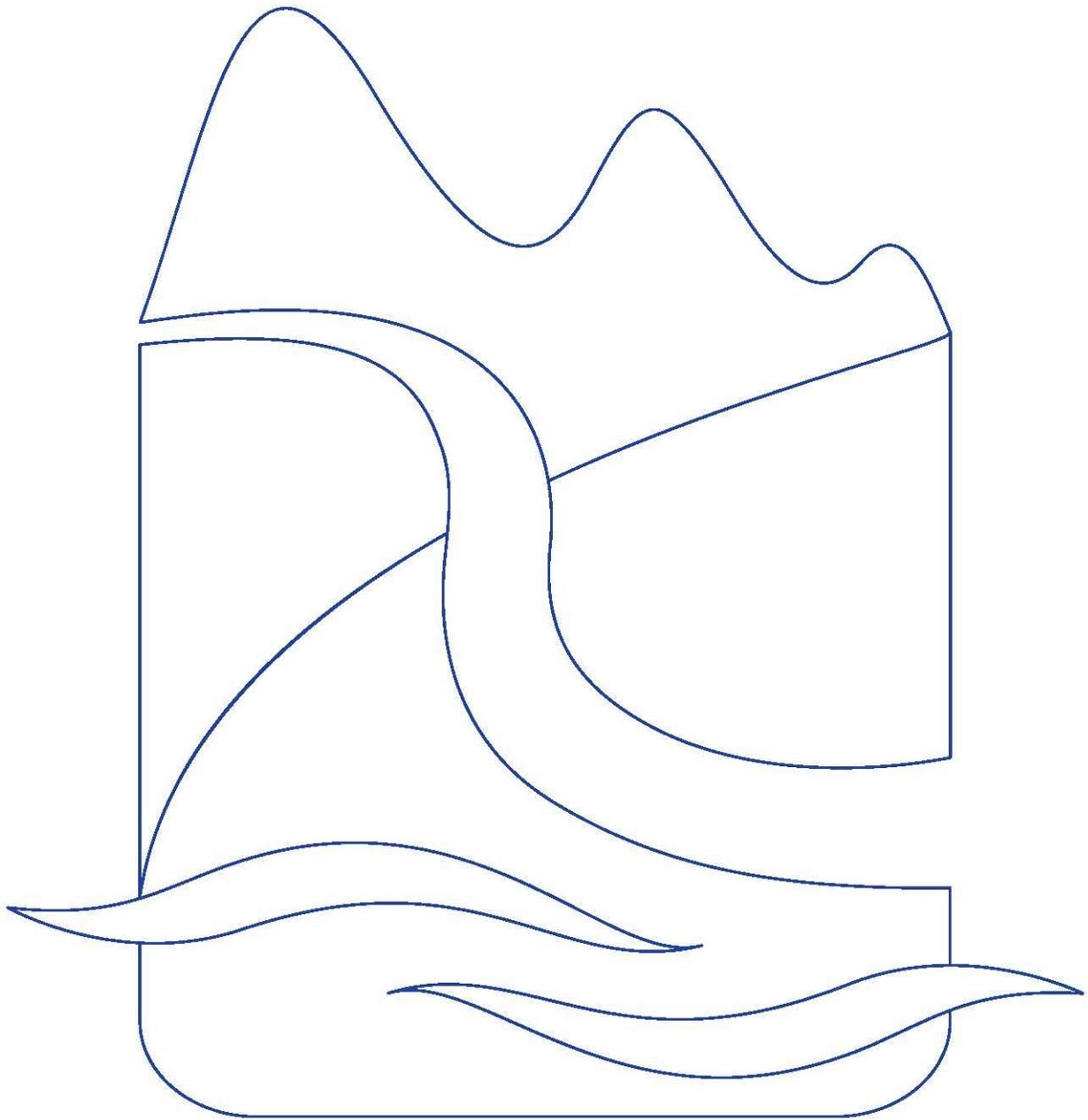




Annual Report | WATER

2012





Introduction

The Annual Water Report is a summary of the City of Campbell River's ongoing effort to achieve excellence through continued responsible operation, monitoring, evaluation, and management of its water system. The intent is to evaluate the previous year's progress and determine how effective the organization is at meeting the current and future needs of the community.



The City is regulated by the Vancouver Island Health Authority as part of the Ministry of Health for its activities as a potable water supplier. The City must meet the requirements set out in the *Drinking Water Protection Act and Regulation* in order to maintain its operating permit and manage the community's drinking water system.

This report aims to provide information to the public, while also acting as a working document for system operators and management staff who are working toward established goals and objectives. Furthermore, by increasing public awareness of both the water system and water services, this report will enable the community to provide educated input on the direction and focus of future initiatives. With understanding and support from the community, the City can work towards its objectives of enhanced water quality and operational efficiency.

Water System Mission Statement

It is the goal of the City of Campbell River to consistently meet community expectations in the cost effective and sustainable delivery of safe, adequate, secure, reliable and aesthetically pleasing potable water.

2012 Highlights

- ✓ 83% of service requests completed within target response time
- ✓ Implemented improved hydrant maintenance program
- ✓ Changed operations to reduce power consumption at Evergreen pump station by 10%, down 54% total since 2008.
- ✓ Initiated redundancy upgrades at John Hart Water Quality Centre
- ✓ Initiated transition to red coloured fire hydrants
- ✓ Developed a taste and odor profile and conducted radiological testing of raw water
- ✓ Replaced SCBAs, and UVT monitors to ensure safety and effective disinfection
- ✓ Installed back-up power device and alarming for Snowden Reservoir
- ✓ Completed a Water System Strategic Action Plan to detail water capital upgrade and expansion plans
- ✓ Completed construction of a new control valve at Rockland and check valve to the 82 meter zone to optimize system capacity in the southern end of town
- ✓ Initiated an update of the Watershed Management Plan
- ✓ Constructed new pressure reducing valve and transmission main for the north Campbell River pressure zone

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Chapter 1 – Operations

Operations Goals

To provide high quality drinking water to all customers through efficient and effective disinfection and distribution operations.

Operations Targets

- To have complete micro-organism deactivation through disinfection
- To meet or exceed the Canadian Drinking Water Quality Guidelines
- To have a minimum 0.20 mg/L free chlorine and no positive bacteria results in the distribution system

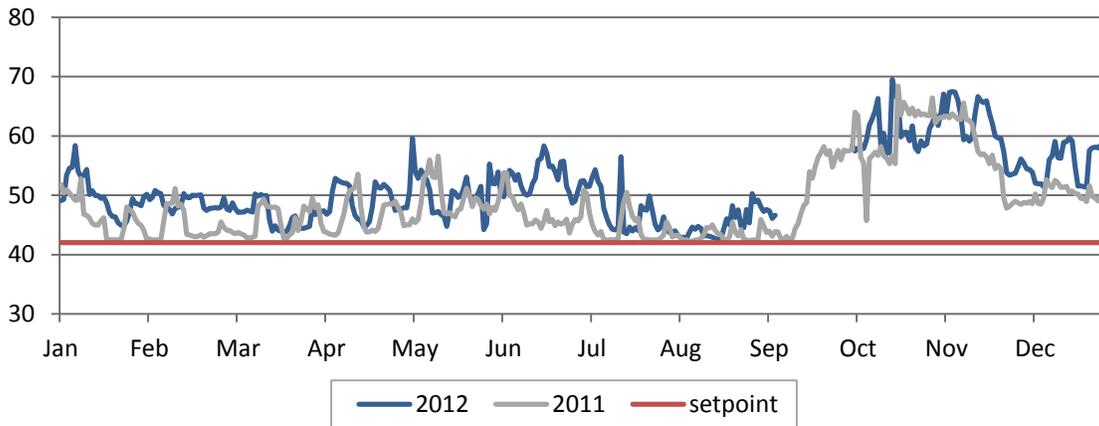
Main Water System		2012	2011	Target
Water Disinfection				
	Ultra Violet Dose (mJ/cm2)	51.39	48.72	> 42.0
	Chlorine Dosing Setpoint (mg/L)	1.10	1.30	< 2.00
	Trihalomethanes (mg/L)	0.028	0.030	<0.080
	Haloaceticacids (mg/L)	0.027	0.012	<0.060
Canadian Drinking Water Quality Guidelines				
	CDWQG chemical parameters (as percent of limit)	100%	100%	< 100%
	Distribution System Turbidity (average NTU)	0.30	0.27	< 1.0
	Distribution System pH Levels	7.29	7.30	6.5 – 8.5
Residual Disinfection				
	Main System (mg/L)	0.61	0.58	> 0.20
	Total coliforms (positive samples)	0	1	0
	E. coli bacteria (positive samples)	0	0	0

Snowden Water System		2012	2011	Target
Water Disinfection				
	Ultra Violet Dose (mJ/cm2)	51.30	52.45	> 42.0
	Chlorine Dosing Setpoint (mg/L)	1.15	1.15	< 2.00
Canadian Drinking Water Quality Guidelines				
	CDWQG chemical parameters (as percent of limit)	100%	100%	< 100%
	Distribution System Turbidity (average NTU)	0.29	0.25	< 1.0
	Distribution System pH Levels	7.62	7.77	6.5 – 8.5
Residual Disinfection				
	Snowden System (mg/L)	0.59	0.60	> 0.20
	Total coliforms (positive samples)	0	0	0
	E. coli bacteria (positive samples)	0	0	0

Water Disinfection - In 2012, the City met the target of 4 log (99.99%) removal of viruses and 3 log (99.9%) removal of Giardia and Cryptosporidium in 100% of raw water entering the main distribution system. This was achieved by dosing with UV light at a minimum of 42 mJ/cm².

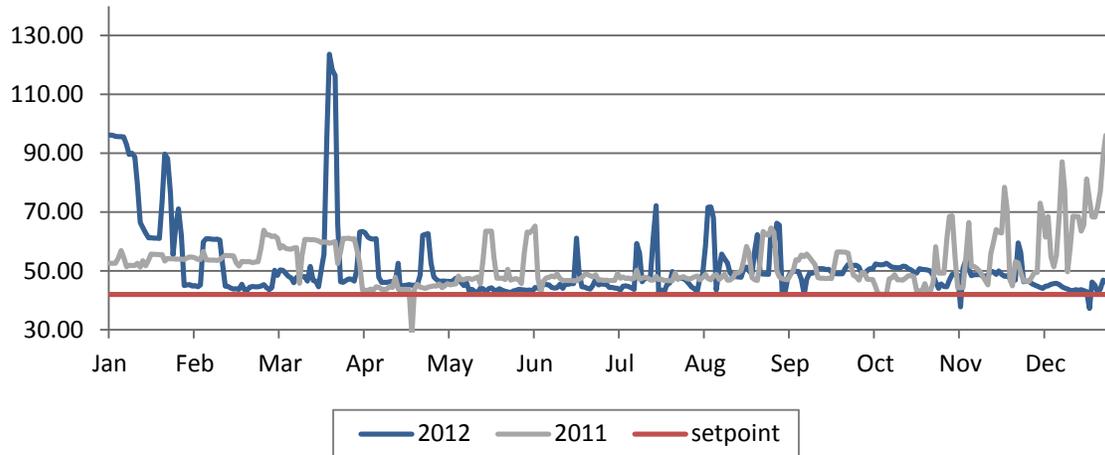


Main System Average UV Dose



The Snowden water system met the disinfection target with the exception of two days in November and December. The low dose on November 6th was the result of maintenance activities. On December 23rd, a power outage and a generator failure coincided to disrupt disinfection. The generator was promptly repaired and disinfection was restored. The failure occurred at night during a period of minimal flow, and all untreated water was flushed from the system.

Snowden Average UV Dose



The City also adds chlorine to the water to ensure there is residual disinfection within the distribution system. The goal of dosing under 2.00 mg/L minimizes the creation of disinfection byproducts. Dosing was reduced to 1.10 mg/L in 2012, down from 1.30 mg/L in 2011. There was a slight reduction in Trihalomethanes, but an increase in Haloacetic Acids. However the recorded levels of all disinfection byproducts were well below the Maximum Allowable Concentration guideline.

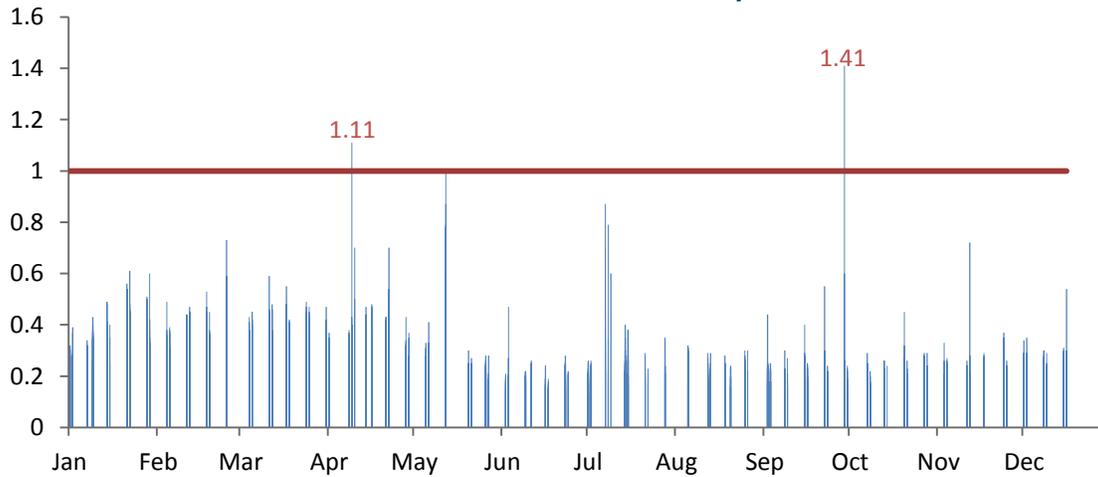
Canadian Drinking Water Quality Guidelines – This system provides aesthetic and human health based guidelines for drinking water quality. Results show that both treated water and source water were significantly under the maximum allowable concentrations (MAC) in the guidelines.

Parameter	Source Avg mg/l	Treated Avg mg/l	Guideline MAC mg/l
Antimony	0.054	<0.0001	0.006
Arsenic	<0.03	0.00009	0.01
Barium	0.0026	0.00243	1.0
Boron	<0.01	0.007	5.0
Cadmium	<0.005	0.00001	0.005
Copper	<0.02	0.0087	≤ 1.0
Chromium	<0.01	<0.0004	0.05
Lead	n/a	0.002	0.01
Iron	<0.03	0.0004	AO ≤ 0.3
Manganese	0.024	<0.021	AO ≤ 0.05
Zinc	0.0042	0.0028	AO ≤ 5.0
Nitrate	0.0085	0.004	45.0
Chloride	n/a	0.05	AO ≤ 250
Selenium	<0.1	0.0001	0.01

Parameter	Source Avg mg/l	Treated Avg mg/l	Guideline mg/l
Hardness	n/a	22.1	
Sodium	0.906	1.176	≤ 200
Sulphate	2.309	n/a	≤ 500
TDS	34.0	29.6	≤ 500
Temperature	(annual average) 10.5	(annual average) 11.1	15.0

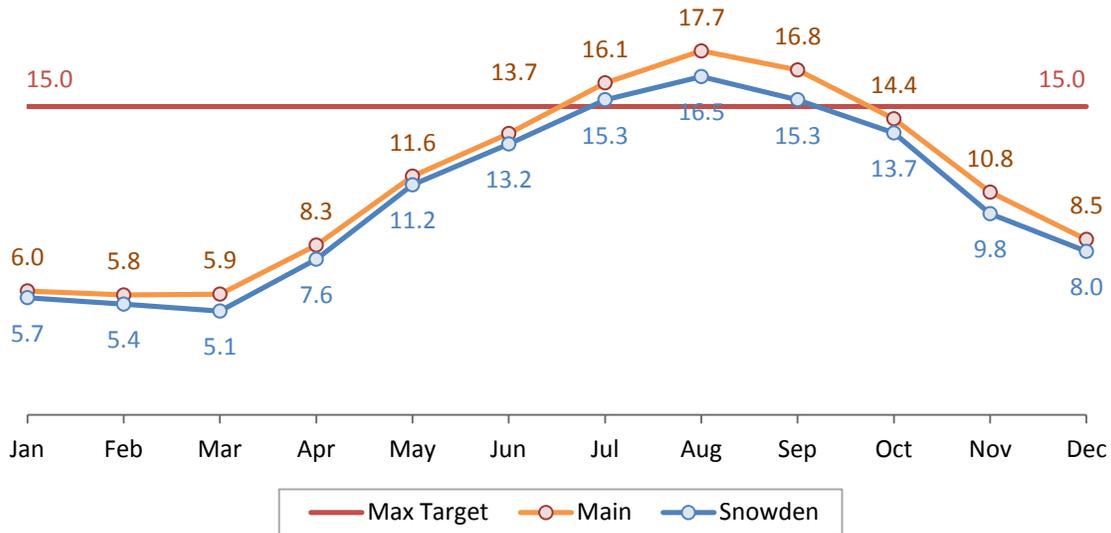
Turbidity – Additionally, the guidelines require turbidity to be below 1 NTU. This requirement was maintained throughout the year with the exception of 2 instances as shown on the graph below. Turbidity in the distribution system is often created by pipe breaks or other high flow events which stir up sediment in the mains. High turbidity recorded in both April and October was directly related to the North Island Highway water main construction project.

Treated Water Turbidity 2012



Temperature – The following chart shows monthly average temperature in both water distribution systems. Distribution temperature is directly impacted by the source lake temperature. As normally occurs during the summer months, average water temperature was over the guideline of a maximum of 15 degrees Celsius. The highest recorded temperature was in the main system and measured 19.2 degrees on August 14th.

Average Distribution System Temperature

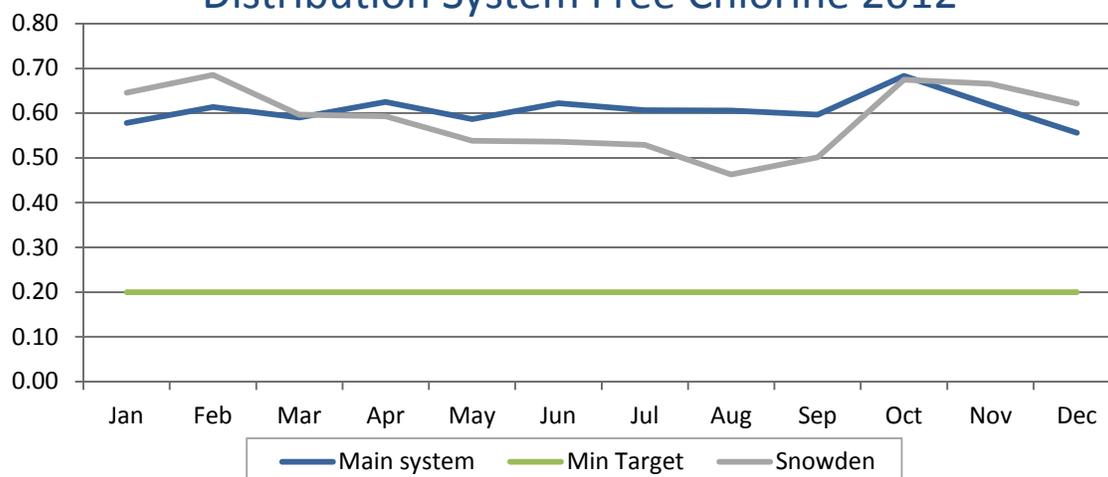


Residual Disinfection – Free chlorine residual prevents the growth of biofilm and creates a barrier against post-disinfection contamination. In 2012, average free chlorine in the distribution system was maintained above 0.20 mg/L. Furthermore, out of 435 samples collected, zero samples tested positive for E. coli.

The risk assessment of the John Hart WQC, completed in 2011, identified deficiencies in the City’s main disinfection facility that need to be addressed to ensure that continuous secondary disinfection is maintained at all times. Redundancy upgrades began in 2012 with the installation of new pipes and a new booster pump.



Distribution System Free Chlorine 2012



Accomplishments

- ✓ Developed a taste and odor profile and conducted radiological testing of raw water
- ✓ Replaced SCBAs, and UVT monitors to ensure safety and effective disinfection
- ✓ Installed back-up power device and alarming for Snowden Reservoir
- ✓ Installed a Beta Test site for a micro-turbine to assess the feasibility of generating power at remote PRV sites

2013 Objectives

- Implement dose reduction at UV facilities
- Complete back-up operation upgrades identified in the JHWQC risk assessment report
- Initiate a bulk valve exercising program and continue hydrant re-colour coding program
- Initiate formal internal cross connection control program
- Install fencing, upgrade intrusion security, and install SCADA control for the Beaver Lodge Forest Reservoir
- Initiate internal water sampling training program
- Review alternate secondary disinfection options

Chapter 2 – Customer Service

Customer Service Goals

To meet our customers expectation for service from their publicly owned utility.

Customer Service Benchmarks

Service Ratios	2012	2011	Comparison
Service Load per Full Time Employee			
Service Requests	66.33	50.80	-
Customer Accounts	1562.1	1396.5	414*
Complaints per 1000 People Served			
Technical Water Quality Complaint Rate	0.87	0.93	0.50**
Customer Service Complaint Rate	0.10	0.13	-
Service Requests per 1000 People Served			
Public Service Request Rate	9.94	11.35	-
Internal Service Request Rate	9.20	4.94	-
Total Service Request Rate	19.14	16.29	-
Service Response Time			
Requests Completed within Target	83%	81%	-

*Source: AWWA, *Benchmarking Performance Indicators for Water and Wastewater Utilities*, 2007.

**National Water and Wastewater Benchmarking Initiative: 2012 Public Report

Service Load - In 2012, the water department received 597 service requests for a total of 14,059 customer accounts. This equates to approximately 66 service requests and 1,562 customer accounts for each full-time employee in the water department. This compares with the average of other similar sized municipalities of 414 customer accounts per full-time employee. FTE total includes all members of the department. The water department experienced a number of staffing vacancies this year, thereby increasing the service load ratios from 2011.

Complaints - The operations center dispatch received 27 water quality complaints in 2012. Using data from the National Benchmarking Initiative, Campbell River is slightly above the median value of 0.50 complaints per 1000 people. Only 3 complaints were related to customer service



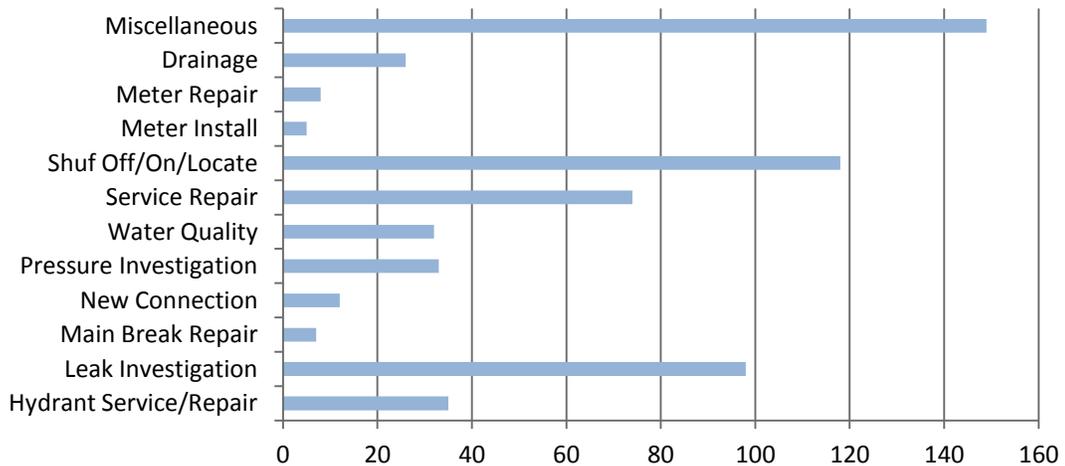
In 2012, the water department continued its program to leave door-hangers at properties where work had been completed. Twelve surveys were returned by the public. The results show

customer satisfaction is high, rating all categories as excellent or above average, except for the overall process for requesting service where 3 responses rated it as ‘Needs Improvement’. The cost for conducting this survey is low and will be continued in 2013.

Service Requests - The water department received 597 service requests in 2012 of which 310 requests were initiated by the public, averaging 9.94 public service requests per 1000 people. The remaining requests were generated from within the City as an organization. Sixty-one percent of service requests were investigations into leaks or other problems, 13.2% were for billed services where all costs for work are recovered, 20.9% were for regular maintenance items and 3.9% for work done for contractors or under service contracts. City crews also responded to an additional 42 requests from the Strathcona Regional District. Work was performed under the contract to provide service to this area.

The City stores all service request information in a database and sorts them into sub-categories for tracking specific job types. These sub-categories are shown in the chart below. Water *shut-offs* and *locates*, *leak investigations*, and *service repairs* account for the majority of service requests. In 2012, the water department began tracking scheduled maintenance under the *Miscellaneous* sub-category, which explains how it has surpassed all other job types. In 2013, this work will be tracked under a new, more specific, sub-category.

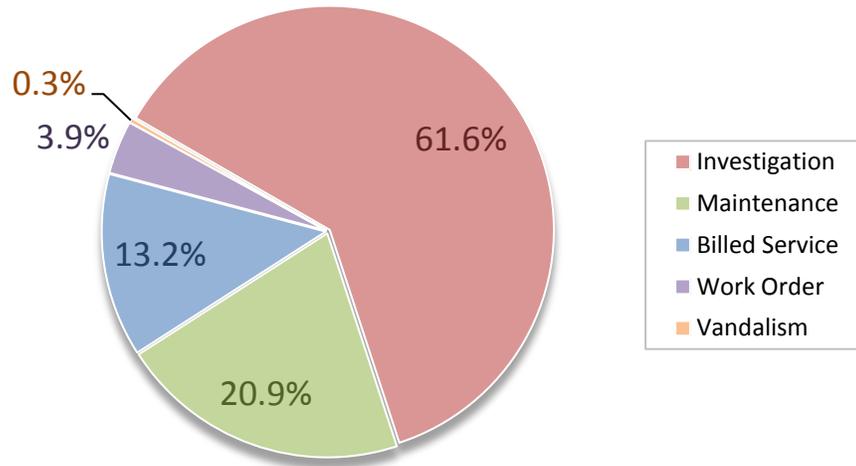
Service Requests by Job type



**Drainage Requests are calls to investigate a reported water leak that turns out to be a drainage issue*

Service Response Time - The goal of the department is to respond to all requests within a timely manner. For all investigations and water quality complaints we strive to complete the work within 72 hours, all repairs within 7 days, and maintenance items within 14 days. These targets can be challenging as they are inclusive of weekends, and depending on when the request is received there may be less time available to meet the target. In 2012, 83% of all service requests were completed within these target time frames. This is slightly higher than 2011 in which 81% were completed within the target.

Service Requests by Category



Accomplishments

- ✓ Increased percentage of service requests completed under target from 81% to 83% despite staffing shortages.
- ✓ Improved internal department education on common water issues
- ✓ Continued an on-going customer feedback program to continually monitor how services are meeting customers' expectations
- ✓ Began providing water quality information through the City's website

2013 Objectives

- Add emailing/online form for service requests on City website

Chapter 3 - Planning

Planning Goals

To ensure effective long-term planning and management programs are in place to meet the needs of all user groups while minimizing operation and infrastructure costs.

Planning Targets

- To avoid filtration and further treatment requirements through watershed protection
- To reduce peak day demand to less than twice the average winter day demand
- To ensure at all times that the full water system can provide a minimum of 120 l/s and 20 psi for fire protection
- To reduce average residential consumption to below the Canadian average
- To have less than the national average of main breaks per 100 km of main per year
- To reduce system leakage to less than 10% of total water draw

		2012	2011	Target	
Watershed Protection					
	Protozoa – Giardia, Cryptosporidium	0	0	0	
	Source Water Turbidity	0.29	0.30	<1.0 NTU	
Water Demand Management					
	Peak Day Demand Ratio	2.04	1.75	<2.00	
	Average Residential Consumption (litres per capita/ day)	451	467	BC	Canada
				353*	329**
System Leakage					
	Leakage (estimated as a percentage of water draw)	15%	15%	<10%	
Infrastructure Integrity					
	Breaks (per 100 km of main)	27.9	32.4	<31.8***	

*Source: BC residential per capita water use. *2011 Municipal Water Use Report*. Environment Canada, 2011.

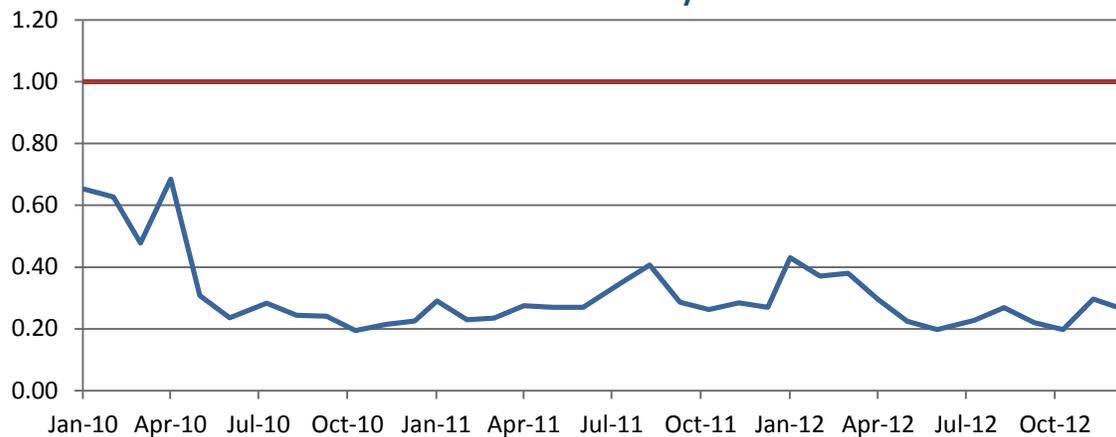
**Source: Average Canadian domestic water use per capita in 2004. Environment Canada, 2012.

***Source: AWWA, *Benchmarking Performance Indicators for Water and Wastewater Utilities*, 2007.

Watershed Protection - The City is able to avoid construction and operation of expensive treatment systems such as filtration by demonstrating effective watershed protection. Although it can be difficult to demonstrate whether protection efforts are effective, we check for degradation by monitoring levels of turbidity and the presence of protozoan pathogens. In 2012, all source water samples tested negative for protozoan pathogens and turbidity remained below 1.0 NTU throughout the year. This indicates that our source water continues to be of a high quality.

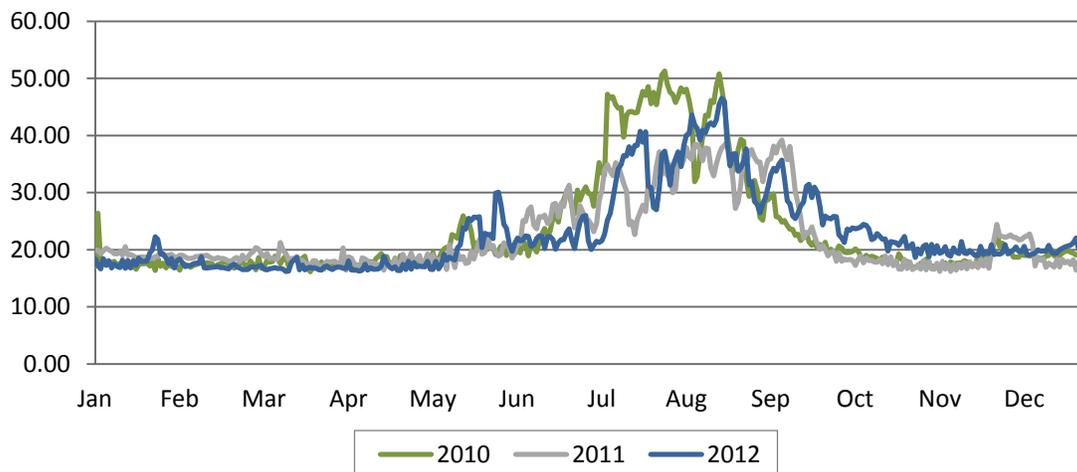


Source Water Turbidity 2010-2012



Demand Management – Water systems must be constructed to meet the community’s needs. The size of infrastructure – reservoirs, treatment systems, transmission mains – is determined based on the peak day demands and fire flow requirements of each customer user group. During winter (October to April) the average daily water demand was less than 20 Million litres per day. The annual average day demand was 23 million liters compared to the peak day on August 18th which was 46.51 million liters.

Total Daily Water Demand (ML/Day)

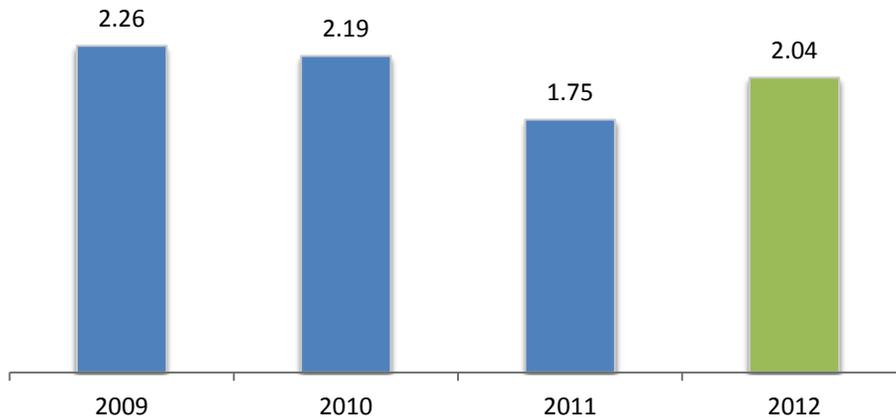


Peak Day Demand (PDD) Ratio – This ratio can be used as a benchmark for successful demand management. The PDD ratio is the difference between peak day demand and average day demand. For example, a ratio of 1 would indicate that water demand remained consistent throughout the entire year. A ratio of 2 would mean that the peak day demand was twice the annual average day demand.

In 2012, the City’s PDD ratio was 2.04 – slightly above the target of 2.00. In Campbell River, this difference indicates increased water demand in the summer months and greater stress on the

capacity of the system. The PDD ratio has been steadily declining for the last three years, but was slightly higher in 2012. Factors which reduce water demand will also lower this ratio such as water-use restrictions, conservation education, and variations in the weather.

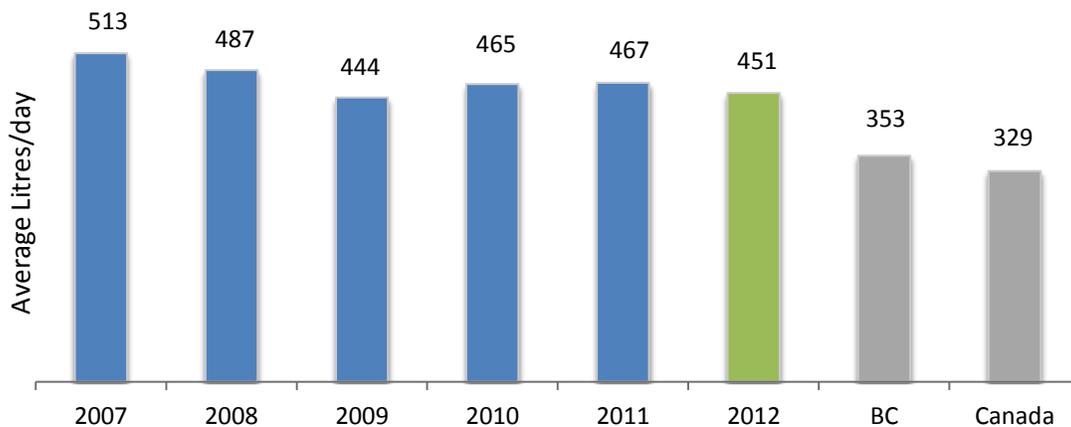
Peak Day Demand Ratio



Public Awareness – Due to budget restrictions the water conservation budget was reduced in 2012. Available resources were focused on watershed awareness and the Watershed Management Plan. The contract educator organized five water tours for local students, and 2 weekend water tours for the public. A number of educational ads were also published in local newspapers.

Average Residential Consumption - The average daily per capita residential demand for 2012 was 451 litres per person per day. This is a 3.5% decrease from last year’s average of 467 litres per person per day.

Residential Demand per Capita

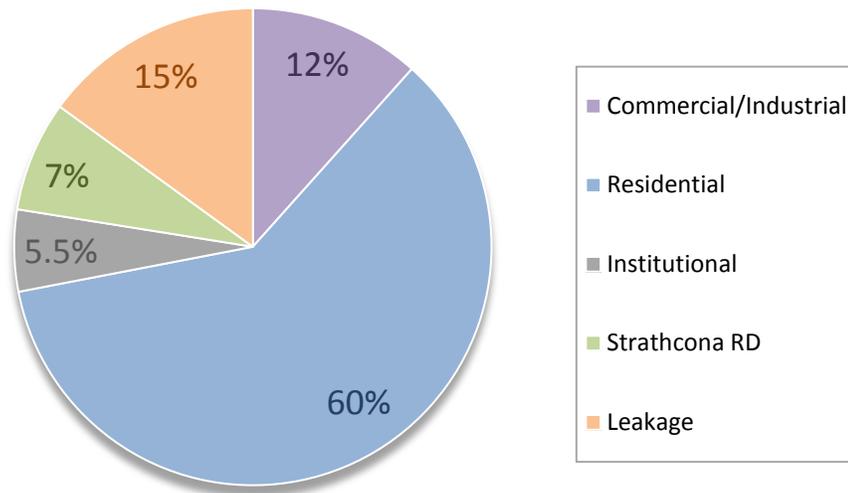


System Leakage - Currently the City has no means of accurately measuring the amount of leakage that occurs in the distribution system. Considering the age and materials used in the

distribution system, it is estimated based on national research that overall system leakage accounts for approximately 15% of total water consumption.

Annual Consumption by User Group – The following chart shows how much of the City’s treated water is consumed by each user group. Industrial, commercial, institutional, and SRD water data is collected from water meters. The residential portion is estimated by subtracting the metered amount and from the total annual demand and assuming that 15% is lost due to leakage. Residential water usage continues to be the main source of water demand at 60%. Likewise, the percentage of commercial and industrial waster use remained the same from 2011.

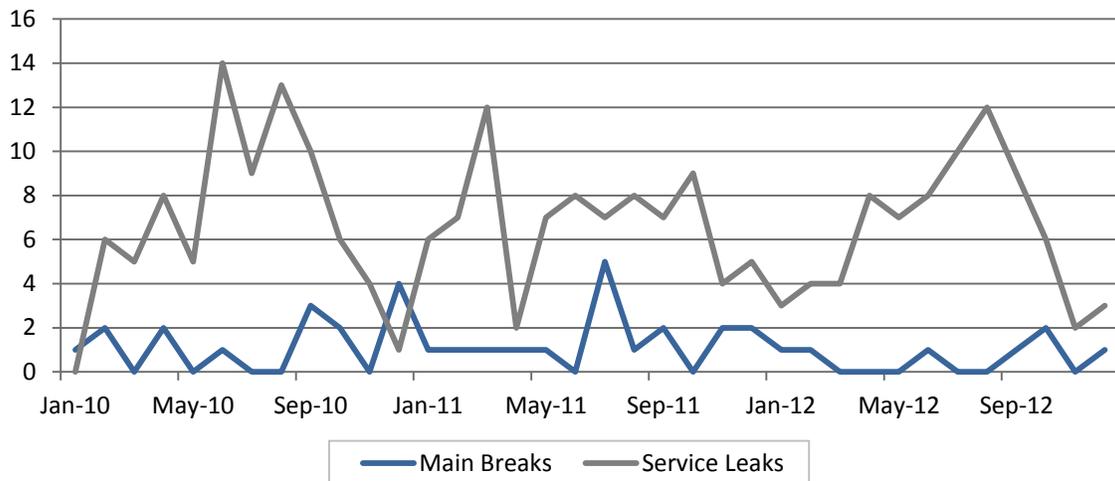
Annual Consumption by Usergroup 2011



**Leakage is estimated at 15% based on literature and review of age and type of infrastructure in City’s water system*

Infrastructure Integrity - Premature infrastructure failure results in excessive system costs, water loss, and water quality problems. Campbell River has 290 km of water main. In 2012, the City experienced 7 main breaks and 74 service breaks. The ratio of breaks to 100 km of water main is 27.9 which is below the number of breaks in 2011, and below the average of similar sized communities at 31.8. Service breaks are often the result of corrosion on aging copper lines. Water main breaks indicate the need to implement a proactive replacement program for aged and failing infrastructure.

Main Breaks and Service Leaks 2009-2011



Accomplishments

- ✓ Completed a Water System Strategic Action Plan to detail water capital upgrade and expansion plans
- ✓ Completed construction of a new control valve at Rockland and check valve to the 82 meter zone to optimize system capacity in the southern end of town.
- ✓ Initiated update to the Watershed Management Plan
- ✓ Constructed new pressure reducing valve and transmission main for the north Campbell River pressure zone

2013 Objectives

- Complete SCADA System Upgrades
- Complete update to Watershed Management Plan
- Initiate design of new water supply
- Conduct internal Water Emergency Response training
- Downtown water main renewal as part of the revitalization project
- Dalton watermain renewal
- Installation of emergency chlorine injection system
- Highway 19A watermain renewal (Pinecrest to Merecroft)
- Design of Dogwood watermain upgrade

Chapter 4 – Finance

Finance Goals

To ensure City of Campbell River water operations are efficient and financially sustainable to minimize cost to customers, and ensure water rates are adequate to cover the cost of operations and capital upgrades.

Finance Benchmarks

Cost Ratios		2012	Comparison
Account Based Cost Ratios			
	Cost of Operation and Maintenance per Customer Account	\$194.95	\$247.00*
Expense Ratios			
	Cost of Operation and Maintenance Expenditures per m3	\$0.32	\$0.35*
	Cost of Treatment per m3	\$0.04	\$0.13*
	Cost of Capital Improvements/Renewal per m3	\$0.33	-
	Total Cost per m3	\$0.69	-
Revenue Ratios			
	Metered Water Revenue per m3	\$0.40	\$1.01**
	Annual Flat Rate Account Fee (including parcel tax)	\$186.00	\$261.50**

*Source: AWWA, *Benchmarking Performance Indicators for Water and Wastewater Utilities*, 2007.

**Source: Civic Info BC, *Water and Sewer Fees, 2010*. <http://www.civicinfo.bc.ca>

Account-Based Cost Ratios - In comparison to an AWWA survey of similar sized municipalities, the average cost of operations in Campbell River is 21% less than the median reported cost in relation to the number of customer accounts.

Expense Ratios - The current metered water rate (\$0.40) is slightly above the City's cost to operate, maintain, and treat (\$0.36/m3). Costs associated with replacing the City's aging water infrastructure are not being recovered under the current rate/user fee system. In comparison to an AWWA survey of similar sized municipalities in the United States and Canada, Campbell River's operation and maintenance costs are below the median reported cost. However, the treatment cost per cubic metre is three times below the median value. This is due to the high quality of our source water and our ability to avoid filtration through watershed protection.



Revenue Ratios - The City of Campbell River charges its metered water customers \$0.40 per m3. The current fee structure does not reflect the true life-cycle costs for the water system as shown in the expense ratios above. Unmetered customers are charged an annual flat fee of \$186. Both

rate systems charge lower fees than other municipalities in British Columbia. Of 28 municipalities surveyed by Civic Info BC, the average water was \$1.01 per m³. The average annual flat rate of 64 municipalities that responded was \$261.50 per year.

Accomplishments

- ✓ Minimized electricity costs through trial power reduction for the pump zone. Power consumption was reduced by an additional 18%.

2013 Objectives

- To update water rates so that revenue more closely reflects the costs of operations and infrastructure renewal
- Implement UV dosing target reductions to minimize electricity costs for UV disinfection

Appendix 1 – Target and Benchmark Details

Benchmark/Target	Method	Data Source
Water Disinfection		
Ultra Violet Dose (mJ/cm2)	Annual Average	iHistorian Database
Chlorine Dosing Set point (mg/L)	-	Operational Procedures
Trihalomethanes (mg/L)	Annual Average	WaterTrax Database
Haloaceticacids (mg/L)	Annual Average	WaterTrax Database
Protozoa - Giardia, Cryptosporidium	Annual Total	WaterTrax Database
Canadian Drinking Water Quality Guidelines		
CDWQG chemical parameters (% of limit)	Annual Average / Maximum Limit	WaterTrax Database
Distribution System Turbidity (NTU)	Annual Average	WaterTrax Database
Distribution System pH Levels	Annual Average	WaterTrax Database
Source Water Turbidity	Annual Average	iHistorian Database
Residual Disinfection		
Main System (mg/L)	Annual Average	WaterTrax Database
Snowden System (mg/L)	Annual Average	WaterTrax Database
Total coliforms	Annual Total	VIHA Summary 2011
E. coli bacteria	Annual Total	VIHA Summary 2011
Service Ratios		
Service Load per Full Time Employee		
Service Requests	Total Service Requests / Number of FTE	Carteaphe Database
Customer Accounts	Customer Accounts / Number of FTE	Carteaphe Database
FTE Total	9	2012 Staffing Level
Complaints per 1000 People Served		
Technical WQ Complaint Rate	WQ Complaints / (Population / 1000)	Carteaphe Database
Customer Service Complaint Rate	Customer Service Complaints / (Population / 1000)	Carteaphe Database
Service Request per 1000 People Served		
Public Service Request Rate	CCR Public Requests / (Population / 1000)	Carteaphe Database
Internal Service Request Rate	CCR Internal Requests / (Population / 1000)	Carteaphe Database
Total Service Request Rate	Total Requests / (Population / 1000)	Carteaphe Database

Service Response Time		
Requests Completed within Target	1. Response Time = [Close Date] - [Observed Date/Time] 2. Requests Completed within Target Hours / Total Requests	Carteographie Database
Water Demand Management		
Peak day demand ratio	Peak Day Volume / Average Annual Day Volume	iHistorian Database: Elk Falls
Average residential consumption	(Residential Annual Consumption / 366) / Population	iHistorian, 2011 Census
City Population	31, 186	2011 Census, Campbell River (City) Subdivision.
Infrastructure Integrity		
Breaks per 100 km of main	(Main Break Repairs + Service Repairs) / (km of pipe / 100)	Carteographie Database
System Leakage		
Leakage as a percentage of water draw	Assumed 15%	-
Cost Ratios		
Account Based Cost Ratios		
Cost of O&M per Customer Account	Total Annual O&M Expenses / Customer Accounts	Vadim
Expense Ratios		
Cost of Operations per m3	(Operations Cost - Treatment Cost) / Total Annual Water Consumption	Vadim
Cost of Treatment per m3	Total Treatment Cost / Total Annual Water Consumption	Vadim
Cost of Infrastructure Renewal Budget per m3	Approved Capital Budget / Total Annual Water Consumption	Vadim
Total Cost per m3	(O&M Cost + Approved Capital Budget) / Total Annual Water Consumption	Vadim
Revenue Ratios		
Metered Water Revenue per m3	Total Metered Water Sales x Metered Water Rate	Tempest, Finance Department
Annual Flat Rate Account Revenue per Average m3	(Flute Rate Accounts x Flat Rate Fee) / Non-metered Water Consumption	Finance Department
Annual Flat Rate Account Fee	Set Value	Finance Department

Appendix 2 – Residential Water Consumption per Capita per Day

Variable	Method / Data Source	Value
Total Annual m3	iHistorian Database	8,352,616.03 m3
ICI	Tempest Database	2,079,415.00 m3
Commercial	-	966,834.00 m3
Industrial	-	12,906.00 m3
Institutional	-	468,039.00 m3
Strathcona RD	-	631,636.00 m3
Residential metered	Tempest Database	133,121.00 m3
Estimated Leakage	15% of Total Annual m3	1,252,892.40 m3
Estimated Residential (unmetered)	Total Annual m3 – (ICI + Leakage)	5,020,308.63 m3
Population	2011 Federal Census, Campbell River (City) Subdivision.	31, 186
Days per Year	2012 Leap Year	366
Residential m3 per year	Residential metered + Estimated Residential	5,153,429.63
Litres per Year	Residential m3 per Year * 1000	5,153,429,625.88
Litres per Day	Litres per Year / Days per Year	14,080,408.81
Litres per Capita Consumption per Day	Litres per Day / Population	451.50

