CITY OF VANCOUVER

ADMINISTRATIVE REPORT

Report Date: October 16, 2015
Contact: Brian Crowe
Contact No.: 604.873.7313
RTS No.: 11121
VanRIMS No.: 08-2000-20
Meeting Date: November 4, 2015

TO: Standing Committee on Planning, Transportation and Environment

FROM: General Manager of Engineering Services

SUBJECT: Greenest City 2020 - Clean Water Work Program

RECOMMENDATION

A. THAT Council approve the 2016-2020 Clean Water Work Program to expand water conservation programs as described in this report, in support of the Greenest City Action Plan Refresh.

B. THAT Council approve a budget increase of $653,500 in Water utility operating funds and $200,000 in capital funds for 5 years (a total of $4,267,500) beginning in 2016. Funding will be initially drawn from the Water Rate Stabilization Reserve, and will be updated as part of the annual budget and Utility Rate Setting process.

REPORT SUMMARY

This report provides an update on the 2011-2014 Clean Water Work Plan and describes a water conservation strategy to guide the next phase of City efforts to reach the Greenest City Clean Water target of reducing per capita consumption by 33% by 2020.

The strategy is based upon lessons learned from the 2015 drought, past projects, market research into barriers and best practices, and consultation with sector representatives. It aims to:

- Support 'water wise' behaviours through a targeted communications campaign,
- Broaden the City's conservation effort to include the Industrial, Commercial and Institutional (ICI) sector, where water consumption has increased,
- Demonstrate corporate leadership in the management of civic facilities, parks and the water distribution system,
- Apply City enabling and enforcement tools (various by-laws and ticketing) to phase out inefficient water fixtures or wasteful behaviour, and
- Enhance monitoring of program effectiveness and consumption trends.

COUNCIL AUTHORITY/PREVIOUS DECISIONS

On December 13, 2011, Council adopted the Greenest City Clean Water Work Program. This work plan established the work priorities from 2011 through to 2014.

On December 13, 2011, Council approved By-law revisions requiring residential water metering for all new single family and duplex properties.

On December 13, 2011, Council approved transition from a uniform volumetric rate for commercial and residential metered customers to a seasonal rate consisting of two different rates for low and high seasons.

On November 27, 2012, Council approved the establishment of a peak and off-peak seasonal rate structure for all remaining metered properties.

On November 27, 2012, Council approved By-law revisions that changed billing frequency to 3 reads and 3 bills per year to align with seasonal rates.

CITY MANAGER'S COMMENTS

Through focused efforts and investments of the Greenest City Action Plan (GCAP) in water conservation and quality significant progress has been made. Despite considerable progress toward achieving GCAP targets, further investment is required to ensure that GCAP targets are met. The Acting City Manager supports the recommendations in this report as important steps to ensure that GCAP water targets are achieved.

REPORT

Background/Context

In 2011, as part of the Greenest City Action Plan, Council adopted two targets to allow Vancouver to have the best drinking water of any city in the world.

Target 1 – Water Quality

Meet or beat the most stringent of British Columbian, Canadian and international drinking water standards and guidelines.

Target 2 – Water Conservation

Reduce per capita water consumption by 33% from 2006 levels.

As part of a companion report in support of the Greenest City Action Plan, Council approved the Clean Water 2011-2014 work plan establishing various work priorities to achieve these two targets.

The following sections describe the accomplishments to date for each target and the lessons learned that inform the next 5 years of the proposed work plan.

Target 1 – Water Quality

Background

The City purchases bulk water from Metro Vancouver to distribute to residents and businesses across the City. The drinking water received from Metro Vancouver is of excellent quality. Metro Vancouver has made significant investment in our water treatment facilities over the last decade with the construction and commissioning of the Seymour-Capilano Filtration Plant. As such, the City's water quality is consistently in compliance with all health based water quality parameters.

The City's role is to ensure that water quality is preserved through the City's own distribution network of 1470km of water mains, more than 100,000 service connections, 6,400 hydrants and 230 water fountains.

The City's Water Quality Program includes extensive testing for microbiological, physical and chemical water quality parameters, as required by Vancouver Coastal Health Authority's Drinking Water System Operating permit. Drinking water samples are collected from fifty-three dedicated sampling stations located in representative locations across the City.

Outcomes of 2011-2014 Work Plan

In 2011, Council approved the Water Quality Work Plan to stay at the forefront of emerging water quality science and industry best practices and expand public access to drinking water.

The 2011-2014 work plan and accomplishments include:

- **Expanding the use of real-time water quality monitoring technology.**
  Two systems are monitoring water quality 24 hours a day for various parameters such as chlorine levels, water pressure and turbidity. On-line monitors are connected to an upgraded radio system providing greater reliability.

- **Continue capital programs to minimize breaks, leaks, and to "loop" dead end water mains to decrease stagnation of water.**
  In this plan period, capital programs have replaced 36km of the most vulnerable mains in the City.

- **Update water system computer model and review water sampling locations.**
  A consultancy to rebuild the City's water system model is underway and is expected to be complete in 2016. The model will enable the use of simulations to predict water quality changes over time and to optimize the hydrant flushing program to use the least amount of water possible.

- **Explore the expansion of the cross connection control program (to protect the water system from contaminants).**
  Current program (resource levels and database tracking) is being reviewed for expansion.

- **Strengthen the City's advocacy and leadership role in regional water quality.**
  Water utility staff are active and, in some cases, have assumed leadership roles on water advisory committees at a regional, provincial and federal level; including as Chairs of the BC Water and Waste Association Cross Connection Control Committee and Canadian Water and Wastewater Water Efficiency Committee.

- **Establish an emerging water quality issues forum with partner agencies and academia.**
  Achieved through participation in associations mentioned above.

- **Eliminate combined sewer overflows at Crowe Street and Burrard Street outfalls.**
  Sewer separation was completed at Crowe Street in 2014. Ongoing work on Burrard Street is required to identify and separate private property services.

- **Develop an Integrated Rainwater Management Plan for the City and the Musqueam Creek watershed.**
  Both the City-wide Integrated Rainwater Management Plan and Musqueam Creek Integrated Rainwater Management Plan, in partnership with the Musqueam First Nation, will be complete by the end of 2016.

- **Continue to increase public access to water.**
  Ten new fountains and two bottle filling stations were installed. Six fountains were replaced with frost free designs allowing year round operation. This increases the City's overall total to 230 fountains.

The City's longstanding water quality monitoring program was expanded through incorporating water quality testing from drinking water fountains and addressing seasonal turbidity fluctuations in several neighbourhoods.

Water quality remains excellent with zero instances of water quality exceedances. The completion of Metro Vancouver's Seymour Capilano Filtration plant provides further certainty that our treated drinking water is of excellent quality and is less susceptible to turbidity caused by storm events.

Results – Target 2 – Water Conservation

Background

The City's objective for water conservation is to promote the sustainable use of our current water supply, aspiring to completely offset population growth through efficient use of drinking water supply to avoid the costs, both economic and ecological, associated with expanding water sources by way of raising dams, flooding watersheds, or upgrading reservoirs.

The Greenest City target of reducing total per capita water consumption by 33% from 2006 levels supports this goal.

Water conservation programs have been in place since 1996 largely focussing on education and awareness relating to residential outdoor water use and lawn watering. The 2011-2014 program broadened the scope to further encourage water efficiency.

The 2011-2014 water conservation work plan details and accomplishments include:

1. **Expanding Water Meter and Pricing Policy:**
   In 2012, water meters became mandatory for all new services for single/dual family dwellings which resulted in approximately 1000 new meters installed per year. 4% of single family/dual family homes are now metered. Further, all metered customers are charged seasonal rates - a 25% premium during the peak summer months (June to September) - to influence discretionary outdoor uses.

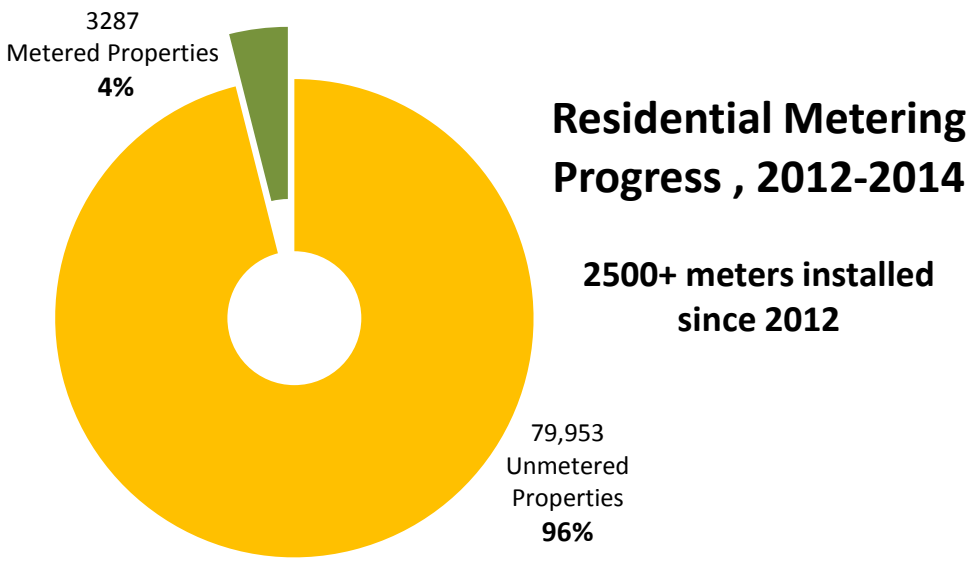

Figure 1 – Progress of Residential Metering (2012-2014)

2. **Education, Awareness and Behaviour Change**
   Efforts to increase awareness and educate the public were significantly increased during the 2011-2014 period.

   Outreach was achieved through an increased website presence, promotion of water efficiency tips and programs through social media (Facebook, Twitter), and public presence and promotion of the conservation program at community events.

   A number of educational programs directly targeting specific interest groups included:
   - 3 seasonal offerings of Water-wise Garden Parties for home gardeners & their social networks,
   - Annual School Plays and in-classroom Workshops,
   - Green Plumber Training,
   - Development of Waterwise gardening tips with Van Dusen Master Gardeners, and
   - Community-based rain barrel sales.

3. **Designation of water related bylaw infractions as Ticketable Offences**
   Willful wastage of water and non-compliance with water restrictions were designated as ticketable offences. Bylaw officers patrol regularly in the peak season when water restrictions are in effect. Typically about 50 tickets are issued each year, with the exception of the 2015 drought year in which 419 tickets were served.

4. **Partnerships with utility companies for water efficiency through rebate and retrofit programs**
   Programs were successfully delivered with various partners, including BC Hydro and Fortis BC.

   For the residential sector, over 200 washing machine rebates and 1500 high efficiency toilet rebates have been issued to date, through a partnership with BC Hydro and the Green Landlord Program, respectively.

In the commercial sector, over 2000 water fixtures in restaurants were replaced and 450 water audits conducted.

5. **Advanced water system leak detection and repairs**
   Three advanced leak detection technologies were piloted over the last several years, which use video or acoustics to detect underground leaks, allowing Operations staff to perform repairs to reduce system water losses. The Operational Proactive Leak Detection program has been expanded to cover one half of the City's water system annually, increased from one third.

Conservation Results

Overall, through implementing the above programs to complement existing programs, Vancouver has reduced its total per capita water consumption by 16% from 2006 levels. Although this is still on pace to meet target, water consumption in recent years has been atypical compared to the trend over the last decade. Between 2013 and 2014, total consumption actually increased 4%, with greatest increases seen in the ICI sectors, largely due to economic growth, increased tourism, and expansion of some institutional facilities.

This flattening trend has prompted an analysis to reveal the drivers, and to determine how to intensify the City's water conservation efforts.

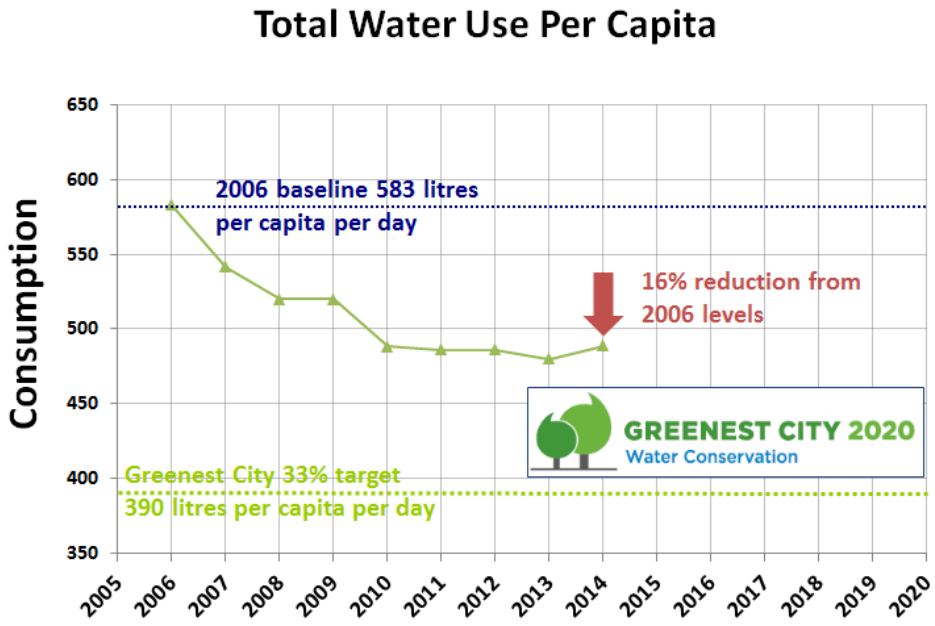

Figure 2 - Total Water Use Per Capita Trend (2006-2014)

Lessons Learned 2011-2015 – Challenges & Opportunities

Over the last four years important lessons have been learned that form the rationale for the proposed 2016-2020 work plan.

1 Articulating the Value of Water, Encourage Water Efficient Behaviour

1.1 Learning: Convey the value of water, the limitations of our current supply, and the economic and ecological costs associated with inefficient water use.

A broad, strategic messaging campaign across traditional and social media is necessary to reinforce the value of our water and the infrastructure that supports its use.

An overall key finding resulting from City led focus groups, surveys, and consultation with a cross-industry advisory group is that while Vancouverites are motivated to conserve water as part of their commitment to sustainability, customers report no financial incentive to conserve because they either don't pay for water on a volume basis, or the low cost of water does not provide a significant incentive.

Additionally in a rainy city like Vancouver, the need doesn't feel pressing. Residents report health and appearance of their yard as the motivator for irrigating but often the amount of water used is based on a 'gut feeling'.

1.2 Learning: Leverage public awareness and response to the 2015 drought

The opportunity exists in the near term and on an ongoing basis to support the adoption of water efficient behaviours inspired by recent drought conditions.

The public response to the drought conditions of 2015 illustrates the broad adoption of suggested behaviour change when an objective is well understood and a sense of urgency is developed. This was achieved through consistent and frequent messaging.

The broad media coverage of escalating water restrictions and daily monitoring of regional demand and supply levels elevated water consumption to the top of mind for many citizens. During Stage 3 water restrictions, when outdoor water uses were either banned or severely restricted, water demand was reduced by 25%. This effectively reduced water demand to near winter levels.

A further indication of a motivated and responsible public were the number of 3-1-1 interactions where up to 600 calls a day were received on water related topics, representing a ten-fold increase from previous years. By the end of the season, over 7000 warning letters and 419 tickets were issued, reflecting a similar ten-fold increase.

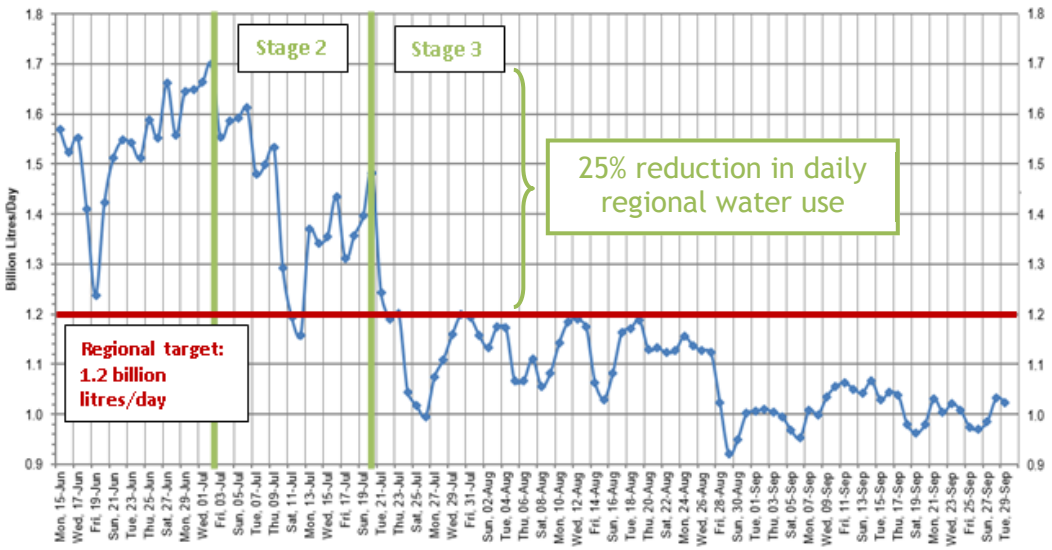

Figure 3: Regional Daily Consumption June 15 to September 29, 2015

2 Learning: Capitalize on Opportunities Beyond the Single Family Residential Sector

Historically, the City's water conservation focus has been on the single/dual family residential sector. Since 2011, water meter policy, seasonal pricing, lawn watering education/enforcement and rain barrel sales have targeted this segment of water use. While there remains opportunities in this sector to leverage greater efficiency (old fixture replacement, irrigation practices, behaviour), it is recommended that a greater intensity be directed toward the other sectors of water use who, as a group of customers, represent over two thirds of water usage in the City.

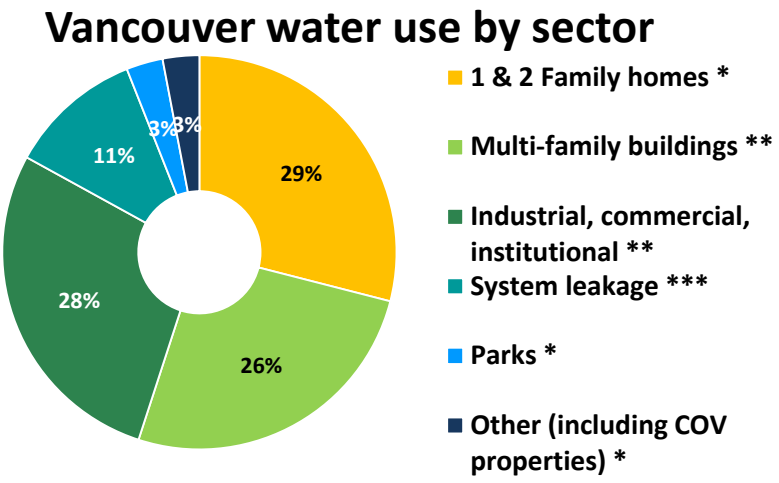

Figure 4: Vancouver Water Use by Sector 2014
***partially metered, ** fully metered, ***unmetered**

2.2 Intensify Conservation Efforts in Industrial, Commercial and Institutional Sectors

Since 2013, water use in the industrial and institutional sectors has increased by over 10%. In the commercial sector, total water use has increased by 25%. A review of accounts and assessment of economic factors have shown that these increases are largely due to a rise in tourism, economic growth, and expansion of institutional facilities. Discussions through focus groups with sector stakeholders and a review of best management practices of other jurisdictions leading in conservation policy have indicated that a hands-on, customized approach through water use audits and tailored rebates, is recommended for these customers.

2.3 Reducing Corporate water use

The City as a policy maker and owner/operator of public facilities has an important role in demonstrating leadership in water use, through the adoption and achievement of a corporate water reduction target of at least 33%. Doing so reinforces the City's credibility and drives new standards and practices throughout the organization.

It is estimated that non-revenue water use (Civic Facilities, Parks, and water system operations) represents up to 17% of total water use. The majority of this is attributed to system leakage in the vast pipe network of the water system, which can be reduced but not completely eliminated. Many other opportunities are available to reduce corporate water use at our facilities and within our operations.

During the drought many great examples of leadership were shown by City staff and appreciated by the public, including: minimizing irrigation of playing fields; using reclaimed or untreated water for operational uses such as tree watering, lane flushing, and cleaning street furnishings; and ceasing to top-up naturalized water features with potable water (at Lost Lagoon, Trout Lake and Charleston Park). These examples and other opportunities to offset drinking water use should be reviewed and incorporated into day-to-day operations.

2.4 Opportunities in multi-family dwellings with fixture retrofits or rebates

Through progressive building code requirements, high efficiency fixtures including toilets have been the standard in the City of Vancouver since 1994 and in the Provincial Building Code since 2011. All toilets sold in B.C. must now meet water-efficiency standards. As such, most municipalities across the region have either cancelled or are considering canceling toilet rebate programs. Rebates are no longer seen to provide incentives for citizens to replace toilets; they are now generally seen as an unnecessary municipal subsidy.

With the building code and point-of-sale standards in place to mandate efficient toilet replacement, a targeted approach is required to expedite retrofits where the market isn't driving it already, particularly in rental buildings and low-income housing.

Over the last several years, toilet rebate programs for property owners that control large numbers of residential units has been successful. A single or dual family residential toilet rebate program will also be considered as a part of the work plan.

3 Advanced Metering & Pricing Policy

3.1 Early indication that metering SF/DF homes results in water efficiency. Detailed feasibility study is required.

In addition to improving billing equity and providing meaningful feedback to customers, the mandatory metering policy for single and dual family residences was expected to promote water efficient behaviour. A review of various case studies of jurisdictions across North America that have implemented universal metering led to the expectation that water savings between 15% and 30% would typically result in Vancouver. A detailed comparison of consumption between newly metered properties in Vancouver to the average consumption of a flat rate customer in a sample residential neighbourhood of 3000+ homes provides evidence that savings of at least 22% are indeed realized.

While the results cannot be broadly applied across the entire City yet (due to the small sample size), there is enough supporting evidence to warrant a detailed feasibility study to explore the costs and benefits of various means to accelerate installation of water meters on the remaining unmetered service connections.

Proposed Clean Water Work Plan 2015-2020

Based on lessons learned to date, the proposed 2016-2020 Clean Water Work Plan recommends a targeted approach to increase water efficiency across the City. Connecting these initiatives is a communication campaign that promotes the value of our drinking water and encourages conservative use within each sector to meet our Greenest City goals. Progress will ultimately defer costly expansion of our regional water supply.

Target 1: Water Quality

The proposed Water Quality Work Plan for 2016-2020 includes enhancements in maintaining high-quality drinking water through water system management, and continued effort in the protection of our receiving waters, as described below:

- Continue capital programs to minimize breaks, leaks, and to “loop” dead end water mains to reduce residency time of water in the distribution system before reaching customers.
- Use the completed water system computer model to review water sampling locations and proactively identify neighbourhoods that could be susceptible to seasonal fluctuations in water quality and to update the water main cleaning strategy.
- Complete and adopt the recommendations from the review of the cross connection control program.
- Strengthen the City’s advocacy and leadership role in water quality through participation and assuming leadership roles in industry associations.
- Eliminate combined sewer overflows at the Burrard Street outfalls.
- Complete and practically implement recommendations from the Integrated Rainwater Management Plan for the City and the Musqueam watershed.

Target 2: Water Conservation

The Water Conservation Work Plan for 2016-2020 includes a doubling of effort to expand the water conservation program through the various programs listed below, leveraging partners and grants, wherever possible:

Residential

- Accelerate retrofits with high-efficiency toilets, fixtures and appliances in older building stock through targeted rebate/grant programs in rental and low-income buildings.
- Continue to provide education and enforcement of the region-wide water restrictions, and encourage best practices (outdoor and indoor uses) through a communications campaign and providing incentives such as rain barrels.
- Conduct a detailed feasibility study to explore the costs and benefits of various means to accelerate the installation of water meters on the remaining unmetered single-family service connections.

Industrial, Commercial and Institutional (ICI) Sector

- Develop an audit and customized rebate program for customers.
- Investigate policy and program tools to phase-out single pass cooling and refrigeration systems.
- Continue to work with emerging industries (for example, the BC Craft Brewers Guild) to develop Best Management Practices for water and wastewater.

Corporate Water Use and Water System

- A Corporate Water Use Reduction target of 33% has been adopted. The proposed work plan includes reducing water wastage through elimination of single pass water features, retrofitting civic facilities with high-efficiency fixtures, metering and ongoing monitoring of water usage, and exploring sources of untreated water for civic operations.
- Improve management of the water system through an expanded leak detection program and pressure management.

Program Validation

To assess the robustness of the proposed water conservation programs, an expert consultant in water demand-side management programs was commissioned to conduct a national comparative scan of best management practices and identify gaps in Vancouver's proposed plan. Vancouver's proposed strategies were deemed robust and mature. It was also indicated that certain tools, such as the adoption of conservation oriented pricing and advanced water loss management were not possible in a partially metered system.

Although the acceleration of metering and adoption of conservation pricing are not currently proposed for this phase of the strategy, a detailed feasibility study is recommended to be completed in 2016 to be considered for future years.

Financial Implications

The following table summarizes the capital and operating budget requests associated with delivery of the Clean Water Work Program 2016-2020, as described in this report.

Greenest City Clean Water Work Program Proposed Budget 2016-2020				
Sector	**Action**	**Metrics**	**Water savings percent by 2020**	**Annual Program cost**
Residential	Natural fixture replacement/Redevelopment (no action required)	Rate of Renovations	9%	N/A
	Metering of new homes	1000 homes per year		Recovered through fees
	Outdoor water education/enforcement	2 dedicated enforcement officers, supporting clerk		$140,000
	Toilet and Showerhead retrofits - Rental and Low-income buildings	1000 toilets per year		$100,000
	Partnerships with utilities (various incentives/rebates)	rebates per year		$10,000
	Rain Barrel Truckload sales	400 rain barrels per year		N/A
	Irrigation policy and incentives (eg. rain sensors)	2017 work plan		TBD
Industrial & Commercial & Institutional	ICI audit and custom rebates/grants	15 audits and incentive package per year	3.6%	$165,000
	Account Manager for major accounts	Uptake of ICI programs		Existing Resources
	Once through cooling rebates	30 rebates per year		$75,000
	Working with emerging industries (including BC Craft Brewers Guild) to develop Best Management Practices	N/A, metered data closely monitored		Existing Resources
Civic Use (Parks, Facilities, Water System)	Once through systems/Ornamental fountains	3 fountains retrofitted per year	2.4%	$75,000
	Eliminate potable water to natural features	4 lakes/creeks per year to allow for monitoring		$100,000
	System leak detection; reducing response time to leaks	Increase frequency		$390,000
	Retrofit with high efficiency fixtures (faucets, toilets, and showerheads)	250 retrofits per year		$76,500
	Metering of connections	89 properties over 3 years, select Parks connections in years 4 & 5		$100,000
All	Communications Campaign	TBD	2%	$30,000
	Program Support (Monitoring of consumption across all sectors, reporting, program support)	N/A		$102,000
	Feasibility Study - Accelerate Water Metering, Pricing	N/A	TBD	Existing Resources
TOTAL			17%	$1,363,500

A total budget increase of $653,500 in operating funds for the next 5 years (total of $3,267,500) is required to deliver the proposed Clean Water Work Program from 2016-2020. An additional $200,000 is also required annually in the capital budget for the next 5 years (total of $1,000,000) to replace leaking services discovered by the expanded leak detection program.

The proposed funding source is the Water Utility Rate Stabilization Reserve. An investment in water conservation measures from the Stabilization Reserve will reduce bulk water purchases and defer large capital upgrades associated with increasing regional water supply in the long term. The annual budgetary impact is summarized in the table below. It is projected that the savings resulting from the increased water efficiency across all sectors will offset the cost of the expanded programs.

Table 1 – Clean Water Work Program 2016-2020

	2016	2017	2018	2019	2020	
Operating Budget Increase	$653,500	$653,500	$653,500	$653,500	$653,500	
Capital Budget Increase	$200,000	$200,000	$200,000	$200,000	$200,000	**2016-2020 Total Program Funding**
Total	$853,500	$853,500	$853,500	$853,500	$853,500	**$4,267,500**

Water purchases in 2015 are forecasted to be $72.4M and based on the initiatives contained in this report Table 2 outlines expected cumulative benefits from water conservation.

Table 2 – Projected Cumulative Water Purchase Savings 2016-2021

	2016	2017	2018	2019	2020	2021	Ongoing Annual Savings
Cumulative Savings (avoided bulk water purchase)	$400,000	$1,400,000	$2,200,000	$3,000,000	$3,800,000	$4,600,000	**$4,600,000**

The work program budget presented above is based on projected uptake and efficacy. Performance will be reviewed on an annual basis and program budgets may require adjustment to continue to achieve the greatest water saved per dollar of program funding to meet water conservation targets. Budget adjustments, and adjustments to the Stabilization Reserve, if necessary, will be brought forward to Council as part of annual budget and Utility rate reports process.

Human Resources/Labour Relations

The Proposed Clean Water Work Program will require both seasonal and temporary full time staff, as well as, assistance by consultants and contractors, where necessary. Positions will be subject to classification by Human Resources. Hiring of consultants and contractors will be supported by Supply Chain Management.

Environmental

The proposed Clean Water Work Program will ensure that residents will continue to have access to high quality drinking water and enable the City to assume a leadership role in water quality advocacy. Further, the City will expand water conservation efforts across all sectors of water use to meet the Greenest City target of reducing total per capita water consumption by 33% from 2006 levels. These efforts will allow all water demands of projected population growth to be addressed from existing sources, providing a less costly alternative to expanding water supplies. In addition, this will make Vancouver one of the most water efficient cities in North America.

CONCLUSION

The report provides a proposed strategy to reach the 2020 targets in the City's Clean Water Greenest City Action Plan 2020 and the goal of having the best drinking water in the world

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