 5				
Manholes	9	EA	$3,000	$27,000
New Line	3650	LF	$200	$730,000
Connections	19	EA	$500	$9,500
			Total	**$766,500**

In terms of Table 8-4, Option 4 and Option 5 will both cost about the same amount of money. However, Option 5 will require additional purchasing of easements as well as additional cost associated with abandoning a larger amount of existing pipe.

It is also recommended that the City proceed with Option 4, as mentioned above, which includes replacement of all clay pipes because of the documented cracking, root invasion, and structural deterioration of the existing clay pipe within Waverly Heights, and the relocation of manholes #1097 through #1101 to a future easement at the base of the hill extending the current alignment of the existing 8" main to the north. Option 4 also includes constructing Lines A, B, and C. Option 4 is recommended over Option 5 because Option 5 includes abandoning the line from property 1532 to manhole #1111. This line currently seems to be functional and performing this abandonment may stir argument from property owners to the City, as well as require additional funds and purchasing of easements. However, if the City of Milwaukie desires to eliminate all possible party lines, it is recommended that the City pursue Option 5. The main clay pipe line connects manhole 1103 to manhole 1102. This line is currently underneath an 8-foot walkway connecting Cambridge Lane to the Waverly Country Club. This line currently has three (3) service laterals connecting to it. Another clay line connects manhole 1102 to manhole 1101. This segment of pipe has two (2) service laterals connecting to it. Upon repair of these clay lines, the City of Milwaukie should claim ownership for the existing sewer mains and require residences to provide and maintain their sewer laterals joining into the sewer main. Sewer manholes that are currently located in difficult to access areas should be relocated to provide for easier maintenance.

Lines A and B will be gravity flow to intercept the existing main at the western edge of Waverly Heights. Line C, located within Cambridge Lane will also be a gravity main, joining with the existing line already located within Cambridge Lane to the north. Constructability of Line C appears to be possible regarding elevation change. It is recommended that more precise surveying or measurements be performed at the possible location of Line C to ensure this.

CHAPTER 9. LENTS SEWER LINE ANALYSIS

INTRODUCTION AND SCOPE

The purpose of this technical memorandum is to provide an analysis of the existing sewer collection system of the Lents Trunk line and the City of Milwaukie's agreement with the City of Portland (referred hereinafter as "IGA"). The Lents Trunk line begins near 162nd Avenue and SE Foster Road and ends in the Sellwood neighborhood of Portland at the Willamette River. The location of the Lents Trunk line can be seen in Figure 9-1 (this draft figure was prepared by and provided by the City of Portland).

EXISTING CONDITIONS

The City of Milwaukie and the City of Portland operate under an existing agreement with regard to providing sewer service to connections outside their respective city limits. The agreement outlines that each City may accept sewage from services within the other City's limits pending approval from the City Engineer and requiring that the City who is accepting the sewage charges the service with rates similar to comparable services within its own city limits.

The City of Milwaukie has future plans to connect some Milwaukie residences to the Portland line. Figure 9-2 shows an estimate of which properties the City of Milwaukie services, which properties the City of Portland services, and which properties are for potential future connections (this figure was prepared and provided by the City of Milwaukie). These services would be regulated by the existing agreement between the City of Portland and the City of Milwaukie. Currently, there are some inefficiencies between the cities regarding maintaining accurate records for number of services that each City is treating for the other and with billing. Some properties are paying City of Milwaukie sewage costs and others are paying higher rates for City of Portland sewage costs. The City of Milwaukie wishes to determine a just way to remedy the cost difference with existing customers and also with future customers.

ANALYSIS

The City of Milwaukie has future plans to connect current Milwaukie residences onto the Lents Trunk line, to be treated by the City of Portland. Discussions between the City of Milwaukie and the City of Portland have concluded that Portland has the capacity to add on such services. Hydraulic modeling during peak flows shall be done to ensure that the system will not be overloaded due to these connections.

The City of Milwaukie desires an analysis of the current IGA. Review of the current IGA reveals that it is lacking in detail and direction.

The current IGA between the City of Milwaukie and the City of Portland operates by requiring each City to provide a report to the other, at the beginning of each quarter, with "all new sewer connections to the other City's sewer system made during the previous quarter, including the address and number of equivalent dwelling units at each connection" (3(c)). The IGA then goes on to address how many equivalent dwelling units (EDU's) are awarded to different types of buildings. However, according to the IGA, the "City responsible for treatment of the sewage shall bill the other for such service at the rate charged to similar properties within its City boundaries" (4(a)). This statement does not enforce billing in terms of EDU's, which are required to be reported quarterly. This inconsistency provides difficulty for the City of Milwaukie or the City of Portland to add or remove any such services from

being treated by the other City. In addition, it appears that such reports have not been maintained. Upon requesting information detailing each City's current services with the other, reports were unable to be located. This suggests that completion of reports should be overseen more steadily in order to keep up accurate records.

Another issue raised with the current IGA is the cost discrepancy between properties. In some instances, neighbors are paying different rates strictly due to which City is treating their sewage. The City of Milwaukie wishes to make sewage rates as close in range as possible. One of the causes for these discrepancies is that each City is required to bill the other for rates similar to properties within their own city limits, as stated in 4(a) of the IGA. Also, in terms of monthly sewage rates, the City of Milwaukie has a minimum monthly charge, whereas the City of Portland does not. This means that people using Milwaukie services will always pay a minimum monthly charge, regardless if they use less water; people using Portland services will pay for what they use.

To be able to compare rates and costs between the City of Milwaukie and the City of Portland, information regarding number of accounts, and billing per account for residential and commercial areas was gathered. The City of Portland was unable to identify the number of accounts they billed out and therefore an approximation of 300 gallons per day per home was used to compare sewage costs per service. Commercial wastes are difficult to compare because costs depend on sewage characteristics. As a result, only residential services will be analyzed.

The City of Milwaukie has five residential accounts which contribute sewage to the City of Portland for a bi-monthly billing of $196.80. When broken down, the average cost per month per account for a residential service for the City of Milwaukie is $56.02. Currently the City of Milwaukie measures sewage flow based on water usage. During three winter months, the City of Milwaukie uses a residences average monthly water usage to determine a monthly sewage flow for the entire year.

The City of Portland is being charged by the City of Milwaukie $6.13 per 100 cubic feet of sewage. When converted, this cost becomes $0.0082 per gallon. On average, a residence will use 300 gallons per day. For a residence contributing 300 gallons per day (9,000 gallons per month) at $0.0082 per gallon, the City of Milwaukie charges the City of Portland $73.80 per month per residence. Table 9-1 provides a summary of charges.

Table 9-1. City of Milwaukie Summary of Charges Bi-Monthly Billing to Portland

	Commercial		
	Bi-Monthly	**Accounts**	**Average/Month/Account**
Johnson Creek	$28,234.43	4	$3,529.30
Stanley Pump Station Cycle 1	$571.73	5	$57.17
Stanley Pump Station Cycle 2	$780.59	2	$195.15
Total:	**$29,586.75**	**11**	**$3,781.62**
	Residential		
	Bi-Monthly	**Accounts**	**Average/Month/Account**
Johnson Creek	$63.03	1	$31.52
Stanley Pump Station Cycle 1	$6.62	1	$3.31
Stanley Pump Station Cycle 2	$127.15	3	$21.19
Total:	**$196.80**	**5**	**$56.02**

Two additional Intergovernmental Agreements were reviewed for purposes of analyzing the City of Milwaukie and City of Portland IGA: "City of Portland and Unified Sewerage Agency Wholesale Sewer Service Agreement," (hereinafter called the "USA IGA") and the "Dunthorpe-Riverdale Service District and City of Portland Sewage Transportation, Treatment, Maintenance and Engineering Service Agreement," (hereinafter called the "Dunthorpe IGA").

The USA IGA also utilizes a sewage charge based on EDUs. Each month, each party (Party A and Party B) determines the number of EDU's producing flow and will then provide information in a report. If Party A has a greater number of EDU's than Party B, then Party A will pay the difference in EDU's between Party A EDU's and Party B EDU's at Party B's current sewage rate to Party B. If Party B has a greater number of EDU's than Party A, then the opposite calculation is carried out for Party B to pay Party A.

Also outlined in the USA IGA are charges for use of the bypass connection during times of overflow. During times when the use of the emergency bypass is necessary, the charge for using so will be three (3) times the usual sewage rate.

For future connections to the system, the USA IGA outlines that there is no limit to the number of connections which may be made, however, connection permits and all applicable fees must be made.

The Dunthorpe IGA uses a sewage charge based on EDU's as well. This IGA was based on a flat number of EDU's purchased at the onset of the agreement. Since then, additional EDU's have been purchased. Additional EDU's may be purchased at any time, at the current connection charge per EDU. Monthly charges are determined using the number of EDU's connected within each party multiplied by the average winter water use per month.

The Dunthorpe IGA also includes clauses detailing operation and maintenance services for both parties.

CONCLUSIONS/RECOMMENDATIONS/RESULTS

The City of Milwaukie and the City of Portland have designed an agreement which allows each City to accept sewage from the other City for a fee. Currently, the City of Milwaukie bills the City of Portland an estimated $73.80 per account and the City of Portland bills the City of Milwaukie an average of $56.02 per account per month. The number of accounts billed by the City of Milwaukie for Portland accounts is an unknown. However, looking at average cost per account, the City of Milwaukie is charging the City of Portland approximately $17 more dollars per account per month. This difference in cost could be compensating for a lower number of accounts with the City of Portland or for a difference in commercial sewage costs. However, for purposes of this analysis, commercial costs were not taken into consideration. To accurately compare overall costs for each City, commercial sewage characteristics with associated costs, as well as both commercial and residential monthly flows would need to be included in the analysis.

Upon review of the City of Milwaukie and the City of Portland IGA, as well as the review of the USA IGA and the Dunthorpe IGA, it is recommended that the City of Milwaukie pursue an updated IGA with the City of Portland. The current IGA makes it difficult for the City of Milwaukie to allow for future connections and to move forward with any possible future plans within City limits. The current IGA is vague in terms of monthly billing for each party involved and also provides limited documentation of reports. The USA IGA seems to be an effective model because payment is based on the difference in EDU's between parties each quarter. This method requires both parties to produce reports quarterly, and also allows for changes in EDU's made within each quarter, as compared to yearly.

Figure 9-1. Lents Trunk Sewer and Contributing Basins

Figure 9-2. Interconnection Map

CHAPTER 10. STAFFING NEEDS

The purpose of this chapter is to provide a recommendation for staffing needs within the City of Milwaukie's Engineering and Wastewater Operations departments. Metrics used will come from reviews of current and expected future regulatory requirements, past staffing history within the city, comparisons to staffing within other similar municipalities, and projected capital improvement projects within the city. Using this information, recommendations will be made regarding the City's Departmental staffing needs.

REGULATORY REQUIREMENTS

While there are currently no state or federal regulations directly governing the number of engineering and operations staff required for a given city size, National Pollutant Discharge Elimination System (NPDES) permits do indirectly require that adequate staffing be available to effectively manage maintenance and improvement projects within the collection system to minimize the number and severity of combined and sanitary sewer overflows. In addition, those cities that choose to run their own Industrial Pretreatment Program must also account for staffing requirements assuming the program is managed through the engineering department. EPA currently recommends developing a Capacity, Management, Operations and Maintenance (CMOM) Program to help cities efficiently coordinate staffing with asset management to reduce noncompliance. While this is not currently a mandatory requirement, the EPA has been considering making it one over the past several years. We recommend the City of Milwaukie track the progression of CMOM regulations and consider developing a CMOM Program before regulations are in place.

CITY'S CURRENT AND HISTORICAL STAFFING

The City of Milwaukie engineering department currently has 4 FTE engineers consisting of two senior level engineers and two mid-level engineers. Approximately 1.25 FTE hours are dedicated to managing wastewater projects for the 396,495 linear feet of sewer line and 5 pump stations. According to City staff, the recent historical staffing has been approximately 5 FTE engineers. It was estimated that about half of the wastewater design projects are done internally. The remaining projects are outsourced to consulting firms. The Wastewater Department currently consists of 4 FTE staff members dedicated to sewer collection system maintenance.

COMPARISON TO OTHER MUNICIPALITIES

As noted in chapter 3, the city of Milwaukie has approximately 20,915 residents. Three other municipalities of similar size and location in Oregon were interviewed to determine the number of full-time equivalent senior engineers, junior to mid-level engineers, technical staff, and administrative staff dedicated to wastewater operations. Questions were also asked as to the staffing levels and equipment used within the O&M departments. These municipalities included Newberg, Forest Grove, and Sherwood. In addition to staffing inquiries, Parametrix staff also asked questions related to wastewater infrastructure and annual capital maintenance and improvement project budgets for comparison purposes.

Forest Grove (population 20,775) currently has an agreement with Clean Water Services (CWS) for wastewater treatment. The City is responsible for maintaining all sewer lines less than 24" in diameter (approximately 350,000 linear feet). All pump stations and sewer lines 24" and larger are maintained by CWS. In addition, CWS also runs the Industrial Pretreatment Program for Forest Grove's collection system and the wastewater treatment plant. Forest Grove's Engineering Department currently staffs two FTE senior engineers and four FTE junior to mid level engineers with one administrative staff member. When asked if they were comfortable with the level of staffing, the answer was positive with the exception that extra thought needed to be put into determining how to fill vacancies left by retiring staff members in the future. In speaking with Forest Grove staff, approximately 30% of their work is related to sewer systems. Their CIP/CMP budget was approximately $320,000 last year. When asked what types of work they do in house, the response was largely design review. They estimate that they only do about 5% of design work in house. The Forest Grove O&M department currently has 3.5 FTEs working on the collection system with one TV van and one vacuum truck.

The City of Newberg (population 21,675) has an engineering department consisting of 2 FTE senior engineers (one for water/wastewater projects and one for transportation projects with each giving help to the other when needed), 2.5 FTE junior to mid-level engineers, 2 FTE engineering technicians, and 2 administrative assistants. The percent of time dedicated to wastewater collection system related projects is roughly 30-40% with this department doing both review and design. In speaking with Newberg staff, this department considers its staff size adequate to handle usual projects. Although it was difficult to estimate, the City staff claims that it may perform approximately 50% of its design projects internally, depending on size. The City maintains approximately 391,000 linear feet sewer pipe, 7 pump stations, and a wastewater treatment plant. It also coordinates its own Industrial Pretreatment Program which is staffed through the Operations Department. The annual CIP/CMP budget is between $10 and $15 million due to the City maintaining its own sewer and water treatment plant. No information was readily available regarding how much of this was dedicated to collections system CIPs. As for the O&M department, the City currently has 2 staff members dedicated to the sanitary collection system. In speaking with the Newberg O&M staff, they are understaffed in this department and are hoping to increase staff size to 6 members. The City currently has one vacuum truck and one TV van that is shared with the water and storm system O&M departments.

The City of Sherwood (population 16,365) has an engineering department consisting of 2 senior engineers, 3 junior to mid-level engineers, 2 engineering technicians, and one administrative assistant according to the City's website. Attempts at making contact with the engineering department were unsuccessful. Therefore, answers as to the number of FTEs working on sanitary collection system projects, amount of design done in-house, and the annual CIP budget were unavailable. Based on the online copy of the City's 2005 Wastewater Master Plan, the City maintains approximately 294,000-feet of sewer line. This does not include the lines over 24-inches in diameter which are maintained by Clean Water Services. The City does not maintain any pump stations, a wastewater treatment plant, or an industrial pretreatment program. The O&M department currently has 2 FTEs working on the sewer collection system with one TV van and one vacuum truck.

PROJECTED CAPITAL IMPROVEMENT NEEDS

As shown in Chapter 15, the City has 8 capital improvement projects (CIP) to be constructed within the next 5 years. These projects include potential relocation of lines that will require engineering design and review. Approximately 22 capital maintenance projects (CMP) are planned within the next 5 years. One of the CIPs (Main Street main replacement) was recently solicited for engineering services (August 2008). Engineering Department staffing needs for CMP projects is largely related to coordinating internally with City crews, design reviews (if necessary), coordinating a project for an outside contractor, tracking work progress, and documenting work completed.

RECOMMENDATION

Because of the number of design projects within the 5 year time frame, there does not appear to be a need for additional staffing in the engineering department based on sewer improvement project needs alone. Staffing needs for other Milwaukie public works projects or departments were not analyzed. The past history of the City with regard to staffing levels and the comparison to other municipalities shows that there may be a need to hire an additional junior to mid-level engineer if other projects (transportation, water, etc.) are significant. In addition, as regulatory requirements for improving sanitary collection systems continue to increase, the City may benefit from having additional resources to address these issues. With regard to the City of Milwaukie's O&M department, the staffing level and field equipment appears to be adequate based on comparisons with other municipalities.

Most of the City's current engineering staff are relatively new to the City. The City may wish to implement a program for training replacement staff or developing a succession plan to increase future year's continuity and retention of knowledge base. This issue was identified as a concern by the City of Forest Grove.

CHAPTER 11. DUAL INTEREST AREA A FINANCING OPTIONS

INTRODUCTION

The City of Milwaukie is working cooperatively with CCSD #1 to provide sewer service to an area known as Dual Interest Area A. This area is located in northeast Milwaukie and is roughly bounded on the east by Linwood Avenue, on the north by West Fork Avenue, on the west by Stanley Avenue, and on the south by King Road. The area is located outside the Milwaukie City Limits and within the City's Urban Growth Management Area. CCSD #1 is serving as the lead agency for the overall project, while Milwaukie is leading the effort for the portion of the project for which they will assume ownership.

The purpose of this chapter is to provide the City with information on the funding and implementation of their portion of project costs. CCSD #1 has applied for overall project funding through DEQ's Clean Water State Revolving Fund (CWSRF) low-interest loan program. The City of Milwaukie also applied for, and was successful in receiving, the same CWSRF loan to provide the up front payment of their share of project costs. Financing the debt to service this loan is the subject of this chapter.

FUNDING OPTIONS

Two of the more common methods used to generate revenue to provide debt service payments for projects of this type include:

- Rate surcharge for users within the area to be served.
- A local improvement or reimbursement district.

Rate Surcharge: This funding method assumes that a low interest loan is obtained from the DEQ's CWSRF low-interest loan program to provide up front payment to CCSD #1. The CWSRF provides low-cost loans for the planning, design and construction of various water pollution control activities. Any public agency in Oregon is eligible for a CWSRF loan.

There are various types of loans available within the program including loans for the design and construction of sewer projects of the type being considered by the City. There are also loans available for emergencies, urgent repairs, and local community projects. Each of these loan types has different financial terms, and is intended to provide communities with choices when financing water quality improvements. A conservative estimate of loan terms would be 4% for a 20-year term loan and 3% for a 10-year term loan. Loan payback periods vary, ranging from 5 to 20 years. Loans include an annual loan fee of 0.5% of the outstanding balance. Table 11-1 summarizes key financial data for this alternative:

Table 11-1. Key Financial Data

Loan Term	20 years	10 years
Principal	$3,000,000	$3,000,000
Assumed Interest Rate	4%	3%
A/P Factor	0.07358	0.11723
Estimated Annual Payment	$220,800	$351,700
Estimated Total of All Payments	$4,416,000	$3,517,000
Assumed # of New Accounts	305	305
Monthly Surcharge	$61.00	$97.00

As the table shows, the rate surcharge option results in high rates that may not be reasonable. Assuming projected costs are accurate, the costs would have to be distributed over a larger group of customers to be feasible.

The City has been provided an Excel spreadsheet template that estimates cost impact to the City if property owners were allowed to delay payment to the City until connecting to the system. The spreadsheet assumes roughly 50% of the properties connect to the system and begin paying immediately with an additional 10% connecting per year for the next five years. These "connection scenarios" can be modified to model different circumstances. Under the CWSRF option, loan draws occur as project costs are incurred. Payments to the CWSRF program are assumed to begin 6 months after project completion. The spreadsheet shows the dollar amounts the City would need to provide from other sources depending on initial model assumptions.

The City, in principle, has other options they can offer residents to help defray project costs including delaying billings until connection to the system occurs, eliminating connection fees, and eliminating SDCs if connection is made within a certain period of time. The decision of whether or not to implement these options should be made on considering previous City policy. It is important that the City implement policies that are consistent, provide equal treatment of customers, and have a firm financial basis. The decision on whether to implement any of these options should be made after a careful review of historical City policies related to new infrastructure, SDCs and connection charges.

Local Improvement District: A Local Improvement District (LID) is a geographic area around a capital improvement in which benefited real property receives a special assessment to defray all or part of the costs of a public improvement. A distinctive feature of the assessment is that its amount is capped according to the estimated benefit that will accrue to each property. LIDs may be formed when property owners petition the City for the purpose of constructing and funding public improvements in their neighborhood or when a City determines that improvements are necessary. Chapter 3.08 of the City's municipal code governs the establishment of a LID.

> Note:
>
> A reimbursement district is similar to the LID with the exception of the initiation method. A reimbursement district is initiated by the developer (the City in this case), without property owner petition. Another key distinction is that property owners are not required to connect to the system until they choose to do so (or by County, State or Federal mandate). Otherwise the provisions listed below for a LID apply to a reimbursement district. Chapter 13.30 of the City's municipal code governs the establishment of reimbursement districts.

The LID provides a mechanism to coordinate the installation and funding of improvements between one or more property owners. Property owners benefit by participating in improvements that increase the value of their property but can take advantage of more favorable payment terms available to municipalities than they could secure on their own.

LIDs are initiated either by written petition from property owners or directly by a City as outlined in the following examples:

1. A City may desire to require installation of public improvements that are considered essential to the welfare of the city such as the installation of sewer in previously

unsewered areas and could initiate an LID to construct and assess the sewer costs to affected property owners.

2. Alternatively, when 80% of property owners that would benefit from the construction of a particular public improvement petition a City to initiate an LID, an LID could be formed to construct the improvements and assess those costs to the benefiting properties.

Based on preliminary data presently available, Table 11-2 summarizes key aspects of an LID for this project. The table assumes an average assessment per affected property. A detailed financial/engineering report would be prepared in the LID process that established the methodology used to make project assessments, i.e., frontage foot, lot square footage, etc.

Table 11-2. LID Key Aspects (Approximate numbers are shown for illustrative purposes, final costs and payback terms will be determined as the project develops)

Estimated Project Cost	$3,000,000
Estimated Number of Affected Properties	305
Average Assessment per Property	$9,800
Estimated Payment Amount (assumes 10-yr term, 6% interest, and two payments per year [20 payments])	$670 each payment, two per year
Total of Payments	**$13,400**

Procedures for establishing an LID may vary somewhat but generally include the following:

- A City will direct the preparation of an initial engineer's report and financial investigation in response to a City initiative or property owner petition.
- Reports are prepared which outline the project scope, estimated costs, and recommended assessment methodology. It is recommended that public information meetings be held to share information with property owners prior to submitting the report to Council.
- The engineer's report and financial report is accepted and a public hearing scheduled.
- A City would typically hire a bond counsel to help direct the financial portions of the LID process, help assure the process is consistent with State of Oregon statutes established to govern the LID process, and help assure the LID process is consistent with the City's charter.
- The Public Hearing is held to discuss initiation of the improvement. If the LID proceeds, the City would adopt the report and financial investigation.
- Interim financing must be used for the design and construction of improvements, typically through a commercial bank. Bonds for the project are not issued and final assessments made to individual properties until the project is complete.
- The project is designed, bid, and constructed in accordance with state law for public contracting.
- When the project is complete, the City develops a proposed assessment ordinance and schedules a public hearing.
- The staff notifies affected property owners of the proposed final assessment.

- The City typically holds a public hearing to consider any objections to the proposed assessment and to reach a final determination on the proper manner to allocate the cost.
- Upon adoption of the assessment ordinance, the City notifies property owners of their specific cost.

Upon receiving a notice of payment, property owners typically make their payment in one of two ways:

Method 1

Upon receiving notice of the assessment, the property owner makes a single payment for the value of the assessment.

Method 2:

Utilize a payment plan set up by the City to make payments over time for a City specified term and interest rate. These are commonly for 10 years with 2 payments per year. The interest rate for this method is often 0.5 to 1.0% higher than the issued bond rate.

Other general information relative to LIDs:

- An LID is an assessment levied against property ownership. It is not a tax and is not affected by whether the property initially chooses to actually connect to the sewer or not. (With a reimbursement district, the assessment is levied at the time of connection).
- After a project is completed, some property owners may choose to pay their assessment in full. This revenue is used to buy down the interim financing. Bonds are then sold for the balance and the remaining property owners would be assumed to be on a payment plan set up by the City.
- There is no property tax assessment and the County is not involved in the collection of funds or distribution of funds to the City.
- The assessment is a foreclosable assessment meaning if payments by property owners on a payment plan are not made, the City has recourse to collect funds through the initiation of foreclosure procedure.
- The risk to the City for this alternative is for non-payment by property owners. Because making the assessment is not dependent on whether the property is connected to sewer or not, the revenue stream to the City would be expected to be consistent. If non-payment occurred, the City's recourse would be initiation of foreclosure proceedings. The cost to the City would be lost revenue and legal fees. The cost would be dependent upon the number of property owners not paying. For planning purposes, $6,000 per non-paying property owner for legal fees and lost revenues could be used. (The risk for the City with a reimbursement district is different in that properties may choose when to pay by delaying connection).

Bancroft Bonds are a type of bond that could be used once bonds are issued at project completion. The Bancroft Bond is a bond vehicle that allows property owners to make semi-annual payments rather than a large up front payment. A bond counsel would advise the City as to whether this was the appropriate bonding vehicle for a specific project.

CHAPTER 12. COST OF SERVICE STUDY (UPDATE WITH FCS WORK)

INTRODUCTION/BACKGROUND

In March 2008, the City of Milwaukie contracted with Financial Consulting Solutions Group, Inc. (FCS Group), through Parametrix, Inc., to perform a revenue requirement analysis for its wastewater service and update its wastewater system development charge (SDC). The city of Milwaukie is a mature city experiencing ongoing demands on its aging wastewater system. The City's wastewater system will incur significant financial obligations due to improvements of its collection infrastructure and increasing County charges for treatment plant improvements.

With the study, the City wished to develop a rate requirement forecast that addressed the planned capital improvements and expected County treatment charge increases, and also produce a defensible wastewater SDC that would generate funding to meet the infrastructure needs of growth without unduly burdening existing residents and business owners.

Consistent with these objectives, the following general approach was used in the wastewater revenue requirement analysis and the update of the City's wastewater SDC:

- **SDC Methodology.** In this step, we worked with City staff to isolate the recoverable portion of existing and planned facility costs and to calculate SDC alternatives.
- **Revenue Requirements Analysis.** Incorporating policy recommendations received at the beginning of the study, we projected operations and capital revenue requirements for the wastewater service for a 10-year study period. We reviewed two alternatives: the first utilized the Capital Fund to meet increasing County capital costs, and the second assumed that rate revenues would bear the full share of such cost increases.
- **Documentation and Presentation.** In this step, we wrote this report describing the recommended SDC methodology, the revenue requirements analysis, and the resulting rate forecast, drafted adopting resolutions, and participated in Council and Citizens Utility Advisory Board (CUAB) meetings.

REVENUE REQUIREMENTS ANALYSIS

The City of Milwaukie is experiencing significant increases in its annual treatment charges from Clackamas County. At the same time, its aging wastewater infrastructure requires annual improvements to maintain and meet system needs. For the 10 years, beginning in fiscal year 2009, annual capital expenditures will average nearly $550,000 (based on today's cost and as escalated to year of construction); the County's higher treatment charges are expected to average an additional $1.1 million every year.

Cash Flow and Debt Coverage Tests

The revenue requirement analysis models the financial impacts of the capital program and County charges, in addition to budgeted expenses to determine the amount of rate revenue needed in a given year to meet the wastewater service's overall expected financial obligations. At least two separate conditions must be satisfied in order for rates to be sufficient: the wastewater service must generate revenues adequate to meet cash needs, and revenues must satisfy debt coverage requirements.

The cash flow test identifies all cash requirements as projected in each given year. Cash requirements include operations and maintenance expenses, treatment charges, policy-driven additions to working capital, and capital improvement costs. If the wastewater service collected replacement funding, it would also be included in the test as an expense. These expenses are compared to the total projected revenues, including interest on fund balances. Shortfalls are then used to estimate the necessary rate increases.

The debt coverage test measures the ability of rate revenues to meet both legal and policy-driven revenue obligations. Loans typically require that rate revenues equal at least the wastewater service's ongoing operating and maintenance expenditures plus 1.5 times its annual debt service. For the purpose of the coverage test, ongoing operating expenses exclude policy-driven additions to working capital, rate-funded capital expenditures, and replacement funding (which the wastewater service does not currently collect). It is assumed that the wastewater service could delay these costs in a given year, if necessary, in order to meet its debt service obligations.

Revenues should be sufficient to satisfy both tests. If revenues are found to be deficient by one or more of the tests, then the greater deficiency drives the rate increase. As noted above, the coverage test ensures that the wastewater service meets its legal and policy debt coverage requirements, and revenues may exceed actual cash needs. Consequently, capital expenditures may be partially funded with cash surpluses that result from rate revenues in excess of cash needs, due to debt coverage requirements.

Operating Expenses

The revenue requirement analysis uses the City's FY 2009 wastewater budget as the basis for forecasting future revenue needs. The analysis is dependent on economic, financial, and policy-based assumptions incorporated into the forecasting model.

Revenues and expenses were projected for future fiscal years using the following annual escalation factors:

- General Cost Inflation: 3.0% – applied to non-personnel operating expenditures
- Labor Inflation: 5.0% – applied to operating expenditures related to personnel
- Construction Inflation: 5.0% – applied to capital improvement project costs
- Customer (and Revenue) Growth: 0.15% – based on an estimated 10 new accounts per year (excluding potential growth within the Dual Interest Area A)
- Fund Earnings: 2.0% through FY 2010, 2.5% thereafter.

Minimum and maximum operating reserve balances have been sustained both to ensure that there are sufficient funds to cushion any temporary declines in revenue and to allow for excess funds to be used for capital expenditures. These parameters are set at 45 days (minimum) and 50 days (maximum) of cash operating expenses. Balances greater than the maximum are set aside for capital purposes. Also, for our analysis of current and future revenue requirements, we excluded the $150,979 contingency expense included in the City's FY 2009 wastewater budget. As will be shown, the 45-day minimum included in our model results in operating fund balances of at least $380,000.

Capital Expenses and Funding

The revenue requirement analysis incorporated the schedule of capital improvement projects contained in the City's Capital Improvement Plan. Several sources are available to fund the capital costs associated with this improvement program. These sources include:

1. Developer Funding – Includes developer-constructed facilities, often as a condition of development
2. Accumulated Capital Reserves – Includes receipts from system development charges
3. Direct Rate Funding
4. Loans

All planned project costs incorporated into the rate study were expected to be funded from capital reserves and, eventually, direct rate funding.

The City has been approved for a loan of $3,610,150 from DEQ; however, the proceeds will fund improvements that serve only the Dual Interest Area (DIA), and the debt service is expected to be fully funded by direct assessments to new connections within the DIA. Accordingly, all DIA project costs funded by the DEQ loan were excluded from the rate and SDC analysis.

Revenue Requirement Forecast

The results of the revenue requirement analysis are summarized in the tables found in this chapter. As noted before, the rate forecast is developed to project annual revenue needs and determine the rate increases necessary to support those needs. The required increases that are initially projected are then smoothed to provide relatively small and predictable annual increases.

Two scenarios were analyzed: the first assumed that the wastewater Capital Fund balance would be utilized to help fund the year-end adjustment in County charges—which are based on County capital improvement costs—and the second assumed that rate revenues would support all County treatment charges. Both rate forecasts assume that the City adopts the maximum SDC allowable by statute.

Table 12-1. First Scenario – Capital Fund Contribution

Revenue Requirements	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total Revenues Under Existing Rates	**$ 3,345,208**	**$ 3,340,434**	**$ 3,347,660**	**$ 3,352,867**	**$ 3,358,089**
Expenses					
Cash O&M Expenses	$ 1,720,723	$ 1,810,548	$ 1,882,380	$ 1,957,352	$ 2,035,612
Treatment Expense (Rate-Funded Share)	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Existing Debt Service	-	-	-	-	-
New Debt Service	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-
Rate Funded CIP	-	-	-	-	-
Total Expenses	**$ 2,920,723**	**$ 3,010,548**	**$ 3,082,380**	**$ 3,157,352**	**$ 3,235,612**
Annual Rate Adjustment	**5.99%**	**5.99%**	**5.99%**	**5.99%**	**5.99%**
Sample Residential Bill (bi-monthly)	*$ 74.19*	*$ 78.64*	*$ 83.35*	*$ 88.34*	*$ 93.63*
Total WES Treatment Expense	*1,914,922*	*2,094,997*	*2,275,613*	*2,309,549*	*2,344,556*
Total Revenues After Rate Increase	$ 3,411,646	$ 3,751,618	$ 3,984,043	$ 4,228,600	$ 4,488,192
Net Cash Flow After Rate Increase	$ 490,923	$ 741,070	$ 901,663	$ 1,071,249	$ 1,252,580
	FY 2014	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Total Revenues Under Existing Rates	**$ 3,365,480**	**$ 3,370,773**	**$ 3,376,083**	**$ 3,389,716**	**$ 3,445,071**
Expenses					
Cash O&M Expenses	$ 2,117,320	$ 2,202,640	$ 2,291,748	$ 2,384,335	$ 2,454,294
Treatment Expense (Rate-Funded Share)	1,200,000	1,200,000	2,456,343	2,495,981	2,536,869
Existing Debt Service	-	-	-	-	-
New Debt Service	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-
Rate Funded CIP	-	-	-	820,399	93,624
Total Expenses	**$ 3,317,320**	**$ 3,402,640**	**$ 4,748,091**	**$ 5,700,715**	**$ 5,084,788**
Annual Rate Adjustment	**5.99%**	**5.99%**	**5.99%**	**5.88%**	**0.00%**
Sample Residential Bill (bi-monthly)	*$ 99.24*	*$ 105.18*	*$ 111.49*	*$ 118.04*	*$ 118.04*
Total WES Treatment Expense	*2,380,667*	*2,417,917*	*2,456,343*	*2,495,981*	*2,536,869*
Total Revenues After Rate Increase	$ 4,765,897	$ 5,058,429	$ 5,368,945	$ 5,700,715	$ 5,759,549
Net Cash Flow After Rate Increase	1,448,577	1,655,789	620,854	-	674,761

Above, the City's annual wastewater revenue requirement is forecasted through FY 2018, assuming that the Capital Fund balance (excluding proceeds of the DEQ loan) is utilized to help pay for the capital portion of treatment cost adjustments charged by the County. We have assumed that the capital portion of the treatment expense is the difference between total projected treatment cost and the existing treatment cost before the annual capital adjustment, assumed to be replaced by a contractually agreed-upon annual total. It must be noted that the above revenues and rate increases are based on a 5.99% rate increase implemented by February 2009, and each increase thereafter would need to take effect before the start of each fiscal year in July.

In this scenario, the key driver for the rate increases is the fiscal year 2017 when rate revenues amounting to $820,399 are needed to fund City capital projects during the year. Furthermore, in FY 2016, the Capital Fund no longer contributes to County capital charges and rate revenues must meet all County costs. Additionally, if customer growth (or water demand) does not materialize as planned, the City may have to adjust rates beyond the projected percentage increases.

Importantly, if customer connections within the Dual Interest Area fail to materialize as planned, the debt service on the DEQ loan may need to be borne wholly by the existing wastewater customer base. Over the 10 year study period, debt service on the loan would average approximately $270,000 per year. Adding this burden to the above forecast would result in annual rate increases of 7.26% through FY 2016 and 7.37% for FY 2017. Note that the first increase would need to be implemented before February 2009.

Below, the City's planned capital improvement program spending is shown, with forecasted fund balances. It is important to note that the City will consume much of that portion of the Capital Fund that had been earmarked for future Kellogg de-commissioning costs.

Table 12-2. Planned Capital Improvement Program Spending

Capital Improvement Program	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total Capital Projects	**$ 911,049**	**$ 501,564**	**$ 598,029**	**$ 238,239**	**$ 164,130**
Grants and Developer Donations	-	-	-	-	-
SDC - Improvement Fund Contributions	20,383	227,036	491,991	12,100	-
SDC - Reimbursement Fund Contributions	501,652	14,380	4,641	4,453	4,456
Special Loan Proceeds (i.e. DEQ CWSRF)	-	-	-	-	-
Use of Capital Fund Balance / Loan Proceeds	389,014	260,148	101,397	221,686	159,674
Direct Rate Funding	-	-	-	-	-
Total Funding Sources	**$ 911,049**	**$ 501,564**	**$ 598,029**	**$ 238,239**	**$ 164,130**
	FY 2014	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Total Capital Projects	**$ 201,014**	**$ 351,775**	**$ 886,473**	**$ 1,396,195**	**$ 244,334**
Grants and Developer Donations	-	-	-	-	-
SDC - Improvement Fund Contributions	-	14,008	230,568	14,443	-
SDC - Reimbursement Fund Contributions	4,462	4,469	4,476	4,482	4,592
Special Loan Proceeds (i.e. DEQ CWSRF)	-	-	-	-	-
Use of Capital Fund Balance / Loan Proceeds	196,552	333,298	651,430	556,871	146,118
Direct Rate Funding	-	-	-	820,399	93,624
Total Funding Sources	**$ 201,014**	**$ 351,775**	**$ 886,473**	**$ 1,396,195**	**$ 244,334**

Fund Balances	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Operating Fund	$ 399,371	$ 407,898	$ 415,270	$ 422,917	$ 430,850
Capital Fund	1,592,633	1,201,884	949,211	705,308	663,358
SDC -- Improvement Fee Fund	865,133	663,077	195,352	195,836	208,444
SDC -- Reimbursement Fee Fund	9,944	199	4	0	0
Debt Reserve Fund	-	-	-	-	-
Total	**$ 2,867,081**	**$ 2,273,057**	**$ 1,559,837**	**$ 1,324,061**	**$ 1,302,651**
	FY 2014	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Operating Fund	$ 439,080	$ 447,620	$ 628,584	$ 628,584	$ 658,357
Capital Fund	746,386	864,811	679,216	146,118	661,792
SDC -- Improvement Fee Fund	222,421	222,821	6,685	234	8,208
SDC -- Reimbursement Fee Fund	0	0	0	0	0
Debt Reserve Fund	-	-	-	-	-
Total	**$ 1,407,887**	**$ 1,535,252**	**$ 1,314,485**	**$ 774,936**	**$ 1,328,357**

Table 12-3. Second Scenario – No Capital Fund Contribution

Revenue Requirements	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total Revenues Under Existing Rates	**$ 3,345,208**	**$ 3,342,392**	**$ 3,349,895**	**$ 3,355,144**	**$ 3,361,889**
Expenses					
Cash O&M Expenses	$ 1,723,673	$ 1,823,763	$ 1,898,099	$ 1,970,695	$ 2,046,263
Treatment Expense (Rate-Funded Share)	1,914,922	2,094,997	2,275,613	2,309,549	2,344,556
Existing Debt Service	-	-	-	-	-
New Debt Service	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-
Rate Funded CIP	-	-	-	-	-
Total Expenses	**$ 3,638,594**	**$ 3,918,760**	**$ 4,173,712**	**$ 4,280,245**	**$ 4,390,819**
Annual Rate Adjustment	**9.31%**	**7.30%**	**6.53%**	**4.99%**	**4.99%**
Sample Residential Bill (bi-monthly)	*$ 76.52*	*$ 82.11*	*$ 87.47*	*$ 91.83*	*$ 96.42*
Total WES Treatment Expense	*1,914,922*	*2,094,997*	*2,275,613*	*2,309,549*	*2,344,556*
Total Revenues After Rate Increase	$ 3,448,513	$ 3,918,760	$ 4,182,759	$ 4,397,675	$ 4,625,130
Net Cash Flow After Rate Increase	$ (190,081)	$ 0	$ 9,047	$ 117,430	$ 234,311
	FY 2014	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Total Revenues Under Existing Rates	**$ 3,370,184**	**$ 3,375,625**	**$ 3,381,088**	**$ 3,389,716**	**$ 3,446,753**
Expenses					
Cash O&M Expenses	$ 2,124,932	$ 2,206,836	$ 2,292,117	$ 2,380,924	$ 2,450,878
Treatment Expense (Rate-Funded Share)	2,380,667	2,417,917	2,456,343	2,495,981	2,536,869
Existing Debt Service	-	-	-	-	-
New Debt Service	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-
Rate Funded CIP	-	-	-	-	-
Total Expenses	**$ 4,505,598**	**$ 4,624,753**	**$ 4,748,460**	**$ 4,876,905**	**$ 4,987,747**
Annual Rate Adjustment	**4.99%**	**4.99%**	**4.99%**	**4.99%**	**0.00%**
Sample Residential Bill (bi-monthly)	*$ 101.23*	*$ 106.28*	*$ 111.58*	*$ 117.15*	*$ 117.15*
Total WES Treatment Expense	*2,380,667*	*2,417,917*	*2,456,343*	*2,495,981*	*2,536,869*
Total Revenues After Rate Increase	$ 4,865,749	$ 5,115,727	$ 5,378,567	$ 5,658,075	$ 5,718,526
Net Cash Flow After Rate Increase	360,151	490,974	630,107	781,170	730,779

Above, the City's annual wastewater revenue requirement is forecasted through FY 2018, assuming that only rate revenues are utilized to pay the annual capital adjustments charged by the County. Also, it must be noted that the above revenues and rate increases are based on a 9.31% rate increase implemented by February 2009.

In this scenario, the key driver for the rate increases is escalating County treatment charges in FY 2009 through 2011. It is assumed that the year-end FY 2009 capital adjustment will result in a total County charge of $18 per month per equivalent dwelling unit (EDU) for the year. In FY 2010, the overall rate is assumed to increase to $20 per month per EDU. In FY 2011, the overall rate is assumed to increase to $22 per month per EDU. Total County treatment charges are expected to escalate with inflation (3%) and customer growth (0.15%) each year thereafter.

And as with the first scenario, a shortfall in customer growth (or water usage) may require that the City adjust rates beyond the projected percentage increases as well as increase the size of its debt issues.

Finally, it is important to note that both rate forecasts were developed based on the assumption of fully funding the capital program with existing fund balances and rate revenues. Accordingly, any grant funding or low-interest loans that the City receives would have a material and beneficial impact on the rate forecasts. Additionally, planned project costs have a significant impact on required rate increases. To the extent that these costs are higher than expected or are delayed to a later year, there will be a material impact on rate requirements.

Below, the City's planned CIP spending is shown, with forecasted fund balances. It is important to note that the Capital Fund balance will remain no less than $1 million throughout the study period.

Table 12-4. Planned CIP Spending with Forecasted Balances

Capital Improvement Program	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total Capital Projects	**$ 911,049**	**$ 501,564**	**$ 598,029**	**$ 238,239**	**$ 164,130**
Grants and Developer Donations	-	-	-	-	-
SDC - Improvement Fund Contributions	20,383	227,036	491,991	12,100	-
SDC - Reimbursement Fund Contributions	501,652	14,380	4,641	4,453	4,456
Special Loan Proceeds (i.e. DEQ CWSRF)	-	-	-	-	-
Use of Capital Fund Balance / Loan Proceeds	389,014	260,148	101,397	221,686	159,674
Direct Rate Funding	-	-	-	-	-
Total Funding Sources	**$ 911,049**	**$ 501,564**	**$ 598,029**	**$ 238,239**	**$ 164,130**
	FY 2014	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Total Capital Projects	**$ 201,014**	**$ 351,775**	**$ 886,473**	**$ 1,396,195**	**$ 244,334**
Grants and Developer Donations	-	-	-	-	-
SDC - Improvement Fund Contributions	-	14,008	230,568	14,443	-
SDC - Reimbursement Fund Contributions	4,462	4,469	4,476	4,482	4,592
Special Loan Proceeds (i.e. DEQ CWSRF)	-	-	-	-	-
Use of Capital Fund Balance / Loan Proceeds	196,552	333,298	651,430	1,377,270	239,743
Direct Rate Funding	-	-	-	-	-
Total Funding Sources	**$ 201,014**	**$ 351,775**	**$ 886,473**	**$ 1,396,195**	**$ 244,334**

Fund Balances	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Operating Fund	$ 497,305	$ 497,305	$ 506,353	$ 574,910	$ 587,638
Capital Fund	1,528,617	1,299,041	1,230,120	1,088,060	1,177,170
SDC -- Improvement Fee Fund	865,133	663,077	195,352	195,836	208,444
SDC -- Reimbursement Fee Fund	9,944	199	4	0	0
Debt Reserve Fund	-	-	-	-	-
Total	**$ 2,900,999**	**$ 2,459,622**	**$ 1,931,828**	**$ 1,858,806**	**$ 1,973,252**
	FY 2014	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Operating Fund	$ 600,816	$ 614,458	$ 628,584	$ 643,210	$ 658,357
Capital Fund	1,362,907	1,547,827	1,558,813	1,002,645	1,593,839
SDC -- Improvement Fee Fund	222,421	222,821	6,685	234	8,208
SDC -- Reimbursement Fee Fund	0	0	0	0	0
Debt Reserve Fund	-	-	-	-	-
Total	**$ 2,186,143**	**$ 2,385,106**	**$ 2,194,081**	**$ 1,646,089**	**$ 2,260,405**

SYSTEM DEVELOPMENT CHARGE METHODOLOGY

A system development charge is a one-time fee imposed on new development (and some types of re-development) at the time of development. The fee is intended to recover a fair share of the costs of existing and planned facilities that provide capacity to serve growth.

Oregon Revised Statute (ORS) 223.297 - 223.314 defines SDCs and specifies how they shall be calculated, applied, and accounted for. By statute, an SDC is the sum of two components:

- A **reimbursement fee**, designed to recover costs associated with capital improvements already constructed or under construction, and
- An **improvement fee**, designed to recover costs associated with capital improvements to be constructed in the future.

The reimbursement fee methodology must be based on "the value of unused capacity available to future system users or the cost of the existing facilities," and must further consider prior contributions by existing users and gifted and grant-funded facilities. The calculation must also "promote the objective of future system users contributing no more than an equitable share to the cost of existing facilities." Reimbursement fee proceeds may be spent on any capital improvements related to the systems for which the SDC applied. Thus, wastewater SDCs must be spent on wastewater improvements.

The improvement fee methodology must include only the cost of projected capital improvements or portions of improvements needed to increase system capacity for future users. In other words, the cost(s) of planned projects or portions of projects that correct existing deficiencies, or that do not otherwise increase capacity for future users, may not be included in the improvement fee calculation. Improvement fee proceeds may be spent only on capital improvements, or portions thereof, which increase the capacity of the systems for which they were applied.

Reimbursement Fee Methodology

The calculation of the reimbursement fee, described in detail under *Wastewater SDC*, below, is fairly straightforward under the approach taken. In short, it is the dollar value of unused, available system capacity divided by the capacity it will serve. The unit of capacity used becomes the basis of the fee – e.g., meter equivalents, wastewater fixture units, or equivalent dwelling units. In addition to the cost or value of the system, Oregon law (ORS 223.304) requires that the reimbursement fee methodology also incorporate the following:

- "Ratemaking principles employed to finance publicly owned capital improvements", taken to mean that the fees must be calculated to equitably recover appropriate costs;
- "Prior contributions by existing users", taken to mean that the cost of contributed assets should not be included in the reimbursement fee basis;
- "Gifts or grants from federal or state government or private persons", taken to mean that gifted or grant-funded assets should not be included in the reimbursement fee basis; and
- "Other relevant factors identified by the local government imposing the fee".

Finally, the methodology must promote the objective of future system users contributing no more than an equitable share to the cost of existing facilities.

In the case of wastewater, the application of the statutory framework is straightforward. The reimbursement fee will serve to "reimburse" those who funded construction of the system, namely ratepayers, not of the adjustments noted.

Improvement Fee Methodology

The improvement fee calculation, like that of the reimbursement fee, is straightforward. In short, it is the eligible dollar cost of capacity-increasing capital projects divided by the capacity they will serve. Again, the unit of capacity used becomes the basis of the fee. The overriding issue to consider in the improvement fee calculation is the identification and separation of capacity-increasing capital costs.

For most projects, the capacity method was utilized to allocate costs to the improvement fee basis. Under the capacity approach, the cost of a given project is allocated to growth proportionately to the capacity made available for growth. As an example, assume we are allocating the $1 million cost of upsizing a collection main from 8" to 10" to meet the needs of growth. The capacity of a 10" main is 1,250 gallons per minute. The capacity of an 8" main is 800 gallons per minute. The allocation to growth would be determined as follows: (1,250 – 800) / 1,250 x $1 million or 36% x $1 million, which is $360,000.

However, several projects were either designed to serve only existing customers or only future customers. Such projects were allocated either 0% or 100% to growth, respectively.

Summary

In general, an SDC is calculated by adding the applicable reimbursement fee component to the applicable improvement fee component. Each separate component is calculated by dividing the eligible cost by the appropriate measure of growth in capacity. The unit of capacity used becomes the basis of the charge. A sample calculation is shown below.

Reimbursement Fee		**Improvement Fee**		**SDC**
Eligible cost of capacity in existing facilities / Growth in system capacity demand	+	Eligible cost of planned capacity-increasing capital improvements / Growth in system capacity demand	=	SDC ($ / unit)

SDC (Improvement Fee) Credits

The law requires that credits be provided against the improvement fee, for the construction of qualified public improvements. Oregon Revised Statute 223.304 states that, at a minimum, credits be provided against the improvement fee for

> *"the construction of a qualified public improvement. A 'qualified public improvement' means a capital improvement that is required as a condition of development approval, identified in the plan and list adopted pursuant to ORS 223.309 and either:*
>
> *(a) Not located on or contiguous to property that is the subject of development approval; or*
>
> *(b) Located in whole or in part on or contiguous to property that is the subject of development approval and required to be built larger or with greater capacity than is necessary for the particular development project to which the improvement fee is related."*

The law further states that credits

> *"may be granted only for the cost of that portion of such improvement that exceeds the local government's minimum standard facility size or capacity needed to serve the particular development project or property."*

The challenge is to craft a credit approach that meets statutory requirements and the City's assumed general objectives for cash flow, prioritization of capital projects, and orderly but sustained development. It must be noted that we believe it is important for the City to retain as much control as possible over the prioritization and implementation of its capital plans. These plans are created to address total system needs, not just the needs of growth. Without control over how and when those needs are addressed, the re-prioritization of projects over time can leave important City needs unmet. To avoid this outcome, credits should:

- be only for the portion of the actual, estimated, or agreed-upon cost of capacity in excess of that needed to serve the particular development;
- include no cash reimbursement;
- be for planned projects only; and
- be provided only upon completion of a "qualified public improvement."

We recommend that the City maintain its current SDC credit policy, which is in compliance with statutory requirements and incorporates our recommended guidelines.

Indexing Charge for Inflation

Oregon law (ORS 223.304) allows for the periodic indexing of system development charges for inflation, as long as the index used is:

> *"(A) A relevant measurement of the average change in prices or costs over an identified time period for materials, labor, real property or a combination of the three;*
>
> *(B) Published by a recognized organization or agency that produces the index or data source for reasons that are independent of the system development charge methodology; and*
>
> *(C) Incorporated as part of the established methodology or identified and adopted in a separate ordinance, resolution or order."*

We propose that City index its charges to the Engineering News Record (ENR) Construction Cost Index (CCI) for the City of Seattle, and adjust the charges annually as per that index. There is no comparable Oregon-specific index.

WASTEWATER SDC

As shown below, the City's existing wastewater SDC is applied according to equivalent dwelling units. For non-residential accounts, 16 wastewater fixture units comprise one EDU.

Table 12-5. Existing Wastewater SDC Schedule

Charge	Amount	Charge Basis
Reimbursement Fee	$327	EDU/16 Fixture Units
Improvement Fee	$566	EDU/16 Fixture Units
Total SDC	$893	EDU/16 Fixture Units

The proposed charge includes the application methodology of the existing wastewater SDC. Two potential alternatives were also reviewed. One charge is calculated based on EDUs, in which the EDU value is established by projected volume instead of fixture units, and the second is based on the size of the water meter and its associated flow capacity.

In addition, we evaluated the feasibility of charging a separate SDC in the Dual Interest Area, opting instead to develop a charge to be applied uniformly throughout the service area. The calculation of the proposed charge is summarized below.

Capacity Basis

In order to estimate growth in equivalent dwelling units during the study period – the denominator in both the reimbursement and improvement fee calculations – the following approach was taken.

- The City's 2004 Wastewater Master Plan reported an initial EDU total of 7,110. It also reported that 7,953 EDUs would be served at build-out in 2014. This total reflects an average annual customer growth of 1.31% per year.
- Applying the 1.31% growth rate to the initial EDU total of 7,110 resulted in a 2008 estimate of 7,436 EDUs.

  Additionally, the City provided a report of customers by meter size. Utilizing cold water flow factors, based on a 5/8" x 3/4" meter, it was determined that the City served 8,999 meter equivalents.

  Additionally, the number of wastewater fixture units in the system was estimated, based on fixture unit values assigned to different fixture types by the Uniform Plumbing Code. Applying the following assumptions, which link wastewater fixture units and meter size, resulted in an estimate of 148,533 total wastewater fixture units for City customers.

Current Customers by Meter Size				Fixture Unit Calculation	
Meter Size	**Customers**	**Flow Factor**	**Total MEs**	**Fixture Units**	**Total**
5/8" x 3/4"	6,083	1.00	6,083.00	16	97,328
1"	275	2.50	687.50	20	5,548
1-1/2"	105	5.00	525.00	79	8,254
2"	159	8.00	1,272.00	193	30,749
3"	16	16.00	256.00	261	4,174
4"	5	25.00	125.00	392	1,958
6"	1	50.00	50.00	522	522
Totals	**6,644**		**8,999**		**148,533**

- Finally, as a portion of the project costs included in the improvement fee cost basis that would serve new connections within the Dual Interest Area, the 305 future accounts within the DIA were added to the number of EDUs served at build-out. This resulted in a future total of 8,258 EDUs.

To project total meter equivalents and wastewater fixture units served at build-out, 2008 totals were grown proportionately with equivalent dwelling units. Accordingly, ending meter equivalents and wastewater fixture units totaled 9,993 and 164,954, respectively.

Reimbursement Fee Cost Basis

In order to estimate the cost of unused capacity in the existing wastewater system – the numerator in the reimbursement fee calculation – the following approach was taken.

- The City provided a schedule of wastewater assets as of FY 2008 that would serve the build-out customer base. These assets had an original cost total of $6,986,088.
- Of an ending customer base of 8,258 EDUs, growth – including DIA customers – of 822 EDUs represents 9.96% of the future customer total. Accordingly, the unused capacity cost from 2000 was reduced by 22.9% to account for customer growth that had occurred since that evaluation. Doing so reduced the cost of unused capacity to $2,963,589.
- Accordingly, based on growth's share of system capacity, 9.96% of existing asset costs were allocated to the reimbursement fee cost basis. This resulted in an initial unused capacity cost total of $695,470.
- The sum of the costs of unused capacity, $695,470, less a pro-rata share of outstanding debt principal of 3,056,208 resulted in a reimbursement fee cost basis of $391,222.

Reimbursement Fee Calculation

The reimbursement fee was then calculated as the reimbursement fee cost basis, $391,222, divided by forecasted customer growth, 822 EDUs, 995 meter equivalents, and 16,421 wastewater fixture units. The result of this calculation is a reimbursement fee of $476 per EDU, $393 per meter equivalent, and $23.82 per wastewater fixture unit.

Improvement Fee Cost Basis

The following approach was taken to determine the cost of capacity-increasing capital improvements for inclusion in the improvement fee cost basis.

- The City provided a wastewater capital improvement plan with a list of needed capital projects. The sum of this list of project costs in current dollars was $9,663,799.
- In allocating project costs to growth, the following steps were taken: (1) projects that did not increase capacity for future customers were given a 0% growth allocation; (2) projects that provided capacity for only future customers were given a growth allocation of 100%; and (3) projects that provided capacity for both existing customers and future customers were given a growth allocation equal to growth's share of the future customer base – 9.96%. The sum of each project's growth allocation resulted in $1,304,419 of improvement fee-eligible costs.
- Finally, the current improvement fee fund balance, $800,178, was deducted from the total eligible cost to (1) recognize that the fund balance is available for spending on the project list and (2) prevent new customers from paying for those project costs twice. The resulting improvement fee cost basis was $504,241.

Improvement Fee Calculation

The improvement fee was then calculated as follows. The cost basis of $504,241 was divided by total forecasted growth, 822 EDUs, 995 meter equivalents, and 16,421 wastewater fixture units, to establish the improvement fee of $613 per EDU, $507 per meter equivalent, and $30.71 per wastewater fixture unit.

Recommended SDC

The recommended wastewater SDC is the sum of the reimbursement fee and the improvement fee for each respective basis, adjusted by an administrative cost recovery factor of 1.13%, or $12 per EDU, $10 per meter equivalent, and $0.62 per wastewater fixture unit. The administrative cost recovery factor was derived by dividing the amortized cost of this study by forecasted annual SDC revenues. The resulting recommended SDCs were $1,101 per EDU, $910 per meter equivalent, and $55.15 per wastewater fixture unit.

Note that the charge based on EDUs diverges from the fixture unit SDC due to the fact that many customers install upsized meters for irrigation purposes, resulting in an understated fixture unit charge. The resulting recommended SDCs are provided in Table 12-6.

Table 12-6. Recommended SDCs

SDC Charge Basis	Charge per Unit
Equivalent Dwelling Units	$1,101 per EDU
Meter Equivalents	$910 per ME
Wastewater Fixture Units	$55.15 per Fixture Unit

The following tables summarize the charge applications based on meter equivalents and fixture units.

Meter Size	Meter Flow Factor	Meter SDC
1"	2.5	$ 2,275
1.5"	5	$ 4,551
2"	8	$ 7,281
3"	16	$ 14,563
4"	25	$ 22,755
6"	50	$ 45,509
8"	53.33	$ 48,540

Fixture	Fixture Units	Fixture Charge
Bar Sink	1.0	$ 55.15
Bathtub	4.0	$ 220.59
Bath/Shower combo	4.0	$ 220.59
Bidet	1.0	$ 55.15
Clotheswasher, domestic	4.0	$ 220.59
Dishwasher, domestic	1.5	$ 82.72
Kitchen sink, domestic	1.5	$ 82.72
Laundry sink	1.5	$ 82.72
Lavatory	1.0	$ 55.15
Shower	2.0	$ 110.30
Water closet - 1.6 gpf gravity tank	2.5	$ 137.87