

CITY OF
WESTMINSTER

Rate and Fee Cost of Service Study

Report / March 11, 2019



March 11, 2019

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Public Works & Utilities
4800 W. 92nd Ave., Westminster, CO 80031
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Subject: Rate and Fee Cost of Service Study Report

Dear Ms. Gray,

Raftelis is pleased to provide this Rate and Fee Cost of Service Study (Rate Study) Report for the City of Westminster. The major objectives of the Rate Study included:

- Financial plan to estimate the amount of rate revenue and debt financing required to fund the City's water and wastewater utility operations during the years 2019 and 2020.
- Successfully financial positioning of the City's Water and Wastewater Enterprise Funds to attract new external debt financing at a reasonable cost.
- Water and wastewater cost of service (COS) studies to determine the amount of rate revenues that must be recovered from each customer class.
- Developing water and wastewater rates for the years 2019 and 2020 for each customer class.
- Updating the City's water and wastewater tap fees and tap fee assessment methodologies.
- Evaluating the City's asset inventory assessment tool which is used to value the City's water and wastewater infrastructure and develop future capital improvement program expenditure budgets.

This report summarizes our key COS findings and recommendations. It has been a pleasure working with you, and we thank you and the City staff for the support provided during the course of this study. Please do not hesitate to contact John or myself if you have any questions regarding the attached report and/or the project.

Sincerely,



Rick Giardina
Executive Vice President



John Wright
Manager

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Executive Summary

Study Background

On April 24, 2017, the City of Westminster (City) engaged Raftelis to conduct a Rate and Fee Cost of Service Study (Rate Study) for its water and wastewater utilities. During the period May 2017-October 2018, Raftelis completed the study with the assistance of City Staff. On October 8, 2018, the City Council adopted water and wastewater rates and water and wastewater tap fees for the years 2019 and 2020 based on the findings and recommendations described in this report.

The major objectives of the Rate Study included the following:

- Prepare a financial plan to estimate the amount of rate revenue and debt financing required to fund the City's water and wastewater utility operations during the years 2019 and 2020.
- Successfully position the City's Water and Wastewater Enterprise Funds to attract new external debt financing at a reasonable cost.
- Complete water and wastewater cost of service studies to determine the amount of rate revenues to be recovered from each customer class.
- Develop water and wastewater rates for the years 2019 and 2020 for each customer.
- Update the City's water and wastewater tap fees and tap fee assessment methodologies.
- Evaluate the City's asset inventory assessment tool which is used to value the City's water and wastewater infrastructure and develop future capital improvement program expenditure budgets.

Summary Results - Water Utility

The key outcomes and recommendations stemming from the water portion of the Rate Study are listed below. More detail regarding each item can be found in the body of this report:

- Financial Planning - 10% Increases in Water Rate Revenues Required in 2019 and 2020: The financial planning process determines the amount of rate revenue required to maintain utility financial integrity. The results of this process indicate that water rate revenues should be increased by 10% in 2019 and 10% in 2020. The 2019 and 2020 water rates adopted by the City Council are designed to achieve these rate increases.
- Cost of Service Study - Misalignment Between Water Rate Revenues and Cost of Service: A cost of service study determines the amount of rate revenue that must be recovered from each customer class based on their unique consumption characteristics. This analysis indicates that there is a significant misalignment between the amount of rate revenues earned from various water service customer classes and the estimated cost of providing service. In particular, customers in the Residential class are estimated to be paying 32% less than the costs incurred to provide service to them.
- Cost of Service Study - Eight-Year Phase-In to Cost of Service Water Rates: The misalignment between rate revenues and costs identified by the cost of service study can be corrected in two ways. The first option is to immediately implement rates that reflect the actual cost of providing service to each customer class. As noted above, this would result in a 32% increase in the rates paid by the Residential customer class. The second option is to phase-in the implementation of cost of service rates over a multi-year period. To minimize customer bill impacts, the City adopted phased-in cost of service rates for 2019/2020. Staff will recommend the adoption of phased cost of service rates for the years 2021-2026.. The practical outcome of this phase-in is that until 2026, Residential customers will be paying rates lower than their estimated cost of service while

other customer classes will be paying rates higher than their cost estimated cost of service. The 2019 and 2020 water rates adopted by the City Council reflect the first two-years of the recommended 8-year phase-in. If future City Councils choose to adopt rates that don't meet the phased timing, the rebalance effort to reflect cost of service rates may take longer than 8 years to achieve.

- Rate Design - Water Rate Structure Modifications: The rate design process determines how rates should be structured to recover the desired, appropriate amount of revenue. The following water rate structure modifications recommended by Raftelis were adopted by City Council and will become effective on January 1, 2019:
 - Residential Customers - Modification to TIER 1 Consumption Threshold: The City currently bills Residential customers using a three-TIER volumetric rate structure that requires customers to pay a higher volumetric rate as their water consumption increases. This three-TIER volumetric rate structure will remain in place. Beginning in 2019, the TIER 1 consumption threshold for Residential customers will be increased from 4,000 gallons per month to 6,000 gallons per month. This change is more effective in billing non-discretionary indoor water consumption of most customers at the lower TIER 1 volumetric rate, and allows for households with greater indoor water use to remain within the lowest cost Tier.
 - Commercial Customers - Implementation of a Water Resource Surcharge: When new customers connect to the City's water utility system, they pay a tap fee that reflects the infrastructure and water resource costs incurred by the City to provide a permanent service commitment to the customer based on their estimated future water consumption. However, some commercial customers consume water in amounts greater than the annual service commitment made by the City and reflected in the tap fee paid by the customer, or where there is no service commitment, the average 10-year water use history for the account. This forces the City to acquire water supplies in excess of those identified in the City's long-term water resource plans. At present, the cost of acquiring these additional water supplies is paid for by all water service customers. In order to mitigate this inequity, customers in the Commercial customer class will be assessed a volumetric Water Resource Surcharge when their actual water consumption exceeds their annual water budget as determined by either their service commitment made (based on the tap fee they paid) or the average of the account's 10-year water use history. The revenues earned from this surcharge will be used by the City to help offset the cost of acquiring additional long-term water resources. Customers will have the option to reduce their water use to remain within this water budget, pay the surcharge, or pay an additional water resources tap fee to cover the costs of their actual need.
 - Commercial Customers - Implementation of a Uniform Rate Structure: The City's existing rate structure for Commercial customers features two consumption TIERS. The amount of water consumption allowed in each consumption TIER varies by meter size. For example, in 2018, a Commercial customer with a 3/4" meter pays a TIER 1 rate \$6.63 per thousand gallon (Kgal) for up to 20,000 gallons of monthly consumption. In contrast, a Commercial customer a 2" meter pays a TIER 1 rate of \$6.63 per Kgal for up to 160,000 gallons of monthly consumption. Beginning in 2019, this two-TIER and meter-sized based approach will be eliminated and all Commercial customers will pay a single uniform volumetric rate for water consumption regardless of their meter size.

Monthly Meter Service Charges - Phase-In to Higher Revenue Contributions: All water customers pay a fixed monthly service charge that increases by meter size. For example, the 2018 monthly

meter service charge for a customer with a 3/4" meter is \$14.40 while a customer with a 2" meter pays \$43.47. In 2018, approximately 13% of the City's water rate revenues will be provided by monthly meter service charges while 87% will be provided by volumetric rates. To enhance revenue stability, the City adopted phased-in higher monthly meter service charges for 2019/2020, and Staff will recommend the adoption of higher monthly meter service charges for the years 2021-2026. The long-term goal is to increase the percentage of revenue contributed by fixed charges to 20% in 2026. Greater revenue stability is one factor considered by the debt rating agencies in assessing credit worthiness and with this change should put the City in a better position as it approaches the capital markets in the future. If future City Councils choose to adopt monthly service charges that don't meet the phased timing, the goal of achieving a fixed revenue component may take longer than 8 years to achieve.

- Water Tap Fees – Overall increase of 2.80%: The tap fees paid by new customers to connect to the City's water system consist of an infrastructure component and water resources component. The City updates the water resource component of its tap fees on an annual basis. While the infrastructure cost component of the City's tap fees will be increased by 3.67% effective January 1, 2019, the overall water tap fee increase in 2019 will be 2.80% in order to fully recover the cost of growth-related infrastructure.
- Water Tap Fees - Modification of Residential Assessment Methodology: Beginning in 2019, the City will use a scalable approach for calculating residential tap fees based on bathrooms for single family homes and bedrooms for multi-family developments. The new scalable tap fees will also vary for single family homes based on irrigable area to more directly correlate the tap fee paid to outdoor irrigation water demands.

Summary Results - Wastewater Utility

The key outcomes and recommendations stemming from the wastewater portion of the Rate Study are listed below. More detail regarding each item can be found in the body of this report:

- Financial Planning - 16% and 12% Wastewater Rate Revenue Increase Required in 2019 and 2020, Respectively: The results of this process indicate that wastewater rate revenues should be increased by 16% in 2019 and 12% in 2020. The 2019 and 2020 wastewater rates adopted by the City Council are designed to achieve these rate revenue increases.
- Cost of Service Study - Misalignment Between Wastewater Rate Revenues and Cost of Service: There is a significant misalignment between the amount of rate revenues earned from various wastewater customer classes and the estimated cost of providing service. In particular, customers in the Residential class are estimated to be paying 21% less than the costs incurred to provide service to them.

Cost of Service Study - Eight-Year Phase-In to Cost of Service Wastewater Rates: The misalignment between rate revenues and costs identified by the cost of service study can be corrected in two ways. The first option is to immediately implement rates that reflect the actual cost of providing service to each customer class. As noted above, this would result in a 21% increase in the rates paid by the Residential customer class. The second option is to phase-in the implementation of cost of service rates over a multi-year period. To minimize customer bill impacts, the City adopted phased-in cost of service rates for 2019/2020, and Staff will recommend the adoption of phased cost of service rates for the years 2021-2026. The practical outcome of this phase-in is that until 2026, Residential customers will be paying rates lower than their estimated cost of service while other customer classes will be paying rates higher than their cost estimated cost of service. The 2019 and 2020 water rates adopted by the City Council reflect the first two-years of the recommended 8-year phase-in. If future City Councils choose

to adopt rates that don't meet the phased timing, the rebalance effort to reflect cost of service rates may take longer than 8 years to achieve.

- Rate Design - Wastewater Rate Structure Modifications: All wastewater customers served by the City pay a volumetric rate that is assessed on their winter period average water consumption. The City does not charge a fixed monthly meter service charge. No changes to this existing rate structure were recommended by Raftelis or adopted by City Council.
- Customer Billing - Residential Wastewater 2,000 Gallon Minimum: All wastewater customers served by the City pay a volumetric rate assessed on their winter average water consumption during the months of December - February. Thus, a Residential or Commercial customer with no winter water consumption (for example, a "snow bird" customer who lives in a different location during the winter) can avoid paying any wastewater bills even if their home is occupied the vast majority of the year. The City has built and maintained a wastewater system that stands ready to serve all city customers at any time. While the average single-family residential customer uses 5,000 gallons of water in the winter time, some customers have little or no water use in these months. Staff recognizes that even though some customers may be gone from their homes during a portion of the year, and others may use very little indoor water in the winter, the city must operate the wastewater system to provide that service at any time. To ensure that each customer pays an appropriate amount to keep the sewer system ready to provide service, all customers, both residential and commercial, will pay a minimum monthly "readiness to serve" charge that is set at an amount equivalent to a 2,000 gallon monthly charge when their actual winter average water consumption is below this amount. With water revenues, all customers pay a fixed fee to cover the operation of the water system, regardless of water use. In the wastewater system, a minimum charge will provide a similar level of equity.
- Wastewater Tap Fees - Increase in Infrastructure Cost Component: The City charges new customers connecting to the wastewater system two separate tap fees. The first is the wastewater treatment tap fee charged by the Metropolitan Water Reclamation District of Denver and effectively "passed through" by the City. The City has no control over this fee and it was not the subject of analysis by Raftelis. The City also charges a wastewater transport tap fee that recovers the cost of the infrastructure required to transmit customer wastewater discharges to treatment facilities. The wastewater transport tap fee will increase by 22.89% effective January 1, 2019.

Water Utility Rate Study

Water Utility Profile

Table 1 shows the retail water service customer classes served by the City. Rates to customers located in the Shaw Heights area are set at 110% of the applicable Inside City rate. The City also provides water service on a wholesale basis to the City of Federal Heights.¹ No modifications to the City's customer classes, rate areas, or rate differentials was recommended as an outcome of the Rate Study.

¹ The rates paid by Federal Heights are governed by a wholesale water service agreement with the City.

Table 1: Water Service Retail Customer Classes

Customer Class	Inside City	Shaw Heights (Rates Set at 110% of Inside City)	Outside City (Rates Set at 125% of Inside City)
Residential	X	X	X
Blended Multi-Unit Residential	X	X	X
Multi-Unit, Public and Common Area Irrigation (this category includes apartments, HOAs, residential common area irrigation, public accounts and government accounts)	X	X	X
Commercial	X	X	X

Table 2 provides a profile of the City's water utility customers as based on estimated 2018 values.

Table 2: Profile of Water Utility Customers

Customer Class	Accounts		Billed Consumption		Revenues	
	Number	% of Total	Kgal	% of Total	Dollars	% of Total
Residential	30,711	91.9%	2,757,220	45.2%	16,298,692	42.8%
Blended Multi-Unit	20	0.1%	30,039	0.5%	170,735	0.4%
Multi Unit, Public and Common Area Irrigation	951	2.8%	801,945	13.1%	10,719,003	28.1%
Commercial	1,685	5.0%	1,522,525	25.0%	6,175,737	16.2%
Reclaimed Water	47	0.1%	538,131	8.8%	2,519,634	6.6%
Federal Heights (Wholesale)	3	0.0%	450,959	7.4%	2,229,067	5.8%
Total	33,417	100.00%	6,100,819	100.00%	38,112,868	100.00%

Water Utility Financial Plan

Raftelis prepared a financial plan for the City's water utility for the years 2019-2020. The purpose of the financial plan was to estimate the amount of rate revenue and external debt financing required to insure the on-going financial integrity of the City's water utility. Financial integrity, for purposes of the Rate Study, was defined as a level of funding adequate to: 1) pay for projected capital improvement program (CIP) expenditures, debt service expenditures and operating expenses; 2) maintain compliance with contractually mandated, legal, debt service coverage requirements and City financial management policies regarding minimum acceptable debt service coverage levels; 3) maintain adequate cash reserve balances as specified in City financial management policies; and 4) successfully position the water and wastewater utilities to obtain, at a reasonable cost, new external debt financing from investors in the capital markets.

The specific financial planning objectives addressed included:

- Funding critical capital improvement program expenditures such as water main replacement, water treatment and distribution facility repair and replacement, and the acquisition of land for the City's Water 2025 Plan that includes the replacement of the City's Semper Water Treatment Facility.
- Funding routine O&M expenses and maintain cash reserves in the water utility Capital Project Reserve Fund equal to the \$3 million minimum mandated by City financial management policies.
- Maintaining a minimum annual debt service coverage ratio excluding tap fee receipts of at least 1.50x as calculated by the equation: net revenues available for debt service divided debt service payments.

A second important purpose served by the financial planning process is to establish the total amount of revenue that must be recovered from utility customers during each year of the planning horizon. This utility-wide revenue requirement from rates is then allocated, through the cost of service process, to each customer class based on the

specific demands they impose on the utility system. Figure 1 illustrates the role of financial planning in the utility cost of service process.

Figure 1: Steps in the Financial Planning Process

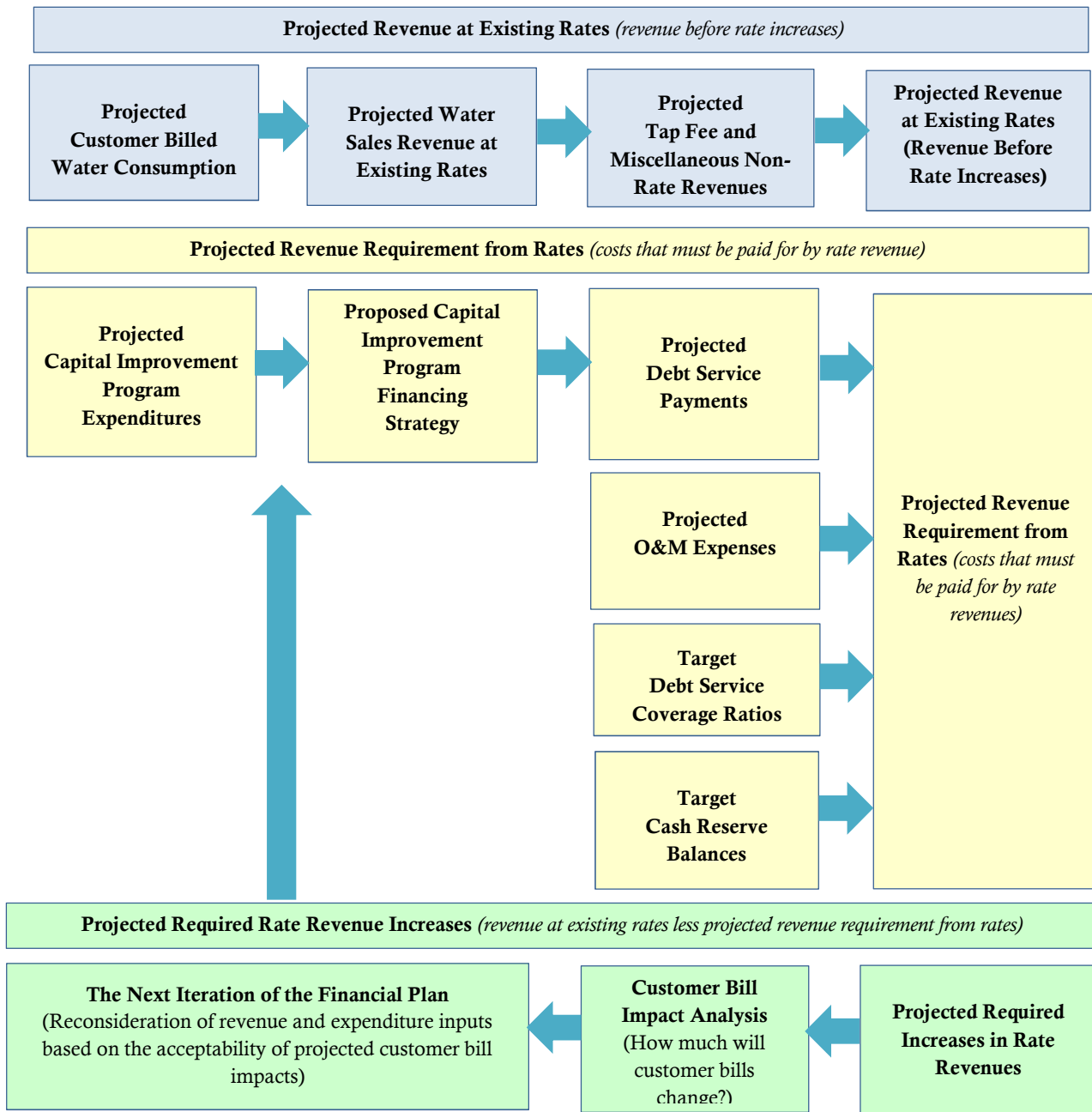


Table 3 summarizes the water utility financial plan for 2019 and 2020. The financial plans prepared by Raftelis indicate that City's water utility requires annual rate revenue increases of 10% in 2019 and 10% in 2020 with \$67 million in external financing required in 2019.

Table 3: Water Utility Financial Plan for 2019 and 2020

Line No.	Metric	2019	2020
1	Required Annual Rate Revenue Increases	10.0%	10.0%
2	Rate Revenues Required from Customers	\$39,600,209	\$44,058,795
3	Tap Fee Receipts	5,532,000	5,667,960
4	Miscellaneous Revenues (including the sale of reclaimed water)	11,406,055	7,828,969
5	Total Funding	56,538,265	57,555,724
6	Capital Improvement Program	32,270,000	19,900,000
7	Operations and Maintenance	29,861,866	30,643,255
8	Debt Service Payments	10,697,149	10,117,004
9	Total Expenditures	72,829,015	60,660,259
10	Annual Operating Surplus/Deficit	-\$16,290,750	-\$3,104,535
11	Ending Capital Project Reserve Fund (Working Cash)	\$7,177,768	\$48,066,229
12	Required External Debt Financing	\$67,000,000	\$0
13	Debt Service Coverage		
14	Including Tap Fees (Target = 1.50)	2.49	2.66
15	Excluding Tap Fees (Target = 1.50)	1.98	2.10
16	Combined Water & Wastewater Debt Service Coverage		
17	Including Tap Fees (Target = 1.50)	2.18	2.44
18	Excluding Tap Fees (Target = 1.50)	1.81	2.04

WATER UTILITY REVENUE REQUIREMENT FROM RATES

The financial planning process determines the amount of water rate revenues that must be recovered from customers (see Line 2 from Table 3). This amount, referred to as the revenue requirement from rates, is the level of rate revenues necessary to pay for utility operating and capital costs. An alternative presentation of the determination of this amount for the years 2019 and 2020 is shown in Table 4 (see Line 10).

Table 4: Water Utility Revenue Requirement for 2019 and 2020

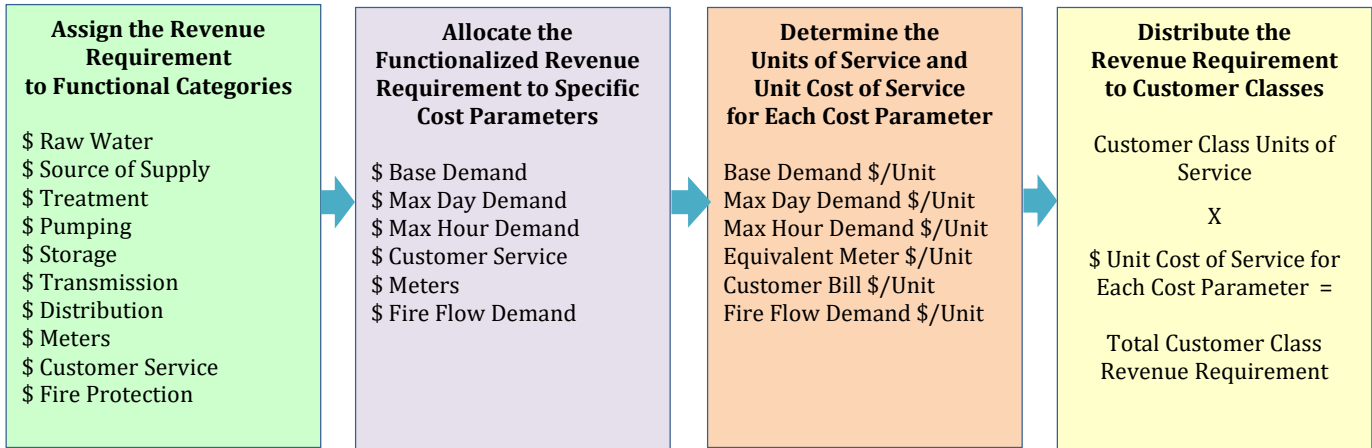
Line No.	Metric	2019	2020
1	O&M Expenses	\$29,861,866	\$30,643,255
2	Capital Improvement Program Expenditures	32,270,000	19,900,000
3	Debt Service Expenditures (including the 2019 debt issue)	10,697,149	10,117,004
4	Total Expenditures	72,829,015	60,660,259
5	Change in Cash Reserves	-16,290,750	-3,104,535
6	Gross Revenue Requirement from Rates	56,538,265	57,555,724
7	Revenue Requirement Offsets		
8	Less: Miscellaneous Revenues	11,406,055	7,828,969
9	Less: Tap Fee Receipts	5,532,000	5,667,960
10	Net Revenue Requirement Rates	\$39,600,209	\$44,058,795

Water Utility Cost of Service Study

After forecasting the revenue requirement from rates, a cost of service study (COS study) is conducted to determine the amount of rate revenue that must be recovered from each customer classes based their unique usage characteristics. To accomplish this objective, Raftelis uses a multi-step cost allocation process that included a comprehensive analysis of customer water consumption characteristics. The procedures used by Raftelis in the water

utility COS study were based on industry accepted methods as published by the American Water Works Association (AWWA) in the publication, "*Manual of Water Supply Practices M1, Principles of Water Rates, Fees, and Charges*, Seventh Edition" (AWWA Manual M1). Figure 2 provides a visual overview of key steps in the cost of service study process used to determine the customer class revenue requirements from rates.

Figure 2: Determination of Customer Class Revenue Requirements



THE IMPORTANCE OF CUSTOMER CLASS PEAKING FACTORS

A water utility system cannot be designed, constructed or operated merely to meet the average day demands imposed by customers. Instead, it must be designed, constructed and operated to meet the coincident (i.e., total system) maximum day and maximum hour peak demands imposed by customers. These peak demands occur on a single day or during a single hour each year and are invariably significantly greater than typical average day demands. To illustrate this point, Table 5 compares the maximum day water demands occurring on the City's water utility system for the three-year period 2014-2016. All the maximum day demands shown in the Table 5 occurred during the summer months of June or July. This is normative for Colorado front-range utilities who typically experience both maximum day and maximum hour peak demands during the summer irrigation season.

Table 5: Water Utility Total System Coincidental Demands

Year	Annual Average Production (thousands of gallons)	Actual Maximum Day Production (thousands of gallons)	Estimated Maximum Hour Production (thousands of gallons)	System Maximum Day Peaking Factor	System Maximum Hour Peaking Factor
2016	16,790	34,790	72,359	2.07	4.31
2015	15,821	33,450	70,431	2.11	4.45
2014	15,964	33,740	72,236	2.11	4.52
Average	16,192	33,993	71,675	2.10	4.43

Due to the peak demands they impose on a water utility system, customer classes that have higher maximum day and maximum hour peaking factors generally make a large proportional contribution to the coincident peak demands experienced by a utility, i.e., place greater summer season demands on the system. As a result, through of the cost of service process, they are allocated a larger proportional share of the water utility revenue requirement.

The approach employed by Raftelis to estimate customer class peaking factors are those described in Appendix A of the AWWA *Manual M1*. Specifically, we conducted a detailed analysis of the monthly and annual billed water consumption characteristics of each customer class during the three-year period 2014-2016. This resulted in an

estimate, for each individual year, of customer class average day, maximum day, and maximum hour peaking factors. Table 6 shows the peaking factors calculated for inside city customers.

Table 6: Calculated Customer Class Peaking Factors

Inside City Customer Classes	Estimated Maximum Day Peaking Factors	Estimated Maximum Hour Peaking Factors
Multi Unit, Public and Residential Irrigation	2.20	4.65
Blended Multi-Unit	2.10	4.43
Residential	2.21	4.66
Commercial		
5/8"	2.08	4.38
3/4"	2.42	5.10
1"	2.16	4.56
1 1/2"	2.17	4.57
2"	2.24	4.72
3"	1.72	3.64
4"	1.78	3.75
6"	1.34	2.83

2019 COST OF SERVICE STUDY SUMMARY RESULTS

Table 7 shows the results of the water utility COS study for 2019 which compares the estimated 2019 cost of service for each customer class to the level of revenue projected to be collected in 2019 if 2018 rates remain in place without modification. There is a significant imbalance between the level of revenue projected to be collected from each customer class in 2019 and the estimated cost of providing service to them. This is particularly true as it relates to Residential customers who provide user charge revenues that are approximately 32% below their estimated cost of service and Inside City Commercial customers who are paying rates that produce revenue approximately 12% greater than their estimated cost of service.

Such imbalances can occur for a variety of reasons. For example, the relationships between utility revenue requirement components and customer water consumption characteristics can change over time. Residential and commercial customer growth can impact both of these variables. The last COS Study undertaken by the City was done in 2007, and the City has experienced growth in both residential and commercial customers. Similarly, utility governing bodies such as City Council may elect to adopt rates that do not reflect the outcome of the COS Study process. The outcomes shown in Table 7 reflect updated relationships between the water utility revenue requirement (i.e., costs) and current customer class consumption characteristics.

Table 7: 2019 Water Cost of Service Study Results

Line No.	Customer Class (Note 1)	2019 Estimated Revenue at 2018 Rates	2019 Estimated Cost of Service	Required \$ Change	Required % Change
1	Inside City				
2	Residential	\$15,272,923	\$20,210,750	\$4,937,827	32.3%
3	Blended Multi-Unit Residential	162,183	192,337	30,154	18.6%
4	Multi Unit, Public and Residential Irrigation	10,743,156	9,888,763	-854,393	-8.0%
5	Commercial	6,236,490	5,473,792	-762,697	-12.2%
6	Total	32,414,751	35,765,642	3,350,891	10.3%
7	Shaw Heights				
8	Residential	889,388	1,176,717	287,329	32.3%
9	Blended Multi-Unit Residential	10,444	10,459	15	0.1%
10	Multi Unit, Public and Residential Irrigation	60,765	63,401	2,636	4.3%
11	Commercial	<u>18,522</u>	<u>18,854</u>	<u>332</u>	1.8%
12	Total	979,119	1,269,431	290,312	29.7%
13	Outside City				
14	Residential	328,901	430,731	101,830	31.0%
15	Blended Multi-Unit Residential	0	0	0	
16	Multi Unit, Public and Residential Irrigation	34,991	37,784	2,793	8.0%
17	Commercial	<u>13,361</u>	<u>11,164</u>	<u>-2,197</u>	-16.4%
18	Total	377,253	479,679	102,426	27.2%
19	Federal Heights	2,229,067	2,085,457	-143,609	-6.4%
20	Total	\$36,000,190	\$39,600,209	\$3,600,019	10.0%

Note 1: This table shows the cost of service study results for potable water customer classes. Reclaimed water service revenues are an offset to the potable water cost of service.

Water Utility Rate Design

Given the imbalance between customer class revenues and their estimated cost of service shown in Table 7, it would be imprudent to immediately implement cost of service-based water rates in 2019. Such an action would cause significant financial impacts (both positive and negative) for different types of customers and, from our perspective, create unnecessary controversy. For this reason, Raftelis recommends that the move to cost of service water rates be phased-in over the 8-year period from 2019-2026. Under this approach, customer classes such as Residential, who are currently paying less than the costs required to serve them, would slowly be phased-up to full cost of service rates by 2026. Similarly, customer class such as Commercial, who are currently paying more than the costs required to serve them, would see the imbalance adjusted by 2026. For this reason, the rates recommended for 2019 and 2020 below are based on an 8-year phase-in to cost of service rates.

RESIDENTIAL VOLUMETRIC RATES

Table 8 shows the existing 2018 and recommended 2019 and 2020 volumetric water rates for Residential customers who live in single family residential detached homes. Raftelis recommends modifications to the existing consumption TIERs used to bill the Residential customer class while maintaining the existing TIER 2 and TIER 3. Increasing the TIER 1 consumption threshold from 4,000 gallons to 6,000 gallons will help to ensure that the non-discretionary indoor water consumption of the vast majority of Residential customers is billed at the lower TIER 1 rate. In keeping with existing City policy, the volumetric rates shown in Table 8 for Shaw Heights and Outside City customers are 110% and 125% greater than the volumetric rates for Inside City customers.

Table 8: Residential Volumetric Rates

Existing 2018		Recommended 2019 and 2020		
Consumption TIER (Monthly Gallons)	2018 \$/Kgal	Consumption TIER (Monthly Gallons)	2019 \$/Kgal	2020 \$/Kgal
Inside City		Inside City		
TIER 1: 1,000 - 4,000	\$3.21	TIER 1: 1,000 - 6,000	\$3.57	\$3.96
TIER 2: 5,000 - 20,000	5.32	TIER 2: 7,000 - 20,000	7.35	8.15
TIER 3: 21,000 and greater	7.92	TIER 3: 21,000 and greater	11.62	12.88
Shaw Heights		Shaw Heights		
TIER 1: 1,000 - 4,000	\$3.53	TIER 1: 1,000 - 6,000	\$3.92	\$4.35
TIER 2: 5,000 - 20,000	5.85	TIER 2: 7,000 - 20,000	8.08	8.96
TIER 3: 21,000 and greater	8.71	TIER 3: 21,000 and greater	12.78	14.16
Outside City		Outside City		
TIER 1: 1,000 - 4,000	\$4.01	TIER 1: 1,000 - 6,000	\$4.46	\$4.95
TIER 2: 5,000 - 20,000	6.65	TIER 2: 7,000 - 20,000	9.18	10.18
TIER 3: 21,000 and greater	9.90	TIER 3: 21,000 and greater	14.52	16.10

BLENDED MULTI-UNIT VOLUMETRIC RATES

Table 9 shows the existing 2018 and recommended 2019 and 2020 volumetric rates for Blended Multi-Unit customers. These customers consist of residential customers in multi-family housing such condominiums and townhomes with over 80% of the housing occupied by the owner. Raftelis has no recommended changes to the rate structure for this customer class.

Table 9: Blended Multi-Unit Volumetric Rates

Existing 2018		Recommended 2019 and 2020		
Consumption TIER (Monthly Gallons)	2018 \$/Kgal	Consumption TIER (Monthly Gallons)	2019 \$/Kgal	2020 \$/Kgal
Inside City		Inside City		
All Consumption	\$5.46	All Consumption	\$6.39	\$7.04
Shaw Heights		Shaw Heights		
All Consumption	\$6.01	All Consumption	\$7.02	\$7.74
Outside City		Outside City		
All Consumption	\$6.83	All Consumption	\$7.98	\$8.80

MULTI-UNIT, PUBLIC AND RESIDENTIAL IRRIGATION VOLUMETRIC RATES

Table 10 shows the existing 2018 and recommended 2019 and 2020 volumetric water rates for the Multi-Unit, Public and Common Area Irrigation customer class (i.e., irrigation-only customers). This customer class includes apartments, HOAs, residential common area irrigation, public customers (e.g., schools) and government customers. Customers in this class currently pay a single volumetric rate for all water consumption, and no structural changes are recommended for this customer class.

Table 10: Multi-Unit, Public and Common Area Irrigation Volumetric Rates

Existing 2018		Recommended 2019 and 2020		
Consumption TIER (Monthly Gallons)	2018 \$/Kgal	Consumption TIER (Monthly Gallons)	2019 \$/Kgal	2020 \$/Kgal
Inside City		Inside City		
All Consumption	\$6.63	All Consumption	\$7.11	\$7.55
Shaw Heights		Shaw Heights		
All Consumption	\$7.29	All Consumption	\$7.82	\$8.30
Outside City		Outside City		
All Consumption	\$8.28	All Consumption	\$8.88	\$9.43

COMMERCIAL VOLUMETRIC RATES

Table 11 shows the existing 2018 and recommended 2019 and 2020 volumetric rates for the Commercial customer class. Customers in this class currently are billed using a two-TIER volumetric rate structure in which the consumption thresholds in each TIER are based on the meter size. Beginning in 2019, two rate structure modifications will be made for this customer class. The first, is the elimination of consumption thresholds based on meter size. This change will be made due to the wide variation in consumption that can occur across customers with different meter sizes. For example, a customer served by a 2" meter may use 50 million gallons annually and a customer served by a 4" meter may use only 20 million gallons annually. The extreme diversity of usage patterns within the commercial customer class renders TIER-based rate structures that vary by meter size ineffective at sending relevant price signals for commercial customer consumption.

Table 11: Commercial Volumetric Rates

Existing 2018		Recommended 2019 and 2020		
Consumption TIER (Monthly Gallons)	2018 \$/Kgal	Consumption TIER (Monthly Gallons)	2019 \$/Kgal	2020 \$/Kgal
Inside City		Inside City		
TIER 1: Varies by Meter Size	\$6.63	TIER 1: Consumption within Original Service Commitment	\$7.32	\$7.78
TIER 2: Varies by Meter Size	\$8.06	TIER 2: Surcharge on TIER 1 Rate for Consumption in Excess of Original Service Commitment	1.35	1.76
Shaw Heights		Shaw Heights		
TIER 1: Varies by Meter Size	\$7.29	TIER 1: Consumption within Original Service Commitment	\$8.05	\$8.55
TIER 2: Varies by Meter Size	8.86	TIER 2: Surcharge on TIER 1 Rate for Consumption in Excess of Original Service Commitment	1.48	1.93
Outside City		Outside City		
TIER 1: Varies by Meter Size	\$8.28	TIER 1: Consumption within Original Service Commitment	\$9.15	\$9.72
TIER 2: Varies by Meter Size	10.07	TIER 2: Surcharge on TIER 1 Rate for Consumption in Excess of Original Service Commitment	1.68	2.20

The second rate structure change for commercial customers is to modify the volume of water billed in each consumption TIER. Under this approach, the first TIER would be used to bill all customer water consumption that is within the annual amount specified in the service commitment agreed to by City when the customer originally

purchased a water tap. If there is no service commitment on file, the account’s annual water budget will be based on a rolling annual average of the account’s 10-year water use history. The second TIER would be used to bill all water consumption in excess of the customer's original service commitment or 10-year history. This approach allows the City to partially recover the cost of acquiring new water resources from those customers who consume water more than the amounts they paid for when they originally purchased a tap.

MONTHLY METER SERVICE CHARGES

Monthly meter service charges are assessed on all water customer classes based on each customer's water meter size. Currently, approximately 13% of the total user charge revenue earned by the Water Enterprise Fund is derived from monthly meter service charges. Table 12 shows the City's existing 2018 and recommended 2019 and 2020 monthly meter service charges. The recommended base charges for 2019 and 2020 reflect the first two years of an 8-year phase-in period designed to increase the revenue contribution made by monthly meter service charges to approximately 20% of total user charge revenue. Raftelis recommends this increase in fixed revenue contributions to help partially mitigate the potential for climate induced variability in volumetric user charge revenues and enhance overall Water Enterprise Fund revenue stability. This increase in overall revenue stability is also a positive factor that credit rating agencies consider when the City issues debt to fund large projects. Like the volumetric rates shown in Tables 8 through 11, the monthly meter service charges shown in Table 12 for Shaw Heights and Outside City customers are respectively approximately 110% and 125% greater than the monthly meter service charges for Inside City customers.

Table 12: Monthly Meter Service Charges

Meter Size	Inside City			Shaw Heights			Outside City		
	Existing 2018	Recommended		Existing 2018	Recommended		Existing 2018	Recommended	
		2019	2020		2019	2020		2019	2020
5/8"	\$9.06	\$10.96	\$13.05	\$9.96	\$12.05	\$14.36	\$11.32	\$13.70	\$16.31
3/4"	14.40	16.75	19.33	15.84	18.42	21.26	18.00	20.93	24.16
1"	19.86	23.64	27.78	21.84	26.00	30.56	24.82	29.55	34.72
1.5"	31.33	38.88	47.18	34.46	42.76	51.90	39.16	48.60	58.97
2"	43.47	55.72	69.19	47.81	61.29	76.11	54.33	69.65	86.48
3"	88.94	115.35	144.39	97.83	126.88	158.83	111.17	144.18	180.48
4"	104.63	154.14	208.59	115.09	169.55	229.45	130.78	192.67	260.73
6"	162.19	270.06	388.70	178.40	297.06	427.57	202.73	337.57	485.87
8"	263.73	415.63	582.72	290.10	457.19	640.99	329.66	519.53	728.40
10"	366.34	616.48	891.62	402.97	678.12	980.78	457.92	770.60	1,114.52

Wastewater Utility Rate Study

Wastewater Utility Profile

The City has two distinct wastewater treatment basins. The City does not charge different wastewater rates or tap fees between these two treatment basins. It is City policy to charge a single sewer rate for all customers, regardless of location, to provide a uniform sewer rate for all residents and businesses. This provides consistency for customers wherever they live within the City. Approximately 75% of the City's customers are in the Big Dry Creek basin. Wastewater discharges from these customers are treated at the City's Big Dry Creek Wastewater Treatment Facility. The City's remaining customers are in the Little Dry Creek basin. Wastewater discharges from these customers are conveyed to the Metropolitan Wastewater Reclamation District of Denver (Metro) and treated at Metro's Central Wastewater Treatment Plant. Table 13 shows the retail wastewater service customer classes served by the City.

Table 13: Wastewater Service Retail Customer Classes

Customer Class	Inside City and Shaw Heights	Outside City (Rates Set at 125% of Inside City)
Residential	X	X
Non-Residential	X	X

Table 14 provides a profile of the City's wastewater utility customers.

Table 14: Profile of Wastewater Utility Customer Classes

Customer Class	Accounts		Billed Consumption		Revenues	
	Number	% of Total	Kgal	% of Total	Dollars	% of Total
Residential	30,861	96.9%	2,407,035	83.3%	\$14,326,901	81.7%
Non-Residential	973	3.1%	482,417	16.7%	3,200,066	18.3%
Total	31,834	100.0%	2,889,452	100.0%	\$17,526,968	100.0%

Wastewater Utility Financial Plan

Raftelis prepared a financial plan for the City's wastewater utility for the years 2019 and 2020. The purpose of the financial plan was to estimate the amount of rate revenue and external debt financing required to insure the on-going financial integrity of the City's wastewater utility. Financial integrity, for purposes of the Rate Study, was defined as a level of funding adequate to: 1) pay for projected capital improvement program (CIP) expenditures, debt service expenditures and operating expenses; 2) maintain compliance with contractually mandated, legal, debt service coverage requirements and City financial management policies regarding minimum acceptable debt service coverage levels; 3) maintain adequate cash reserve balances as specified in City financial management policies; and 4) successfully position the water and wastewater utilities to obtain, at a reasonable cost, new external debt financing from investors in the capital markets. The specific financial planning objectives addressed included:

- Funding critical capital improvement program expenditures such as wastewater collection and treatment facility repairs and replacement, including the replacement and capacity increase of the sewer interceptor lines serving the Big Dry Creek wastewater treatment basin.
- Pay for routine O&M expenses and maintain cash reserves in the wastewater utility Capital Project Reserve Fund equal to the \$2 million minimum mandated by City financial management policies.
- Maintain a minimum debt service coverage ratio excluding tap fee receipts of at least 1.50x as calculated by the equation: net revenues available for debt service divided debt service payments.

Table 15 summarizes the wastewater utility financial plan for 2019 and 2020.

Table 15: Wastewater Utility Financial Plans for 2019 and 2020

Line No.	Metric	2019	2020
1	Required Annual Rate Revenue Increases	16.0%	12.0%
2	Rate Revenues Required from Customers	\$20,569,046	\$23,306,798
3	Tap Fee Receipts	605,443	614,606
4	Miscellaneous Revenues	142,609	142,927
5	Total Funding	21,317,098	24,064,331
		0	0
6	Capital Improvement Program	10,950,000	28,255,000
7	Operations and Maintenance	11,812,288	11,978,618
8	Debt Service Payments	5,889,172	5,892,223
9	Total Expenditures	28,651,460	46,125,841
10	Annual Operating Surplus/Deficit	-\$7,334,361	-\$22,061,510
11	Ending Capital Project Reserve Fund (Working Cash)	\$29,679,600	\$7,618,090
12	Required External Debt Financing	\$35,000,000	\$0
13	Debt Service Coverage		
14	Including Tap Fees (Target = 1.50)	1.61	2.05
15	Excluding Tap Fees (Target = 1.50)	1.51	1.95
16	Combined Water & Wastewater Debt Service Coverage		
17	Including Tap Fees (Target = 1.50)	2.18	2.44
18	Excluding Tap Fees (Target = 1.50)	1.81	2.04

WASTEWATER REVENUE REQUIREMENT FROM RATES

The financial planning process determines the amount of wastewater rate revenues that must be recovered from customers (see Line 2 from Table 15). This amount, referred to as the revenue requirement from rates, is the level of rate revenues necessary to cover utility operating and capital costs. An alternative presentation of how this amount is determined for the years 2019 and 2020 is shown in Table 16 (see Line 10).

Table 16: Wastewater Utility Revenue Requirement for 2019 and 2020

Line No.	Metric	2019	2020
1	O&M Expenses	\$29,861,866	\$30,643,255
2	Capital Improvement Program Expenditures	32,270,000	19,900,000
3	Debt Service Expenditures	10,697,149	10,117,004
4	Total Expenditures	72,829,015	60,660,259
5	Change in Cash Reserves	-16,290,750	-3,104,535
6	Gross Revenue Requirement from Rates	56,538,265	57,555,724
7	Revenue Requirement Offsets		
8	Less: Miscellaneous Revenues	11,406,055	7,828,969
9	Less: Tap Fee Receipts	5,532,000	5,667,960
10	Net Revenue Requirement Rates	\$39,600,209	\$44,058,795

Wastewater Cost of Service Study

To determine the amount of rate revenue that must be recovered from each customer classes based their unique usage characteristics, Raftelis used a multi-step cost allocation process that included a comprehensive analysis of customer water use characteristics adjusted to “reflect” wastewater discharges. The procedures used by Raftelis in the wastewater utility COS are based on industry accepted methods as published by the Water Environment Federation

(WEF) in the publication, "Manual of Practice No. 27, Financing and Charges for Wastewater Systems, Fourth Edition" (WEF Manual No. 27).

Table 17 shows the results of the water utility COS study for 2019 which compares the estimated 2019 cost of service for each customer class to the level of revenue projected to be collected in 2019 if 2018 rates remain in place without modification.

Table 17: 2019 Wastewater Cost of Service Study Results

Line No.	Customer Class	2019 Estimated Revenue at 2018 Rates	2019 Estimated Cost of Service	Required \$ Change Increase/(Decrease)	Required % Change Increase/(Decrease)
1	Inside City & Shaw Heights				
2	Residential	\$14,337,843	\$17,316,178	\$2,978,335	20.8%
3	Non-Residential	3,239,715	3,068,935	-170,780	-5.3%
4	New Residents	3,649	2,984	-664	-18.2%
5	Total	17,581,206	20,388,098	2,806,891	16.0%
6	Outside City				
7	Residential	141,915	173,226	31,311	22.1%
8	Non-Residential	8,352	7,607	-745	-8.9%
9	New Residents	462	115	-347	-75.0%
10	Total	150,730	180,949	30,218	20.0%
11	Total	\$17,731,937	\$20,569,046	\$2,837,110	16.0%

As shown in Table 17, there is a significant imbalance between the level of revenue projected to be collected from each customer class in 2019 and the estimated cost of providing service to them. This is particularly true as it relates to Inside City Residential customers who provide user charge revenues that are approximately 21% below their estimated cost of service and Inside City Non-Residential customers who are paying rates that produce revenue approximately 5% greater than their estimated cost of service.

As noted in the discussion of the water cost of service study, such imbalances can occur for a variety of reasons. Most notably, these imbalances are due to the changes in the relationships between utility revenue requirement components and customer wastewater discharge characteristics or decisions made by the utility governing body to implement rates that do not reflect the true cost of service for each customer class. The outcomes shown in Table 17 reflect updated relationship between the Wastewater Enterprise Fund revenue requirement (i.e., costs) and current customer class consumption characteristics. They also do not reflect any cross-subsidies between customer classes.

Wastewater Rate Design

Given the imbalance between customer class revenues and their estimated cost of service shown in Table 17, it would be imprudent to immediately implement cost of service-based wastewater rates in 2019. Such an action would cause significant financial impacts (both positive and negative) for different types of customers and, from our perspective, create unnecessary controversy. For this reason, Raftelis recommends that the move to cost of service wastewater rates be phased-in over the 8-year period from 2019-2026. Under this approach, customer classes such as Residential, who are currently paying less than the costs required to serve them, would slowly be phased-up to full cost of service rates by 2026. Similarly, customer class such as Non-Residential, who are currently paying more than the costs required to serve them, would see the imbalance slowly adjusted by 2026. For this reason, the rates recommended for 2019 and 2020 below are based on an 8-year phase-in to cost of service rates.

WASTEWATER RATES

The City's wastewater user charge structure does not include a monthly meter service charge. Instead, all existing customers pay a volumetric rate assessed on their average winter water consumption. No changes have been made to this rate structure. Table 18 shows existing 2018 wastewater rates and the recommended rates for 2019 and 2020. In keeping with existing City policy, the wastewater rates for Outside City customers are 125% higher than the rates for Inside City and Shaw Heights customers.

Table 18: 2019 Wastewater Cost of Service Study Results

Customer Class	Existing 2018	Recommended	
		2019	2020
Inside City and Shaw Heights			
Residential (1)	\$5.94	\$6.96	\$7.84
Non-Residential (1)	6.63	7.37	8.15
New Residents (flat rate per month)	29.89	Property's current sewer rate as calculated for the AWC calculation period	
Outside City			
Residential (1)	\$7.42	\$8.70	\$9.80
Non-Residential (1)	8.28	9.21	10.18
New Residents (flat rate per month)	37.36	Property's current sewer rate as calculated for the AWC calculation period	

(1) Volumetric rates are assessed on customer winter average water consumption

2019 RESIDENTIAL WASTEWATER 2,000 GALLON MINIMUM

All wastewater customers served by the City pay a volumetric rate assessed on their winter average water consumption during the months of December - February. Thus, a Residential customer with no winter water consumption (for example, a "snow bird" customer who lives in a different location during the winter) can avoid paying any wastewater bills even if their home is occupied the vast majority of the year. The City has built and maintained a wastewater system that stands ready to serve all city customers at any time. While the average single-family residential customer uses 5,000 gallons of water in the winter time, some customers have little or no water use in these months. Staff recognizes that even though some customers may be gone from their homes during a portion of the year, and others may use very little indoor water in the winter, the city must operate the wastewater system to provide that service at any time. To ensure that each customer pays an appropriate amount to keep the sewer system ready to provide service, all customers, both residential and commercial, will pay a minimum monthly "readiness to serve" charge that is set at an amount equivalent to a 2,000 gallon monthly charge when their actual winter average water consumption is below this amount. With water revenues, all customers pay a fixed fee to cover the operation of the water system, regardless of water use. In the wastewater system, a minimum charge will provide a similar level of equity.

Customer Bill Impacts

Table 19 shows the estimated water and wastewater bill impacts for single family residential customers based on the water and wastewater rates adopted by City Council for 2019.

Table 19: Estimated 2019 Single Family Residential Customer Bill Impacts

Low Water Use Customer				
Metric	Increase Over Previous Year			Total
	Fixed	Water	Sewer	
2018 Old Tier Structure	\$109	\$122	\$95	\$326
2019 New Tier Structure	\$132	\$125	\$167	\$424
% Increase	21%	3%	76%	30%
\$ Annual Increase	\$23	\$3	\$72	\$98
\$ Average Monthly Increase	\$1.90	\$0.28	\$6.00	\$8.18
Average Water Use Customer				
Metric	Increase Over Previous Year			Total
	Fixed	Water	Sewer	
2018 Old Tier Structure	\$109	\$409	\$428	\$946
2019 New Tier Structure	\$132	\$449	\$501	\$1,081
% Increase	21%	10%	17%	14%
\$ Annual Increase	\$23	\$39	\$73	\$135
\$ Average Monthly Increase	\$1.90	\$3.26	\$6.12	\$11.28
High Water Use Customer				
Metric	INCREASE OVER PREVIOUS YR			Total
	Fixed	Water	Sewer	
2018 Old Tier Structure	\$109	\$ 1,926	\$475	\$2,510
2019 New Tier Structure	\$132	\$ 2,629	\$557	\$3,317
% Increase	21%	36%	17%	32%
\$ Annual Increase	\$23	\$703	\$82	\$807
\$ Average Monthly Increase	\$1.90	\$58.58	\$6.80	\$67.28

Water and Wastewater Tap Fees

Summary of Infrastructure Tap Fees

Raftelis calculated the infrastructure component of the water and wastewater tap fees using three industry accepted methods. Each is method is discussed more fully later in this report.

SUMMARY OF WATER TAP FEES

Table 20 shows the City's existing water tap fees and the maximum allowable updated values calculated by Raftelis. The tap fees shown in Table 20 reflect the cost of all water utility infrastructure (e.g., treatment, transmission, pumping, etc.) but do not include the cost of water resources. Water resource costs are a separate cost input to the City's tap fee assessment model and are not discussed in this report.

Table 20: Summary of Existing and Calculated Water Tap Fees

Water Meter Size	2018 Water Tap Fee	Calculated Maximum Allowable Tap Fee	Dollar Change	% Change
5/8"x 3/4"	\$11,117	\$11,525	\$408	3.7%
3/4"	16,675	17,287	612	3.7%
1"	27,792	28,812	1,020	3.7%
1-1/2"	55,585	57,625	2,040	3.7%
2"	88,936	92,200	3,264	3.7%
3"	194,547	201,687	7,140	3.7%
4"	333,510	345,750	12,240	3.7%
6"	694,812	720,312	25,500	3.7%
8"	\$1,000,530	\$1,037,250	\$36,720	3.7%

SUMMARY OF WASTEWATER TREATMENT TAP FEES

As noted in the discussion of the wastewater Rate Study, the City has two distinct wastewater treatment basins. Approximately 75% of the City's customers are in the Big Dry Creek basin. Wastewater discharges from these customers are treated at the City's Big Dry Creek Wastewater Treatment Facility (BDCWWTF). The City's remaining customers are in the Little Dry Creek basin. Wastewater discharges from these customers are conveyed to the Metro and treated at Metro's Central Wastewater Treatment Plant.

The City currently charges all new connections to the wastewater system the wastewater treatment tap fee assessed by Metro, regardless of the specific basin in which they are located. The City has no control over the wastewater treatment tap fee assessed by Metro, and is maintaining the existing policy to apply the Metro wastewater treatment fee to the City's overall sewer tap fee to keep Citywide development costs consistent. Therefore, an analysis of the Metro fee was not included in the scope of services provided by Raftelis.

SUMMARY OF WASTEWATER TRANSPORT TAP FEES

In addition to wastewater treatment tap fees, the City assesses a wastewater transport fee for the conveyance of wastewater discharges to the BDCWWTF or to Metro. This fee, which is the same in both the Big Dry Creek and Little Dry Creek basins, recovers the cost of the wastewater utility collection and conveyance systems including the lift stations used for pumping. Table 21 shows the existing wastewater transport tap fee and the maximum allowable updated values calculated by Raftelis.

Table 21: Summary of Existing and Calculated Wastewater Transport Fees

Water Meter Size	Existing Wastewater Transport Tap Fee	Calculated Maximum Allowable Tap Fee	Dollar Change	% Change
5/8"x 3/4"	\$1,756	\$2,158	\$402	22.9%
3/4"	3,512	4,316	804	22.9%
1"	8,428	10,358	1,930	22.9%
1-1/2"	19,316	23,738	4,422	22.9%
2"	35,120	43,160	8,040	22.9%
3"	75,508	92,794	17,286	22.9%
4"	151,016	\$185,588	\$34,572	22.9%

The Tap Fee Calculation Process

The primary funding sources used by water and wastewater utilities to pay for required capital improvement program (CIP) expenditures are operating revenues from rates, external debt financing, and tap fee receipts. In rapidly growing communities, tap fee receipts can provide a significant portion of required CIP funding and/or debt repayment. As a result, the calculation of tap fees and the projection of future tap fee receipts is a critical part of the financial planning process.

Tap fees are also referred to as system development charges, plant investment fees, capacity fees, connection fees, and a variety of other terms. As described in the M1 Manual, these fees compensate utilities for the cost of acquiring, constructing and extending infrastructure to support new development:

"A system development charge (SDC) is a one-time charge paid by a new water system customer for system capacity. It is also assessed to existing customers requiring increased system capacity. The receipts from this charge are used to finance the development of capacity-related water facilities and are an important funding/financing source for these facilities."

There are several legal standards that define the design and application of tap fees. Tap fees cannot be used to pay for O&M expenses, or the repair and replacement of existing infrastructure or facilities. There must also be a rational nexus between the tap fees paid by new development and the costs these tap fee receipts are used to pay for. This means that tap fee receipts must be dedicated solely for infrastructure expansion required by new development and/or the debt service incurred to finance this infrastructure. In addition, tap fees must be proportional to a new development's share of growth-related infrastructure costs.

INDUSTRY ACCEPTED TAP FEE CALCULATION METHODS

The three primary industry accepted methods for calculating water and wastewater tap fees are the equity buy-in, incremental cost, and hybrid methods. Depending on the unique circumstances of the utility in question, the use of one or more of these methods results in a legally defensible and fundamentally equitable approach for recovering the cost of system capacity additions required to serve new development.

EQUITY BUY-IN METHOD

The equity buy-in method is typically used by utilities with existing available capacity to meet the long-term demands imposed by new development. This method estimates the value of a unit of system capacity based upon customer equity in existing capacity-related infrastructure. Thus, the resulting tap fee reflects the proportional cost of a new customer's share of existing system capacity. Under the equity buy-in method, the cost of existing utility financed capacity-related infrastructure is frequently based on current replacement cost less depreciation (RCNLD). However, some utilities, depending on their unique circumstances, choose to value existing capacity-related infrastructure at original cost, net book value, or full replacement cost. Assets contributed by or paid for by developers are excluded from the tap fee calculation under the equity buy-in method. Raftelis believes that the equity buy-in method best reflects the unit cost of capacity on the City's water and wastewater transport system. As a result, we recommend the equity buy-in method be used in as the basis for the City's tap fees.

INCREMENTAL COST METHOD

The incremental cost method focuses on the cost of the additional capacity-related assets the utility must acquire to serve new customers. The incremental cost method is most appropriate for utilities that do not have existing available capacity to serve growth. The resulting tap fee reflects the proportional cost of each new customer's share of future system capacity. The incremental cost method requires the utility to have a well-defined planning process featuring a capital improvement program or utility master plan that shows the estimated construction/acquisition cost of future growth-related capital expenditures.

HYBRID METHOD

In addition to the equity buy-in and incremental cost methods, it is also common for many water and wastewater utilities to use a combination of these two approaches. This combined "hybrid" method is often used when a utility has some existing system capacity to accommodate growth but will also be required to construct additional new capacity in the future. For example, assume that a water utility has adequate treatment capacity to accommodate long-term demand growth but that it has a shortage of backbone transmission main and pumping capacity. In such a situation, it may be appropriate to use the hybrid method in which that portion of the tap fee associated with water treatment plant capacity is calculated using an equity buy-in approach and that portion of the tap fee associated with incremental additions to backbone transmission and pumping capacity is calculated using an incremental approach.

STEPS IN THE TAP FEE CALCULATION PROCESS

The calculation of tap fees requires a multi-step process that begins with the valuation of utility infrastructure. In the case of the equity buy-in method, this valuation generally includes all the utility financed assets used to provide service but excludes infrastructure paid for or contributed by developers. For the incremental method, the valuation includes only those projected infrastructure additions required to serve demand growth.

The second step in the tap fee calculation process is to determine the appropriate units of capacity to use in the calculation. In the case of the City, the fundamental unit of capacity is defined as equivalent 5/8" x 3/4" demand. This metric reflects the average amount of customer water consumption or wastewater discharges when all connections are expressed on an equivalent 5/8" x 3/4" basis. In other cases, the fundamental unit of capacity is defined as single family residential equivalent demand which reflects the average billed water or wastewater demand imposed by single family residential customers.

The third step in the tap fee calculation process is to determine the unit cost of capacity. This is achieved by dividing capacity-related costs as defined by the valuation of utility infrastructure in Step 1 by the appropriate units of capacity of as defined in Step 2. The final step in the tap fee calculation process is to develop an assessment schedule that reflects the demand relationships between various types of customers, as expressed by factors such as meter sizes and land uses. Table 22 summarizes these steps for each industry accepted tap fee calculation method.

Table 22: Steps in the Tap Fee Calculation Process

Calculation Steps	Equity Buy-In Method	Incremental Method	Hybrid Method
Asset Valuation	Value existing infrastructure	Value future growth-related infrastructure additions	Value of existing infrastructure plus value of future growth-related infrastructure additions
Units of Capacity	Determine existing units of capacity	Determine units of capacity from future growth-related infrastructure additions	Existing units of capacity plus capacity from future growth-related infrastructure additions
Unit Cost of Capacity	Calculate the unit cost of existing capacity	Calculate unit cost of incremental capacity additions	Calculate unit cost of combined existing and future capacity additions
Assessment Schedule	Create the tap fee assessment schedule based on land use types using the City's Tap Fee Calculation Model		

Detail of Water Tap Fee Calculation

VALUATION OF WATER UTILITY INFRASTRUCTURE

The estimated value of water utility infrastructure as used by Raftelis in our calculation of the City's water tap fee was provided by the City's engineering staff. This includes both the estimated current replacement cost less depreciation of the City's existing water utility infrastructure as used in the equity buy-in method and the projected growth-related capital improvement expenditures as used in the incremental cost method.

As of December 31, 2016, the estimated replacement cost new less depreciation of the City's existing water utility infrastructure was \$946.4 million. Projected capital expenditures for growth-related infrastructure during the period 2018-2028 total \$163.7 million. Table 23 summarizes the valuation of the City's water utility infrastructure and shows the cash reserves, appropriated but unspent capital project funding, and outstanding debt included by Raftelis in the cost basis of the City's water utility infrastructure.

Table 23: Valuation of Water Utility Infrastructure

Water Infrastructure Function/Type	Column 1 Equity Buy-In Method	Column 2 Incremental Cost Method	Column 3 Hybrid Method (Columns 1 + 2) = 3
Source of Supply		\$26,506,653	\$26,506,653
Water Transmission & Distribution System (1)	\$422,188,879	7,875,012	430,063,891
Reclaimed Distribution System	79,690,000	12,025,606	91,715,606
Master Meters & Shop	63,440,000		63,440,000
Pump Stations	17,620,000	8,042,249	25,662,249
Storage Tanks	22,770,000	1,191,003	23,961,003
Water Treatment Facilities	97,767,303	95,159,477	192,926,780
Water Quality Lab - Water	250,000		250,000
Raw Water Sys	235,580,000	12,950,000	248,530,000
Communications Backhaul System	<u>7,530,000</u>		<u>7,530,000</u>
Total Water Utility Infrastructure	946,836,182	163,750,000	1,110,586,182
Add: Appropriated but Unspent CIP Funding at 12/31/17 (2)	48,359,652		48,359,652
Add: Cash Reserves at 12/31/17 (3)	15,384,685		15,384,685
Less: Outstanding Debt Principal (4)	<u>(64,193,682)</u>		<u>(64,193,682)</u>
Total	\$946,386,837	\$163,750,000	\$1,110,136,837

(1) Reflects only the value of water distribution system infrastructure financed by the City. Developer contributed distribution infrastructure has been excluded from the cost basis.

(2) Reflects actual dollars appropriated and set aside by the City at 12/31/17 to finance specific water utility infrastructure projects

(3) Cash reserves at 12/31/17 reflect a contribution of equity on the part of the City's existing water utility customers

(4) The City had approximately \$81.7 million in outstanding debt principal at 12/31/16. This amount was allocated between water and wastewater based on the estimated replacement new less depreciation of all utility infrastructure at 12/31/16. Outstanding debt used to finance utility infrastructure must be subtracted from the value of utility assets to determine a true reflection of the equity contributed by the City's existing water customer.

ESTIMATED WATER TREATMENT UNITS OF CAPACITY

The City's water tap fee calculation is based on the estimated maximum day demands of equivalent 5/8" x 3/4" connections. As noted previously, this metric reflects the average amount of customer water consumption when all customer connections are expressed on an equivalent 5/8" x 3/4" basis. The estimated values shown in Table 24 for 5/8" x 3/4" annual, daily and maximum day demands were derived by Raftelis as part of the analysis we completed

during the water utility cost of service study. The water treatment facility capacities shown in Table 24 were provided by the City's engineering staff.

Table 24: Units of Water Treatment Capacity

Line	Metric	Column 1 Equity Buy-In Method	Column 2 Incremental Method	Column 3 Hybrid Method (Col. 1 + 2) = 3
1	Water Treatment Facility Capacity (millions of gallons per day)			
2	Semper Water Treatment Facility	44.0	13.0	57.0
3	Northwest Water Treatment Capacity	<u>15.0</u>	<u>0.0</u>	<u>15.0</u>
4	Total Max Day Treatment Capacity	59.0	13.0	72.0
5	Total Max Day Treatment Capacity (gallons per day)	59,000,000	13,000,000	72,000,000
6				
7	Demand Metrics for Equivalent 5/8" x 3/4" Connections			
8	Annual Demand	124,880	124,880	124,880
9	Annual Daily Demand (gallons per day)	342.14	342.14	342.14
10	System Maximum Day Peaking Factor	2.1	2.1	2.1
11	Maximum Day Demand (gallons per day)	718.49	718.49	718.49
12				
13	5/8" x 3/4" Equivalent Connections that Can Be Served (Line 5 divided by Line 11)	82,117	18,094	100,210

ESTIMATED WATER UNIT COST OF CAPACITY

The unit cost of capacity is calculated by dividing the value of infrastructure but the number of connections that can be served. Table 25 shows this calculation for the City's water tap fee under each industry standard calculation method. Raffelis believes that the equity buy-in method best reflects the unit cost of capacity on the City's water and wastewater transport system. As a result, we recommend the equity buy-in method be used in as the basis for the City's tap fees.

Table 25: Water Unit Cost of Capacity

Line	Metric	Column 1 Equity Buy-In Method	Column 2 Incremental Method	Column 3 Hybrid Method (Columns 1 + 2) = 3
1	Value of Water Infrastructure (from Table 23)	\$946,386,837	\$163,750,000	\$1,110,136,837
2	5/8" x 3/4" Equivalent Connections that Can Be Served	<u>82,117</u>	<u>18,094</u>	<u>100,210</u>
3	Unit Cost of Capacity for a 5/8" x 3/4" Connection (Line 1 divided by Line 3)	\$11,525	\$9,050	\$11,078

SUMMARY OF CALCULATED WATER TAP FEES

After calculating the unit cost of capacity for a 5/8" x 3/4" connection as shown in Table 26, the final step in the process of determining the infrastructure component of the water tap fee is to derive the tap fee for larger meter sizes. Raffelis recommends that the City charge no more than \$11,525 per 5/8" x 3/4" connection as shown under the column labeled "Equity Buy-In Method". These water tap fees were adopted by the City Council for 2019, on October 8, 2018.

Table 26: Summary of Calculated Water Tap Fees

Meter Size	2018	Equity Buy-In Method (Maximum Allowable) (1)	Incremental Method	Hybrid Method
5/8"x 3/4"	\$11,117	\$11,525	\$9,050	\$11,078
3/4"	16,675	17,287	13,575	16,617
1"	27,792	28,812	22,626	27,695
1-1/2"	55,585	57,624	45,251	55,390
2"	88,936	92,199	72,402	88,625
3"	194,547	201,686	158,379	193,866
4"	333,510	345,747	271,506	332,342
6"	694,812	720,306	565,638	692,380
8"	\$1,000,530	\$1,037,241	\$814,518	\$997,027

1) Equity Buy-In Method Tap Fees adopted by City Council for 2019

Wastewater Transport Tap Fee Calculation

VALUATION OF WASTEWATER TRANSPORT INFRASTRUCTURE

The estimated value of wastewater transport infrastructure is shown in Table 27. These values were provided by the City's engineering staff. This includes both the estimated current replacement cost less depreciation of the City's existing wastewater transport infrastructure as used in the equity buy-in method and the projected growth-related capital improvement expenditures as used in the incremental cost method.

As of December 31, 2016, the estimated replacement cost new less depreciation of the City's existing wastewater transport infrastructure was \$153.9 million. Projected capital expenditures for growth-related infrastructure during the period 2018-2028 total \$23.3 million. Table 27 summarizes the valuation of the City's wastewater utility infrastructure and shows the cash reserves, appropriated but unspent capital project funding, and outstanding debt included by Raftelis in the cost basis of the City's wastewater infrastructure.

Table 27: Valuation of Wastewater Utility Infrastructure

Water Infrastructure Function/Type	Column 1 Equity Buy-In Method	Column 2 Incremental Cost Method	Column 3 Hybrid Method (Columns 1 + 2) = 3
Wastewater Collection System (1)	\$125,538,267		\$125,538,267
Lift Stations	<u>14,110,000</u>		<u>14,110,000</u>
Total Wastewater Transport Infrastructure	139,648,267		139,648,267
Collection System		2,698,760	2,698,760
Interceptor		18,855,000	18,855,000
Lift Stations		1,774,276	1,774,276
Add: Appropriated but Unspent CIP Funding at 12/31/17 (2)	18,761,652		18,761,652
Add: Cash Reserves at 12/31/17 (3)	7,011,702		7,011,702
Less: Outstanding Debt Principal (4)	<u>11,560,936</u>		<u>11,560,936</u>
Total	\$153,860,685	\$22,848,035	\$177,158,721

(1) Reflects only the value of wastewater collection system infrastructure financed by the City. Developer contributed distribution infrastructure has been excluded from the cost basis.

(2) Reflects actual dollars appropriated and set aside by the City at 12/31/17 to finance specific wastewater transport infrastructure projects

(3) Cash reserves at 12/31/17 reflect a contribution of equity on the part of the City's existing wastewater utility customers

(4) The City had approximately \$81.7 million in outstanding debt principal at 12/31/16. This amount was allocated between water and wastewater based on the estimated replacement new less depreciation of all utility infrastructure at 12/31/16. Outstanding debt used to finance utility infrastructure must be subtracted from the value of utility assets to determine a true reflection of the equity contributed by the City's existing water customer.

ESTIMATED WASTEWATER TRANSPORT UNITS OF CAPACITY

Table 28 shows the calculation of the units of capacity for the BDCWWTF. The estimated values shown in Table 28 for 5/8" x 3/4" for the annual, daily, and infiltration and inflow demands were derived by Raftelis as part of the analysis we completed during the wastewater utility cost of service study. The wastewater transport capacities shown in Table 28 were provided by the City's engineering staff.

Table 28: Units of Wastewater Transport Capacity

Line	Metric	Column 1 Equity Buy-In Method	Column 2 Incremental Method	Column 3 Hybrid Method (Col. 1 + 2) = 3
1	Wastewater Transport Capacity (millions of gallons per day)	13.7	4.6	18.3
2	Wastewater Transport Capacity (gallons per day)	13,700,000	4,600,000	18,300,000
3				
4	Demand Metrics for Equivalent 5/8" x 3/4" Connections			
5	Annual Demand	53,938	53,938	53,938
6	Annual Daily Demand (gallons per day)	147.78	147.78	147.78
7	System Infill and Infiltration (I/I) Factor	1.30	1.30	1.30
8	Annual Daily Demand Including (I/I)	192.11	192.11	192.11
9				
10	5/8" x 3/4" Equivalent Connections that Can Be Served (Line 2 divided by Line 8)	71,314	23,945	95,259

ESTIMATED WASTEWATER TRANSPORT UNIT COST OF CAPACITY

The unit cost of capacity is calculated by dividing the value of infrastructure but the number of connections that can be served. Table 29 shows this calculation for the City's wastewater tap fee. Raftelis believes that the equity buy-in method best reflects the unit cost of capacity on the City's water and wastewater transport system. As a result, we recommend the equity buy-in method be used in as the basis for the City's tap fees.

Table 29: Wastewater Transport Unit Cost of Capacity

Line	Metric	Column 1 Equity Buy-In Method	Column 2 Incremental Method	Column 3 Hybrid Method (Columns 1 + 2) = 3
1	Value of BDCWWTF Infrastructure (from Table 27)	\$153,860,685	\$22,848,035	\$176,708,721
2	5/8" x 3/4" Equivalent Connections that Can Be Served	71,314	23,945	95,259
3	Unit Cost of Capacity for a 5/8" x 3/4" Connection (Line 1 divided by Line 3)	\$2,158	\$954	\$1,855

SUMMARY OF CALCULATED WASTEWATER TRANSPORT TAP FEES

Table 30 summarizes the Raftelis wastewater transport tap fee calculation. Raftelis recommends that the City charge no more than a maximum of \$2,158 per 5/8" x 3/4" connection as shown under the column labeled "Equity Buy-In Method". These wastewater transport tap fees were adopted by the City Council for 2019, on October 8, 2018.

Table 30: Summary of Calculated Wastewater Transport Tap Fees

Water Meter Size	Existing	Equity Buy-In Method (Maximum Allowable Tap Fee)	Incremental Method	Hybrid Method
5/8"x 3/4"	\$1,756	\$2,158	\$954	\$1,855
3/4"	3,512	4,316	1,908	3,710
1"	8,428	10,358	4,580	8,904
1-1/2"	19,316	23,738	10,496	20,405
2"	35,120	43,160	19,084	37,101
3"	75,508	92,774	41,030	79,767
4"	\$151,016	\$185,588	\$82,061	\$159,533

RECOMMENDED ESCALATION FACTORS FOR TAP FEE UPDATES

In years when no comprehensive review of tap fee components is performed, the City has historically updated the tap fees annually by applying an inflation rate derived from the Consumer Price Index (CPI) as published by the U.S. Bureau of Labor Statistics. The CPI is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services. The inflation rate for consumer goods may not be the most appropriate measurement of the projected change in costs associated with the construction of the water and wastewater utility infrastructure.

A more appropriate measurement of construction cost inflation is the 20-city Construction Cost Index (CCI) as published by the Engineering News-Record (ENR). The ENR publishes the monthly 20-city CCI that reflects the national average of construction costs based on data from the following 20 cities: Atlanta, GA; Baltimore, MD; Birmingham, AL; Boston, MA; Chicago, IL; Cincinnati, OH; Cleveland, OH; Dallas, TX; Denver, CO; Detroit, MI; Kansas City, MO; Los Angeles, CA; Minneapolis, MN; New Orleans, LA; New York, NY; Philadelphia, PA; Pittsburgh, PA; San Francisco, CA; Seattle, WA; and, St. Louis, MO. The costs reflected in the 20-city ENR CCI include: union wages and fringe benefits, Portland cement, 2"x4" lumber, and structural steel.

Table 31 shows the monthly 20-City ENR CCI for the years 2015-2017. Also shown in Table 31 are metrics of a type that may be used by the City to update its tap fees.

Table 31: ENR CCI for Annual Tap Fee Updates

20-City ENR CCI Data			
Month	2015	2016	2017
January	9,972	10,132	10,542
February	9,962	10,181	10,559
March	9,972	10,242	10,667
April	9,992	10,279	10,678
May	9,975	10,315	10,692
June	10,039	10,337	10,703
July	10,037	10,379	10,789
August	10,039	10,385	10,826
September	10,065	10,403	10,823
October	10,128	10,434	10,817
November	10,092	10,442	10,870
December	10,152	10,530	10,873
Average	10,035	10,338	10,737
Calculated Metric for Use in Tap Fee Update			
Two-Year Compound Annual Growth Rate: 2015 Annual Average to 2017 Annual Average $(10,737/10,035)^{(1/2)}-1 = 3.44\%$			3.44%

As an example of how the above data could be used by the City to update its tap fees, assume that the City has an existing tap fee of \$11,525 for a 5/8” x 3/4” connection. If the City wishes to update this tap fee based on the two-year compound annual growth rate in the 20-City ENR CCI from December 2015 to December 2017, the following equation would be used:

$$\$11,525.00 * (1+.0344) = \$11,921$$

Raftelis recommends that the City conduct a comprehensive formal tap fee study at least once every five years to fully update the cost and demand inputs that underlying the tap fees assessed by the City. Between such studies, updated tap fees can be updated in the manner described above.