# Columbia Water and Light

**Comprehensive Water Cost of Service Study** 

Preliminary Draft Report / May 17, 2018





May 17, 2018

Mr. Ryan Williams Assistant Director of Water and Light City of Columbia 701 E Broadway Columbia, MO 65201

#### Subject: Water Financial Plan Study Report

Dear Mr. Williams,

Raftelis Financial Consultants, Inc. (Raftelis) is pleased to provide this Water Financial Plan Study Report (Report) for the City of Columbia (City) to address current financial challenges the City is facing and to establish water rates that are equitable and sufficient.

The major objectives of the study include the following:

- » Develop a financial plan for the water enterprise to ensure financial sufficiency, meet operation and maintenance (O&M) costs, ensure sufficient funding for capital replacement and refurbishment (R&R) needs, and improve the financial health of the enterprises
- » Review current rate structures for the water enterprise.

The Report summarizes the key findings and recommendations related to the development of the financial plan for the water utility and the development of the updated water rates.

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.

Sincerely, RAFTELIS FINANCIAL CONSULTANTS, INC.

Thomas Beckley Senior Manager

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# **EXECUTIVE SUMMARY**

# **Objectives of the Study**

The major objectives of the study include the following:

- Develop financial plans for the water enterprise to ensure financial sufficiency, meet operation and maintenance (O&M) costs, ensure sufficient funding for capital replacement and refurbishment (R&R) needs, and improve the financial health of the enterprise
- » Review current and potential future rate structures for the water enterprise

# **EXISTING RATE REVENUES**

Figure A compares the forecast revenue based on existing water rates with the forecast revenue requirements. With forecasted revenues of just below \$27 million, the water utility cannot sufficiently recover the forecast revenue requirements of above \$27 million in the next fiscal year. Due to increasing capital spending in the future, increased overhead charges and payments in lieu of taxes, and the need to maintain a minimum fund balance, revenues at existing rates are insufficient beginning in FY18. **Raftelis recommends 5% annual rate increases for the remainder of the forecast period.** 



### Figure A: Water Revenue Sufficiency

# **RATE SETTING OBJECTIVES**

An important part of the Study was to establish the rate setting objectives considered most important by CWL staff, the CWL advisory board, and the Columbia City Council. Raftelis conducted separate workshops with each group to determine the relative level of importance of each potential objective identified during the workshops. Figure B lists the different objectives RFC discussed with workshop attendees.



# Attendees of each workshop were provided worksheets and asked to rate each objective as "Essential", "Very Important", "Important" or "Least Important". After the exercise was completed, the individual worksheets were used to determine which three objectives were deemed most essential to the attendees of each workshop. Overall, stakeholders valued water conservation.

# **PROPOSED RATE STRUCTURE CHANGES**

Raftelis proposes adding a third tier at a rate double the second. The third tier would apply to all usage above 8 Ccf for residential customers and all usage above 170% of average winter consumption for all other classes. This would send a strong pricing signal that CWL values water conservation and would recover more costs from the customers who place the highest demands on the system. Figure C shows the proposed rate structure for inside city residential customers.

<b>Inside City</b> Residential	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>				
Tier 1	2.79	2.79	2.91	3.03	3.16	3.32				
Tier 2	3.91	3.91	4.11	4.32	4.54	4.77				
Tier 3	-	7.82	8.22	8.64	9.08	9.54				

### Figure C: Forecast of Proposed Volume Rates

# **CUSTOMER BILL IMPACTS**

The following Figures show the impact of the new rate structure and revenue increases on an inside city residential customer with a 5/8" meter with varying levels of usage.

Figure D: 5 Cct Usage								
	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>		
Fixed Charge	9.75	9.75	10.24	10.76	11.30	11.87		
Volume Charge								
Tier 1	5.58	5.58	5.82	6.06	6.32	6.64		
Tier 2	11.73	11.73	12.33	12.96	13.62	14.31		
Tier 3		-	-	-	-	-		
Total	27.06	27.06	28.39	29.78	31.24	32.82		
		0 00%	4 97%	4 90%	4 90%	5 06%		

### Figure E: 10 Ccf Usage

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Fixed Charge	9.75	9.75	10.24	10.76	11.30	11.87
Volume Charge						
Tier 1	5.58	5.58	5.82	6.06	6.32	6.64
Tier 2	31.28	23.46	24.66	25.92	27.24	28.62
Tier 3		15.64	16.44	17.28	18.16	19.08
Total	46.61	54.43	57.16	60.02	63.02	66.21
		16.78%	5.02%	5.00%	5.00%	5.06%

# INTRODUCTION

# **BACKGROUND OF THE STUDY**

In 2018, Columbia Water and Light (CWL) engaged Raftelis to conduct a Water Financial Plan Study (Study) to develop a solvent financial plan for the water enterprise and to establish water rates that are equitable and sufficient to meet the utility's future needs.

# **Objectives of the Study**

The major objectives of the study include the following:

- Develop financial plans for the water enterprise to ensure financial sufficiency, meet operation and maintenance (O&M) costs, ensure sufficient funding for capital replacement and refurbishment (R&R) needs, and improve the financial health of the enterprise
- » Review current and potential future rate structures for the water enterprise

# **RATE STUDY OVERVIEW**

There are three phases in executing the comprehensive rate study:

- 1. Financial Plan
- 2. Cost of Service Analysis
- 3. Rate Design

## **Financial Plan**

The general objective of the financial planning process is to arrive at the level of water rate revenue required **to provide for the financial sustainability** of the utility into the future.

For this study, the financial plan was developed for the current fiscal year (FY 18) and a five-year forecast period (FY19 – FY23). The five-year forecast period allows CWL to evaluate trends over time and evaluate the impact of challenges that occur beyond FY18. Separate financial plans were developed for each utility **to provide the water utility with the resources that are needed to operate self-sustainingly**.

# **Cost of Service Analysis**

While the financial planning process determines the overall level of rate revenue necessary to sustain each utility, the cost of service analysis determines how that revenue should be recovered from the CWL customer classes. CWL has the following customer classes:

- » Residential (inside/outside city/water district)
- » Commercial (inside/outside city/water district)

- » Large Commercial (inside city)
- » Master Meter (inside/outside city/water district)
- » Residential Irrigation (inside/outside city/water district)
- » Commercial Irrigation (inside/outside city/water district)

For the water utility, costs are allocated on the basis of average and peak demand. Average demand represents water consumption on an average day, while peak demand represents the highest usage day and hour. To serve both types of demand, the water utility system must be built to provide water for both the average days and the peak days and hours. Consequently, customers who use water *more* consistently (those with lower peak demand to average demand ratio) cause the utility to incur *less* costs to provide service than customers who use water *less* consistently (those with higher peak demand to average demand ratio) cause the utility to incur *more* costs to provide service.

# **Rate Design**

Once revenue requirements were identified and costs of operating the system properly allocated to customer classes, alternative rate structures were developed. The purpose of the rate design was to improve upon the current rate structure so that it would meet future revenue requirements of the water and wastewater utilities, appropriately allocating costs to customer classes and addresses the rate setting objectives identified by CWL staff, the CWL advisory board, and the Columbia City Council.

# **RATE SETTING OBJECTIVES**

An important part of the Study was to establish the rate setting objectives considered most important by CWL staff, the CWL advisory board (WLAB), and the Columbia City Council. Raftelis conducted separate workshops with each group to determine the relative level of importance of each potential objective identified during the workshops. Figure 1 lists the different objectives Raftelis discussed with workshop attendees. A description of the rate setting objectives can be found in Figure 2.



### Figure 1: Rate Setting Objectives

Attendees of each workshop were provided worksheets and asked to rate each objective as "Essential", "Very Important", "Important" or "Least Important". After the exercise was completed, the individual worksheets were used to determine which three objectives were deemed most essential to the attendees of each workshop.

### Figure 2: Description of Potential Rate Setting Objectives

Rate Setting	Description
Objectives	
Affordability	A properly designed rate structure combined with other mechanisms (e.g. rebates, water audits, and payment arrangements) can be used to meet affordability objectives.
Conservation / Demand Management	The rate structure should encourage conservation as well as assist in managing system demand.
Cost of Service Based Allocations	The rate structure should ensure that each customer class is contributing equitably towards revenue requirements based upon the costs of providing service to each customer class.
Ease of Implementation	The rate structure should be compatible with existing billing system. In addition, the rate structure should allow for the continuation of existing management and system reports.
Economic	The rate structure should incorporate a preferential rate that may be used
Development	to attract economic development.
Equitable	New customers should be responsible for the capital costs of providing
Contributions from	them service.
New Customers	
Minimization of	The rate structure should be developed such that adverse rate impacts on
Customer Impacts	each customer class are minimized.
Rate Stability	The rate structure should minimize dramatic rate increases or decreases over the planning period.
Revenue Stability	The rate structure should provide for a steady and predictable stream of revenues to the CWL such that the CWL is capable of meeting its current financial requirements.
Simple to	The rate structure should be easy for customers to understand, utilizing a
Understand and Update	moderate level of educational tools. In addition, the rate structure should be able to be effectively maintained by staff in future years.
Sustainability	The rate structure and level of revenue recovery should ensure adequate funds for ongoing repair and replacement of infrastructure to promote a sustainable system.

The rankings of the rate setting objectives provided the CWL staff and Raftelis team with direction as decisions were made throughout the rate design process. Although these results did not dictate the selection of the proposed rate structures, they did provide valuable guidance as the team sought to incorporate the values of the community into the rate design process. The rankings from WLAB and City council can be found in Figure 3.

WLAB	City Council	
Cost of Service Based	Cost of Service Based	
Allocations	Allocations	
Revenue Stability	Affordability	
	Conservation/Demand	Most Important
Affordability	Management	
Conservation/Demand		
Management	Rate Stability	
	Equitable Contributions	
Rate Stability	from New Customers	
Equitable Contributions	Minimization of	Important
from New Customers	Customer Impacts	Important
Simple to Understand and		
Update	Revenue Stability	
Minimization of Customer	Simple to Understand	
Impacts	and Update	Loost Important
Economic Development	Ease of Implementation	
Ease of Implementation	Economic Development	

### Figure 3: Objective Rankings

# **REVENUE REQUIREMENTS**

Revenue requirements for the water and wastewater utilities were calculated for the current fiscal year (FY18) and for the five-year forecast period: FY19 through FY23. Requirements for each utility are comprised of four components:

- » Operation and maintenance (O&M) expenses,
- » Cash funded capital projects,
- » Debt service payments, and
- » Transfers to the City of Columbia General Fund.

## FORECAST O&M EXPENSES

The budgets provided by CWL are the basis for the forecast of water and wastewater utility O&M expenses. To project the level of O&M expenses over the forecast period Raftelis applied a variety of escalation rates to the different O&M expense budget categories based on historical trends of the CWL budget, as well as Raftelis's experience with similar utilities.

Figure 3 summarizes the forecast O&M expenses for the water utility by department.

<u>Department</u>		<u>2018</u>		<u>2019</u>		<u>2020</u>	<u>2021</u>		<u>2022</u>		<u>2023</u>
Water Administration	\$	471,520	\$	525,909	\$	540,458	\$ 555,514	\$	571,099	\$	587,239
Rate Analysis		57,759		405,298		406,404	407,532		408,683		409,856
WT Utility Services		38,963		36,706		37,440	38,189		38,953		39,732
Water Engineering		716,782		748,212		763,176	778,440		794,009		809,889
WT Other Overhead Charges		2,579,285		2,884,392		2,973,632	3,073,536		3,187,350		3,180,645
WT Production Plant		4,866,711		5,254,722		5,355,452	5,458,558		5,564,098		5,672,131
WT Trans and Distr Operations		5,635,212		5,405,056		5,340,565	5,451,710		5,565,270		5,681,300
WT Storeroom		246,278		238,276		243,042	247,902		252,860		257,918
WT Meter Testing and Maint		42,268		195,170		199,073	203,055		207,116		211,258
WT Meter Reading		224,266		204,769		208,864	213,042		217,303		221,649
PILOT		4,130,674		4,800,230		5,099,440	5,417,754		5,756,418		6,116,759
Total	\$1	9,009,718	\$2	20,698,740	\$2	21,167,547	\$ 21,845,231	\$2	22,563,158	\$2	23,188,375

#### Figure 3: Forecast of O&M Expenses

CWL is required by city ordinance to make a payment in lieu of taxes (PILOT). There are two components of this payment. The first is based on revenue and has a dedicated source of income in a separate line item on a customer's bill equal to 7.65% of their total water charges. The second is based on property values. This amount is projected to increase from approximately \$2.4 million in 2018 to \$3.9 million in 2023, an increase of 62%.

# **CAPITAL IMPROVEMENTS**

Large water capital expenditures are projected between FY18 and FY23. The large majority of the expenditures are part of the major upgrades to the water treatment plant included in CWL long term planning documents.

CWL plans to fund water utility capital from three sources:

- Debt issuance,
- Cash from water sales, and
- Fund balance in the existing water reserve fund.

CWL anticipates spending approximately \$42 million from FY19 to FY23 on capital projects. Over half of this amount is for the water treatment plant upgrade. The majority of the funding for these projects will come from debt issuances. CWL plans to spend \$600 thousand per year from rate revenues as well.

### **Debt Service Payments**

Figure 4 shows CWL's existing and proposed debt service payments for the forecast period.

#### Figure 4: Debt Service Payments

<u>Water</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Revenue Bonds						
Existing	\$5,581,674	\$ 5,584,589	\$ 5,595,421	\$ 5,611,579	\$ 5,615,086	\$ 5,629,111
Proposed	-	340,000	953,572	1,527,322	2,562,725	2,562,725
Total Debt Service	\$5,581,674	\$ 5,924,589	\$ 6,548,993	\$ 7,138,900	\$ 8,177,810	\$ 8,191,835

#### **Figure 5: Total Revenue Requirements**

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
0&M	\$ 19,009,718	\$ 20,698,740	\$21,167,547	\$ 21,845,231	\$ 22,563,158	\$ 23,188,375
Debt Service	5,581,674	5,924,589	6,548,993	7,138,900	8,177,810	8,191,835
Cash Funded Capital	3,600,000	600,000	600,000	600,000	600,000	600,000
Total	\$ 28,191,392	\$27,223,329	\$28,316,540	\$ 29,584,132	\$ 31,340,968	\$ 31,980,210

# EXISTING RATES AND REVENUES

CWL recovers the cost of operating the water utility via volumetric rates and fixed customer service charges. Figure 6 contains the existing retail water rate structure for residential customers. In accordance with the City Code requirements, outside city customers are charged a rate 1.33 times that of the inside city rate and former water district customers are charged 1.157 times the inside city rate.

gure o. Existing it		e Structure
Monthly Charges	Base Charge	<b>Fire Flow</b>
5/8"	9.75	1.55
3/4"	9.75	1.55
1"	14.04	1.64
1 1/2"	28.25	2.38
2"	42.00	2.56
3"	147.00	6.15
4"	325.00	9.51
6"	700.00	19.03
8"	1,200.00	19.03
Volumetric Rate		
Base Usage*	2.79	

### Figure 6: Existing Residential Rate Structure

\*Includes all usage October through May and first 2 Ccf June through September

3.91

Summer Usage

## **EXISTING RATE REVENUES**

Due to modest account growth and declining retail consumption, water customer accounts and water consumption are forecasted to remain at their 2017 levels throughout the forecast period. Using billing data provided by CWL, Raftelis calculated the level of volumetric rate revenue, customer service charge revenue, and total rate revenue forecast to be generated under CWL's existing rates for the current fiscal year and the forecast period.

### Figure 7: Annual Revenues Under Existing Rates

	<u>Revenue</u>
Inside City	\$ 21,913,422
Outside City	615,433
Water District	756,941
Misc Revenues	3,678,675
Total	\$ 26,964,471

# **FINANCIAL PLAN**

Figure 8 compares the forecast revenue based on existing water rates with the forecast revenue requirements. With forecasted revenues of just below \$27 million, the water utility cannot sufficiently recover the forecast revenue requirements of above \$27 million in the next fiscal year. Due to increasing capital spending in the future and the need to maintain a minimum fund balance, revenues at existing rates are insufficient beginning in FY18. **Raftelis recommends 5% annual rate increases for the remainder of the forecast period.** 



### Figure 8: Water Revenue Sufficiency

Figure 9 shows a forecast of revenues, expenditures, and operating reserve balances under the recommended rate increases. Figure 10 shows a forecast of several financial performance indicators, including debt service coverage ratios that are an important factor in credit ratings. CWL is required by bond covenant to maintain a utility wide (including electric) ratio of 1.25. It is a good practice, however, to ensure that each utility maintains a ratio of 1.25 on debt issued for its benefit to avoid one utility subsidizing the other.

#### Figure 9: Financial Plan

Annual Surplus/Deficit		<u>2018</u>		<u>2019</u>		<u>2020</u>		<u>2021</u>	<u>2022</u>	<u>2023</u>
Revenues	\$	26,949,734	\$2	28,216,395	\$	29,530,914	\$	30,911,160	\$ 32,360,418	\$ 33,882,139
Expenditures		28,191,392		27,223,329		28,316,540		29,584,132	31,340,968	31,980,210
Surplus/(Deficit)	\$	(1,241,658)	\$	993,066	\$	1,214,374	\$	1,327,028	\$ 1,019,450	\$ 1,901,929
<b>Operating Reserve</b>										
Beginning Balance	\$	3,170,253	\$	1,928,595	\$	2,921,661	\$	4,136,035	\$ 5,463,063	\$ 6,482,513
Surplus/(Deficit)		(1,241,658)		993,066		1,214,374		1,327,028	1,019,450	1,901,929
Ending Balance	\$	1,928,595	\$	2,921,661	\$	4,136,035	\$	5,463,063	\$ 6,482,513	\$ 8,384,442
Target Balance	\$	5,444,666	\$	5,663,308	\$	5,916,826	\$	6,268,194	\$ 6,396,042	\$ 6,318,315
Variance from Target		(3,516,071)		(2,741,647)		(1,780,791)		(805,130)	86,471	2,066,127
		Fig	ur	e 10: Fina	nc	ial Perforn	na	nce		
Days Cash on Hand		<u>2018</u>		<u>2019</u>		2020	1	2021	2022	<u>2023</u>
Ending Reserve Balance	\$	1,928,595	\$	2,921,661	\$	4,136,035	\$	5,463,063	\$ 6,482,513	\$ 8,384,442
O&M		19,009,718		20,698,740		21,167,547		21,845,231	22,563,158	23,188,375
Days Cash		37		52		71		91	105	 132
Debt Service Coverage Rat	tio	s - Water Uti	lity	<u>/</u>						
Parity Bonds										
Debt Service	\$	5,581,674	\$	5,924,589	\$	6,548,993	\$	7,138,900	\$ 8,177,810	\$ 8,191,835
Net Revenue Available		7,940,016		7,517,655		8,363,368		9,065,929	9,797,260	10,693,764
Parity DSCR		1.42		1.26		1.27		1.26	1.19	1.30
Debt Service Coverage Rat	tio	s - Whole Uti	lit	Y						
Parity Bonds										
Debt Service	\$	16,897,625	\$	17,240,575	\$	17,871,347	\$	18,448,997	\$ 19,493,125	\$ 19,512,706
Net Revenue Available		15,988,187		22,665,182		25,415,030		29,784,565	31,868,330	34,180,648
Parity DSCR		0.94		1.31		1.42		1.61	1.63	1.75

# **COST OF SERVICE**

Following the development of the FY19 total revenue requirement, the proportion of the total revenue requirement (i.e. 0&M and capital) allocable to each customer class must be determined. This allocation represents the level of revenues that must be recovered from each customer class, given the operational demands that class places on the water utility system. This allocation is performed via the following steps:

- » Cost Functionalization
- » Allocation of Functionalized Costs to Cost Components
- » Determination of Peaking Factors

- » Determination of Units of Service
- » Calculation of Unit Cost of Service
- » Determination of Revenue Requirements by Customer Class

### **Cost Functionalization**

The first step in determining revenue requirements by customer class involves the allocation of water utility O&M and capital costs to functional categories. These categories relate to the various functions performed by the water utility system and staff in order to provide service to CWL customers. For this study the functions are:

- » Source of Supply
- » Treatment
- » Transmission
- » Distribution
- » Pumping
- » Meters
- » Customer Service
- » Fire Protection
- » Administration

### Allocation of Water Utility O&M to Functional Categories

Figure 11 below summarizes the functional allocation of the water utility's FY19 O&M revenue requirement. These allocations relate to the proportion of expenditures in each cost center that is associated with performing each function. WT Meter Reading, for example, is associated with the cost of billing CWL's customers. Consequently, all O&M expenses for this cost center have been allocated to the Customer Service function.

#### Figure 11: O&M Functionalization

	Revenue	Source of						Customer	Fire	
Cost Center	Requirement	Supply	Treatment	Transmission	Distribution	Pumping	Meters	Service	Protection	Administration
Water Administration	525,909									100%
Rate Analysis	405,298									100%
WT Utility Services	36,706									100%
Water Engineering	748,212	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%
WT Other Overhead Charges	2,298,641									100%
Customer Service	585,751							100%		
WT Production Plant	5,254,722		100%							
WT Trans and Distr Operation	5,405,056			43.8%	56.2%					
WT Storeroom	238,276									100%
WT Meter Testing and Maint	195,170						100%			
WT Meter Reading	204,769							100%		
PILOT	4,800,230									100%
Non-Rate Revenue	(3,066,309)									100%
Contribution to Reserves	993,066									100%
Total	\$ 18,625,496	32,971	5,313,470	2,589,424	3,322,039	12,022	298,898	790,520	14,825	6,251,327

# Allocation of Water Utility Capital Costs to Functional Categories

Similar to the allocation of the 0&M revenue requirement described in the previous section, the capital revenue requirement must be allocated to functional categories. Figure 12 indicates the functional allocation of capital costs. The basis for the allocation of capital costs was the existing level of water utility investment in fixed assets as of the end of FY17.

			<b>J</b> •								
		Revenue	Source of						Customer	Fire	
Cost Center	R	equirement	Supply	Treatment	Transmission	Distribution	Pumping	Meters	Service	Protection	Administration
Rate Funded CIP		600,000	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%
Existing Debt Service		5,584,589	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%
Proposed Debt Service		340,000	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%
Non-Rate Revenue		(700,000)	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%
Total	\$	5,824,589	256,672	457,333	1,726,827	2,215,391	93,586	807,493		115,404	151,883

### Figure 12: Capital Cost Functionalization

# Allocation of O&M, Capital Costs and Non-Rate Revenue to Cost Components

Once the O&M and capital costs have been allocated to the functional categories, the totals allocated to each functional category must be further allocated based on the operational need each function is designed to fulfill.

For this allocation, Raftelis has utilized the "Base Extra Capacity" method described in the American Water Works Association ("AWWA") publication, "Manual of Water Supply Practices M1, Principles of Rates, Fees and Charges" ("AWWA M1"). The Base Extra Capacity Method involves allocating each of the functionalized O&M costs in accordance with operational need that function was designed to satisfy. The cost components can be generalized as pertaining to either the volumetric, customer service, or fire protection demand of water utility customers.

The volumetric cost components are: base demand, which relates to the water demand of CWL customers on an average day; max day extra capacity, or the level of demand in excess of base demand, demonstrated by CWL customers on the highest consumption day of the year, and maximum hour extra capacity, the theoretical demand, in excess of maximum day demand, demonstrated by CWL customers in the highest consumption hour.

The customer service related cost components are customer meters, services, and customer bills. These components relate to—at a minimum—the cost of reading customer meters and processing customer bills. Additionally, customer meter costs may also relate to the fixed investment in water utility assets associated with providing water service which is available (virtually at all times) regardless of how much water is consumed by CWL customers (i.e. "readiness to serve").

The fire protection cost components are public fire hydrants. These costs relate to the theoretical demand of fire hydrants as well the costs associated with providing needed capacity to provide fire service.

The cost components are units of operating demand, which the various functions of the water utility system are designed to meet.

Figures 13 and 14 show the allocation of functionalized costs to cost components based on actual system historical demand.

Function	Total	Base	Max Day	Max Hour	Bills	Meters	Fire
Source of Supply	32,971	32,971	-	-	-	-	-
Treatment	5,313,470	3,299,502	2,013,967	-	-	-	-
Transmission	2,589,424	1,607,953	981,471	-	-	-	-
Distribution	3,322,039	1,029,420	628,342	1,664,277	-	-	-
Pumping	12,022	3,725	2,274	6,023		-	-
Meters	298,898	-	-	-	-	298,898	-
<b>Customer Service</b>	790,520	-	-	-	790,520	-	-
Fire Protection	14,825	-	-	-	-	-	14,825
Administration	6,251,327	3,017,798	1,831,852	843,822	399,364	151,001	7,489
Total	18,625,496	8,991,370	5,457,907	2,514,122	1,189,884	449,900	22,314

#### Figure 13: Allocation of O&M to Cost Components

### Figure 14: Allocation of Capital Costs to Cost Components

Function	Total	Base	Max Day	Max Hour	Bills	Meters	Fire
Source of Supply	256,672	256,672	-	-	-	-	-
Treatment	457,333	283,990	173,343	-	-	-	-
Transmission	1,726,827	1,072,307	654,520	-	-	-	-
Distribution	2,215,391	686,496	419,027	1,109,868	-	-	-
Pumping	93,586	29,000	17,701	46,885	-	-	-
Meters	807,493	-	-	-	-	807,493	-
Customer Service	-	-	-	-	-	-	-
Fire Protection	115,404	-	-	-	-	-	115,404
Administration	151,883	62,343	33,859	30,971	-	21,620	3,090
Total	5,824,589	2,390,808	1,298,450	1,187,724	-	829,113	118,494

## **Determination of Customer Class Peaking Factors**

Once each of the revenue requirements is allocated to the cost components, maximum day and hour peaking factors for each customer class are estimated. These are the basis upon which the maximum day and hour cost allocations, determined in the previous step, are allocated to each customer class. In general, the guidelines for determining maximum day and hour peaking factors outlined in AWWA M1 were the basis for this component of the analysis.

The maximum day demand for each customer class is estimated as the average consumption per day in the highest consumption month, divided by the annual average consumption per day, weighted by the ratio of maximum day demand to the average demand in the maximum month for the entire water system. In other words:

» System Max Day to Average Day in Max Month=(System Max Day Demand)/(System Max Month/30)

» Class Maximum Day=[(Class Max Month/30)/(Class Annual Total)/365]\*[System Max Day to Average Day in Max Month]

The weighting occurs because the exact maximum day, by customer class is not known, but is assumed to have the same relationship to the average day in the maximum month as the entire system. As the exact customer class maximum hour is not known, a similar weighting process occurs to determine the customer class maximum hour demands:

- » System Max Hour to Average Day in Max Month=(System Max Hour)/(System Max Month/30)
- » Class Maximum Hour=Class Max Day\*System Max Hour to Average Day in Max Month

# **Determination of Water Units of Service**

The next step in the cost allocation process is to summarize the units of service, which are the basis for the allocation of the total revenue requirement to each of the customer classes. The units are Base units, Maximum Day Extra Capacity units, Maximum Hour Extra Capacity units, Equivalent Meters and Total Bills and are indicated in Figure 15.

Base units are the annual consumption for each customer class. Maximum Day Extra Capacity units represent the water demand in excess of that which is used on an average day for that customer class, and is a function of the average daily consumption and the customer class peaking factor determined in the prior step.

As an example, the Residential class is forecast to use approximately 2.6 million Ccf on an annual basis in FY19. Based on the maximum day peaking factor determined in the previous step, Residential customers, on their highest consumption day of the year, typically use 2.6 times their average day consumption, or around 7.1 million gallons. The difference between the maximum day and average day, around 4.4 million gallons, represents that class's Maximum Day Extra Capacity units.

A similar calculation is used to determine the Maximum Hour Extra Capacity Units, which are simply the consumption forecast in the highest hour of FY19, less the maximum day demand.

Customer Units are equivalent meters, and customer monthly bills. The number of bills for each customer class was ascertained via an examination of the billing data from CWL. The equivalent meters are the number of customer meters at each meter size weighted by the potential water demand each meter can place on the water system. For CWL, a 5/8" meter is the current standard for residential services. The number of equivalent meters for sizes larger than 5/8" is determined by multiplying the nominal number of meters (the number at each connection size) by a meter factor, which represents the ratio of the flow rate of the larger meter, to that of the standard 5/8" meter. Once the number of equivalent meters which are larger than 5/8" is determined, this total is added to the number of 5/8" meters to arrive at the total number of equivalent meters.

	Base	Max Day	Max Hour	Bills	Meters	Fire
Inside City						
Residential	2,646,982	4,949	22,263	490,788	41,662	-
Commercial	1,027,572	1,417	7,723	41,832	8,840	-
Large Commercial	737,346	1,073	5,644	336	605	-
Master Meter	292,031	431	2,246	10,572	2,238	-
Residential Irrigation	47,298	318	816	3,108	580	-
Commercial Irrigation	252,343	1,791	4,530	9,432	1,784	-
Airport	2,154	10	29	156	61	-
Total	5,005,726	9,988	43,250	556,224	55,769	-
Outside City						
Residential	73,965	107	565	15,792	1,328	-
Commercial	5,232	6	38	468	140	-
Large Commercial	-	-	-	-	-	-
Master Meter	6,702	11	54	36	10	-
Residential Irrigation	27	1	1	36	5	-
Commercial Irrigation	14	0	1	84	28	-
Total	85,940	126	659	16,416	1,511	-
Water District						
Residential	106,167	304	1,086	18,180	1,523	-
Commercial	9,105	13	70	612	109	-
Large Commercial	-	-	-	-	-	-
Master Meter	25,039	69	252	720	131	-
Residential Irrigation	379	8	16	12	3	-
Commercial Irrigation	999	11	25	36	9	-
Total	141,689	406	1,448	19,560	1,774	-
Public Fire Protection		561	6,737	-	-	6,009
Total	5,233,355	11,081	52,095	592,200	59,053	6,009

### Figure 15: Units of Service

## **Determination of Water Unit Cost of Service**

Once each component of the FY19 revenue requirement (i.e. 0&M and Capital) has been allocated to each of the cost components (i.e. base, max day etc.), the unit cost of service can be determined. The unit cost of service is the basis by which costs are allocated to each customer class.

Figure 16 provides an example of the determination of the unit cost of service.

The total system units are the sum of all of the units from Figure 19. Base units represent all retail customer use on an annual basis. Max day units represent the daily use, in excess of that which is used on an average day for all customer classes. Max hour use is that which is used in excess of max day consumption. Equivalent

meters are the nominal number of retail customer meters (i.e. 3/4", 2" etc.) multiplied by an equivalent meter factor.

Also shown is each of the revenue requirements, as they have been allocated to the cost components, and the unit cost for each component. As an example, the total O&M costs allocated to the "base" cost component is \$8.9 million. Since there are 5.2 million base units, the cost per unit is \$1.72. This calculation is repeated for each of the cost components and revenue requirements to arrive at a total system unit cost for each cost component. These are the basis by which costs are allocated to customer classes.

Units Costs of Service	Total	Base	Max Day	Max Hour	Bills	Meters	Fire
Net Operating Expense							
Total Cost	18,625,496	8,991,370	5,457,907	2,514,122	1,189,884	449,900	22,314
Unit Cost		1.72	492.55	48.26	2.01	7.62	3.71
Net Capital Cost							
Total Cost	5,824,589	2,390,808	1,298,450	1,187,724	-	829,113	118,494
Unit Cost		0.46	117.18	22.80	-	14.04	19.72
Total Unit Cost		2.17	609.73	71.06	2.01	21.66	23.43

### Figure 16: Unit Cost of Service

### **Determination of Revenue Requirements by Customer Class**

To determine the allocation of the FY19 revenue requirements to each of the customer classes, the total unit cost of service is multiplied by the units of service for that class. Figure 17 provides an example of the revenue requirements for the retail class. For example, \$1.5 million in base demand costs are allocated to inside CWL residential customers only, which is equal to the cost per unit of the base demand for inside CWL residential customers multiplied by the FY19 projected annual consumption for inside CWL residential customers.

Inside City	 Base	Max Day	Max Ho	ur Bil	s Meter	s Fire	<u> </u>	Total
Residential	5,756,999	3,017,368	1,581,98	986,12	L 902,342	-		12,244,810
Commercial	2,234,897	864,182	548,81	0 84,05:	l 191,465	-		3,923,405
Large Commercial	1,603,676	654,107	401,03	5 67	5 13,104	-		2,672,597
Master Meter	635,147	262,571	159,57	9 21,242	48,462	-		1,127,000
Residential Irrigation	102,870	193,633	57,97	9 6,24	5 12,551	-		373,278
Commercial Irrigation	548,828	1,092,145	321,894	4 18,95	L 38,639	-		2,020,459
Airport	4,685	5,947	2,03	313	3 1,321	-		14,297
Total	\$ 10,887,101	\$ 6,089,953	\$ 3,073,30	3 \$ 1,117,59	\$ 1,207,885	\$-	\$	22,375,846
Outside City								
Residential	160,869	65,320	40,16	5 31,730	28,763	-		326,848
Commercial	11,379	3,904	2,68	9 940	3,032	-		21,944
Large Commercial	-	-		-		-		-
Master Meter	14,576	6,939	3,85	5 72	2 217	-		25,660
<b>Residential Irrigation</b>	59	383	9:	1 72	2 97	-		703
Commercial Irrigation	30	254	5	9 169	9 606	-		1,118
Total	\$ 186,913	\$ 76,799	\$ 46,86	1 \$ 32,984	\$ 32,716	\$-	\$	376,273
Water District								
Residential	230,906	185,561	77,17	5 36,528	3 32,976	-		563,146
Commercial	19,803	8,113	4,96	0 1,230	) 2,361	-		36,466
Large Commercial	-	-		-		-		-
Master Meter	54,458	42,270	17,88	4 1,44	7 2,837	-		118,896
Residential Irrigation	824	4,757	1,14	5 24	1 54	-		6,806
Commercial Irrigation	2,173	6,567	1,75	1 72	2 184	-		10,748
Total	308,164	247,268	102,91	7 39,30	L 38,412	-		736,062
Public Fire Protection	-	342,338	478,76	0		140,808		961,905
Total System	\$ 11,382,178	\$ 6,756,357	\$ 3,701,84	5 \$ 1,189,884	\$ 1,279,012	\$ 140,808	\$	24,450,086

### Figure 17: Class Cost of Service

# **RATE DESIGN**

In addition to determining the level of revenue necessary for future sustainable operation of the utility, the existing and alternative rate structures were evaluated the rate setting objectives that were established with this study. Raftelis held a conceptual design workshop with CPL staff to explore how CWL might restructure the rates. Raftelis also met with the CWL advisory board and the Columbia City Council, so that utility rate concerns reflected a broad range of viewpoints. From these meetings, a general consensus emerged. Stakeholders would like to see a rate structure that incentivizes water conservation.

# **PROPOSED RATE STRUCTURE**

## **Fixed Charge**

The fixed monthly charges consists of three components: customer cost, meter cost, and readiness to serve (RTS). The customer costs comprise those expenses associated with serving customers, irrespective of the

amount or rate of water use. They include, but are not limited to, meter reading, billing, customer accounting, customer service, and collecting expense. The meter cost includes maintenance and capital costs related to meters and services. The RTS component is based on the rationale that a minimum amount of distribution system investment and operation and maintenance (O&M) expenses are required to enable the system to be ready to serve. CWL makes investments to provide the ability to serve, and these costs must be recovered regardless of the amount of water used during a given period. Figure 18 shows the development of the fixed charge. Figure 19 shows a forecast of fixed charges through FY23.

Meter Size	Customer Cost	Meter Cost	RTS	Total
5/8"	2.01	1.80	5.94	9.75
3/4"	2.01	1.80	5.94	9.75
1"	2.01	4.51	7.52	14.04
1 1/2"	2.01	9.02	17.22	28.25
2"	2.01	14.44	25.55	42.00
3"	2.01	27.07	117.92	147.00
4"	2.01	45.12	277.87	325.00
6"	2.01	90.25	607.75	700.00
8"	2.01	144.39	1,053.60	1,200.00

### Figure 18: Fixed Charge Development

#### Figure 19: Fixed Charge Forecast

In	side City	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
	5/8"	9.75	9.75	10.24	10.76	11.30	11.87
	3/4"	9.75	9.75	10.24	10.76	11.30	11.87
	1"	14.04	14.04	14.75	15.49	16.27	17.09
	1 1/2"	28.25	28.25	29.67	31.16	32.72	34.36
	2"	42.00	42.00	44.10	46.31	48.63	51.07
	3"	147.00	147.00	154.35	162.07	170.18	178.69
	4"	325.00	325.00	341.25	358.32	376.24	395.06
	6"	700.00	700.00	735.00	771.75	810.34	850.86
	8"	1,200.00	1,200.00	1,260.00	1,323.00	1,389.15	1,458.61

## **Volumetric Charge**

CWL's current two tier rate structure charges a high rate in the summer months (June – September) once a customer crosses a certain level of base usage. Currently, the cutoff is 2 Ccf for residential customers and 70% of average winter consumption for the commercial, large commercial, and master meter classes. Usage below this cutoff, as well as all usage in months outside the summer period, is charged at a lower rate. Irrigation customers are pay the higher rate on all usage during the summer months.

**Raftelis proposes adding a third tier at a rate double the second**. The third tier would apply to all usage above 8 Ccf for residential customers and all usage above 170% of average winter consumption for all other classes. This would send a strong pricing signal that CWL values water conservation and would recover more

costs from the customers who place the highest demands on the system. The proposed rate forecast is shown in Figure 20.

Inside City Residential	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Tier 1	2.79	2.79	2.91	3.03	3.16	3.32
Tier 2	3.91	3.91	4.11	4.32	4.54	4.77
Tier 3	-	7.82	8.22	8.64	9.08	9.54
Commercial						
Tier 1	2.63	2.63	2.79	2.96	3.14	3.32
Tier 2	3.91	3.91	4.11	4.32	4.54	4.77
Tier 3	-	7.82	8.22	8.64	9.08	9.54
Large Commercial						
Tior 1	2 15	2 62	2 70	2.06	2 1/	2 22
Tier 2	2.45	2.05	2.79	2.90	5.14 1 E1	5.5Z
Tier 2	5.91	5.91	4.11	4.52	4.54	4.77
TIEF 5	-	7.82	ð.22	8.04	9.08	9.54
Residential Irrigation						
Tier 1	2.79	2.79	2.91	3.03	3.16	3.32
Tier 2	3.91	7.82	8.22	8.64	9.08	9.54
Commercial Irrigation	n					
Tier 1	2.63	2.63	2.79	2.96	3.14	3.32
Tier 2	3.91	7.82	8.22	8.64	9.08	9.54

### Figure 20: Volumetric Rate Forecast

# **CUSTOMER IMPACTS**

The following Figures show the impact of the new rate structure and revenue increases on the typical water bill of an inside city residential customer with a 5/8" meter with varying levels of usage.

Figure 21: 5 Cct Usage							
	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	
Fixed Charge	9.75	9.75	10.24	10.76	11.30	11.87	
Volume Charge							
Tier 1	5.58	5.58	5.82	6.06	6.32	6.64	
Tier 2	11.73	11.73	12.33	12.96	13.62	14.31	
Tier 3		-	-	-	-	-	
Total	27.06	27.06	28.39	29.78	31.24	32.82	
		0.00%	4.92%	4.90%	4.90%	5.06%	

### Figure 22: 10 Ccf Usage

<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>		
9.75	9.75	10.24	10.76	11.30	11.87		
5.58	5.58	5.82	6.06	6.32	6.64		
31.28	23.46	24.66	25.92	27.24	28.62		
	15.64	16.44	17.28	18.16	19.08		
46.61	54.43	57.16	60.02	63.02	66.21		
	16.78%	5.02%	5.00%	5.00%	5.06%		
	2018 9.75 5.58 31.28 46.61	2018 2019   9.75 9.75   5.58 5.58   31.28 23.46   15.64 15.64   46.61 54.43   16.78% 16.78%	2018201920209.759.7510.245.585.585.8231.2823.4624.6615.6416.4446.6154.4357.1616.78%5.02%	20182019202020219.759.7510.2410.765.585.585.826.0631.2823.4624.6625.9215.6416.4417.2846.6154.4357.1660.0216.78%5.02%5.00%	201820192020202120229.759.7510.2410.7611.305.585.585.826.066.3231.2823.4624.6625.9227.2415.6416.4417.2818.1646.6154.4357.1660.0263.0216.78%5.02%5.00%5.00%		

### Figure 23: 15 Ccf Usage

	<u>2018</u>	2019	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Fixed Charge	9.75	9.75	10.24	10.76	11.30	11.87
Volume Charge						
Tier 1	5.58	5.58	5.82	6.06	6.32	6.64
Tier 2	50.83	23.46	24.66	25.92	27.24	28.62
Tier 3		54.74	57.54	60.48	63.56	66.78
Total	66.16	93.53	98.26	103.22	108.42	113.91
		41.37%	5.06%	5.05%	5.04%	5.06%