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UCS2018-0884

Attachment 1

Cost of Service Study for Water, Wastewater and Drainage Services Executive Summary Report

The City of Calgary, Water Resources and Water
Services



ISC: Unrestricted

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1.0 Executive Summary

1.1 Introduction

In April 2017, Stack'd Consulting Inc. was engaged by The City of Calgary to perform a Cost of Service Study (COSS) as outlined in Request for Proposal (RFP) # 16-1773.¹ The purpose of this engagement was to perform a Cost of Service Study for each of the Water, Wastewater, and Drainage Services. Specifically, the purpose of these studies was to develop rates for the 2019-2022 business cycle.

As indicated in The City's RFP, the desired outcomes from the cost of service studies were to:

- a) Determine the equitable allocation of the revenue requirements between customer classes;
- b) Address in-scope utility issues and strategic objectives associated with cost of service, rates, and rate setting; and
- c) Establish fair and defensible rates, based on Guiding Principles for Utility Rates for Water, Wastewater, and Drainage Services that inform the 2019 to 2022 business plans and budgets.

A phased project approach and work plan was developed, reviewed with The City Project Manager and Steering Committee, and executed to deliver upon all in-scope deliverables.

1.2 Rate-Making Objectives

To develop an optimum 2019-2022 rate structure, it was necessary to establish clear and prioritized rate-making objectives. To establish these, a review of the Utilities' existing Guiding Principles was performed. In addition, a strategic session was facilitated with the Steering Committee to further prioritize individual rate-making objectives for each of the Water, Wastewater, and Drainage Services.

The Guiding Principles are utilized as an overarching and enduring set of distinct rate-making objectives which each business cycle's rates need to consider and appropriately reflect. These principles and their definitions are summarized as below:

FINANCIAL SUSTAINABILITY

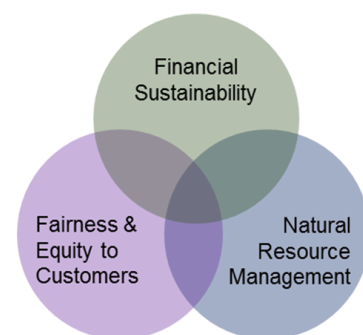
- **Deliver sufficient and predictable revenue:** In order to meet current and future regulatory requirements, and provide reliable services desired by customers, The Utility needs to receive sufficient and predictable revenue to recover its costs
- **Rate Stability:** Offer stability and predictability to The Utility and The Utilities customers
- **Adaptability:** Set rates structures that are dynamic, and provide flexibility to changing supply and demand

FAIRNESS AND EQUITY TO CUSTOMERS

- **User Pay philosophy:** Rates are based on the philosophy that a customer's rates should reflect the cost of providing the service to the customer
- **Customer Equity:** Each customer class should pay their fair share based on the customer class usage pattern and service benefits offered
- **Accessible and Simple:** Rate structures should be transparent and easy to understand

NATURAL RESOURCE MANAGEMENT

- **Conservation:** Establish a rate that allows The City to continue to meet current and future regulatory requirements, while encouraging customers to adopt behaviours focused on water conservation, and protecting the watershed and river water quality



¹ The City of Calgary, "Cost of Service Studies for Water and Wastewater Services, and Drainage Services", Issued December 7, 2016

Figure 1: Guiding Principles for Utility Rates

Based on the outcomes from the facilitated session, the following priority rate-making objectives were confirmed for the 2019-2022 business cycle per Utility (see **Appendix A** for definitions):

Water & Wastewater	Drainage
Critically Important	Critically Important
<ul style="list-style-type: none"> • Revenue Sufficiency & Predictability • Accessible and Simple 	<ul style="list-style-type: none"> • Revenue Sufficiency & Predictability • Accessible and Simple
Very Important	Very Important
<ul style="list-style-type: none"> • Rate Stability & Customer Impact • Customer Equity & User Pay Philosophy • Wastewater: Conservation (<i>Watershed Protection</i>) 	<ul style="list-style-type: none"> • Conservation (<i>Watershed Protection, River Water Quality</i>) • Customer Equity & User Pay Philosophy • Implementation
Important	Important
<ul style="list-style-type: none"> • Affordability (<i>Disadvantaged customers</i>) • Economic Development Incentive • Water: Conservation • Adaptability • Implementation • New Customer Contributions 	<ul style="list-style-type: none"> • Rate Stability & Customer Impact • Affordability (<i>Disadvantaged customers</i>) • Economic Development Incentive • Adaptability • New Customer Contributions

Figure 2: Priority 2019-2022 Rate-Making Objectives

There was a list of in-scope strategic issues which required internal review, external research, and the development of recommendations for the Utilities. A description of all strategic issues is provided in **Appendix B**.

1.3 Cost of Service Analysis

This section provides an overview of the approach used to conduct the cost of service analysis, highlights of the analysis, and summary results.

1.3.1 Cost of Service Approach

An industry-accepted practice was followed to both analyze costs and develop the desired rate structure. It consists of four overarching analytical steps. Each of the rate revenue requirements are allocated to distinct functions based on their purpose as part of delivering services. Then, costs within each of these functional pools are classified against customer cost drivers using a combination of industry-accepted and utility-specific cost drivers. Finally, costs from these cost driver pools are allocated against relevant customer classes based on their relative usage, as primarily represented by each class' projected units of service. A generic illustration of the steps used is illustrated below (note, actual functions and cost drivers are described in the following sections):

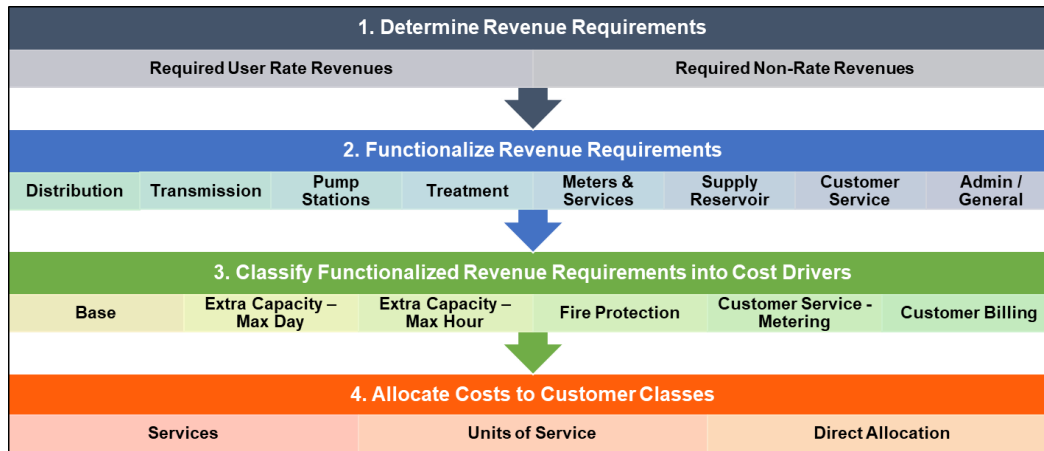


Figure 3: Generic Cost of Service Approach

Water cost allocations were developed and performed in collaboration with a Water Cost of Service Technical Team. Both functions and allocations to cost causation factors were based on review of appropriate industry leading practices, financial and operating information, and input from team members.

1.3.2 Rate Revenue Requirements

For Inside-City customers, the Utilities utilize a cash-basis approach to define total rate revenue requirements per utility. As such, rate revenues are primarily focused on covering each year’s cash requirements for both operating and capital needs. This is a common method for municipal utilities to define their rate revenue requirements, as it places emphasis on addressing the Utilities’ cash flows.

Both the Water and Wastewater Services have identical rate revenue requirement cash components. The graphic below highlights each distinct cash requirement and its specific uses:

Water & Wastewater Utilities: Cash Basis	
+	O&M Expenses (including overhead allocations)
+	Debt Interest Expense (funds debt interest)
+	Debt Principal Repayments (pays down debt)
+	Cash Financed Capital (pay-as-you-go funding)
+	ROE Payments to City (dividend to shareholder)
+	Franchise Fees (flow through to City)
-	Non Rate Revenues

Σ	Total Rate Revenue Requirement

Figure 4: Water and Wastewater Rate Revenue Requirements

It should be noted that the Debt Interest Expense and Debt Principal Repayments are net of projected Principal and Interest contributions from the scheduled Off-Site Levies (from developers for Inside City growth). These contributions were forecasted by the Utilities’ Off-Site Levy models and were used as input to this analysis.

In addition, it is noted that the Utilities have established “to-be” utility fiscal policies for both the Water and Wastewater Services. Of pertinence is the target to establish an Operating Reserve equivalent to 120 days (i.e. 4 months) worth of annual Operations and Maintenance expenses. It is understood that this target is planned for implementation across the 2019-2022 business cycle, with the end goal to build this reserve to its target level by the end of 2022. This targeted reserve level represents an additional rate revenue requirement to evaluate the appropriateness of the 2019-2022 rate schedules.

Although the Drainage Service also uses the cash basis, its composition is slightly different as compared to the Water and Wastewater Services. The graphic below highlights each distinct cash requirement:

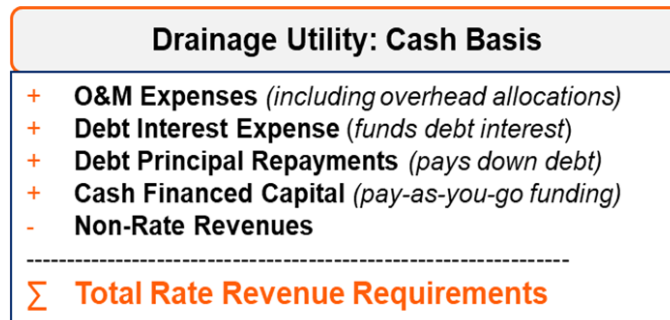


Figure 5: Drainage Rate Revenue Requirements

It is noted that the Drainage Service does not include a Return on Equity (or Dividend) payment to The City, nor does it include a Franchise Fee payment obligation. It is recommended to avoid implementing such rate revenue requirements in the short-term given rising funding requirements for increasing Drainage levels of service and a potential move to a Variable Rate Structure in 2023.

Similar to the Water and Wastewater Services, the Drainage Service has a targeted fiscal policy to establish an operating reserve equivalent to 120 days of Operating and Maintenance expenses by the end of 2022. This targeted reserve level represents an additional rate revenue requirement to evaluate the appropriateness of the 2019-2022 rate schedules.

Based on the 2016 “test year” (based on actual financial results), the total rate revenue requirements for each utility were analyzed and confirmed. Based on received growth projections, capital planning, and net-new operating activities, they were projected forward from 2016 out across a 10-year horizon (with focus on the 2019-2022 business cycle). Rate revenue requirements for 2016 are summarized below:

Rate Revenue Requirement	Water 2016	Wastewater 2016	Drainage 2016
O&M Expenses	\$113,329,524	\$118,555,647	\$31,178,489
Debt Interest Expense	\$26,929,690	\$24,144,892	\$4,144,240
Debt Principal Repayment	\$44,371,223	\$25,691,231	\$5,754,724
Cash-Financed Capital	\$63,286,000	\$51,970,000	\$13,831,000
Non-Rate Revenues	\$(3,764,966)	\$(4,140,984)	\$(1,389,184)
ROE Payment to City	\$28,750,000	\$13,750,000	-
Franchise Fees	\$29,017,466	\$29,038,005	-
Total	\$301,918,937	\$259,008,791	\$53,519,269

Table 1: Summary Rate Revenue Requirements 2016

1.3.3 Water Cost of Service Analysis and Results

1.3.3.1 Water Projected Rate Revenue Requirements

Based on the assumed operating and capital projections, the total rate revenue requirements were projected from the 2016 base year to the end of 2022. The following graph illustrates both the total rate revenue requirements and trends for the specific elements:

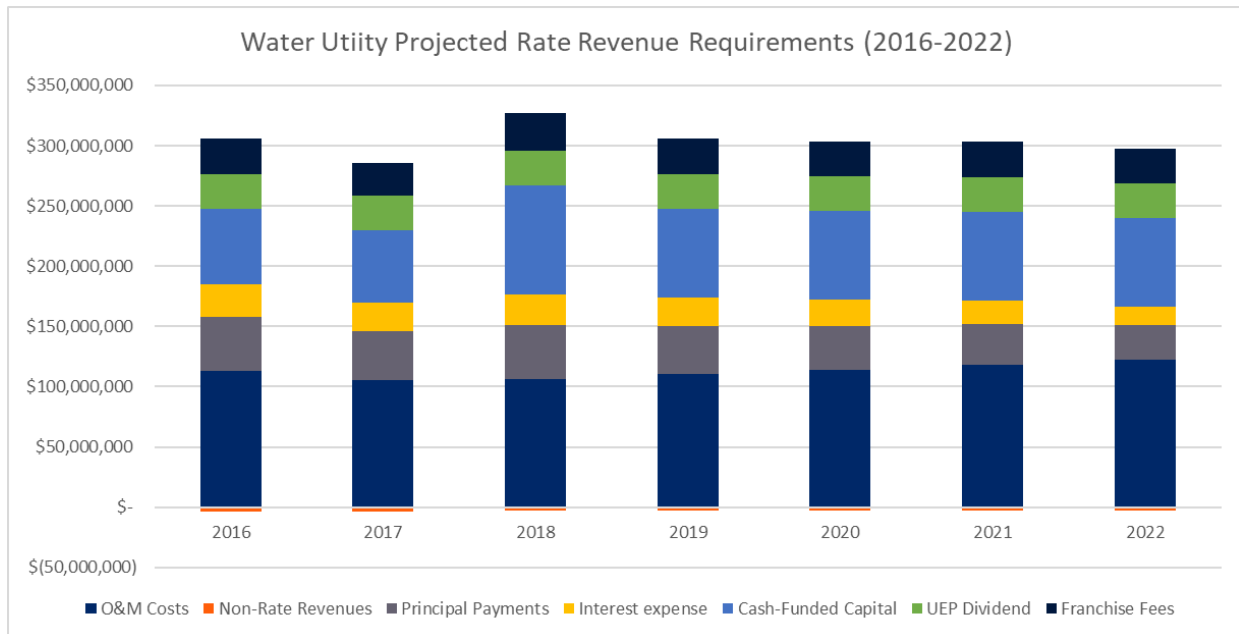


Figure 6: 2016-2022 Water Rate Revenue Requirements

From this figure, it can be determined that the Water Service’s total rate revenue requirements are expected to remain somewhat stable over the next business cycle. They reach a maximum of approximately \$304 million in 2019, and then slightly decline to approximately \$295 million in 2022. A key reason for this slight decline is less debt servicing costs, as the capital financing plan emphasizes more cash-financed capital to decrease current debt levels. A snapshot of the specific rate revenue components as compared from 2019 versus 2022 is also provided below, with specific projections for individual rate revenue requirements:

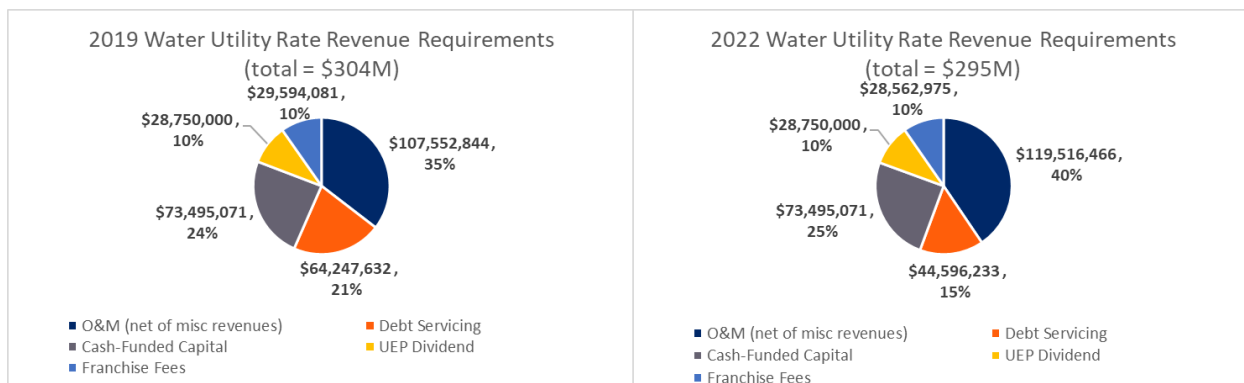


Figure 7: Water 2019 versus 2022 Rate Revenue Requirements

1.3.3.2 Water Functions

Functions were selected to represent the comprehensive scope of distinct work elements performed in the delivery of water services. They were also selected to recognize the distinction between retail versus wholesale customers. Retail customers receive full distribution services as provided by the Utilities, while wholesale receive bulk water at a regional boundary point and then provide their own distribution storage and retail services. The following distinct water functions and supporting descriptions (regarding the assignment of unique assets into specific functions) are summarized below:

Function	Assets
Source of Supply	Glenmore Reservoir; Dam; Raw Water Pumping
Treatment	Plant, Filtration; Lab; Power Generation Area; Residuals Treatment; etc.
Pumping	Pumpstations (<i>split between Distribution vs. Transmission based on an individual assessment</i>)
Distribution Storage	Reservoirs
Transmission Network	Feeder mains; Large Pipes ≥ 500mm; Valve Chambers; Transmission Valves
Distribution Network	Distribution Pipes; Small Pipes < 500mm; Distribution Valves; Anode Retrofit
Meters & Services	Meters; Services
Hydrants	Hydrants
General	General Site Development; Administration; Gate House, etc.

Table 2: Water Functions by Asset Type

Assets designated as “General” were subsequently allocated to all other specific functions based on an overhead allocation. This was based on the percentage of the net book value of assets as directly allocated to each function.

The allocation of debt servicing costs was also performed using the same distribution of the net book value of assets to functions. This is based on the principle that debt capital financing policies can apply equally to assets across all functions. From a cost allocation perspective, it is typically more reasonable to allocate debt servicing based on this approach versus a specific review of each individual debenture.

In addition to the assignment of assets to these functions, a similar exercise was performed to assign all operating-related costs. This exercise was completed in parallel during the Line of Service allocations analysis. A “bottom-up” review of each Division’s activities and chartfield drill financial results (by both Dept ID and Activity ID) was performed. In addition, input on specific allocations was provided by internal Utilities administration and technical subject-matter-experts.

The distribution of the Water Service rate revenue requirements into functions is illustrated in the following graphic. As can be seen, the Treatment and Distribution Network (retail customers only) represent 57% of the 2019-2022 projected costs.

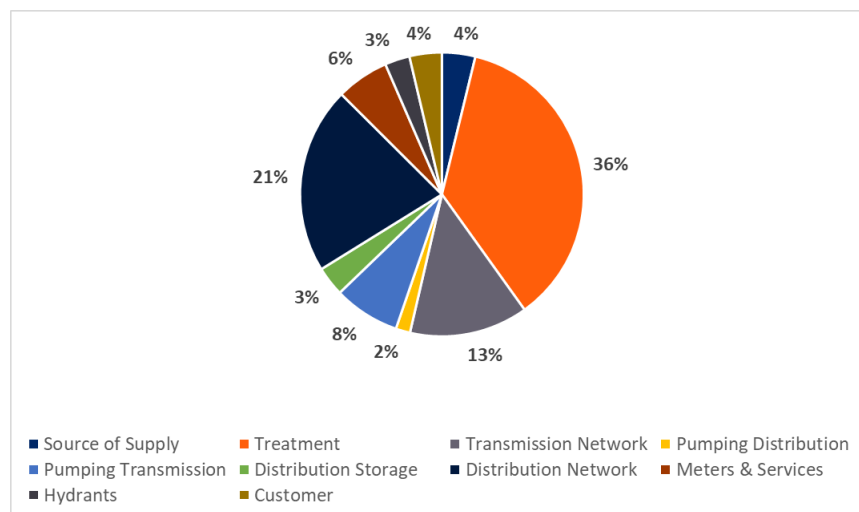


Figure 8: Water Distribution of Functionalized Rate Revenue Requirements

1.3.3.3 Water Cost Drivers

The base-extra capacity method was used to allocate functionalized cost pools into cost drivers. This method is accepted by the American Water Works Association², and is typically used for water utilities across North America. It focuses on assigning costs to (1) base costs, (2) extra-capacity costs, (3) customer-related costs, and (4) fire protection costs. Base costs are those which tend to vary with the total quantity of water consumed or those tied to customer average day usage. Extra-capacity costs are those required to meet peak demand rate of use requirements in excess of average (base) use, and are typically sub-divided into both maximum day and maximum hour components. Customer-related costs comprise those required to serve customers regardless of the volume or capacity of water provided, and typically include meter reading, billing, and customer service. Fire protection costs typically include both dedicated assets (i.e. hydrants) and fire flow capacities required to support community fire protection standards.

To identify the specific cost allocations percentages for each function, internal technical subject-matter-experts were engaged (both through the Water Technical Team and others as appropriate), leading practices were reviewed, and background customer and operating information was analyzed. Further, considerations were made on which cost drivers were the most reasonable and appropriate. From this, cost driver allocations were further refined to support both operating and capital functional costs. The tables below summarize these cost driver allocation frameworks:

Operating Cost Allocations Framework:

Function	Operating Cost Allocations Framework						
	Base Annual Volume m3	Extra Capacity		Meters & Services # Accounts	Fire Protection	Customer # Bills	Total
		Max Day Demand m3	Max Hr Demand m3				
Source of Supply	100.00%						100.00%
Treatment (Excl Chems & Electricity)	63.32%	36.68%					100.00%
Treatment Chemicals	100.00%						100.00%
Treatment Electricity	100.00%						100.00%
Transmission Network	63.32%	36.68%					100.00%
Pumping Distribution	44.82%	25.96%	29.21%				100.00%
Pumping Transmission	63.32%	36.68%					100.00%
Distribution Storage	100.00%						100.00%
Distribution Network	44.82%	25.96%	29.21%				100.00%
Meters & Services				100.00%			100.00%
Hydrants					100.00%		100.00%
Customer Service						100.00%	100.00%

Table 3: Water Operating Cost Allocations Framework

Capital Cost Allocations Framework:

Function	Capital Cost Allocations Framework						
	Base Annual Volume m3	Extra Capacity		Meters & Services # Accounts	Fire Protection	Customer # Bills	Total
		Max Day Demand m3	Max Hr Demand m3				
Source of Supply	100.00%						100.00%
Treatment	50.43%	49.57%					100.00%
Transmission Network	50.43%	49.57%					100.00%
Pumping Distribution	44.82%	25.96%	29.21%				100.00%
Pumping Transmission	50.43%	49.57%					100.00%
Distribution Storage	100.00%						100.00%
Distribution Network	44.82%	25.96%	29.21%				100.00%
Meters & Services				100.00%			100.00%
Hydrants					100.00%		100.00%

Table 4: Water Capital Cost Allocations Framework

² American Water Works Association (AWWA), "Principles of Water Rates, Fees, and Charges M1 Manual", Sixth Edition, 2012

The major difference between the Operating and the Capital Allocations Frameworks is the use of system design versus functional usage. From a review of the Water Service’s engineering records, its max day treatment capacity has been designed to be approximately twice that of its average day demand. Based on this, it is reasonable to assume that design standards drive capital-related investments in the treatment and transmission functions. However, actual system production data was used across 2014-2016 to develop the base versus extra-capacity splits for the treatment and transmission operating costs. It is viewed that the system’s actual use is appropriate to guide the allocation of operating costs.

UEP Dividend rate revenue requirements are allocated across each cost driver based on the percentage allocation of all operating and capital costs. Further, Franchise Fees (10% of revenues as earned on Inside City customers only) are allocated based on this same premise.

Based on these allocations, each rate revenue requirement was split into its base-extra capacity cost drivers. The following table summarizes the 2016 rate revenue requirement allocations:

Rate Revenue Requirement	2016 Test Year Amount	Base Annual Volume m3	Extra Capacity		Meters & Services # Equivalent Meters	Fire Protection Fire Flow L/min	Customer # Bills	Regional Direct Allocation
			Max Day Demand m3	Max Hr Demand m3				
O&M Costs	\$ 113,329,524	\$ 53,215,497	\$ 22,952,383	\$ 11,074,012	\$ 10,860,181	\$ 6,496,474	\$ 8,474,864	\$ 256,114
Non-Rate Revenues	\$ (3,764,966)	\$ (1,316,956)	\$ (696,112)	\$ (378,049)	\$ (168,240)	\$ (223,130)	\$ (982,478)	\$ -
Principal Payments	\$ 44,371,223	\$ 23,065,423	\$ 17,871,266	\$ 1,721,628	\$ 1,528,599	\$ 184,307		
Interest expense	\$ 26,929,690	\$ 13,998,818	\$ 10,846,391	\$ 1,044,887	\$ 927,734	\$ 111,859		
Cash-Funded Capital	\$ 63,286,000	\$ 32,897,861	\$ 25,489,515	\$ 2,455,531	\$ 2,180,218	\$ 262,875		
Sub-Total RRR's	\$ 244,151,472	\$ 121,860,643	\$ 76,463,443	\$ 15,918,008	\$ 15,328,493	\$ 6,832,386	\$ 7,492,386	\$ 256,114
		49.91%	31.32%	6.52%	6.28%	2.80%	3.07%	0.10%
UEP Dividend	\$ 28,750,000	\$ 14,364,740	\$ 9,013,390	\$ 1,876,390	\$ 1,806,899	\$ 805,391	\$ 883,191	\$ -
Franchise Fees	\$ 29,017,466	\$ 14,498,378	\$ 9,097,243	\$ 1,893,846	\$ 1,823,708	\$ 812,884	\$ 891,407	\$ -
Total RRR's	\$ 301,918,938	\$ 150,723,762	\$ 94,574,076	\$ 19,688,244	\$ 18,959,100	\$ 8,450,660	\$ 9,266,983	\$ 256,114

Table 5: 2016 Water Summary Rate Revenue Requirements by Cost Driver

In addition, the composition of 2019-2022 total rate revenue requirements per Cost Driver was also analyzed. Opposite is the distribution of rate revenue requirements for each Cost Driver. It demonstrates that approximately 50% of the costs have been assigned to the “Base Volume” component, while 30% has been assigned to the “Max Day” component. The remaining rate revenue requirements have been almost evenly split between “Max Hour”, “Meters and Services”, “Fire Protection”, and “Customer-Related”.

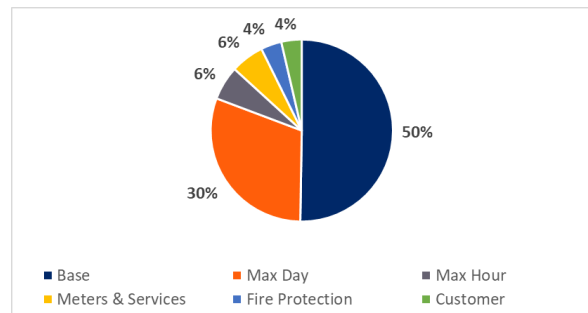


Figure 9: Water 2019-2022 Cost Drivers

1.3.3.4 Water Cost Allocations to Customers

The units of services for each customer class provides a fair and proportional method to allocate rate revenue requirements within the Cost Driver pools across customer classes. Service requirements are determined for each customer class based on its total annual water volume, maximum day demand, maximum hour demand, number of equivalent meter services, billing frequency, and fire protection flow requirements. Units of service per customer class are determined based on analysis of customer consumption data from 2014-2016, customer peaking behaviors, the distribution of meters (by size) per customer class, billing frequencies, and fire flow standards.

Based on the projected units of service per customer class across the 2019-2022 business cycle, the following summary distribution of cost allocations per cost driver was developed:

Customer Class	Base	Max Day	Max Hr	Meters & Services	Fire Protection	Customer
Residential Metered	52.5%	53.9%	52.9%	67.9%	76.7%	92.1%
General Service Large	21.8%	15.8%	19.5%	7.7%	2.1%	0.4%
General Service Regular	12.3%	9.6%	11.3%	10.0%	17.6%	3.8%
Multi-Family Residential	8.8%	5.9%	7.7%	5.4%	2.6%	1.4%
Irrigation	3.3%	13.4%	7.3%	9.1%	0.0%	1.1%
Bulk Water	0.2%	0.3%	0.2%	0.0%	0.0%	0.0%
Residential Unmetered	1.0%	1.0%	1.0%	0.0%	1.0%	1.2%

Table 6: Summary 2019-2022 Distribution of Water Customer Units of Service Allocations

Additionally, based on the projected cost allocations per customer class across 2019-2022, a comparison versus 2018 rates was performed to evaluate projected cost recovery levels. This projects the expected revenues per customer class (using the existing 2018 rates) against its projected cost of service, thus providing a starting point for 2019-2022 rate adjustments. The 2018 versus 2022 cost recoveries for each customer class are summarized below:

Class	2018 Projected Cost Recovery	2022 Projected Cost Recovery
Residential Metered	102%	119%
General Service Large	76%	91%
General Service Regular	88%	104%
Multi-Family Residential	101%	120%
Irrigation	62%	76%
Bulk Water	84%	102%
Residential Unmetered	130%*	154%*

Table 7: Water 2018 versus 2022 Cost Recoveries with 2018 Rates

1.3.4 Wastewater Cost of Service Analysis and Results

1.3.4.1 Wastewater Projected Rate Revenue Requirements

Based on the assumed operating and capital projections, the total rate revenue requirements were projected from the 2016 base year to the end of 2022. The following graph illustrates both the total rate revenue requirements and trends for the specific elements:

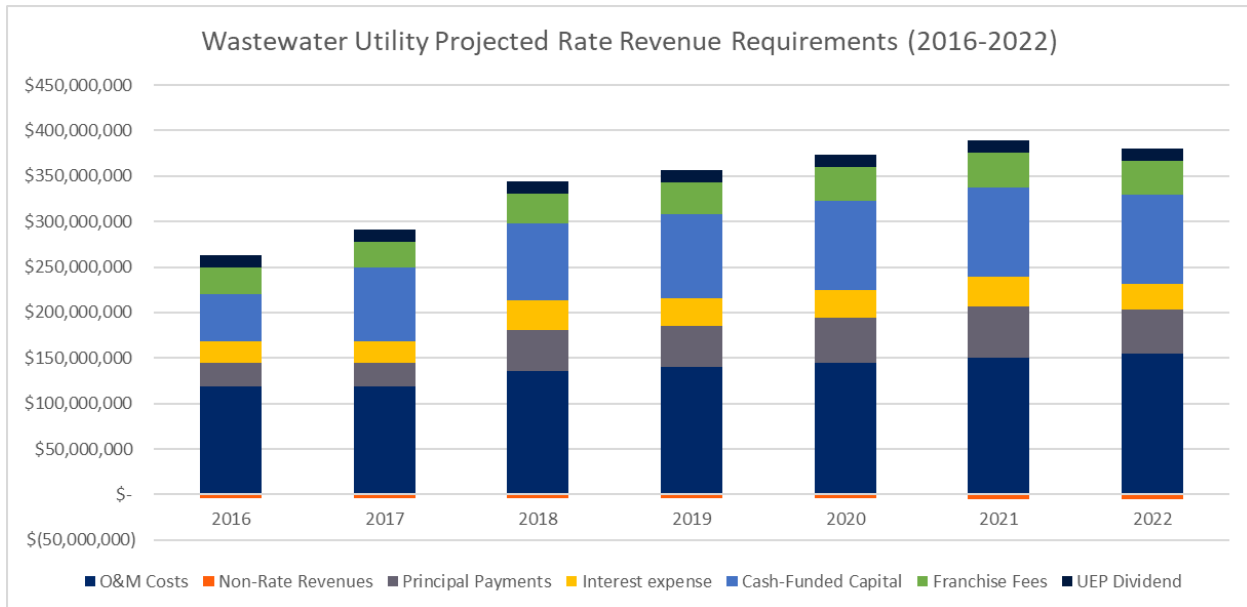


Figure 10: 2016-2022 Wastewater Rate Revenue Requirements

From this figure, it can be determined that the Wastewater Service’s total rate revenue requirements are expected to significantly grow over the next business cycle. They reach a maximum of approximately \$384 million in 2021 from a 2016 value of \$259 million. A key reason for this are increased capital investments and operating costs required for Sludge Processing and Biosolids Management functions, as it is noted that additional capacity is being implemented to accommodate projected customer demands and regulatory requirements.

A snapshot of the specific rate revenue components as compared from 2019 versus 2022 is also provided below, with specific projections for individual rate revenue requirements:

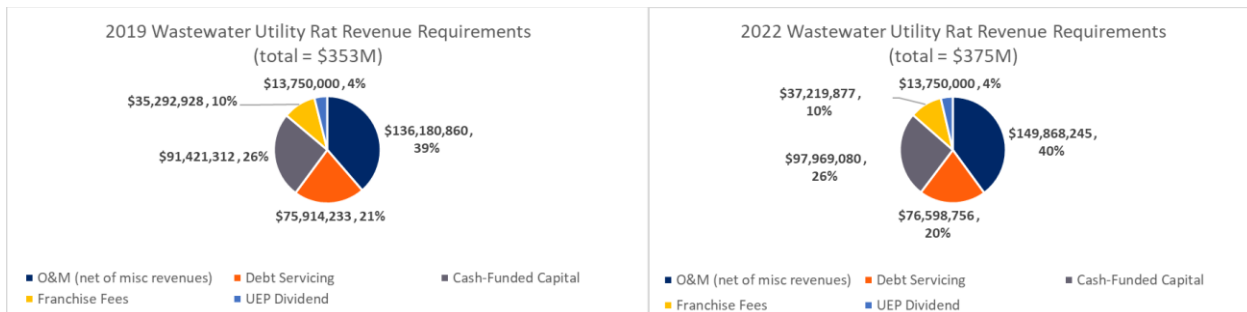


Figure 11: Wastewater 2019 versus 2022 Rate Revenue Requirements

1.3.4.2 Wastewater Functions

Functions were selected to represent the comprehensive scope of distinct work elements performed in the delivery of Wastewater services. They were also selected to recognize the distinction between retail versus wholesale customers. In addition, the Wastewater Treatment Plant functions were subdivided into sub-functions. This was necessary to identify unique Wastewater treatment processes which have unique cost causation drivers. Combined, these functions represent the overarching purpose of a Wastewater treatment facility to not only support contributed Wastewater flows (complete with inflow and infiltration), but also treat these flows for various Wastewater pollutants and produce effluent which fall within regulatory standards.

The following distinct Wastewater functions and supporting descriptions (regarding the assignment of unique assets into specific functions) are summarized below:

Function	Assets (as identified in asset register)
Collection	Manholes, Sanitary Services, Mains & Liners < 600 mm Allocated Forcemains, Chambers, Lift Stations, and Syphons (as reviewed by Engineering)
Transmission	Trunks, Mains, and Liners ≥ 600 mm Allocated Forcemains, Chambers, Lift Stations, and Syphons (as reviewed by Engineering)
Preliminary Treatment	Headworks, Influent Pump Station
Primary Treatment	Primary Clarifier
Secondary Treatment	Secondary Clarifier, Bioreactor, Oxygenation Tanks, Phosphorous Removal, Blower, Fermenters
Disinfection	UV Disinfection,
Effluent Filtration	Effluent Filtration, Outfall Ducts
Sludge Processing	Digesters, Thickeners, Blenders, Dissolved Air Flotation, FOG, Dewatering Facility
Biosolids Management	Lagoons, Composting Facility
Biogas	Thermal Oxidation, Power Gen & Heating, Waste Gas Burner
Reclaimed Water	Reclaimed Water Pump Station, Reclaimed Pipeline
Hauled Wastewater & FOG	Hauled Wastewater Receiving Station
Treatment General	Common Area, Admin, Control Building, General Site Development, Maintenance Shop, Odour Control, Utility Building, etc.

Table 8: Wastewater Functions versus Assets

Assets designated as “Treatment General” were subsequently allocated to all other specific treatment functions (i.e. not including the Collection nor Transmission functions) based on an overhead allocation. This was based on the percentage of the net book value of assets as directly allocated to each function. The allocation of debt servicing costs was also performed using the same distribution of the net book value of assets to functions.

In addition to the assignment of assets to these functions, a similar exercise was performed to assign all operating-related costs. This exercise was completed in parallel during the Line of Service allocations analysis. A “bottom-up” review of each Division’s activities and chartfield drill financial results (by both Dept ID and Activity ID) was performed. In addition, input on specific allocations was provided by internal Utilities administration and technical subject-matter-experts. This included a specific review on chemicals used (versus the pollutants they treat) and manpower analysis for both Operations and Maintenance Sections (as provided by Wastewater Treatment Plant O&M Leaders). Finally, consultant judgment (based on comparable Wastewater treatment utilities) were provided to estimate the distribution of plant electricity costs across the various treatment functions.

The distribution of the Wastewater Service rate revenue requirements into functions is illustrated in the following graphic. As can be seen, the Treatment and Collection Network (retail customers only) represent 82% of the 2019-2022 projected costs. The Treatment function was further detailed into its sub-functions to better allocate costs against contributed Wastewater flows versus various treatment parameters.

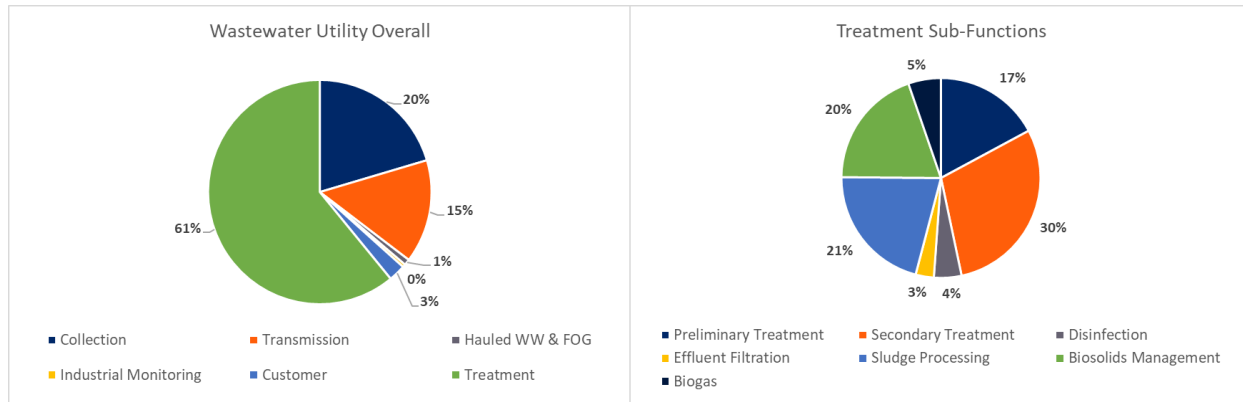


Figure 12: Wastewater Distribution of Functionalized Rate Revenue Requirements

1.3.4.3 Wastewater Cost Drivers

To guide cost allocation efforts, industry leading practices (based on comparison Wastewater treatment utilities) and knowledge were leveraged. In particular, guidance was leveraged from the Water Environment Federation Manual of Practice No. 27³. This provided a starting point for consideration for the Wastewater Technical Team, as facilitated sessions were conducted to identify the most appropriate allocation techniques for the Wastewater Service. This included considerations for both the “design-basis” (which allocates costs based on the premise for what the infrastructure was designed to do) and the “functional-basis” (which allocates costs based on the premise of the actual contributed Wastewater flows and loadings).

From this, cost driver allocations were further refined to support both operating and capital functional costs. The tables below summarize these cost driver allocation frameworks:

Operating Cost Allocations Framework:

Function	Operating Cost Allocations Framework									
	Wastewater Volume	Loading Parameter					Hauled WW & FOG	Reclaimed Water	Industrial Monitoring	Customer Service
Suspended Solids		BOD	TKN	TP	FOG					
Collection	0.0%									100.0%
Transmission	100.0%									
Preliminary Treatment	100.0%									
Primary Treatment	80.0%	20.0%								
Secondary Treatment (not incl. Alum or Liquid O ₂)		20.3%	64.7%	13.4%	1.6%					
Secondary Treatment - Alum					100.0%					
Secondary Treatment - Liquid Oxygen			100.0%							
Disinfection	100.0%									
Effluent Filtration	100.0%									
Sludge Processing		33.3%	11.1%	27.8%	27.8%					
Biosolids Management		40.0%	10.0%	25.0%	25.0%					
Biogas		46.0%	43.9%	9.1%	1.1%					
Reclaimed Water							100.0%			
Hauled Wastewater & FOG						100.0%				
Industrial Monitoring								100.0%		
Customer Service										100.0%

Table 9: Wastewater Operating Cost Allocations Framework

³ Water Environment Federation, “Financing and Charges for Wastewater Systems, Manual of Practice No. 27”, WEF Press, 2004

Capital Cost Allocations Framework:

Function	Capital Cost Allocations Framework									
	Wastewater Volume	Loading Parameter					Hauled WW & FOG	Reclaimed Water	Industrial Monitoring	Customer Service
		Suspended Solids	BOD	TKN	TP	FOG				
Collection	100.00%									
Transmission	100.00%									
Preliminary Treatment	100.00%									
Primary Treatment	80.00%	20.00%								
Secondary Treatment		20.34%	64.69%	13.36%	1.61%					
Disinfection	100.00%									
Effluent Filtration	100.00%									
Sludge Processing		33.30%	11.10%	27.80%	27.80%					
Bio Solids Management		40.00%	10.00%	25.00%	25.00%					
Biogas		45.98%	43.87%	9.06%	1.09%					
Reclaimed Water								100.00%		
Hauled Wastewater							100.00%			
Industrial Monitoring									100.00%	

Table 10: Wastewater Capital Cost Allocations Framework

The major difference between the Operating and the Capital Allocations Frameworks is the allocation of costs in the Collection function. It was viewed that the total contributed Wastewater volume is a reasonable cost driver to allocate all capital-related costs against. However, it was viewed that the number of customers primarily drive operations and maintenance costs (particularly for Construction and Field Services crews).

Based on these allocations, each rate revenue requirement was split into its base-extra capacity cost drivers. The following table summarizes the 2016 rate revenue requirement allocations:

Rate Revenue Requirement	2016 Test Year Amount	Wastewater Volume Annual Volume m3	Loading Parameters					Hauled WW & FOG Volume	Reclaimed Water Volume	Strength Monitoring # Samples	Customer # Accounts	Regional Direct Allocation
			TSS Kg	BOD Kg	TKN Kg	TP Kg	FOG Kg					
O&M Costs	\$ 118,555,647	\$ 20,437,556	\$ 17,218,706	\$ 16,120,923	\$ 10,095,688	\$ 10,794,510	\$ -	\$ 642,104	\$ 1,821,912	\$ 1,201,067	\$ 39,967,066	\$ 256,114
Non-Rate Revenues	\$ (4,140,984)	\$ (471,214)	\$ (412,748)	\$ (418,226)	\$ (243,046)	\$ (179,443)	\$ -	\$ (14,842)	\$ -	\$ (27,538)	\$ (2,373,928)	
Principal Payments	\$ 25,691,231	\$ 15,840,277	\$ 2,944,529	\$ 4,295,864	\$ 1,542,753	\$ 813,842	\$ -	\$ 253,965	\$ -	\$ -	\$ -	
Interest expense	\$ 24,144,892	\$ 14,886,861	\$ 2,767,300	\$ 4,037,299	\$ 1,449,896	\$ 764,857	\$ -	\$ 238,679	\$ -	\$ -	\$ -	
Cash-Funded Capital	\$ 51,970,000	\$ 32,042,809	\$ 5,956,398	\$ 8,689,972	\$ 3,120,788	\$ 1,646,296	\$ -	\$ 513,738	\$ -	\$ -	\$ -	
Sub-Total RRR's	\$ 216,220,786	\$ 82,736,289	\$ 28,474,186	\$ 32,725,832	\$ 15,966,080	\$ 13,840,062	\$ -	\$ 1,633,643	\$ 1,821,912	\$ 1,173,529	\$ 37,593,138	\$ 256,114
		38.26%	13.17%	15.14%	7.38%	6.40%	0.00%	0.76%	0.84%	0.54%	17.39%	0.12%
UEP Dividend	\$ 13,750,000	\$ 5,312,455.92	\$ 1,828,313.28	\$ 2,101,309.40	\$ 1,025,174.08	\$ 888,663.51	\$ -	\$ 104,895.43	\$ -	\$ 75,351.74	\$ 2,413,836.64	\$ -
Franchise Fees	\$ 29,038,005	\$ 9,382,979	\$ 3,166,455	\$ 3,666,720	\$ 1,781,533	\$ 1,540,479	\$ -	\$ 193,171	\$ 202,435	\$ 128,182	\$ 4,445,149	\$ -
Total RRR's	\$ 259,008,791	\$ 97,431,724	\$ 33,468,954	\$ 38,493,862	\$ 18,772,787	\$ 16,269,205	\$ -	\$ 1,931,710	\$ 2,024,346	\$ 1,377,063	\$ 44,452,123	\$ 256,114

Table 11: 2016 Wastewater Summary Rate Revenue Requirements by Cost Driver

In addition, the composition of 2019-2022 total rate revenue requirements per Cost Driver was also analyzed. Opposite is the distribution of rate revenue requirements for each Cost Driver. It demonstrates that approximately 40% of the costs have been assigned to the "Wastewater Volume" component, while 46% has been assigned across the BOD, TSS, TP, and TKN loadings components.

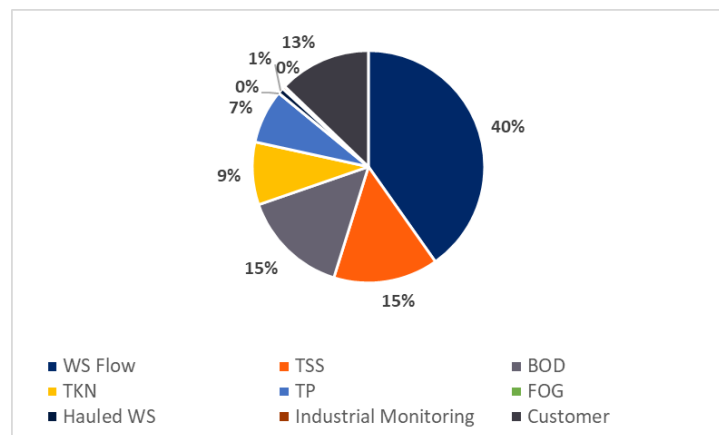


Figure 13: 2019-2022 Wastewater Cost Drivers

1.3.4.4 Wastewater Cost Allocations to Customers

The units of services for each customer class provides a fair and proportional method to allocate rate revenue requirements within the Cost Driver pools across customer classes. Service requirements are determined for each customer class based on its total contributed Wastewater volume, assigned loadings of BOD, TSS, TP, TKN, Wastewater over strength monitoring activities, and billing frequency. Units of service per customer class are determined based on analysis of customer consumption data from 2014-2016, measured effluent volumes (for customers with an effluent meter), plant influent volumes, Wastewater treatment mass balance analysis, Active Surcharge customer over strength data samples, and billing frequencies.

For customers with an effluent meter, their contributed Wastewater volumes are directly measured. However, the vast majority of Wastewater Service customers do not have an effluent meter. For these customers, contributed Wastewater volumes are determined based on an average of the 2014-2016 total water consumption per class (for customers without an effluent meter). Their contributed Wastewater flows are determined by applying a standard return factor, which recognizes that a portion of customers' water consumption does not return to the Wastewater collection network. The return factors are determined by comparing the total annual water consumption per class against its pro-rated annual volumes based on measured consumption during winter months (i.e. December, January, and February). Based on this analysis, it was determined that the updated Wastewater return factors to be used are:

- Residential Metered: 90%
- General Service: 92%
- Multi-Family Residential: 97%

Based on the projected units of service per customer class across the 2019-2022 business cycle, the following summary distribution of cost allocations per cost driver was developed:

Customer Class	Wastewater Volume	Loading Parameters				Hauled Wastewater	Industrial Monitoring	Customer
		TSS	BOD	TKN	TP			
Residential Metered	52.6%	46.4%	45.6%	51.7%	49.9%	0.0%	0.0%	93.2%
General Service	33.3%	29.4%	28.9%	32.8%	31.6%	0.0%	0.0%	4.3%
Multi-Family Residential	9.5%	8.4%	8.2%	9.3%	9.0%	0.0%	0.0%	1.4%
Septage Hauling	0.2%	7.5%	4.0%	1.8%	5.2%	100.0%	0.0%	0.0%
General Service Effluent	3.5%	3.1%	3.0%	3.4%	3.3%	0.0%	0.0%	0.0%
Active Surcharge	0.0%	4.4%	9.5%	0.0%	0.0%	0.0%	100.0%	0.0%
Residential Unmetered	1.0%	0.9%	0.9%	1.0%	1.0%	0.0%	0.0%	1.2%

Table 12: Summary 2019-2022 Distribution of Wastewater Customer Units of Service Allocations

Additionally, based on the projected cost allocations per customer class across 2019-2022, a comparison versus 2018 rates was performed to evaluate projected cost recovery levels. This projects the expected revenues per customer class (using the existing 2018 rates) against its projected cost of service, thus providing a starting point for 2019-2022 rate adjustments. The 2018 versus 2022 cost recoveries for each customer class are summarized below:

Class	2018 Projected Cost Recovery	2022 Projected Cost Recovery
Residential Metered	118%	110%
General Service	80%	76%
Multi-Family Residential	82%	78%
General Service Effluent	78%	74%
Septage Hauling	54%	50%
Residential Unmetered	177%*	169%*

Table 13: Wastewater 2018 versus 2022 Cost Recoveries with 2018 Rates

1.3.5 Drainage Rate Revenue Projections

In parallel, rate revenue requirement projections were developed for the Drainage Service. This was required to identify customer rates not only for the 2019-2022 business cycle, but also indicative rates for 2023 and beyond given a potential move to a Variable Rate Structure.

Note that a cost of service framework as followed for both Water and Wastewater was not required for the Drainage Service. The approved method does not require the functionalization nor classification of costs. Instead, overall rate revenue requirements are allocated across all customers (i.e. both residential and non-residential) based on the selected rate structure and unique customer class characteristics.

Drainage Service projections assumed the same customer growth and cost inflation assumptions as previously described for the Water and Wastewater Services. Based on the projection assumptions and capital financing plan, the total rate revenue requirements were projected from the 2016 base year to the end of 2022:

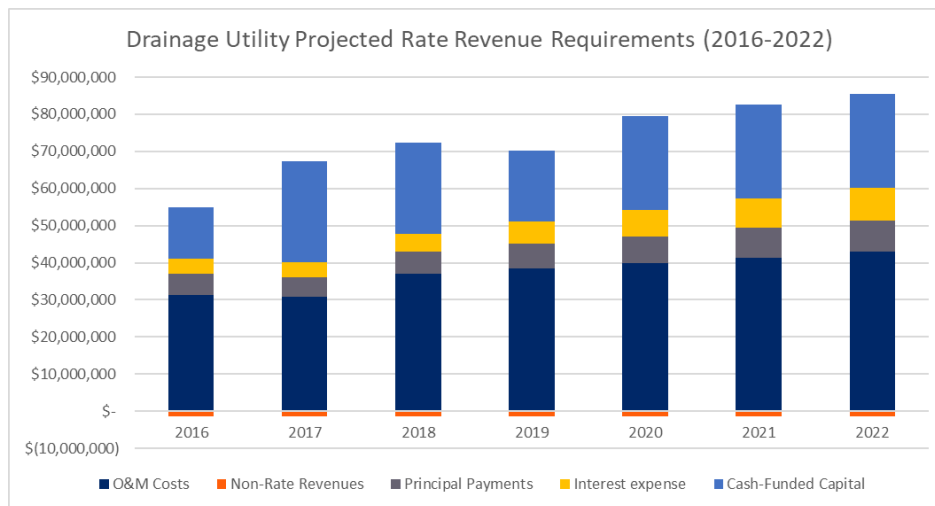


Figure 14: 2016-2022 Drainage Rate Revenue Requirements

From this figure, it can be determined that the Drainage Service's total rate revenue requirements are expected to grow over the next business cycle. They reach a maximum of approximately \$84 million in 2022 from a 2016 value of \$54 million. This largely reflects the investments required by the capital investment plan based on previously reviewed and approved levels of service.

A snapshot of the specific rate revenue components as compared from 2019 versus 2022 is also provided below, with specific projections for individual rate revenue requirements:

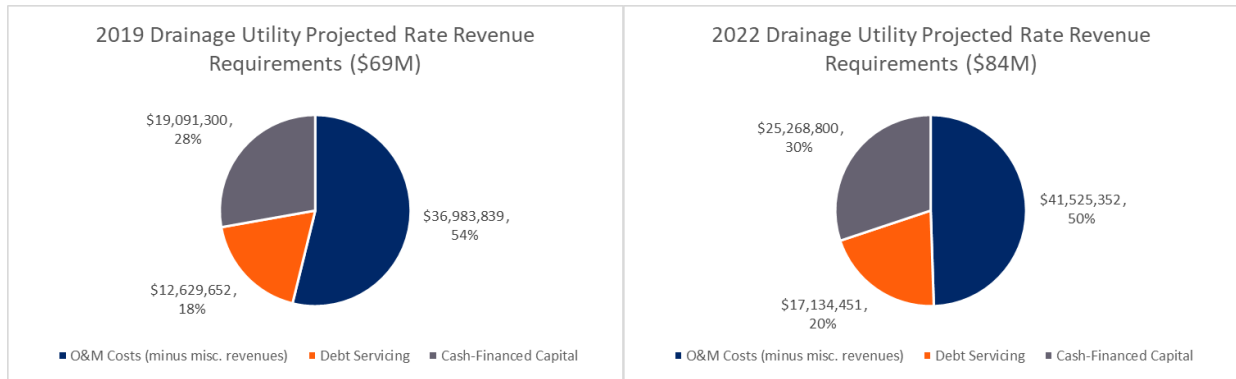


Figure 15: Drainage 2019 versus 2022 Rate Revenue Requirements

As seen from the above figure, all rate revenue requirement components are projected to increase from 2019-2022. Approximately \$10.8 million will be added to the Drainage Service’s capital-related costs (i.e. both cash-financed capital and debt servicing costs, as compared from 2022 versus 2019 projections).

1.4 Inside City Rate Design Strategies

1.4.1 Rate Design Considerations

Beyond the Rate Making Priorities (Section 1.2), input from additional stakeholders was gathered and considered. The following customer input and general community attitudes were specifically noted:

- i. General Service customers are seeing higher property tax increases due to the prolonged economic recession;
- ii. Customers generally don’t realize the extent to which their bill is fixed versus variable;
- iii. Approximately half of customers agreed with the statement that “no matter what I do, the total amount of my bill doesn’t change from month to month”;
- iv. Customers overwhelmingly believe that those who use more should pay more; and
- v. There is support for incorporating an Affordability Program.

In addition, the 2019-2022 were required to meet specific Utility Fiscal Policy objectives. The following fiscal policy objectives were considered in developing 2019-2022 rates:

- i. Maintain annual debt servicing ratio > 1.75;
- ii. Minimize the addition of net-new debt; and
- iii. Ensure each Utility’s Sustainment Reserve has established 120 days of O&M funding by the end of 2022.

Based on these considerations, the cost of service results, and the priority rate-making objectives, unique 2019-2022 rate strategies were developed and reviewed with the Steering Committee. It was noted that the 2015-2018 rates were primarily selected based on closing 50% of the projected gap (for each customer class) by the end of the business cycle. This rate-setting philosophy was utilized further for evaluating alternative 2019-2022 rates, but with individual adjustments per customer class to better align with priority objectives. The following figure visualizes how 2019-2022 rates have been analyzed and phased in across 2019-2022 based on this approach of “closing the cost recovery gap”:

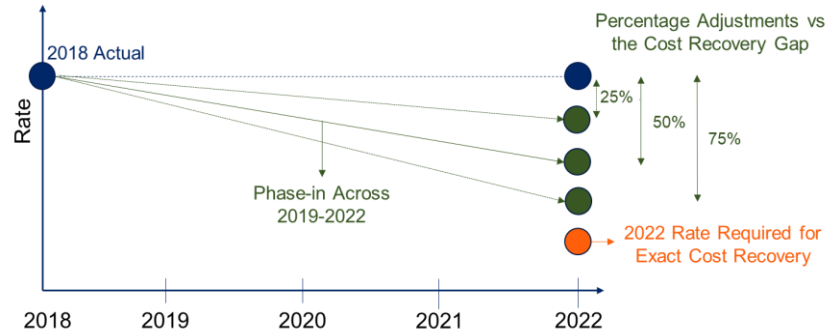


Figure 16: 2019-2022 Rate Setting Approach

Based on this, two alternative rate design scenarios were developed for evaluation. The first was primarily focused on **maximizing the degree of customer fairness**. The second was focused on for each class **moderating the impact to each customer class**.

1.4.2 Rate Scenario 1: Maximize Customer Fairness

This rate design scenario was focused on maximizing the degree of cost recovery for each customer class. This impacted rate design recommendations for each fixed and variable charge across both Water and Wastewater. A description of the rates across 2019-2022 are described in the following sub-sections.

1.4.2.1 Water Fixed Monthly Service Charges

It was acknowledged that customers expressed a lack of clarity regarding the present Water Service billing. In addition, the Water Service had questioned what an appropriate mix of fixed versus variable revenues should be targeted to ensure alignment with utility fiscal policies and ensure appropriate revenue risk management practices.

Per industry accepted practices, the most common costs which the fixed monthly rate are intended to address are all non-consumption related costs. This is based on the rationale that even if customer's usage was zero, there still exists non-consumption related costs which need to be funded on a monthly basis. This includes all rate revenue requirements for the following:

- Customer Service;
- Fire Protection;
- Meters and Services; and
- Customer Assistance Program (assumed for 2019 and 2020 only).

In addition, a recent industry trend for water utilities is the inclusion of system "readiness to serve" costs into the monthly fixed portion of the rate. This is to reflect the capital-related (and hence largely fixed) costs required to invest in utility system capacity. Based on this, a review of the Water Service's "Max Day" and "Max Hour" capital-related costs was performed. These costs were further included as targeted rate revenue requirements to be funded by the fixed portion of the rate.

Finally, a review of additional revenue risks was performed with the goal of identifying other revenue risk-mitigating components to potentially include within the fixed portion of the rate. Based on review of the Water Service's rate model, the following two revenue risks were highlighted:

- i. **Developer Principal and Interest Funding:** Given that rate-payers are allocated all debt servicing costs net of funds provided from developers via off-site levies, there is risk to the total rates required based on potential year-to-year variations in developer growth. Given this

variation, a potential revenue risk mitigation technique may be to include a percentage of annual off-site levy principal and interest funding projections within rate payer’s fixed portions of the rate.

- ii. **Consumption Variability:** Based on historical consumption behaviors (i.e. back to 2012), an analysis on the year-to-year variation on total consumption per customer class was performed. This analysis indicated an approximate standard deviation of approximately 2.5% across all customer classes. Based on this, a potential revenue risk mitigation technique may be to include approximately 2.5% of all “Base Volume” costs into the fixed portion of the rate.

Based on a review of these costs and revenue risks versus present fixed rates, the following elements were proposed to be funded by the Water Service’s fixed portion of the rate:

Rate Revenue Requirement Component	2019-2022 Range \$	% of Total
Customer Service	\$8.9 - \$10.1M	4%
Fire Protection	\$10.7 - \$11.3M	4.50%
Meters & Services	\$17.1 – \$18.1M	6%
Customer Assistance Program ('19 & '20 only)	\$0.8M	0.4%
Extra-Capacity “Readiness to Serve” •Capital costs for Max Day & Max Hr	\$44.8 - \$55.4M	16%
% of Projected Developer OSL’s •fund growth-related P&I	-	-
% of Consumption “Base” Costs •account for consumption variability	-	-
Totals vs. Overall Retail Rate Revenue Requirements:	\$85.0 - \$91.2M	30.3% - 31.1%

Table 14: Water 2019-2022 Fixed Rate Components

It is noted that portions of projected off-site levy funding and consumption “base” costs were ultimately not included as risk components to include in the fixed portions of the rate. However, it is recommended that the 2019-2022 rates still maintain a significant percentage of rate revenues from the fixed rate to better achieve overall revenue sufficiency and predictability. These specific outcomes were noted as the highest priority rate-making objective for the 2019-2022 business cycle. Should the Water Service be successful in building its targeted sustainment reserve levels (i.e. 120 days of O&M expenses by 2022), there may be an opportunity to decrease the fixed portion of the rates for the 2023-2026 business cycle.

Itemizing these rate revenue requirements provided the total target funding to be received from the monthly fixed rates across all customers. However, it was then required to allocate these costs against the different meter sizes. To do this, rate revenue requirements for each element were allocated against each meter size ranging from 15 mm to 250 mm. The use of equivalent meter ratios was leveraged to determine these allocations as appropriate. Additionally, rate adjustment strategies were selected to achieve desired Water Service financial targets, manage customer impact, and move towards improved customer equity.

Based on the objective of maximizing targeted cost recovery for each meter size, the following fixed rate schedule per meter size across 2019-2022 is developed (based on adjusting each meter size by 50% of its respective cost recovery gap):

Fixed Service Charges 30 Days per Meter Size	2018	2019	2020	2021	2022	Average Annual % Change	Cost Recovery Gap %
15 mm	\$ 15.33	\$ 15.3771	\$ 15.2268	\$ 14.8855	\$ 14.7374	-0.97%	close gap by 50% by 2022
20 mm	\$ 30.44	\$ 29.3305	\$ 28.0236	\$ 26.5257	\$ 25.2209	-4.29%	close gap by 50% by 2022
25 mm	\$ 37.17	\$ 36.6836	\$ 35.9997	\$ 35.1248	\$ 34.4431	-1.83%	close gap by 50% by 2022
40 mm	\$ 63.63	\$ 63.4968	\$ 63.1661	\$ 62.6445	\$ 62.3160	-0.52%	close gap by 50% by 2022
50 mm	\$ 86.63	\$ 88.0147	\$ 89.2018	\$ 90.1981	\$ 91.3874	1.37%	close gap by 50% by 2022
75 mm	\$ 173.76	\$ 174.5034	\$ 175.0494	\$ 175.4044	\$ 175.9525	0.32%	close gap by 50% by 2022
100 mm	\$ 242.62	\$ 249.3988	\$ 255.9801	\$ 262.3705	\$ 268.9540	2.71%	close gap by 50% by 2022
150 mm	\$ 406.18	\$ 429.1210	\$ 451.8645	\$ 474.4171	\$ 497.1628	5.60%	close gap by 50% by 2022
200 mm	\$ 653.25	\$ 689.2359	\$ 725.0243	\$ 760.6218	\$ 796.4124	5.48%	close gap by 50% by 2022
250 mm	\$ 1,056.48	\$ 1,093.3122	\$ 1,129.9470	\$ 1,166.3908	\$ 1,203.0277	3.47%	close gap by 50% by 2022
Bulk Water	\$ 30.44	\$ 29.3305	\$ 28.0236	\$ 26.5257	\$ 25.2209	-4.29%	same as Irrigation (20 mm)

Table 15: Water 2019-2022 Fixed Rate Schedule – Maximize Customer Fairness

1.4.2.2 Water Variable Rates

With fixed rates representing a significant portion of total rate revenues, the remaining rate revenue requirements are the responsibility of the variable rates to address. To determine appropriate variable rates, iterative analysis was performed to evaluate overall utility financial results, impact to the calculated cost of service results, impact to customers, and alignment with the priority rate-making objectives.

Based on an objective to maximize the degree of customer fairness, the following recommended variable rates per class were developed:

Customer Class	2018	2019	2020	2021	2022	Average Annual % Change	Cost Recovery Gap %
Calgary Residential Metered	\$ 1.6652	\$ 1.5839	\$ 1.5027	\$ 1.4214	\$ 1.3402	-4.88%	close gap by 88% by 2022
Calgary General Service - Large	\$ 1.2977	\$ 1.3263	\$ 1.3548	\$ 1.3834	\$ 1.4120	2.20%	close gap by 88% by 2022
Calgary General Service - Regular	\$ 1.4099	\$ 1.3971	\$ 1.3844	\$ 1.3716	\$ 1.3589	-0.90%	close gap by 88% by 2022
Calgary Residential Multi Family Metered	\$ 1.6098	\$ 1.5370	\$ 1.4642	\$ 1.3914	\$ 1.3186	-4.52%	close gap by 88% by 2022
Calgary General Service - Irrigation	\$ 2.5911	\$ 2.7264	\$ 2.8617	\$ 2.9970	\$ 3.1323	5.22%	close gap by 50% by 2022
Calgary Bulk Water	\$ 1.7093	\$ 1.7101	\$ 1.7109	\$ 1.7117	\$ 1.7126	0.05%	close gap by 100% by 2022

Table 16: Water Proposed 2019-2022 Variable Rates – Maximize Customer Fairness

1.4.2.3 Wastewater Fixed Monthly Service Charges

Similar to the situation with the Water Service, it was acknowledged that customers expressed a lack of clarity regarding the present Wastewater Service billing. Based on this, an analysis of what specific costs should be addressed by the fixed monthly charge was performed. This leveraged guidance from comparable industry practices and review of the costs of service results. Per industry accepted practices, the most common costs which the fixed monthly rate are intended to address are all non-flow related costs. This is based on the rationale that even if customer's usage was zero, there still exists non-flow related costs which they still need to fund on a monthly basis. Based on the cost of service framework, this includes all rate revenue requirements for the following:

- Customer Service;
- Customer Assistance Program (assumed for 2019 and 2020 only); and
- Collection Network O&M.

In addition, "readiness to serve" costs were analyzed. For Wastewater Utilities, these are represented by the capital-related (and hence largely fixed) costs required to treat pollutants as received by the treatment plants. Based on this, a review of the Wastewater Service's capital-related costs to treat loadings was performed. These costs were further included as targeted rate revenue requirements to be funded by the fixed portion of the rate.

Additionally, a review of costs required to treat plant influent volumes attributable to inflow and infiltration was performed. It can be reasoned that Wastewater treatment facilities are required to treat inflow and infiltration regardless of end-customers actual contributed Wastewater volumes. As such, a percentage of Wastewater flow costs was identified based on the total inflow and infiltration flows calculated at the Wastewater treatment facilities.

Finally, a review of additional revenue risks was performed with the goal of identifying other revenue risk-mitigating components to potentially include within the fixed portion of the rate. The same revenue risks as identified for the Water Service were considered (i.e. both Developer Off-Site Levy funding and Contributed Wastewater Flows). Similar as the Water Service, neither of these considerations were ultimately included in the fixed portions of the rates. However, they are outlined to provide a potential basis for future considerations.

Based on a review of these costs and revenue risks versus present fixed rates, the following elements were proposed to be funded by the Wastewater Service's fixed portion of the rate:

Rate Revenue Requirement Component	2019-2022 Range	% of Total
Customer-Related Costs		
• Customer service and Collection System O&M	\$43.3 – \$48.8M	14%
Customer Assistance Program ('19 & '20 only)	\$1.4M	0.5%
“System Readiness” Costs for Treating Pollutant Strengths		
• WWTP capital costs for treating BOD, TSS, TKN, and TP	\$50.3 - \$63.4M	16%
Inflow & Infiltration Costs		
• Portion of WS volume cost attributable to I/I	\$30.3 - \$34.1M	10%
% of Projected Developer OSL's		
• to fund growth-related P&I	-	-
% of “WS Volume” Costs		
• account for consumption variability	-	-
Totals vs. Overall Retail Rate Revenue Requirements:	\$117.4 - \$136M	38.8% – 40.5%

Table 17: Wastewater 2019-2022 Fixed Rate Components

Itemizing these rate revenue requirements provided the total target funding to be received from the monthly fixed rates across all customers. The Wastewater Service is different than the Water Service in that each customer is charged the same monthly fixed rate, regardless of water meter size. This positions customers across different classes with the requirement to pay the same fixed rate. As such, this rate needs to be carefully considered for both small and large customers.

The 2022 fixed rate is based on correcting the calculated cost recovery gap by 59% by 2022. As such, the following fixed rate schedule across 2019-2022 is recommended:

Fixed Service Charges 30 Days	2018	2019	2020	2021	2022	Average Annual % Change	Cost Recovery Gap %
Monthly Fixed Charge (All Customers)	\$ 25.69	\$ 26.8607	\$ 27.6888	\$ 28.1881	\$ 29.0207	3.24%	close 59% gap by 2022

Table 18: Wastewater 2019-2022 Fixed Rates

1.4.2.4 Wastewater Variable Rates

With fixed rates representing a significant portion of total rate revenues, the remaining rate revenue requirements are the responsibility of the variable rates to address. To determine appropriate variable rates, iterative analysis was performed to evaluate overall utility financial results, impact to the calculated cost of service results, impact to customers, and alignment with the priority rate-making objectives.

Based on this analysis, the following recommended variable rates per class were developed:

Customer Class	2018	2019	2020	2021	2022	Average Annual % Change	Cost Recovery Gap %
Calgary Residential Metered (per m3 Water)	\$ 1.4852	\$ 1.4291	\$ 1.3731	\$ 1.3170	\$ 1.2610	-3.77%	close 47% gap by 2022
Calgary General Service (per m3 Water)	\$ 1.5552	\$ 1.6836	\$ 1.8120	\$ 1.9405	\$ 2.0689	8.26%	close 100% gap by 2022
Calgary Residential Multi Family Metered (per m3 Water)	\$ 1.6636	\$ 1.7901	\$ 1.9166	\$ 2.0431	\$ 2.1696	7.60%	close 100% gap by 2022
Calgary Septage Hauled Wastewater	\$ 22.4483	\$ 28.0072	\$ 33.5661	\$ 39.1251	\$ 44.6840	24.76%	close 100% gap by 2022
Calgary Effluent Meters (per m3 wastewater)	\$ 1.7281	\$ 1.8796	\$ 2.0311	\$ 2.1826	\$ 2.3341	8.77%	close 100% gap by 2022

Table 19: Wastewater Proposed 2019-2022 Variable Rates – Maximize Customer Fairness

1.4.2.5 Wastewater Surcharge Rates

In addition, the costs to treat the in-scope Wastewater pollutants were evaluated. This was completed for BOD, TSS, TP, and TKN. Implementation of TP and TKN into the surcharge rates and transitioning FOG

from an accepted surcharge pollutant to a penalty was also considered. Based on additional work required to review and the plan the transition of these items, it was assumed that these changes would start to be phased in by 2021. As such, it is noted that a Surcharge Bylaw mid-cycle update for these rates will be required to support rate modifications in 2021. The following 2019-2020 rate schedules were developed for surcharge rates:

Extra Strength Surcharges	2018	2019	2020	Average Annual % Change
Monthly Over Strength Charges (\$ per m3 Water for each mg/L > Bylaw)				
TSS (300 mg/L)	\$ 0.001147	\$ 0.001147	\$ 0.001147	0.00%
BOD (300 mg/L)	\$ 0.001443	\$ 0.001443	\$ 0.001443	0.00%
FOG (100 mg/L)	\$ 0.001947	\$ 0.001947	\$ 0.001947	0.00%
TP (10 mg/L)	\$ -	\$ -	\$ -	-
TKN (50 mg/L)	\$ -	\$ -	\$ -	-

Table 20: Wastewater Proposed 2019-2020 Surcharge Rates

1.4.2.6 Impact of Water and Wastewater Rate Strategies

Given the developed rate schedules as outlined, impact to typical customers within each customer class was analyzed. The following table summarizes the projected monthly impact to average customers (based on historical consumption analysis and meter sizes) across the 2019-2022 business cycle:

Average 30-Day Bill Impact	2018			2022			Annual Bill Impact %
	Water	Wastewater	Total	Water	Wastewater	Total	
Residential Metered	\$ 43.08	\$ 50.44	\$ 93.52	\$37.07	\$ 50.03	\$87.10	-1.71%
General Service Large (100 mm)	\$ 2,098.55	\$ 2,249.89	\$ 4,348.45	\$2,288.34	\$ 2,987.86	\$5,276.20	5.33%
General Service Regular (25 mm)	\$ 170.84	\$ 173.14	\$ 343.98	\$163.28	\$ 225.17	\$388.45	3.23%
Multi-Family Residential (40 mm)	\$ 369.14	\$ 341.41	\$ 710.54	\$312.56	\$ 440.77	\$753.33	1.51%
General Service Irrigation (20 mm)	\$ 183.66		\$ 183.66	\$210.45	\$ -	\$210.45	3.65%
General Service Effluent Metered	0	\$ 15,671.75	\$ 15,671.75	0	\$ 21,161.84	\$21,161.84	8.76%
Septage Hauling	0	\$ 10,098.97	\$ 10,098.97	0	\$ 20,080.17	\$20,080.17	24.71%
Bulk Water	\$ 289.64	\$ -	\$ 289.64	\$284.91	\$ -	\$284.91	-0.41%

Table 21: Average Customer Water and Wastewater Billing Impact Analysis – Maximize Customer Fairness

In addition, a review of the projected cost recovery performance per customer class was performed. In this scenario, the primary consideration was to maximize cost recovery for each customer class within both Water and Wastewater Services. The following tables summarize the impact to projected customer cost recovery percentages based on this scenario:

Water

Class	2022 Projected Cost Recovery
Residential Metered	102%
General Service Large	99%
General Service Regular	100%
Multi-Family Residential	102%
Irrigation	87%
Bulk Water	100%
Residential Unmetered	154%*

Wastewater

Class	2022 Projected Cost Recovery
Residential Metered	109%
General Service	100%
Multi-Family Residential	100%
General Service Effluent	100%
Septage Hauling	100%
Residential Unmetered	169%*

Table 22: Projected 2022 Cost Recovery per Utility Service per Class – Maximize Customer Fairness

1.4.3 Rate Scenario 2: Moderate Customer Impact

This rate design scenario was focused on moderating the total rate impact to each customer class (*with improvements to customer fairness outcomes also identified but not maximized*). This impacted rate design recommendations for each fixed and variable charge across both Water and Wastewater. A description of the proposed rates across 2019-2022 are described in the following sub-sections.

1.4.3.1 Water Fixed Rates

Based on the objective of moderating customer impact for each meter size, the following fixed rate schedule per meter size across 2019-2022 is developed. It is based on adjusting the cost recovery gap for 15 mm customers by 50%. Each additional meter's cost recovery gap was adjusted by only 25%.

Fixed Service Charges 30 Days per Meter Size	2018	2019	2020	2021	2022	Average Annual % Change	Cost Recovery Gap %
15 mm	\$ 15.33	\$ 15.3771	\$ 15.2268	\$ 14.8855	\$ 14.7374	-0.97%	close gap by 50% by 2022
20 mm	\$ 30.44	\$ 29.9829	\$ 29.3284	\$ 28.4829	\$ 27.8305	-2.14%	close gap by 25% by 2022
25 mm	\$ 37.17	\$ 37.0244	\$ 36.6814	\$ 36.1474	\$ 35.8065	-0.92%	close gap by 25% by 2022
40 mm	\$ 63.63	\$ 63.6610	\$ 63.4946	\$ 63.1372	\$ 62.9730	-0.26%	close gap by 25% by 2022
50 mm	\$ 86.63	\$ 87.4200	\$ 88.0125	\$ 88.4140	\$ 89.0087	0.69%	close gap by 25% by 2022
75 mm	\$ 173.76	\$ 174.2294	\$ 174.5013	\$ 174.5822	\$ 174.8562	0.16%	close gap by 25% by 2022
100 mm	\$ 242.62	\$ 246.1071	\$ 249.3966	\$ 252.4953	\$ 255.7870	1.36%	close gap by 25% by 2022
150 mm	\$ 406.18	\$ 417.7481	\$ 429.1188	\$ 440.2986	\$ 451.6714	2.80%	close gap by 25% by 2022
200 mm	\$ 653.25	\$ 671.3406	\$ 689.2337	\$ 706.9359	\$ 724.8312	2.74%	close gap by 25% by 2022
250 mm	\$ 1,056.48	\$ 1,074.9938	\$ 1,093.3100	\$ 1,111.4354	\$ 1,129.7538	1.73%	close gap by 25% by 2022
Bulk Water	\$ 30.44	\$ 29.9829	\$ 29.3284	\$ 28.4829	\$ 27.8305	-2.14%	same as Irrigation (20 mm)

Table 23: Water 2019-2022 Fixed Rates – Moderate Customer Impact

1.4.3.2 Water Variable Rates

With fixed rates representing a significant portion of total rate revenues, the remaining rate revenue requirements are the responsibility of the variable rates to address. Based on moderating the degree of customer impact, the following variable rates per class were developed:

Customer Class	2018	2019	2020	2021	2022	Average Annual % Change	Cost Recovery Gap %
Calgary Residential Metered	\$ 1.6652	\$ 1.5947	\$ 1.5242	\$ 1.4537	\$ 1.3832	-4.23%	close gap by 76% by 2022
Calgary General Service - Large	\$ 1.2977	\$ 1.3067	\$ 1.3157	\$ 1.3246	\$ 1.3336	0.69%	close gap by 26% by 2022
Calgary General Service – Regular	\$ 1.4099	\$ 1.3983	\$ 1.3868	\$ 1.3752	\$ 1.3637	-0.82%	close gap by 76% by 2022
Calgary Residential Multi Family Metered	\$ 1.6098	\$ 1.5471	\$ 1.4845	\$ 1.4218	\$ 1.3591	-3.89%	close gap by 76% by 2022
Calgary General Service – Irrigation	\$ 2.5911	\$ 2.6560	\$ 2.7209	\$ 2.7858	\$ 2.8507	2.50%	close gap by 25% by 2022
Calgary Bulk Water	\$ 1.7093	\$ 1.7058	\$ 1.7023	\$ 1.6988	\$ 1.6954	-0.20%	close gap by 100% by 2022

Table 24: Water 2019-2022 Variable Rates – Moderate Customer Impact

Based on these rate strategies, the Water variable rate profiles across 2016 - 2022 per customer class are visualized:

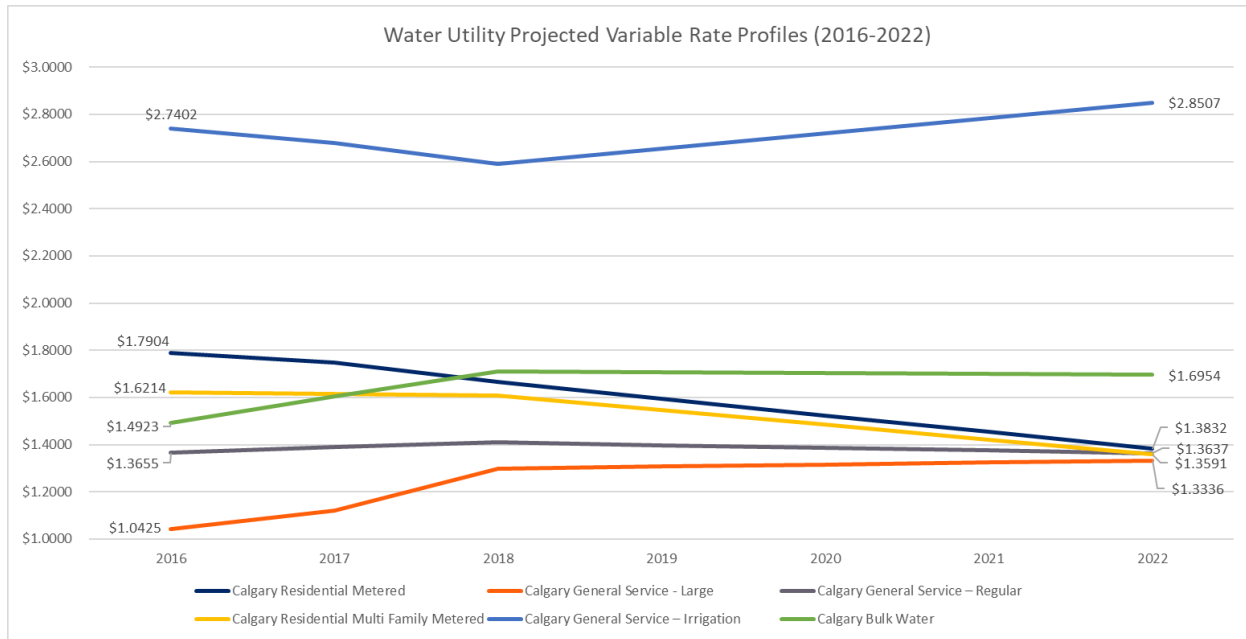


Figure 17: Water 2016-2022 Variable Rates per Class

1.4.3.3 Wastewater Fixed Monthly Service Charges

For Scenario 2, the 2022 fixed rate was maintained as in Scenario 1 (to keep the same overall percentage of fixed revenues the same between the two Scenarios). As such, the same fixed rates schedule as in Table 18 was maintained.

1.4.3.4 Wastewater Variable Rates

With fixed rates representing a significant portion of total rate revenues, the remaining rate revenue requirements are the responsibility of the variable rates to address. Based on the objective to moderate the impact to each customer class, the following variable rates per class were developed:

Customer Class	2018	2019	2020	2021	2022	Average Annual % Change	Cost Recovery Gap %
Calgary Residential Metered (per m3 Water)	\$ 1.4852	\$ 1.4852	\$ 1.4852	\$ 1.4852	\$ 1.4852	0.00%	hold constant
Calgary General Service (per m3 Water)	\$ 1.5552	\$ 1.6341	\$ 1.7131	\$ 1.7920	\$ 1.8709	5.07%	close 61% gap by 2022
Calgary Residential Multi Family Metered (per m3 Water)	\$ 1.6636	\$ 1.7414	\$ 1.8191	\$ 1.8969	\$ 1.9746	4.67%	close 61% gap by 2022
Calgary Septage Hauled Wastewater	\$ 22.4483	\$ 24.3013	\$ 26.1542	\$ 28.0072	\$ 29.8602	8.25%	close 33% gap by 2022
Calgary Effluent Meters (per m3 wastewater)	\$ 1.7281	\$ 1.8212	\$ 1.9143	\$ 2.0074	\$ 2.1006	5.39%	close 61% gap by 2022

Table 25: Wastewater Proposed 2019-2022 Variable Rates

Based on these rate strategies, the Wastewater variable rate profiles per customer class across 2016-2022 are visualized below:

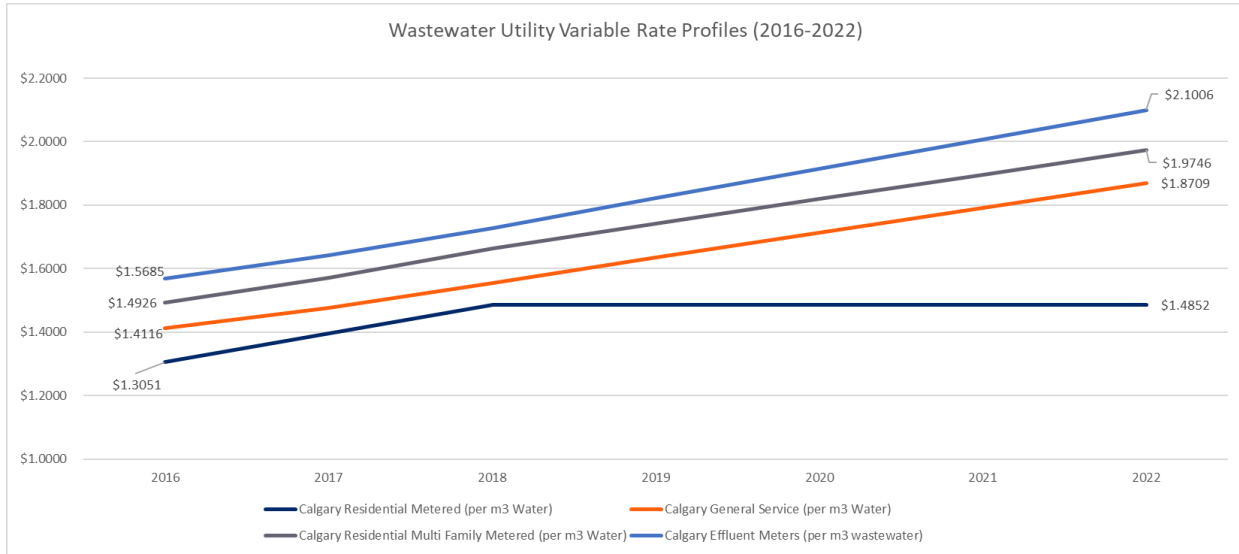


Figure 18: Wastewater 2016-2022 Variable Rates per Class

1.4.3.5 Wastewater Surcharge Rates

No changes to the Wastewater Surcharge Rates were developed for this Scenario. As such, the same rate projections were assumed as in Table 20.

1.4.3.6 Impact of Water and Wastewater Rate Strategies

Given the developed rate schedules as outlined, impact to typical customers within each customer class was analyzed. The following table summarizes the projected 30-day impact to average customers (based on historical consumption analysis and meter sizes) across the 2019-2022 business cycle:

Average 30-Day Bill Impact	2018			2022			Annual Bill Impact %
	Water	Wastewater	Total	Water	Wastewater	Total	
Residential Metered	\$ 43.08	\$ 50.44	\$ 93.52	\$37.79	\$ 53.77	\$91.56	-0.52%
General Service Large (100 mm)	\$ 2,098.55	\$ 2,249.89	\$ 4,348.45	\$2,163.10	\$ 2,704.73	\$4,867.83	2.99%
General Service Regular (25 mm)	\$ 170.84	\$ 173.14	\$ 343.98	\$165.10	\$ 206.40	\$371.50	2.00%
Multi-Family Residential (40 mm)	\$ 369.14	\$ 341.41	\$ 710.54	\$320.90	\$ 403.76	\$724.66	0.50%
General Service Irrigation (20 mm)	\$ 183.66		\$ 183.66	\$196.40	\$ -	\$196.40	1.73%
General Service Effluent Metered	0	\$ 15,671.75	\$ 15,671.75	0	\$ 19,047.24	\$19,047.24	5.38%
Septage Hauling	0	\$ 10,098.97	\$ 10,098.97	0	\$ 13,428.26	\$13,428.26	8.24%
Bulk Water	\$ 289.64	\$ -	\$ 289.64	\$284.91	\$ -	\$284.91	-0.41%

Table 26: Average Customer Water and Wastewater Billing Impact Analysis

In addition, a review of the projected cost recovery performance per customer class was performed. In this scenario, the primary consideration was to moderate customer impact across both Water and Wastewater Services (per Table 26) while still improving customer fairness outcomes (relative to what 2018 rates would otherwise achieve if left unchanged). The following tables summarize the impact to projected customer cost recovery percentages based on the proposed rates:

Water

Class	2022 Projected Cost Recovery
Residential Metered	104%
General Service Large	94%
General Service Regular	101%
Multi-Family Residential	105%
Irrigation	81%
Bulk Water	100%
Residential Unmetered	154%*

Wastewater

Class	2022 Projected Cost Recovery
Residential Metered	118%
General Service	91%
Multi-Family Residential	92%
General Service Effluent	90%
Septage Hauling	67%
Residential Unmetered	169%*

Table 27: Projected 2022 Cost Recovery per Utility Service per Class

1.4.4 Evaluation of Alternative Rate Scenarios

As can be seen, the rate impact of Scenario 1 is more significant across all non-residential classes than Scenario 2. Of note, the expected rate increase for typical General Service Large customers is estimated to be over 5% per year. In turn, Residential Metered customers will see a modest rate decrease.

In exchange, there are improved projected cost recoveries per customer class. However, it can be further seen that there are still projected cost inequities with select customer classes. In particular, the Residential Metered class is forecasted to fund 110% of its allocated Wastewater cost of service in 2022. Additionally, although slight improvements were projected for each Water customer class relative to Scenario 2, 100% cost recovery was only projected for the Bulk Water class. The reasons for these continued differences in Scenario 1 was to ensure the establishment of a Sustainment Reserve equal to at least 120 days of O&M funding. Based on this, funding constraints limit the degree to which absolute cost recovery per class can be realized.

Based on this, the following evaluation⁴ of the two scenarios was developed for each of the top five Rate Making Priorities:











Criteria	Scenario 1: Maximize Customer Fairness	Scenario 2: Moderate Customer Impact	Rationale
1. Revenue Sufficiency & Predictability			Both options target same fixed revenue % and 2022 sustainment reserve level
2. Accessible & Simple			Option 1 rate adjustments may be more difficult to defend
3. Rate Stability & Customer Impact			To maximize customer cost recovery, significant impact to rates is required
4. Customer Equity & User Pay Philosophy			Option 1 achieves slightly greater customer cost recovery vs. Option 2
5. Wastewater: Conservation			Both options provide same charges for treatment of wastewater loadings

Table 28: Evaluation of Rate Scenarios versus Priority Objectives

⁴ **Scoring Legend:** Dark Green – strong support; Light Green – above average support; Yellow – neutral support; Orange – below average support; Red – weak support

As such, it is recommended that the Utilities pursue 2019-2022 rates based on **Scenario 2: Moderate Customer Impact**.

1.4.5 Drainage Rates

It was understood that the Utilities had previously determined to retain the current flat rate structure across all Drainage customers for the 2019-2022 business cycle. Based on this strategy, it requires projecting the Drainage Service's overall rate revenue requirements. Then, each projected Drainage customer account is required to equally fund these requirements. Based on this approach, the projected fixed monthly rates per customer was determined as summarized in the following table:

RATE SCHEDULE (2019-2022)	2018	2019	2020	2021	2022
Forecasted Revenue Requirement	\$ 70,902,944	\$ 68,704,791	\$ 77,961,293	\$ 81,128,572	\$ 83,928,603
Forecasted Billing Units (Accounts)	372,459	376,545	380,702	385,747	391,238
Forecasted Revenue Requirement per Billing Unit	190.36	182.46	204.78	210.32	214.52
Incremental CAP Rate Revenue Requirements	\$ -	\$805,243	\$805,243	\$ -	\$ -
Incremental CAP Fee Requirements per Billing Unit per 30 Days		\$ 0.18	\$ 0.17	\$ -	\$ -
Total Rates (CAP included)	\$ 15.05	\$ 15.80	\$ 16.37	\$ 16.78	\$ 17.35
Annual Rate Increase %		4.99%	3.63%	2.45%	3.43%

Table 29: Drainage Proposed 2019-2022 Rates

The rate schedule above is based on the approach to phase-in rates over the 2019-2022 business cycle. As such, it has been developed to arrive at a stable and constant rate increase per year, which was determined to be \$0.57 per customer per month (except for 2019 and 2021 when the Customer Assistance Program funding is assumed to both start and end). This ensures that the percentage year-over-year increase is kept below 5%. It is noted that this rate of increase is lower than how Drainage rates have increased over the 2015-2018 business cycle.

1.5 Regional 2019-2022 Rates

This section summarizes the key changes to the nature of the rate-making approach with the Regional Customers and projected rate revenue requirements for both Water and Wastewater.

1.5.1 Key Changes to Rate-Making Approach

Based on review with the Regional customers through their engagement with the Cost of Service analysis, the following denote the key changes to the 2019-2022 rate-making approach (relative to that used for 2015-2018):

- i. **Debt/Equity Ratio:** rates shall be determined based on a 60/40 ratio regardless of actual (per Alberta Utilities Commission (AUC) general guidelines);
- ii. **Return on Equity:** rates shall be determined based on an 8.5% as per most recent guidance from the AUC;
- iii. **True-Up:** update rate revenues on annual basis using actual financial results;
 - Contracted capacities shall not be subject to true-up; and
 - Regionals are still required to commit to projected capacities across 2019-2022.

1.5.2 Regional 2019-2022 Rates

Rates for 2019-2022 were developed based on the receipt of “likely flows” for both Water and Wastewater from each Regional customer. The rates were determined using the same Utility Basis as developed for the 2015-2018 business cycle. The format for how rates are determined is summarized as follows:

Rate Component	Water	Wastewater
Monthly Fixed Charge:		
Return on Rate Base	\$ Return / Max Day Capacity	\$ Return / WS Flow Capacity
Depreciation Expense	\$ Depr / Max Day Capacity	\$ Depr / WS Flow Capacity
Variable Charge:		
O&M Expense	\$ O&M / Actual Consumption	\$ O&M / Actual WS Flow

Table 30: Regional Customer Rate-Making Format

Based on the projected costs of service, the following rate revenue requirements, contracted capacities, likely flows, and rates for both the Water and Wastewater Services are summarized (note: pending final review and approvals with Regional customers):

	Detailed Projections			
	2019	2020	2021	2022
Calgary Outside City Metered	\$ 8,377,681	\$ 8,860,260	\$ 9,428,554	\$ 9,996,908
O&M	\$ 3,534,069	\$ 3,751,999	\$ 3,984,703	\$ 4,224,418
Depreciation	\$ 1,497,209	\$ 1,590,726	\$ 1,700,556	\$ 1,814,314
Return on Rate Base	\$ 3,346,403	\$ 3,517,535	\$ 3,743,294	\$ 3,958,175
Outside Metered Contracted Capacities:				
	2019	2020	2021	2022
Annual Consumption (m3) - not incl Water Loss	10,868,491	11,379,361	11,901,230	12,435,100
Max Day Capacity (m3/day)	56,456	59,104	61,952	64,800
Outside Metered "To-Be" Rate Projections:				
	2019	2020	2021	2022
O&M (Variable Rate per m3)	\$ 0.3252	\$ 0.3297	\$ 0.3348	\$ 0.3397
Depreciation (per m3/365 days)	\$ 26.5198	\$ 26.9140	\$ 27.4495	\$ 27.9987
Return on Rate Base (per m3/365 days)	\$ 59.2743	\$ 59.5142	\$ 60.4224	\$ 61.0830
Total Fixed Rate (per m3/365 days)	\$ 85.7941	\$ 86.4281	\$ 87.8720	\$ 89.0816

Table 31: Water 2019-2022 Regional Customer Rate Projections

	Detailed Projections			
	2019	2020	2021	2022
Calgary Outside City Metered	\$ 12,528,372	\$ 13,623,685	\$ 14,890,604	\$ 16,106,554
O&M	\$ 7,124,873	\$ 7,538,419	\$ 7,990,586	\$ 8,464,641
Depreciation	\$ 1,994,269	\$ 2,223,747	\$ 2,497,976	\$ 2,743,184
Return on Rate Base	\$ 3,409,231	\$ 3,861,519	\$ 4,402,042	\$ 4,898,730
Outside Metered Contracted Capacities:				
	2019	2020	2021	2022
Annual Contributed Wastewater Flow (m3) - not incl I&I	10,358,700	10,811,300	11,278,500	11,760,300
Outside Metered "To-Be" Rate Projections:				
	2019	2020	2021	2022
O&M (Variable Rate per m3)	\$ 0.6878	\$ 0.6973	\$ 0.7085	\$ 0.7198
Depreciation (per m3/day)	\$ 0.1925	\$ 0.2057	\$ 0.2215	\$ 0.2333
Return on Rate Base (per m3/day)	\$ 0.3291	\$ 0.3572	\$ 0.3903	\$ 0.4165
Total Fixed Rate (per m3/day)	\$ 0.5216	\$ 0.5629	\$ 0.6118	\$ 0.6498

Table 32: Wastewater 2019-2022 Regional Customer Rate Projections

1.6 Recommendations

1.6.1 Summary 2019-2022 Rates

Based on the evaluation of the alternative rate strategies, it is recommended to implement Alternative 2: Moderate Customer Impact. Based on this strategy, the following proposed 2019-2022 rates are summarized:

1.6.1.1 Water Fixed Rates

Fixed Service Charges 30 Days per Meter Size	2019	2020	2021	2022	Average Annual % Change
15 mm	\$ 15.3771	\$ 15.2268	\$ 14.8855	\$ 14.7374	-0.97%
20 mm	\$ 29.9829	\$ 29.3284	\$ 28.4829	\$ 27.8305	-2.14%
25 mm	\$ 37.0244	\$ 36.6814	\$ 36.1474	\$ 35.8065	-0.92%
40 mm	\$ 63.6610	\$ 63.4946	\$ 63.1372	\$ 62.9730	-0.26%
50 mm	\$ 87.4200	\$ 88.0125	\$ 88.4140	\$ 89.0087	0.69%
75 mm	\$ 174.2294	\$ 174.5013	\$ 174.5822	\$ 174.8562	0.16%
100 mm	\$ 246.1071	\$ 249.3966	\$ 252.4953	\$ 255.7870	1.36%
150 mm	\$ 417.7481	\$ 429.1188	\$ 440.2986	\$ 451.6714	2.80%
200 mm	\$ 671.3406	\$ 689.2337	\$ 706.9359	\$ 724.8312	2.74%
250 mm	\$ 1,074.9938	\$ 1,093.3100	\$ 1,111.4354	\$ 1,129.7538	1.73%
Bulk Water	\$ 29.9829	\$ 29.3284	\$ 28.4829	\$ 27.8305	-2.14%

Table 33: Summary Water Fixed 2019-2022 Proposed Rates

In addition, it is recommended to maintain the existing 2018 rates for Residential Unmetered Customers across 2019-2022.

1.6.1.2 Water Variable Rates

Customer Class	2019	2020	2021	2022	Average Annual % Change
Calgary Residential Metered	\$ 1.5947	\$ 1.5242	\$ 1.4537	\$ 1.3832	-4.23%
Calgary General Service - Large	\$ 1.3067	\$ 1.3157	\$ 1.3246	\$ 1.3336	0.69%
Calgary General Service – Regular	\$ 1.3983	\$ 1.3868	\$ 1.3752	\$ 1.3637	-0.82%
Calgary Residential Multi Family Metered	\$ 1.5471	\$ 1.4845	\$ 1.4218	\$ 1.3591	-3.89%
Calgary General Service – Irrigation	\$ 2.6560	\$ 2.7209	\$ 2.7858	\$ 2.8507	2.50%
Calgary Bulk Water	\$ 1.7058	\$ 1.7023	\$ 1.6988	\$ 1.6954	-0.20%

Table 34: Summary Water Variable 2019-2022 Proposed Rates

1.6.1.3 Wastewater Fixed Rates

Fixed Service Charges 30 Days	2019	2020	2021	2022	Average Annual % Change
Monthly Fixed Charge (All Customers)	\$ 26.8607	\$ 27.6888	\$ 28.1881	\$ 29.0207	3.24%

Table 35: Summary Wastewater Fixed 2019-2022 Proposed Rates

In addition, it is recommended to maintain the existing 2018 rates for Residential Unmetered Customers across 2019-2022.

1.6.1.4 Wastewater Variable Rates

Customer Class	2019	2020	2021	2022	Average Annual % Change
Calgary Residential Metered (per m3 Water)	\$ 1.4852	\$ 1.4852	\$ 1.4852	\$ 1.4852	0.00%
Calgary General Service (per m3 Water)	\$ 1.6341	\$ 1.7131	\$ 1.7920	\$ 1.8709	5.07%
Calgary Residential Multi Family Metered (per m3 Water)	\$ 1.7414	\$ 1.8191	\$ 1.8969	\$ 1.9746	4.67%
Calgary Septage Hauled Wastewater	\$ 24.3013	\$ 26.1542	\$ 28.0072	\$ 29.8602	8.25%
Calgary Effluent Meters (per m3 wastewater)	\$ 1.8212	\$ 1.9143	\$ 2.0074	\$ 2.1006	5.39%

Table 36: Summary Wastewater Variable 2019-2022 Proposed Rates

1.6.1.5 Wastewater Surcharge Rates

Extra Strength Surcharges	2018	2019	2020	Average Annual % Change
Monthly Over Strength Charges (\$ per m3 Water for each mg/L > Bylaw)				
TSS (300 mg/L)	\$ 0.001147	\$ 0.001147	\$ 0.001147	0.00%
BOD (300 mg/L)	\$ 0.001443	\$ 0.001443	\$ 0.001443	0.00%
FOG (100 mg/L)	\$ 0.001947	\$ 0.001947	\$ 0.001947	0.00%
TP (10 mg/L)	\$ -	\$ -	\$ -	-
TKN (50 mg/L)	\$ -	\$ -	\$ -	-

Table 37: Summary Wastewater Surcharge 2019-2020 Proposed Rates

It is recommended that the Utilities establish 2021-2022 surcharge rates during a mid-cycle rate adjustment process. This is recommended to better enable the phased-in transition of surcharge rates for FOG, TP, and TKN.

1.6.1.6 Drainage Rates

RATE SCHEDULE (2019-2022)	2019	2020	2021	2022
Total Rates (CAP included)	\$ 15.80	\$ 16.37	\$ 16.78	\$ 17.35
Annual Rate Increase %	4.99%	3.63%	2.45%	3.43%

Table 38: Summary Drainage 2019-2022 Proposed Rates

1.6.2 Implementation Next Steps

Based on the analysis performed, there are additional efforts required to further review, analyze, develop, and implement. These are captured in the following table, including reference to customer engagement considerations.

#	Recommendation	Next Steps for Water Resources / Water Services	Customer Engagement Considerations
1	Confirm and transfer customers into updated Rate Classes	<ul style="list-style-type: none"> i. Identify and verify GS, MF, and SF customers who should be moved to different Rate Class <ul style="list-style-type: none"> • Confirm plans to move existing customer accounts versus potential grandfathering situations ii. Establish and confirm planned timing for transfer of identified customer accounts – (i.e. phase in across 2019-2022) iii. Work with Enmax to enact plan for customer account transfers iv. Update bylaw and ensure all net-new customers are designated per the updated customer class definitions 	<ul style="list-style-type: none"> i. Focused information-based communications with verified GS, MF, and SF customer accounts who will be transferred: <ul style="list-style-type: none"> • Why are we doing this? • What is the impact? • What is timing of this transfer?
2	Introduce TKN and TP into Surcharge Rates Schedule	<ul style="list-style-type: none"> i. Plan and confirm timing for implementation ii. Confirm phase-in rates and bylaw limit versus treatment technical capabilities iii. Plan and implement over-strength sampling - measurement – billing process for TKN and TP iv. Update bylaw 	<ul style="list-style-type: none"> i. Focused engagement for existing surcharge customers re: introduction of TKN and TP and what this will mean to them ii. Identify and sign up potential new surcharge customers for inclusion within the surcharge program based on their projected TKN and TP loadings

3	<p>Update Hauled Wastewater Rates</p> <p>Move FOG from accepted pollutant in Wastewater collection network to penalty – receive in FOG receiving station</p>	<p>i. Develop holistic Septage Hauling / FOG strategy with consideration of:</p> <ul style="list-style-type: none"> • Calgary region demand for septage ground water, and FOG • Target customers with higher FOG contributions (e.g. restaurants) versus others • Impact of anticipated FOG volumes to receiving station once FOG is transferred from surcharges to a penalty • Operational capacity for receiving station and digesters versus anticipated volumes and planning for any required capital additions • Go-to-market rates for Septage Hauling and potential for “selling excess treatment capacity” – ensure that variable revenues > variable costs <p>ii. Determine FOG testing protocols and resourcing</p> <p>iii. Plan timing for implementation of transfer to penalty vs accepted pollutant</p> <p>iv. Update bylaw</p>	<p>i. Focused engagement for existing surcharge customers re: transfer of FOG from accepted pollutant to penalty and what this will mean to them</p> <p>ii. Identify and engage select GS customers with higher potential for FOG concentrations > bylaw limit:</p> <ul style="list-style-type: none"> • <i>Ensure understanding of move to penalty, potential consequences, timing of implementation, and their operational alternatives</i>
4	<p>Develop and Implement Customer Assistance Program</p>	<p>i. Confirm program’s target objectives, target customer segments and acceptance criteria (i.e. which customers do we think will benefit from this program) budget, and administrative logistics (i.e. how will we operate it?)</p> <p>ii. Work with Enmax for implementation</p> <p>iii. Launch program and enroll customers who apply within accepted criteria</p>	<p>i. Communicate roll-out of program to all customers and application requirements / logistics</p> <p>ii. Transparent communication to Council / media / customers for why the program is being introduced and how the program will be funded – i.e. billing impact to all other customers who will be funding the program’s budget</p>
5	<p>Discontinue issuing new irrigation meters for Residential customers</p>	<p>i. Ensure plan for discontinuation of Residential Irrigation class for new potential customers who express an interest in it</p> <p>ii. Confirm plan for transfer of existing Residential Irrigation customers versus grandfathering</p> <p>iii. Work with Enmax to implement changes to billing</p>	<p>i. Analyze each of the customer’s historical consumption tendencies (total 50) and identify their historical cost: benefit performance</p> <p>ii. Contact Residential Irrigation customers and see if they want to be grandfathered / discontinued</p> <p>iii. Communicate discontinuation of program for all future Residential customers – focus on why</p>
6	<p>Design and Implement New Wastewater Billing Format</p> <ul style="list-style-type: none"> • Clear Wastewater Return Factor • Distinct versus Drainage billing 	<p>i. Confirm plan for Wastewater and Drainage billing format to support 2019-2022</p> <ul style="list-style-type: none"> • <i>i.e. show return factor in calculation of billing charges</i> <p>ii. Design new billing format with Enmax</p> <p>iii. Create communications to support new billing format change</p>	<p>i. Broad level communications to all customers</p> <p>ii. Details on how return factor used to calculate billings – not “double dipping” – and how return factor is determined</p> <p>iii. Clarification of billing terms and what each charge pays for</p> <p>iv. Separation of Drainage versus Wastewater Service</p>

7	Support Regional Rates Analysis	<ul style="list-style-type: none"> i. Implement time tracking for short-list of specific administrative staff ii. Ensuring resourcing in place to support true-up process iii. Develop and establish process for Regional true-ups 	<ul style="list-style-type: none"> i. Engage Regional Customers to ensure the new true-up process (both detailed scope of analysis, process steps, and key process milestones) is well understood in advance to the 2019 true-up
8	Finalize 2019-2022 Rate Schedule	<ul style="list-style-type: none"> i. Confirm appropriateness of capital financing plan ii. Confirm 2019-2022 rate schedule with Council iii. Work with Enmax to implement rates iv. Communicate updated rates to customers 	<ul style="list-style-type: none"> i. Create story for “why” – support public announcement / media coverage ii. Plan for public communications of new rate schedule

Table 39: Summary Implementation Considerations

1.6.3 Considerations for Next Cost of Service

In addition, there are several opportunities for improvement / updates for the Utilities for the next Cost of Service (expected to be completed during the 2019-2022 business cycle). These include the following:

1. Confirm and Implement the 2023 Drainage Rate Structure:
 - Confirm strategy to implement a variable drainage rate structure for 2023;
 - Confirm variable rate design, including credit program, and rates phase-in plan with specific focus on large non-residential customers; and
 - Update and execute the implementation roadmap.
2. Establish Standardized Strength Customer Class:
 - Understand customer segmentation for select General Service customers with loadings less than Active Surcharge but greater than Residential;
 - Identify specific General Service customers who should belong to such a Standardized Strength class;
 - Identify protocols for customers who wish to challenge their belonging in such a Standardized Strength class;
 - Plan for potential implementation during 2023-2026 business cycle;
 - Update Wastewater Cost of Service to reflect the Standardized Strength customer class:
 - *This will be contingent on the Wastewater Service understanding target customers which should belong to such a customer class and what appropriate customer loadings for BOD, TSS, TP, and TKN may be.*
3. Improve Capital Planning Inputs for Regional Growth:
 - Update capital planning process to indicate the percentage of net-new growth infrastructure required to support Regional customers versus Inside-City customers in accordance with cost of service principles.
4. Evaluate targeted Irrigation customer rates versus combined Water and Wastewater rates:
 - It was noted that customers who choose Irrigation meters as an “add-on” to their existing Water and Wastewater account do so under the belief it will save them money by avoiding

Wastewater usage fees. As such, a policy should be developed to target what this potential savings may be, or what the targeted break-even volumes should be for an Irrigation “add-on” customer to benefit.

5. Understand Loadings from Septage Hauling customers and TKN / TP Loadings for Inside-City Active Surcharge Customers:
 - It was noted that the Utilities does not have recent loadings data for Septage Hauling customers. A review and possible segmentation of customers should be performed, as it was noted that some customers haul primarily ground water (while others haul septage). It is recommended to acquire customer-specific loadings data, as industry guidelines from Alberta Environment were used to estimate the loadings of Septage Haulers during this study.
 - Similarly, there was no recent data for TKN and TP for Inside City Active Surcharge Customers. It is recommended the Wastewater update this data for its targeted Active Surcharge Customers for over strength TKN and TP loadings.
6. Improve Land financial data / include in Rate Base:
 - Per AWWA and AUC guidelines, it is acceptable to include land as part of the Rate Base when determining rates for Outside City / Wholesale customers. There was insufficient information on the book value of land allocated to the Water and Wastewater Services to include it in this cost of service. Preferably, allocations of land against plant and linear infrastructure is required to support and justify its inclusion.
7. Evaluate Lowering Fixed Monthly Service Charges:
 - Fixed monthly fees were kept relatively at the same percentage of overall revenues for the 2019-2022 business cycle. This was primarily due to increase the level of revenue sufficiency and predictability for the Utilities. However, there is a strong desire from customers to adopt rates which further allocate costs to those customers who use higher amounts of water. If the Utilities’ sustainment reserves are at an appropriate level relative to current revenue risks, there may be opportunities to push more of the rate revenue requirements onto the variable portions of the rates.
8. Improve Assignment of Chartfield Financial Activity ID’s to Utilities:
 - During the Line of Service allocations analysis, it was noted that several financial activities as specified within the chartfield financial results do not align with the associated Utility to which it should be assigned. It is recommended that a review and update of the assignment of these activities. Pending this update, the new “map” of Dept ID’s versus each Utility (as established for the Line of Service Allocations deliverable) should continue to be used to guide future cost of service analysis.

Appendices

Appendix A: Rate Objectives Definitions

Objective	Description
Deliver sufficient and predictable revenue	<ul style="list-style-type: none"> To meet current and future regulatory requirements, and provide reliable services desired by customers, The Utility needs to receive sufficient and predictable revenue to recover its costs
Rate Stability	<ul style="list-style-type: none"> Offer stability and predictability to The Utility and The Utilities customers
Adaptability	<ul style="list-style-type: none"> Set rates structures that are dynamic, and provide flexibility to changing supply and demand
User Pay philosophy	<ul style="list-style-type: none"> Rates are based on the philosophy that a customer's rates should reflect the cost of providing the service to the customer
Customer Equity	<ul style="list-style-type: none"> Each customer class should pay their fair share based on the customer class usage pattern and service benefits offered
Accessible and Simple	<ul style="list-style-type: none"> Rate structures should be transparent and easy to understand
Conservation	<ul style="list-style-type: none"> Establish a rate that allows The City to continue to meet current and future regulatory requirements, while encouraging customers to adopt behaviours focused on water conservation, and protecting the watershed and river water quality
Customer Impact	<ul style="list-style-type: none"> Extent to which customers will be impacted after implementing a rate structure
Affordability	<ul style="list-style-type: none"> Customers should be able to afford the essential water and Wastewater services Consideration for disadvantaged customers
Ease of Implementation	<ul style="list-style-type: none"> Degree of ease and costs to implement and administer a new rate structure (e.g. integration with City billing and information systems and customer data)
Economic Development Incentive	<ul style="list-style-type: none"> Water and sewer service are set as an incentive for economic development Rates are comparable with those of regional neighbors Utility serves the municipality to attract non-residential growth
New Customer Contributions	<ul style="list-style-type: none"> Growth pays for growth Utility rates feature intergenerational equity

Table 40: Summary of Rate Objective Definitions

Appendix B: Strategic Issues

Residential Metered, Multi-Family, and General Service Customer Classes

Prior to initiating detailed customer consumption analysis, previous analysis as provided by The City was reviewed. From this, it was understood that the Utilities have identified that over 40,000 customer accounts may be miscoded as per the present bylaw definitions. This was based on a snapshot sampling of customer accounts overlaid with specific building types, and was performed during the 2015 fiscal year.

Using historical consumption data, a series of analysis was performed on customer hydrographs. This was focused on analyzing both customer class summary-level and individual customer consumption behaviors. A comparison against comparable utility customer class definitions was also performed. Based on this analysis, the following key observations were noted:

- i. Based on the individual hydrographs, Townhouses > 4 Units and Apartment Buildings tend to demonstrate less peaking profiles versus other Residential dwellings (i.e. single family detached, duplexes, triplexes, and fourplexes); and
- ii. Duplexes, triplexes, and fourplexes also demonstrated slightly less peaking requirements versus single family detached dwellings.

From this analysis, it was recommended to adjust the definition for the Multi-Family Residential class to be for accounts with larger than 4 dwelling units and master-metered. This would result in triplexes and fourplexes and all individually-metered multi-unit dwellings moving to the Residential Metered. Additionally, it would result in Townhouses > 4 Units and Apartment Buildings now classified as General Service also getting corrected to the Multi-Family class. The rationale for this adjustment included:

- It maintains classifying all residential customers as residential (versus other options which consider moving some residential dwellings to General Service);
- It increases customer equity versus all other options by separating Townhouses > 4 Units and Apartment Buildings into a separate class versus Triplexes and Fourplexes, which were shown to have distinct consumption demands; and
- It requires less customer impact versus all other options identified.

Based on proceeding with the identified customer account transfers as described, an impact analysis was developed. It was assumed that this would require a transfer of 2,957 customers to new rate classes (2,143 existing residential dwellings now classified within General Service and 814 Duplexes, Triplexes and Fourplexes moving from Multi-Family to Residential Metered). However, given the immediate rate increase which Apartment Building customers would see in moving from General Service to Multi-Family, it was decided to make these corrections across the 2019-2022 business cycle (to manage the degree of the customer impact).

Drainage Rate Strategy

It was requested to define a Drainage Rate Strategy (with potential target introduction for 2023) that considers a range of tools, including rate structure, credit programs, and low impact development programs. To guide the evaluation of a desired Drainage Rate Strategy, a prioritized set of Drainage Rate-Making Objectives was developed. These reflected stated goals for the Drainage Service, which are focused on the protection of the watershed and river water quality, achieving greater customer equity, and achieving a greater level of clarity on required investments to meet desired levels of service.

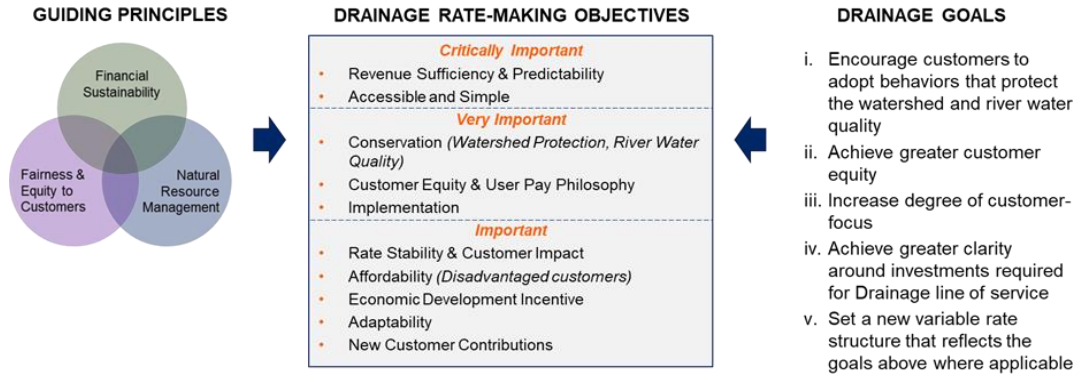


Figure 19: Drainage Goals and Rate-Making Objectives

It was noted that the present rate structure consists of one flat rate for each customer. There is no variation by customer class, nor by any cost-causation factor, regardless of whether the customer account is residential, commercial or industrial. This has led to questions regarding customer equity. Additionally, the present structure doesn't well influence customer behavior to protect watershed or river water quality.

To recap the analytical focus and recommended outcomes for the Variable Rate Structure analysis, the following graphic was developed. Each element is further discussed in the following sections.

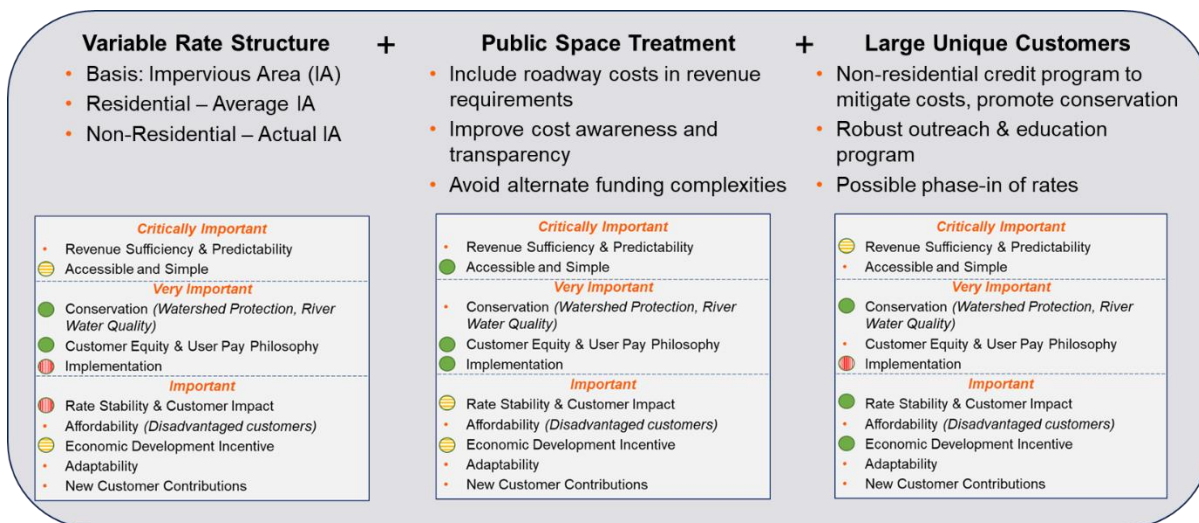


Figure 20: Recommended Drainage Rate Strategy

Variable Rate Structure Indicative Rates

Per the outcomes from the Variable Rate Structure review, the following rate structure recommendations were provided:

- Feature consistent customer classes among Drainage, Water and Wastewater Services;
- For Drainage, group existing customer classes into Residential and Non-Residential, with Multi-Family customers (as based on recommended changes to the current bylaw definition) included with the Drainage Non-Residential class;
- For Residential customers, feature a base rate based on average impervious area calculations;
- For Non-Residential customers, calculate rates individually based on actual measured impervious area; and

- Manage the phase-in on rates to mitigate the impact on Large Customers against desired customer equity outcomes.

Based on implementing this rate structure, the following indicative rates for Drainage Residential versus Non-Residential customers were calculated. This demonstrates an approximate 50% decrease in Drainage rates for Residential customers. Rates would decrease by approximately \$6 per Residential customer per month. In addition, the average Non-Residential rate would increase approximately 300% (or approximately \$54 per customer per month). This due from the higher allocation of rate revenue requirements based on relative impervious area projections. However, it is also noted that actual rates per individual Non-Residential customers could approach \$10,000 per month based on the extent of their impervious area (e.g. malls).

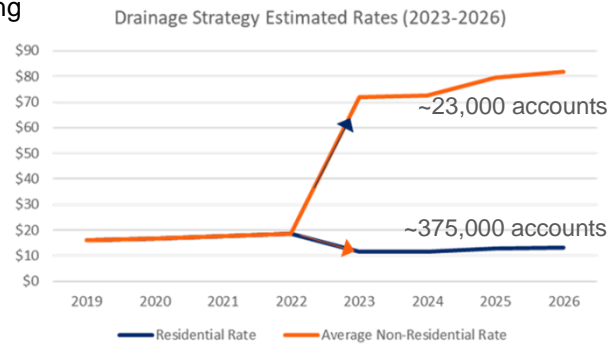


Figure 21: Indicative Drainage Variable Rates

Public Space Considerations

Additional consideration was focused on how to manage public spaces, as it was acknowledged that public / municipal properties represents a significant portion of measured impervious area (i.e. > 40%). Analysis was focused on whether the municipal owners of this public land (e.g. Roads) should be charged directly, rather than omitting and only charging community Residential and Non-Residential customers.

Based on these rate revenue requirements, the impact to indicative rates for both Residential and Non-Residential customers was evaluated. The following graphic illustrates this impact:

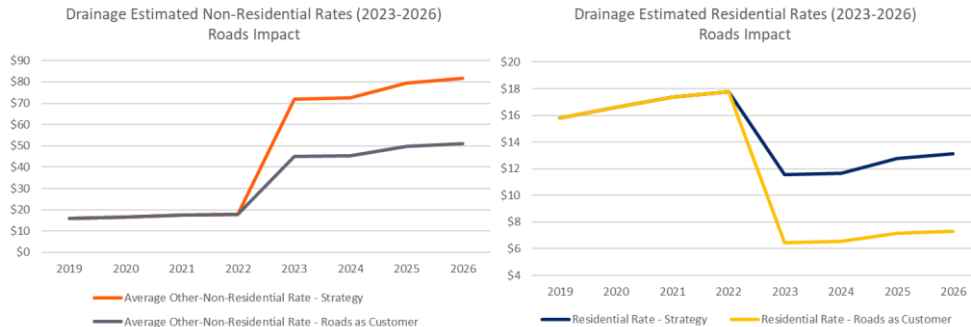


Figure 22: Impact of Roads to Drainage Variable Residential and Non-Residential Rates

From this analysis, including public spaces as Drainage customers would have a significant impact to the projected variable rates for both Residential and Non-Residential customers. Rates would decrease on the order of 35% - 40%. However, there would be a significant impact to the operating budgets for the municipal owners of these public spaces. Given this, there would be a corresponding upward pressure on property taxes to fund these same increases.

Based on the considerations above, it is recommended to maintain that Drainage rates continue to only be divided amongst benefiting end-customers. The rationale for this direction includes:

- As all benefit, this supports a User-Pay Philosophy and would not introduce additional complexity nor administrative costs;
- Pursuing internal transactions would be potentially complex, time consuming, and should likely be part of a larger city-wide policy and approach to interdepartmental transactions; and

- Including public spaces would simply result in increased property taxes for citizens, to which there would likely be significant political and community resistance.

Large Customer Considerations

It is acknowledged that transitioning to a variable rate structure (built on the premise that Non-Residential customers' rates would be based on individual impervious area measurements) can have a significant impact to large customers. It was estimated that the average Non-Residential rate would be of the order of \$72 per customer per month, but with larger customers receiving a Drainage bill of the order of \$10,000 per month.

To help mitigate the impact on Non-Residential customers it is recommended to introduce a credit program headed by a robust outreach and education program. A credit program can both mitigate the customer impact and promote watershed protection objectives through promotion of onsite drainage management practices. Value can be maximized by containing implementation and administration costs by limiting the credit program to Non-Residential customers and capping credits to help ensure Drainage Service revenue sufficiency. Additionally, it is recommended to design the credit program to put the burden of proof on the customer (e.g. engineering report) and help manage administration costs.

Additionally, it is recommended to consider alternative fee phase-in approaches to further mitigate customer impact. To support this, the Drainage Service could adjust Residential rates accordingly to ensure revenue sufficiency is maintained. Below are possible phase-in alternatives which can help mitigate the impact to large customers:

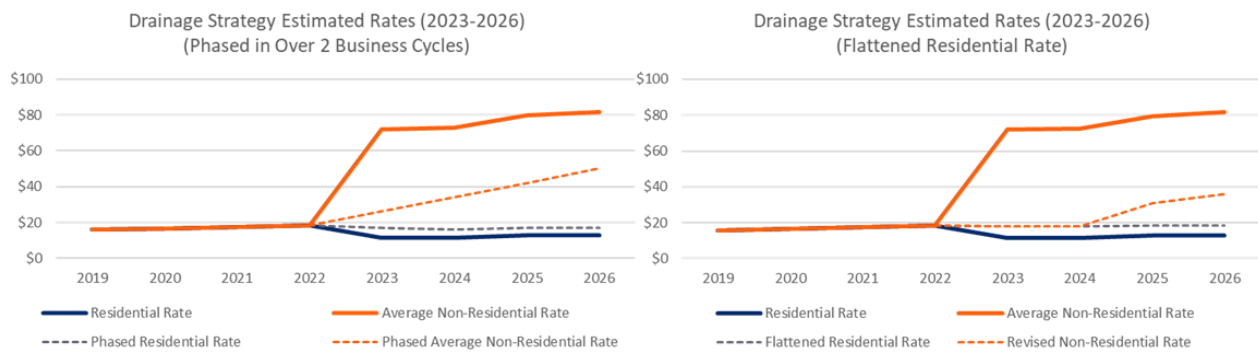


Figure 23: Alternative Drainage Phase-In Strategies for Large Customers

Implementation Roadmap

Finally, a review of the additional Variable Rate Structure detailed design, customer engagement, and implementation activities was performed. Based on the targeted launch for 2023 and the targeted Variable Rate Structure as proposed, a high-level implementation roadmap was developed for 2019-2022. The activities from this roadmap are summarized below:

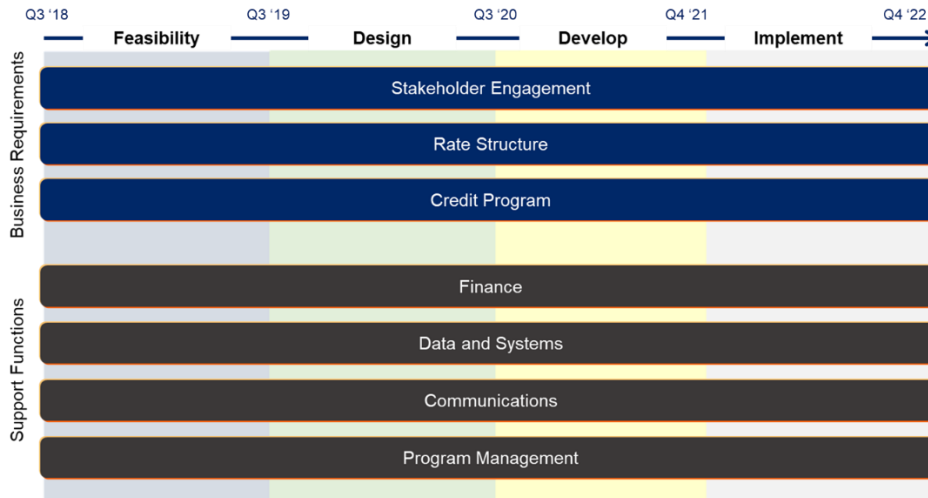


Figure 24: Drainage Variable Rate Strategy Implementation Roadmap

Wastewater Over Strength Customers and Parameters

Standardized Strength Customer Class

It was noted that there are approximately 177 customers which are now classified as an “Active Surcharge” customer. As such, their Wastewater pollutant concentrations are regularly measured (approximately 3-4 times per year) and evaluated as to their contributed levels of surcharge substances relative to established bylaw limits. Customers with measured over strength concentrations in excess of established bylaw limits are subject to surcharges added to their Wastewater billings.

However, a typical practice for municipalities of sufficient size and diversity is to also establish a “Standardized Strength” class. This would typically be applied to other commercial and industrial customers (i.e. those not already included in the Active Surcharge Program) which place demands on the Wastewater Treatment process. These customers are typically found to exhibit concentrations greater than Residential customers, but also less than Active Surcharge customers. Typical customers to which this classification can be applied include restaurants, laundromats, bakeries, car washes, etc.

The creation of this class would improve the level of customer equity amongst Wastewater customers, as currently the costs to treat pollutants are spread evenly across non-Active Surcharge customers (which includes both Residential and Non-Residential customers). These cost allocations would be captured during a Mass Balance analysis of the Wastewater treatment plant loadings.

Given the level of effort and time required to establish this class, it is recommended this be further evaluated and developed during the 2019-2022 business cycle with a target implementation for 2023.

Suite of Over Strength Surcharge Parameters

As part of the scope of work, The City requested that the Cost of Service “review current charges and rate structures for over-strength Wastewater, and recommend a suite of over-strength parameters and associated charges appropriate for this service”. Previous customer class analysis identified and recommended the establishment of a “standardized strength class”. Additional analysis was focused on what strength parameters (pollutants) should be factored into the rate structure.

It was noted that plant influent concentrations are challenging plant influent design limits. In addition, it was noted that the Fish Creek facility has recently exceeded regulatory limits (2013 and 2014 events). Further, river water quality has been a growing focus and concern. In particular, this concern extends to both Total Kjeldahl Nitrogen (TKN) and Total Phosphorous (TP) which are not presently included in the Active Surcharge program.

An external scan was performed to determine what Wastewater loading parameters other utilities measure and set limits for. The results of this scan are summarized in the table below:

Parameter	Denver	Winnipeg	Edmonton	Philadelphia	Charlotte	Halifax	Calgary
BOD (mg/L)	255	300	300 – 3,000	250	-	300	300
TSS (mg/L)	260	350	300 – 3,000	350	250	300	300
TKN (mg/L)	40	-	50 – 200	-	-	-	50
TN (mg/L)	-	60	-	-	-	-	-
TP (mg/L)	-	10	10 – 75	-	-	-	10
COD (mg/L)	-	-	Greater of 600 or 2X BOD – Greater of 6,000 or 2X BOD	-	500	-	600
FOG (mg/L)	-	-	100 – 6,000	-	-	-	100
NH3 (mg/L)	-	-	-	20	-	-	-

Table 41: Comparison of Over-Strength Parameters

It was recognized that Calgary’s limits align closely with other comparable Wastewater utilities (although both Winnipeg and Philadelphia have slightly higher limits for TSS at 350 mg/L). Another key insight was that “river cities” (i.e. Denver, Winnipeg, Edmonton) have a surcharge in place for Nitrogen and/or Phosphorous. Edmonton is the only other city that imposes a surcharge for FOG.

Fats, Oils, and Greases (FOG)

It is recommended that the bylaw and rate structure remove FOG as an accepted over strength parameter and instead moved as a parameter subject to fine / penalty for customers who release FOG into the Wastewater collection system. A review of industry leading practices also identified that it is preferable to impose Fines / Penalties for FOG entering the collection network. It is generally not desired for fats, oils, and greases to enter the Wastewater collection network. Reports of blocked Wastewater mains for other Wastewater utilities worldwide underpin this concern, as these contaminants serve to generate severe and costly blockages.

Further, it was noted that the Wastewater Service incurred costs of approximately \$3.29 million (2010 data) to clear blocked mains from FOG. Charging for FOG may be implying the wrong message that the Utility is willing to accept this substance. Rather, the Utility (and most of its customers) would benefit from significantly reducing or eliminating FOG from the collection mains altogether. FOG is more specifically related to the food service and restaurant industries. The correct installation and use of FOG interceptors / traps is the ideal scenario to ensure FOG does not flow into the Wastewater collection mains.

Total Kjeldahl Nitrogen (TKN) and Total Phosphorous (TP)

In addition, it is recommended to incorporate TKN and TP into the Active Surcharge rates. It is noted that the current bylaw limits are similar as those of comparable communities, and others have already incorporated these parameters as part of their surcharge programs. It is noted that TKN and TP loading measurements are regular tested for at the plants, and through the completion of the cost of service the treatment costs per loading of each parameter was determined.

In addition, these parameters are already regularly measured from the effluent of the Outside City customers. Furthermore, it was noted that a historical sampling event of these parameters from Active Surcharge customers found that over half of the customers tested for levels in excess of current bylaw limits.

Affordability - Customer Assistance Programs (CAP)

As part of the scope of work, The City requested that the Cost of Service “provide some analysis and make recommendations on the inclusion of customer considerations that distinguish socio-economic demographics”.

There is growing momentum amongst utilities to implement Customer Assistance Programs (CAPs) targeted for specific customer segments. The main drivers behind this momentum are concerns for public health (i.e. the belief that all customers should have access to clean and affordable water), and potential financial implications to the utility when customers can't afford their bills. Consequently, the objective any CAP is to provide essential water, wastewater, and drainage services to all customers at an affordable rate and alleviate the financial burden on the utility caused by customers in arrears.

From external research on Affordability, the main benefits of implementing a Customer Assistance Program include both social and business benefits. From a social standpoint, CAPs support community health and safety, build community engagement, and provide financial assistance to disadvantaged customers. CAPs support the Utility's business objectives as they can reduce the number of delinquencies and limit the impact of uncollectable revenue or debt. CAPs also improve the public acceptance of utility rates, reduce the administrative burden of managing “hard-to-collect” accounts, and support the Utility's public image.

To fully realize the benefits of a Customer Assistance Program, the program should be targeted to specific customer segment(s). These segments are typically focused on customers who are truly challenged with water affordability. To this end, it is more useful to focus on segment-related affordability data (i.e. income levels versus water bills) rather than just a community-wide affordability metric. There is a range of affordability approaches that target various customer segments. The most popular program is to provide an ongoing bill discount for customers who fit specified criteria.

- **Bill Discounts:** reduces bills on an ongoing basis, usually by a percentage or dollar amount. Customers must qualify or meet specific requirements to receive this type of assistance. Examples include bill write-offs and reduced fixed fees.
- **Flexible Terms:** relaxes requirements for bill payments including waived penalties, lower interest, or more flexible payment timelines. Examples include payment plans, connection loans, arrear management, levelized billing, or adjusted bill schedules.
- **Temporary Assistance:** reduced bills one time or on a short-term basis to help customers deal with an urgent or unexpected hardship. This could include recent divorce, death of a spouse, or recent unemployment. Examples include emergency or crisis assistance, grants, and one-time bill reductions.
- **Water Efficiency:** reduces bills by installing low flow appliances or repairing leaky pipes, thereby reducing water usage. Examples included rebates for conservation appliances and in-house repair programs.
- **Lifeline Rate:** offers a reduced rate for a basic block of consumption to all customers within a class. This rate is often associated with essential water usage.

An updated analysis of how typical Calgary Water and Wastewater bills for Residential Metered customers compare to community median income levels was performed. Based on this, it was estimated that the average Residential Metered customer in Calgary paid approximately \$90/month for water and

Wastewater services combined in 2016. The following graphic illustrates the percentage of a typical Water and Wastewater bill relative to Calgary's median income, which in 2016 was noted as \$106,498⁵:

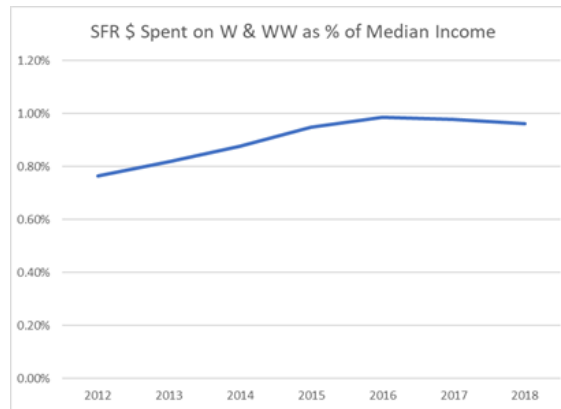


Figure 25: Percentage of Water and Wastewater Bill versus Median Income (2016)

From this graph, it was found that the average bill as a percentage of Calgarian's median income was increasing. Although increasing, the average bill was noted as less than the industry standard of between 3-4% (which is typically used to indicate if rates are affordable across the community);

While this analysis may suggest that Calgary does not have a water affordability issue, it omits those customers who are well below the median income levels. It is noted that approximately 25,000 Calgarians are approved for Transit's low-income pass alone. Similarly, the United Way states that approximately 127,000 Calgarians struggle to make ends meet. If an assumption that close to 10% of Water, Wastewater, and Drainage's residential customers may qualify for such a low-income assistance program, an initial and high-level estimate of between 30,000 – 40,000 customers may be appropriate.

From a review of comparable approaches, industry trends, and association thought leadership, the following comparison of the customer assistance program approaches are summarized:

Approach	Pro's	Concerns
Bill Discount	<ul style="list-style-type: none"> Targets specific disadvantaged customers Provides ongoing assistance as long as customers meet criteria Can offset drawbacks from higher fixed portions of the rate design 	<ul style="list-style-type: none"> Administrative burden can be higher if a partnering opportunity doesn't exist with social agency for customer eligibility and enrollment management Revenue sufficiency at higher risk – need to forecast and imbed into Cost of Service / Rate Design
Flexible Terms	<ul style="list-style-type: none"> Does not require permanent subsidies Can reduce administrative costs for the utility 	<ul style="list-style-type: none"> Does not address core issue of bill affordability Can diminish power of conversation pricing
Temporary Assistance	<ul style="list-style-type: none"> Targeted assistance helps customers in their greatest time of need One-time nature can make the program relatively inexpensive 	<ul style="list-style-type: none"> Utility typically needs to partner with civic / social agency to administer Assistance can become long-term unless limits are imposed
Water Efficiency	<ul style="list-style-type: none"> Promotes conservation Increases public education 	<ul style="list-style-type: none"> Can impact utility's revenue Rebates for low-flow appliances may not benefit low-income customers

⁵ Statistics Canada, <http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil107a-eng.htm>

<p>Lifeline Rate</p>	<ul style="list-style-type: none"> • Ease of administration • Can promote water conservation 	<ul style="list-style-type: none"> • Does not differentiate low-income customers with other customers (if applied across entire customer class) • Many low-income customers are large water users – so end up paying increased amounts in higher block rate
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Table 42: Comparison of CAP Approaches

Typically, the most common customer assistance programs focus only on the utility's actual customers. For residents who receive water services through a master-metered account, as is often the case for Multi-Family Apartment Buildings, they are often not targeted by such programs due to the inability for the utility to directly serve and bill them as a direct customer. From the external research, it was noted that only Austin Texas has implemented a customer assistance program to accommodate low-income master metered residents. Since Austin's electrical utility does issue individual bills to its multi-family customers (as it has individual meters for many of its multi-family premises, as opposed to just a master meter for the building), the Water Service was able to "piggy-back" off this relationship to further the electrical utility's bill to this customer segment. To do this, the Water Service provides funding to the electrical utility to issue these discounts for those customers who fit the criteria (as already managed by the electrical utility).

From the external research, it was also noted that an important implementation feature is the selection of a potential social agency partner. As many community's already have social agencies focused on assisting low-income citizens and those experiencing temporary hardships, it is beneficial to consider partnering with these organizations for customer assistance program administration. Typically, the savings from partnering with such an entity can save significant administration costs.

Based on these options, focus was on analyzing the bill impact for a Bill Discount Program. It should be noted that additional program design and implementation planning efforts are required. To estimate this impact, the number of current participants within The City's Fair Entry Program were noted. Based on this and a range of potential bill discount percentages, the following summary bill impact analysis was completed:

	3,100 Participants		5,000 Participants	
	Yearly Program Cost	Monthly Bill Increase	Yearly Program Cost	Monthly Bill Increase
20% discount	\$1,145,818	\$0.26	\$1,572,287	\$0.36
30% discount	\$1,493,727	\$0.34	\$2,133,430	\$0.49
40% discount	\$1,841,635	\$0.42	\$2,694,573	\$0.62
50% discount	\$2,189,544	\$0.50	\$3,255,717	\$0.75

Table 43: High-Level Impact Analysis of Bill Discount Program

The above analysis included high-level assumptions for administration set-up and management costs through the Fair Entry Program. It also assumed that bill discount revenues would be equally shared across all remaining Water, Wastewater, and Drainage customers. With 5,000 participants receiving a 50% bill discount, the impact to all other customers would be approximately \$0.75 per month. However, it is also noted that these estimates do not factor in master-metered "renters" who would also qualify for a low-income subsidy (which would most likely represent a much larger number of potential recipients of such a program).

Customers Who Use Water in Their Products

This strategic issue originated from The City's question on how to fairly treat customers who use potable water in their products (e.g. water bottlers, breweries). This question stems from the following observations for these types of General Services customers:

- These customers are using a natural and essential resource in their products (which The City produces) which are then sold to the market for economic profit; and
- It was noted that other jurisdictions in Canada (e.g. Ontario, British Columbia) have become focused on establishing appropriate charges for companies who draw groundwater for use in their bottled water businesses.

In summary, it is not recommended that the Water Service change rate-making strategies for customers who use water in their products. The main reasons for this recommendation are as follows:

1. There is no evidence of other jurisdictions that create a separate class for these customers;
2. Singling out these customers could introduce a competitive disadvantage when selling The City for economic development opportunities; and,
3. It holds political risk by potentially placing a value on raw water.

However, it is also noted that these customers should be encouraged to use effluent meters to accurately measure the contributed Wastewater discharged into the collection system (which the Utilities already supports). Given their use of water, it would be reasonable to conclude that they would have Wastewater return factors far less than the average of their class.

Line of Service Allocations

This strategic issue was intended to address how Water Resources and Water Services allocates operating expenses, internal recoverables, and general asset costs across the Water, Wastewater, and Drainage Utilities. This directs how total rate revenue requirements are calculated for each Utility, which provides the basis for the cost of service and rate-making for each Utility and customer class.

From discussions with UEP Finance, it was noted that a review completed in 2008 directed the current Line of Service Allocations. It was noted that a 40/40/20 split is used to allocate general costs across the Utilities (i.e. across Water, Wastewater, and Drainage respectively).

An internal review for each Water Resources and Water Services Division was conducted. This was focused on understanding the nature of the work performed and the Utility to which this work is directed. This was done via interviews with each Division Manager and identified subject-matter-experts, review of man-hours analysis, review of the projected capital plan, and review of chartfield financial results (for both Dept and Financial Activity ID's) for both 2015 and 2016. Based on this analysis, Divisional operating results were allocated to each Utility. It was found that a weighted average distribution of operating results across the Water, Wastewater, and Drainage Utilities was calculated to be:

- Water Service: 42.7%
- Wastewater Service: 44.9%
- Drainage Service: 12.4%

Based on subsequent considerations provided by UEP Finance, it was agreed to base the 2019-2022 Cost of Service with revised Line of Service allocations equal to 43/45/12.

Treatment for Large Customers

During this project, a question was raised on whether any large customers should be treated uniquely (i.e. have their own customer class). Specifically, it was acknowledged that significant work was focused on managing the Calgary Airport accounts. This work has been focused on bundling accounts (which now exist within the Airport boundaries) into a master servicing account (not dissimilar as a General Service or Multi-Family customer with a master meter). This work is to recognize the boundaries surrounding the Airport, given that it is federal land (and not technically part of The City of Calgary boundaries).

Based on the context and input from an external scan, it was recommended to treat the Airport like any other General Service Large or Multi-Family customer with a master meter. In these situations, the boundaries of infrastructure servicing requirements are well defined between the customer (which is responsible for infrastructure within its own property boundaries) and the Utilities (which is responsible up to the point of the boundary). In this way, the Utilities will adopt a standard approach and will minimize the amount of changes to the number of distinct customer classes.

Outside City Customers

A review of the Outside City customers was performed to identify recommended customer classifications (if appropriate). It was noted that historically the Utilities have treated Outside City customers as per follows:

- Regional Municipalities, including Airdrie, Chestermere, Cochrane, Strathmore, and Tsuu T'ina; and
- Outside City General Service customers, including Nexen, Spruce Meadows, Bearspaw, and Elbow Valley / Pinebrook.

From an infrastructure servicing perspective, it is noted Regional Municipal customers do not share in Distribution facilities (i.e. Distribution Network, Distribution Storage, or Distribution Pumping). As such, they are deemed to be wholesale customers, as they ultimately provide retail distribution services themselves to customers within their municipalities. In comparison, it is noted that General Service – Outside customers do share in these Distribution facilities. As such, it is equitable for these customers to be allocated their share of Distribution costs. Given this, it is apparent that there are significant differences in cost allocation requirements between these two Outside City customer classes.

Further, it is noted that General Service – Outside customers are not “growth” customers (like Regional Municipality customers). Given this, the Utilities can approach their projected system demands not unlike any other large General Service customer. For Regional Municipal customers, however, there are significant efforts required to understand longer-term growth and system demand projections to support their growing communities. As such, these activities require a distinct focus on the relevant revenue requirements and rate-making approach.

Given the above, it is recommended that the Utilities maintain unique customer classifications for both the Regional Municipalities and the Outside City General Service customers.

Residential Irrigation Customers

It was requested to evaluate the usage characteristics of the current Residential Irrigation customers. These are Residential customers who already have a Residential Metered water and Wastewater account. In addition, due to perceived irrigation requirements, these customers have obtained an additional irrigation meter. As such, outdoor irrigation usage is measured through the irrigation meter, while indoor use is measured with the normal Residential Metered account.

An evaluation of usage across 2015 – 2016 was performed based on monthly consumption data. From this analysis, it was noted that the vast majority of Residential Irrigation customers do NOT receive value from their irrigation meter (as opposed to their Residential Metered account, which would charge them for both water and Wastewater based on their usage). Based on the 2016 rates, it was determined that a customer would need to use 912 m³ of water per year to make an irrigation meter worthwhile. In 2016, only 1 customer used at least this amount. Further, only 2 customers exceeded this amount in 2015. In comparison, it is noted that the average Residential Irrigation customer uses less than 200 m³ per year.

Based on this analysis, Utilities should consider discontinuing the issuance of new irrigation meters to Residential Metered customers. This would include the grandfathering of existing Residential Irrigation customers. However, it is also advised that targeted communications with existing customers be initiated to raise awareness of their consumption habits versus irrigation rates and determine if they wish to continue their irrigation account.

Wastewater and Drainage Billing Format

A specific review on how the Utilities charges for Wastewater and drainage services was performed, as it was understood some customers have expressed confusion on billing clarity. Based on this review, the following billing format recommendations and simplified visualization were provided:

1. Terminology Recommendations:
 - Change “Drainage” to “Storm Drainage” or “Storm Water”
 - Choose “Sewer” or “Wastewater”
2. Transparency of Calculations:
 - Show the return factor in the Wastewater calculation
3. Billing Structure:
 - Include three billing categories to reflect each Utility Service (i.e. Water, Wastewater, and Storm Water)

Alternative Water and Wastewater Rate Structures

As part of the scope of work, The City requested that the Cost of Service “review different rate structures for both fixed and variable rates, including affordability rate structure”.

Rate Structure

There are several different rate structures that are used by utilities across North America. With each rate structure, there are different approaches and potential implications to consider. For comparison purposes, alternative rate structures and appropriate commentary are presented below:

Rate Structure	Commentary
Fixed Charges	<ul style="list-style-type: none"> • Typically used to recoup “non-consumption” related costs (i.e. billing, meters, fire protection) • Typically calculated based on a ratio versus the 15mm meter size • Revenue stability typically increases with the higher the fixed portion of the rate
Uniform Rate	<ul style="list-style-type: none"> • Each customer within a class receives the same volumetric rate regardless of usage • Easier to administer and higher stability; equitable if customers exhibit similar patterns
Inclining Block	<ul style="list-style-type: none"> • As customers use increasing amounts, a higher rate is charged • Promotes water conservation
Declining Block	<ul style="list-style-type: none"> • As customers use increasing amounts, a lower rate is charged

	<ul style="list-style-type: none"> Promotes usage – supports certain industries / businesses
Seasonal	<ul style="list-style-type: none"> Rates increase in summer in response to increased demand Mitigates peaking consumption during summer; potential supplemental tool with restrictions
Lifeline	<ul style="list-style-type: none"> Lower rate for a basic block of consumption (as previously discussed in Affordability section)

Table 44: Alternative Water Rate Designs

It was confirmed with the Steering Committee that the Utilities shall continue with the existing Uniform Rate Structure (with both a fixed and variable component), as rate objectives which would suggest either a Block or Seasonal Rate Structure were not prioritized as high as others.

Fixed versus Variable Rate

An external scan was completed to compare several North American utilities' percentage of fixed versus variable revenues. This analysis was based on Single Family Residential average usage of 16.5 m³ and 5/8" meter size (Residential class was selected as its revenues typically dominate the utility's overall operating revenues). Half of the utilities had fixed revenues greater than 30%. The results are below:

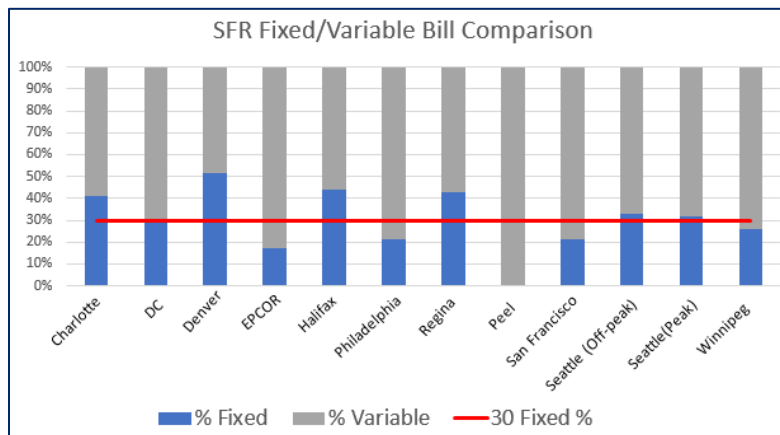


Figure 26: Fixed versus Variable Billing Revenue from Comparable Utilities @ 16.5 m³ Consumption

To analyze the desired level of fixed versus variable rates, an analysis of the utility's specific situation and priority rate-making objectives was considered. This also specifically considered financial risk, including available cash-on-hand (reserves), seasonal weather variability, level of irrigation users within its overall customer mix, contributed funding from developers to pay for growth, and local economic situation. From a recent fiscal policy review (2015) and financial results from 2016, the following observations are noted:

- Available cash-on-hand was lower than levels preferred as viewed from credit agencies;
- The Utilities had not consistently received off-site levies sufficient to fund growth, which put further rate pressure on current rate-payers; and
- 2016 featured a far more wet summer than previous seasons, which resulted in less irrigation use than previously noted. As a result, lower revenues from the variable portions of the rates were recorded which further stressed the Utilities' overall financial situation.

Additionally, input from a customer engagement study was considered. This noted that 95% of respondents surveyed agreed with the statement "Customers should pay based on the amount of water they use". It was also noted that customers generally don't well understand what specific costs are funded by the fixed portion of the rate. Together, this puts downward pressure on the fixed portion.

With respect to the prioritized rate-making objectives, the possible implications to consider with increasing or decreasing the fixed rates are also noted as follows:

↑ Fixed Rates	<ul style="list-style-type: none"> • Increased revenue sufficiency & predictability • Less incentive for conservation • Less equitable • Reduced administrative burden •
↓ Fixed Rates	<ul style="list-style-type: none"> • Decreased revenue sufficiency & predictability • Greater incentive for conservation • More equitable • Increased administrative burden

Figure 27: Advantages versus Disadvantages of Adjusting Fixed Rates

Based on these considerations, a detailed review of specific cost components to fund through the fixed portions of the rate was performed in the Rate Design phases of the project. It was recommended that the Utilities maintain approximately similar levels of the fixed versus variable rates to increase the extent of revenue predictability and stability across the 2019-2022 business cycle. This will also help enable the development of targeted sustainment reserve levels by the end of 2022. However, once these reserves are better established it is recommended that the Utilities consider opportunities to decrease the percentage of revenues to be achieved through the fixed rate to achieve a greater level of customer equity.