1.0 EXECUTIVE SUMMARY

Keller Associates, Inc. was commissioned in 2010 to complete a comprehensive master plan for the City of Ashland sanitary sewer collection system and wastewater treatment plant. This section summarizes the major findings of the master plan, including brief discussions of alternatives considered and final recommendations.

1.1 DESIGN CONDITIONS

1.1.1 Demographics

Populations in the Ashland Comprehensive Plan were utilized without alteration, per City instruction, for all study design considerations. Comprehensive Plan projections were based on an assumed steady population increase of 187 persons per year (<1.0% growth rate).

The study area was selected to match the Urban Growth Boundary (UGB) defined in the Ashland Comprehensive Plan, with its associated land use and zoning. Land use densities from the 2011 Buildable Lands Inventory (BLI) were utilized in this study for identifying growth areas and developing future flows from those areas for use in the model for analysis of collection system components.

1.1.2 Wastewater Flows

Data on daily and monthly treatment plant flows from 2004 thru 2009, and limited hourly flow data from 2008 was used to determine design flows. Design flows were calculated in accordance with Oregon DEQ guidelines, and include average and peak flows for both wet and dry weather periods as summarized in Table 1.1.

TABLE 1.1: Summary of Historical and Projected Ashland Flow Rates

	2005-2009		Existing Design 2010		Projected Unit Flow	2015	2030	2060
	Avg	Max						
Population[1]	-	-	20,980		-	21,913	24,716	30,326
Units	MGD	MGD	**MGD**	GPCD	gpcd[2]	MGD	MGD	MGD
Average Day Dry-Weather[3] (ADWF)	2.06	2.15	**2.1**	100	100	2.19	2.47	3.04
Max Month Dry-Weather ($MMDWF_{10}$)	2.21	2.41	**2.7**	129	129	2.82	3.18	3.90
Annual Average Day (AADF)	2.17	2.41	**2.2**	105	105	2.30	2.59	3.18
Average Day Wet-Weather[4] (AWWF)	2.27	2.68	**2.3**	110	110	2.40	2.71	3.32
Max Month Wet-Weather ($MMWWF_5$)	2.77	3.64	**3.6**	172	172	3.76	4.24	5.20
Peak Week (PWkF)	3.64	5.02	**5.0**	238	**150**	5.14	5.56	6.40
Peak Day ($PDAF_5$)	5.52	8.39	**7.1**	338	**250**	7.33	8.03	9.44
Peak Instantaneous (Hour) (PIF_5)	-	10.00	**10.5**	500	**350**	10.83	11.81	13.77

[1] Populations from Comprehensive Plan
[2] gpcd = gallons per capita per day
[3] Dry-Weather = May – October
[4] Wet-Weather = November – April

Flows increase with precipitation, typically rising during the second week of December with peak flows in January before falling off in February. Winter months have more significant peak day events, and maximum monthly totals are typically 125% of average summer flows.

Analysis of hourly data revealed instantaneous flows as high as 10.0 MGD, with the largest peak events corresponding to rain events. These observations are indicative of significant infiltration and inflow within the collection system.

In addition to WWTP influent flows, flow meters were also placed at selected sites throughout the collection system to measure flows from the various sewer shed basins. These flows were utilized to calibrate the collection system model.

1.2 COLLECTION SYSTEM EVALUATION & RECOMMENDATIONS

1.2.1 Lift Station Evaluation

Keller Associates visited each of the 8 lift stations and completed a general inventory of facilities (including pump curves and data sheets where available), and conducted pump tests at select stations.

Each lift station has a unique set of deficiencies in accordance with its inventoried condition. Those requiring repair and targeted within the Capital Improvements Plan (CIP) include:

Priority 1 (2012-2020)

- Replace Grandview Lift Station (already underway)
- Equip Creek Drive Lift Station with chopper pumps and three phase power
- Abandon Nevada Lift Station – new Oak Street gravity pipeline (under design)
- Add valve vault drain at Windburn Lift Station
- Maintenance Management Software and programming upgrades
- Add SCADA to all lift stations

Priority 2 (2021-2030)

- Grandview Lift Station force main upgrade
- Convert Shamrock Lift Station to submersible pumps
- Upgrade North Mountain Lift Station to design standards

Other general recommendations not listed in the CIP include:

- Creation of Lift Station Design Standards – modeled after North Main Lift Station (ROMTEC) and including the following additional recommendations:
  - Wet well liner
  - Polyurethane sealant for all wet well joints
  - Flow meter(s)
  - Standardized controllers
  - Valve vault and drain
  - Flexible restrained couplings
  - Influent shutoff valve
- Upgrade SCADA at all stations to include:
  - Continuous level monitoring and trending
  - Continuous monitoring and trending of pump on/off status
  - Monthly reports of daily totalized flows and daily pump run times
  - Alarm when all pumps at a particular lift station are called on

1.2.2 Pipeline Condition and Capacity Evaluation

Keller Associates utilized the City's GIS record to conduct an inventory of pipe size and material for the City's 110 miles of gravity sewer. This inventory revealed approximately half of the collection system is made up of pipelines smaller than the current minimum pipe diameter standard of 8 inches. Clay and concrete pipes (generally the oldest and most susceptible to disrepair) constitute approximately 17% and 50%, respectively, of the total system. Pipes smaller than 8 inches and all clay and concrete pipes eventually should be replaced.

During an evaluation of the City's inspection process, about 16 hours of video and accompanying TV monitoring logs were reviewed by Keller Associates. The review also provided a glimpse into system conditions. Typical problems identified include cracks, roots, pipe sags, offset joints, and broken pipe, with over 400 pipeline segments currently identified for either spot repairs or pipeline replacement/rehabilitation. In addition, infiltration and inflow is encountered in many of the City's manholes; rehabilitation of these manholes is recommended. Replacement and/or rehabilitation of other manholes should be evaluated in connection with adjacent pipeline rehabilitation/replacement projects.

A GIS-based computer model (InfoSewer 7.0) of the collection system was built and exercised to evaluate capacities of the system's trunklines (generally 10-inches or larger). The modeling results were used to prioritize improvements recommended in the CIP. Generally, pipelines sufficiently sized for existing flows are also sufficient for City infill, with a few upgrades for system expansion into the UGB.

1.2.3 System Maintenance Evaluation

The City of Ashland has an active collection system maintenance program that includes schedules for jet rod cleaning, TV inspection, smoke testing, root foaming, sewer pipe repairs/replacement, and manhole repair/replacement. In the past three years, the City has exceeded their annual goals for jet rod cleaning, CCTV, and root foaming, with about 58% of the annual maintenance budget used on these three activities. Though the City exceeds industry standards, additional efficiencies may be achieved by implementing the following:

- More closely group monthly activities by geographic location
- Increase annual replacement / repair budget (target 7,800 ft/yr @ $100/ft = $780k/yr)
- Keep digital copies of CCTV inspections and photos
- Revise TV log ratings and pipeline ranking system

Adjustments to prioritization based on the judgment of an experienced operator should periodically be made, to account for limitations of any maintenance management system and considerations of overall risk.

1.2.4 Recommended Collection System Improvements

Recommended collection system capital improvements are summarized in the capital improvement plan (CIP) cost table at the end of this chapter and illustrated in Figure 8.1 in Appendix A. Notable major improvements are summarized below. The majority of Priority 1 & 2 improvements are replacements of pipe sections to correct size or slope issues identified with the model during the capacity analysis.

Priority 1A involves an extension of the Bear Creek Parallel Trunklines, including installation of an 18-inch and 24-inch pipeline parallel to the existing 12-inch pipeline, and installation of several 15-inch or 24-inch sections along the existing parallel trunks to create tiered parallel trunklines (12-inch/18-inch, 12-inch/24-inch, 15-inch/24-inch) from the I-5/Bear Creek intersection to the Ashland Creek Lift Station at the plant. This upgrade will provide sufficient capacity and redundancy for growth well into the future.

Priority 2A consists of installing a new 12-inch pipeline on West Nevada Street to intercept flows from the northwest and convey wastewater by gravity to the headworks of the WWTP, rather than being pumped by the Ashland Creek Lift Station.

Priority 3A involves construction of a new lift station and pressure main along the Rogue Valley Highway 99 to the northwest of town. The station would collect flows from new development along the highway and I-5 corridor as well as from extended service to existing development along Wrights Creek (west edge of City Limits). The existing North Main lift station could be abandoned.

1.3 EFFLUENT DISPOSAL

1.3.1 Effluent Disposal Options

Since the feasible alternatives for wastewater treatment depend on the effluent disposal method and associated effluent requirements, effluent disposal alternatives were evaluated before considering treatment options. Eight disposal alternatives were considered, including effluent recycling (maximum or partial recycling on Imperatrice property, or city-wide recycling); relocating the discharge point to Talent Irrigation District system; or continuation of the current practice of discharging to Ashland Creek.

Considerations in the development and evaluation of disposal options included:

- Land available for effluent recycling
- Phosphorus discharge limits in Ashland Creek
- Maintaining sufficient stream flow for fish in Ashland Creek
- Water rights issues
- Public and/or agency concerns
- Anticipated excess thermal load limits in Ashland and Bear Creek

Based on a review of the previous five years of temperature and flow data, there is an existing excess thermal load with the potential to exceed allowable levels during the May through October period. Therefore, the continued discharge options included various technologies to reduce temperatures and thermal loads both before and after discharge. The continued discharge alternatives evaluated included use of a cooling tower/chiller, shading/trading, blending, and a hyporheic (shallow ground water mixing) option to meet anticipated limits.

1.3.2 Effluent Disposal Recommendation

Though effluent requirements for recycling are less stringent than discharge to surface waters, a 100 percent effluent recycling program for Ashland has two major obstacles: 1) some of the water is needed to sustain flow for fish in Ashland Creek, and 2) the existing City-owned property will not be large enough for 100 percent land application in the future. Partial effluent recycling to limit discharge to periods with less restrictive discharge limits (primarily wet-weather, high-flow periods) would minimize the need for additional treatment, but would also require cost-prohibitive storage volumes. Therefore, the most feasible effluent disposal method is continued discharge, with shading/trading recommended to deal with thermal loads. Effluent recycling can be pursued as needed to address future potable water supply needs.

1.4 WASTEWATER TREATMENT

1.4.1 Existing Facilities

The Ashland WWTP consists of screening and grit removal, biological treatment in an oxidation ditch system with secondary clarification, UV disinfection, and post aeration. Alum addition and a tertiary membrane system are operated from May 1st to November 30th, to aid in meeting a seasonal phosphorus limit. Waste solids from the biological process are dewatered and hauled to the landfill for disposal. (Equipment for lime stabilization of the waste solids is currently not used.)

The Ashland WWTP currently operates and discharges to Ashland Creek under an NPDES permit. A new permit, expected to be completed in 2014, is anticipated to contain more stringent limits connected to Total Maximum Daily Loads (TMDLs) developed for the Bear Creek watershed. The 2007 TMDL addresses temperature, bacteria, and sedimentation issues, which may require a higher degree of treatment to maintain or improve effluent quality as future growth occurs. Additionally, new limits for toxins will trigger additional monitoring and may have impacts on the nature and timing of capital improvements in the future.

Reported effluent characteristics from January 2004 to December 2010 were analyzed to evaluate plant compliance with existing permit limits, and to evaluate the expected capability of the plant to continue meeting the permit limits with increased flows. Hydraulic capacity, treatment capacity based on typical operating criteria, and physical condition of the treatment plant components were also evaluated.

For CBOD, TSS, ammonia, phosphorus, and E. coli, the existing treatment plant technology should be able to meet the current limits in the future as long as treatment units are operating within the existing design criteria. As flow increases, additional components may be needed to maintain the design criteria and continue meeting the effluent limits, based on hydraulic and treatment capacity.

1.4.2 Recommended Improvements

The treatment process components that will need to be upgraded or replaced are:

Priority 1 (2012-2020)

1A – required for permit/Agency compliance

- Effluent temperature upgrade
- Fish screen for outfall (relocated outfall)
- Add UVT monitor

1B – recommended to address capacity and equipment condition issues

- Provide a 6-inch trash pump as a backup for the influent lift pumps
- Replace membranes at end of useful life
- Additional biological capacity (see treatment alternatives below)

- Option to meet DO limit (unless the limit is revised with the new permit and new outfall location).
- Replace RAS pumps with larger pumps

Priority 2 (2021-2030)

- Replace membranes at end of useful life (2023 upgrade will increase capacity, requiring piping, blower, membrane pump, and chemical treatment equipment upgrades)
- Add UV reactors to increase hydraulic capacity, and upgrade existing panels to allow flow pacing (to save energy).
- Upgrade or replace grit removal system
- Replace mechanical bar screen, clarifier mechanism in clarifier #2, and equipment in existing oxidation ditches

Priority 3 (2030-2060)

- Replace influent lift station pumps
- Replace membranes at end of useful life
- Increase biological treatment capacity
- Increase solids dewatering capacity
- Replace clarifier mechanisms in clarifiers 1 and 3

1.4.3 Treatment Alternatives

Treatment alternatives considered for continued effluent discharge included:

- No Action alternative
- Reduction of peak flows through
  - rehabilitation of collection system to minimize inflow and infiltration (I/I)
  - addition of flow equalization
- Expansion of oxidation ditch plant (third oxidation ditch or fourth clarifier)
- Parallel membrane plant to treat flows in excess of existing oxidation ditch capacity
- Enhanced biological treatment by modification of process in existing oxidation ditch
  - Staged aeration
  - Integrated Fixed Film/Activated Sludge (IFAS)
  - In-ditch membrane plant
- Adding a primary filter to reduce loading to the oxidation ditch

After consulting with the technical review committee, the following three options were evaluated in more detail with cost estimates and environmental impacts considered:

1. Expansion of oxidation ditch plant by constructing an **additional oxidation ditch** (which could be staged by initially using the shell as equalization storage);

2. Converting to enhanced biological treatment in the existing oxidation ditches, through **staged aeration** or **IFAS**

3. Adding a fine mesh sieve (**primary filter**) to reduce loading and thus increase treatment capacity.

All options are similar in that they provide capacity to 2030 and beyond. The recommended alternative is building a new ditch for initial use as an equalization basin. By 2030, the equalization basin will need to be equipped to function as a third oxidation ditch. A fourth secondary clarifier would be required by the year 2060.

Proceeding with the recommended option of constructing the outer shell of a third oxidation ditch is dependent on being able to obtain adjacent lands from the Parks Commission. If this is not feasible, the next best option is staged aeration.

1.4.4 Biosolids Handling Alternatives

The estimated amount of sludge produced is expected to increase 28% by the year 2030. The City of Ashland must have a reliable means of disposal for its sludge, since it is produced on a continuous basis and there is limited existing storage on-site.

Currently the City of Ashland disposes of their unstabilized dewatered sludge in the Dry Creek Landfill, and has adequate sludge storage and treatment facilities to manage their sludge through 2030. If this option should become unavailable or if it is desired to beneficially reuse the biosolids for fertilizer, the City would be required to stabilize their sludge before applying it to agricultural land or providing it to the public as fertilizer.

The evaluation of sludge handling alternatives involved a review of available technologies for thickening, sludge stabilization and dewatering. After consulting with the technical review committee (TRC), the following three options were evaluated in more detail with cost estimates and environmental impacts considered:

1. Dewater sludge using the **existing centrifuges, and haul to the landfill** for disposal.
2. Dewater sludge using the **existing centrifuges, and compost** to produce Class A biosolids for sale to commercial businesses and individuals.
3. Dewater sludge using the **existing centrifuges, and dry using a thermal dryer** to produce Class A biosolids for sale to commercial businesses and individuals.

Continuing to landfill is the least expensive alternative. However, it is recommended that the City consider a backup plan. Both compost and dried biosolids can be sold to generate revenue to offset the cost of sludge treatment. Thermal drying is less expensive than composting, and facilities could be located at the existing wastewater treatment plant.

1.4.5 WWTP Improvement Recommendations

Recommended capital improvements necessary to resolve existing and future deficiencies at the treatment plant are summarized in the CIP cost table and illustrated in Figure 12.1 in Appendix A.

Further, improvements were recommended and prioritized through consideration of several treatment planning objectives as outlined below.

- Eliminate NPDES Permit Violations:
  - Dissolved Oxygen - re-evaluate limit and seasons with DEQ

    - Excess Thermal Load – shading (recommended alternative) will be best accomplished by entering into an agreement with an implementation organization, and by relocating existing outfall to Bear Creek to address local plume concerns; local wetland improvements would also be beneficial
- Prevent Plant Deficiencies
    - Eliminate Bottlenecks – pipe from the oxidation ditch to clarifiers reaches capacity around 2030 flows
    - Manage Peak Flows – utilize shell of 3rd oxidation ditch as equalization basin until 2030; I/I reduction in collection system
- Stay Ahead of Growth and Maintain Equipment
    - Ashland Creek LS – provide portable backup pump on-site; replace pumps when pumped flows exceed 8.0 MGD (approx. 12.8 MGD total influent)
    - Screens – reach capacity and life expectancy in 2030
    - Grit removal system – sufficient capacity to 2030, estimated life expectancy near 2025
    - Oxidation Ditch – aerators reach useful life near 2030, new shell/equalization basin will need to be equipped as oxidation ditch #3 in 2030
    - Secondary Clarifiers #1 & #2 – mechanical life expectancy will be reached in 2030 and 2020, respectively; sufficient capacity is provided to 2050 with construction of a 3rd oxidation ditch
    - RAS pumps – replace when peak flows commonly exceed 6.5 MGD
    - UV disinfection – treatment capacity sufficient to 2030, while hydraulic capacity will be reached near 2020
    - Membrane filtration – replacement schedule provided to meet expected capacity increases and revolving life expectancies; based on that schedule, the membrane feed pumps will need to be upsized in 2023.
    - Alum feed – pump capacity will be reached near 2025
- Improve Solids Handling
    - City desires to produce Class A solids at some point
- Improve SCADA system

Relocating the outfall to Bear Creek, the fish screen, and third oxidation ditch involve construction within or near several Water Resource Protection Zones/Riparian Corridors, Locally Significant Wetlands, and Possible Wetlands. These projects will require environmental evaluations and coordination with Oregon Department of Fish & Wildlife (OWDR), Oregon State Department of Lands, and City Planning & Zoning.

1.5 CAPITAL IMPROVEMENTS PLAN & FINANCING

1.5.1 Summary of Costs

Table ES.2 presents a summary of future costs in order of priority. The basis for the need for each improvement varies, including compliance with the City's discharge permit and anticipated new regulations; achieving capacity necessary to accommodate growth; and replacing worn/old equipment.

Priority 1 improvements target existing deficiencies, and are intended to be completed within the next 5-10 years. Priority 2 improvements correct lower risk deficiencies and/or address impacts due to growth, and are expected to be required from 2020 to 2030. Priority 3 improvements are driven by growth. Flexibility in the schedule for completing many of these improvements is warranted. For example, the City should consider accelerating pipeline projects if they can be coordinated with roadway improvements. Similarly, changes in flows and efforts to reduce infiltration and inflow may allow for some improvements to be postponed.

TABLE 1.2: City of Ashland Wastewater Improvements Opinion of Probable Cost

ID#	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment		City's Estimated Portion
				%	Cost	
Priority 1 Improvements (2012 - 2020)						
Wastewater Treatment						
1	Outfall Relocation / Fish Screen	Compliance	$ 856,000	15%	$ 128,400	$ 727,600
2	Shading (Capital Cost + first 6 years of O&M)	Compliance	$ 1,646,000	15%	$ 246,900	$ 1,399,100
3	UVT Monitor	Compliance	Completed	0%	$ -	$ -
4	Backup (Portable) Pump	Capacity	$ 60,000	0%	$ -	$ 60,000
5	Membrane Replacement (two trains)	Replacement	$ 1,248,000	0%	$ -	$ 1,248,000
6	Oxidation Ditch Shell	Capacity	$ 4,000,000	39%	$ 1,560,000	$ 2,440,000
7	RAS Pump Replacement	Capacity	$ 90,000	20%	$ 18,000	$ 72,000
8	Wastewater Master Plan Update	Update	$ 125,000	100%	$ 125,000	$ -
9	Wastewater Facility Plan	Financing	$ 35,000	50%	$ 17,500	$ 17,500
Wastewater Collection System						
1A	18" and 24" Parallel Trunkline Along Creek	Capacity	$ 1,248,000	70%	$ 873,600	$ 374,400
1B	15" Main Along Mountain Ave	Capacity	$ 118,000	25%	$ 29,500	$ 88,500
1C	Oak St. 24" Trunkline	Capacity	$ 40,000	15%	$ 6,000	$ 34,000
1D	A St 15" Main	Capacity	$ 522,000	10%	$ 52,200	$ 469,800
1E	12" Main Along Railroad	Capacity	$ 275,000	57%	$ 156,750	$ 118,250
1F	12" Siskiyou Blvd Main	Capacity	$ 73,000	46%	$ 33,580	$ 39,420
1G	Miscellaneous Upgrades	Various	$ 335,000	10%	$ 33,500	$ 301,500
1H	Portable Flow Meters	Operations	$ 60,000	0%	$ -	$ 60,000
1J	Storm Water Inflow Study (2012 - 2013)	Capacity	$ 60,000	0%	$ -	$ 60,000
	Total Priority 1 Improvements		**$ 10,791,000**		**$ 3,280,930**	**$ 7,510,070**
Priority 2 Improvements (by 2020 - 2030)						
Wastewater Treatment						
1	Membrane Replacement (Larger Membranes)	Capacity/ Replacement	$ 4,659,000	40%	$ 1,863,600	$ 2,795,400
2	Membrane Feed Pumps & Piping Replacement	Capacity	$ 507,000	80%	$ 405,600	$ 101,400
3	Additional UV Reactors & Upgrade Control Panels	Capacity	$ 351,000	100%	$ 351,000	$ -
4	Mechanical Bar Screen Replacement	Replacement	$ 496,000	20%	$ 99,200	$ 396,800
5	Grit Removal System Replacement	Replacement	$ 801,000	20%	$ 160,200	$ 640,800
6	Oxidation Ditch Internals	Capacity	$ 2,150,000	100%	$ 2,150,000	$ -
7	Existing Oxidation Ditch Equipment Replacement	Replacement	$ 1,551,000	0%	$ -	$ 1,551,000
8	Clarifier Mechanism Replacement	Replacement	$ 324,000	0%	$ -	$ 324,000
9	Replace Ashland Creek Lift Station Pumps with Larger Pumps	Capacity	$ 353,000	80%	$ 282,400	$ 70,600
8	Wastewater Master Plan Update	Update	$ 125,000	100%	$ 125,000	$ -
9	Biosolids Disposal (assumes thermal dryer)	Various	$ 4,100,000	20%	$ 820,000	$ 3,280,000
Wastewater Collection System						
2A	12" Pipeline on Nevada Street	Capacity	$ 217,000	38%	$ 82,460	$ 134,540
2B	8" Slope Correction on Walker Ave.	Operations	$ 168,000	28%	$ 47,040	$ 120,960
2C	12" Pipeline on Wightman St.	Capacity	$ 172,000	66%	$ 113,520	$ 58,480
2D	Miscellaneous Upgrades	Various	$ 739,000	10%	$ 73,900	$ 665,100
	Total Priority 2 Improvements		**$ 16,713,000**		**$ 6,573,920**	**$ 10,139,080**

TABLE 1.2: City of Ashland Wastewater Improvements
Opinion of Probable Cost *(Continued)*

ID#	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment		City's Estimated Portion
				%	Cost	
Future Improvements (beyond 2030) or Development Related Improvements						
Wastewater Treatment						
1	Additional Centrifuge	Capacity	$ 817,000	100%	$ 817,000	$ -
2	Clarifier Mechanism Replacement (2)	Replacement	$ 646,000	0%	$ -	$ 646,000
3	Additional Clarifier	Capacity	$ 1,773,000	100%	$ 1,773,000	$ -
Wastewater Collection System						
3A	Rogue Valley Hwy 99 Collection, Lift Station, & Pressure Main (assumes City provides service)	Growth	$ 2,545,000	100%	$ 2,545,000	$ -
3B	Upsize Costs for Future Expansion	Growth	$ 18,000	100%	$ 18,000	$ -
	Total Priority 3 Improvements		**$ 5,799,000**		**$ 5,153,000**	**$ 646,000**
TOTAL WASTEWATER IMPROVEMENTS COSTS (rounded)			**$ 33,303,000**		**$ 15,007,850**	**$ 18,295,150**

1.5.2 Other Annual Costs

In addition to the capital improvement costs presented in the previous section, Keller Associates recommends the following be accounted for in setting annual budgets:

- Additional staffing needs: additional $195,000/year for 2.5 additional full time equivalent employees (collection system supervisor, treatment plant operator, and 0.5 FTE for regulatory compliance).
- Additional collection system replacement / rehabilitation needs: City should eventually budget an additional $637,000/year (either to be contracted out or completed using City crews). To minimize rate impacts, this program may not fully be funded until after 2022 when the existing wastewater loans are retired.
- Additional annual operations and maintenance costs will be required to maintain the shading improvements: anticipated to cost approximately $55,000/year for years 6-10, and closer to $39,000/year for years 11-20.
- Other additional annual operation and maintenance costs are associated with Priority 1 improvements (relocation of the outfall, larger RAS pumps, backup lift station pump, and equalization basin): the additional operations and maintenance costs for these improvements are anticipated at close to $26,000/year, most of which is associated with increased power usage of the RAS pumps.
- Short-lived assets (pumps, equipment, etc.): equates to an average of approximately $93,500/year, of which approximately $29,700/year is attributed to future facilities that will be added over the 20-year planning period.

1.5.3 Financing / Rates

A summary of the sewer financial plan can be found in Chapter 14 of this report. The financial plan considers the total annual cost of owning and operating the sewer system and recommends three new loans to pay for construction of most of the Priority 1 capital improvements. To pay for increasing costs of operation and to repay the existing and three new loans, the plan recommends increasing sewer rates 10 percent per year for the next six years. The base sewer rate paid by most single family households currently is $18.70 per month and will increase over the next 6 years to about $33.00 per month.